Chapter 5 Airport Construction Guidelines

In This Chapter
• What are the standard procedures for initiating a construction project at the state-managed airports? • What are the airport security guidelines? • What are some of the specific design requirements for airside facilities on the airports? • What are some of the specific design requirements for landside facilities on the airports? • How do we deal with vegetation on the state-managed airports? • Where can more information about these topics be found?

As the Washington State Department of Transportation (WSDOT) continues to improve its existing infrastructure and services, the department must be mindful of local, state, and federal considerations and requirements. Construction and alteration guidelines applicable to WSDOT's state-managed airports are discussed within the following sections in this chapter. Reference material and specific procedures are clearly noted.

It should also be noted that the WSDOT Aviation Airport Manager (referred to herein as the Airport Manager) has the ultimate responsibility for ensuring that the sections within this chapter are practiced, maintained and updated.

Additionally, it is important to note that construction on and around the state-managed airports could require construction permits, environmental permits, etc. As such, it is critical that prior to any construction project occurring at any of the state-managed airports, the Airport Manager must coordinate with the WSDOT Aviation Planner and WSDOT Environmental Services to ensure that all required permits are considered and appropriately obtained.

Section Contents

Make Sure

- Check that the sections are current!
- Do they need to be updated?

Key Section Dates

Information is only as good as its current relevance. Therefore, it is important that the information contained within this chapter be updated on a regular basis to ensure that it remains appropriate to current conditions. The following table presents the dates that each section was formally adopted by WSDOT Aviation, as well as the scheduled date for the next internal review of each section to ensure its currency.

Section	Current Date	Scheduled Review Date
5.1 What Are WSDOT Aviation's General Design Development Considerations	7/1/10	6/1/11
5.2 What Are the Airport Security Design Guidelines	7/1/10	6/1/11
5.3 What Are the Airport Design Guidelines for Airside Facilities	7/1/10	6/1/11
5.4 What Are the Airport Design Guidelines for Landside Facilities	7/1/10	6/1/11
5.5 What Are the Airport Vegetation Design Guidelines	7/1/10	6/1/11
5.6 What Are the Airport Aids to Airman Design Guidelines	7/1/10	6/1/11
5.7 Chapter References and Supporting Documentation	NA	

5.1 What Are WSDOT Aviation's General Design Development Considerations

Construction activities on and around the state-managed airports involve a number of processes and considerations that must be examined as part of any WSDOT Aviation project. This section generally describes or provides references for key considerations involved in construction activities.

WSDOT Aviation Standard Procedures
1. Project Scoping
Scoping of a construction project requires a thorough review by WSDOT Aviation. Specific details related to project scoping procedures can be found under Section 7.4.
2. Purchasing and Procurement
Any construction-related purchasing or procurement related to a construction scope of work shall abide by standard WSDOT Aviation procedures. Specific details related to purchasing and procurement can be found under Section 7.4.
3. Environmental Considerations
All construction projects shall appropriately consider relevant environmental factors per WSDOT Aviation requirements. Specific details related to environmental considerations can be found under Section 6.3.

4. Building Construction or Modification

Compliance with all building construction or modification will meet the standards and requirements of RCW 19.27.031 to include:

a. (1) The International Building Code, published by the International Code Council[,] Inc.

(2) The International Residential Code, published by the International Code Council, Inc.

b. The International Mechanical Code, published by the International Code Council[,] Inc., except that the standards for liquified petroleum gas installations shall be NFPA 58 (Storage and Handling of Liquified Petroleum Gases) and ANSI Z223.1/ NFPA 54 (National Fuel Gas Code).

c. The International Fire Code, published by the International Code Council[,] Inc., including those standards of the National Fire Protection Association specifically referenced in the International Fire Code: PROVIDED, That, notwithstanding any wording in this code, participants in religious ceremonies shall not be precluded from carrying hand-held candles.

d. Except as provided in RCW 19.27.170, the Uniform Plumbing Code and Uniform Plumbing Code Standards, published by the International Association of Plumbing and Mechanical Officials: PROVIDED, That any provisions of such code affecting sewers or fuel gas piping are not adopted.

e. The rules adopted by the council establishing standards for making buildings and facilities accessible to and usable by the physically disabled or elderly persons as provided in RCW 70.92.100 through 70.92.160. In case of conflict among the codes enumerated in subsections a., b., c., and d. of this section, the first named code shall govern over those following.

5. Electrical Work, Maintenance, and Installation

All electrical work, apparatus, maintenance, and installations shall meet the requirements of WAC 296-46B. All electrical work performed shall also be inspected by the WA Dept of L&I or local authority having jurisdiction.

6. Specifications Overview

WSDOT Aviation does not have any state-managed airport-specific construction specifications or requirements currently established. This is due primarily to the fact that there are multiple federal, state, and industry resources currently available for such specifications and that these types of specifications can change rapidly, given the constantly evolving airport regulatory environment. As such, WSDOT Aviation has elected to utilize current federal, state and industry specifications to the greatest extent possible; this is reflected in the following sections of this chapter. If appropriate specifications are not available from any of these resources, WSDOT Aviation will establish additional specifications on an as-needed basis.

The following sections within this chapter contain references to appropriate construction specifications. *Note:* Unless there is a specific WSDOT Aviation specification established, employment of the specifications listings will be at the discretion of WSDOT Aviation.

7. General Standardized Engineering Drawings

The WSDOT Design Standards Team provides graphical support and develops and maintains *Standard Plans* M 21-01 and a Plan Sheet Library. These support documents contain general standardized engineering drawings for a range of applications including fence and sign installation, drainage structures and roadways. Each drawing has been prepared under the direct supervision of a professional engineer, licensed in the state of Washington, knowledgeable in the specialized field of civil engineering depicted in that drawing. The Washington State Department of Transportation (WSDOT) makes these documents available on an "as is" basis. All warranties and representations of any kind with regard to said documents are disclaimed, including the implied warranties of merchantability and fitness for a particular use. All CAD files were created with Bentley MicroStation (*.dgn files). WSDOT does not warrant the documents against deficiencies of any kind. Although the *Standard Plans* and Plan Sheet Library do not include specific airport-related construction drawings, this is a resource that should be reviewed by WSDOT Aviation when developing construction plans and projects.

5.2 What Are the Airport Security Design Guidelines

In order to provide airport users with safe and secure facilities, careful attention should be made regarding the design of access controls such as perimeter fencing and gates. It is important for WSDOT Aviation to utilize specific procedures in determining the type, size, and number of access controls (fencing and gates) at their airports. ***Note:*** The type and extent of these controls will be dependent on the type of airport, its location, and the perceived security risk.

State-managed airports that are included in the FAA National Plan of Integrated Airport Systems (NPIAS) are obligated to abide by FAA design specifications, as reflected below. While it would be ideal for the non-NPIAS state-managed airports to abide by the same requirements, this is not always practicable. As such, some additional WSDOT Aviation design specifications are provided below.

Note: All construction related to airport security shall be consistent with the WSDOT Airport Security Guidelines and applicable airport security plan developed pursuant to Section 3.6.

Wildlife and Security Fencing

Wildlife and security fencing, the most common means of securing an airport perimeter, can vary in design, height, and type depending on airport needs. Typically, fences are low-maintenance, provide clear visibility, and can be installed in almost any environment. Barbed wire, razor wire, and other available features increase intrusion difficulty.

While fencing is normally the most effective physical barrier for securing the airside, fencing an entire perimeter may not be economically feasible or even necessary for many airports. Partial fencing of sensitive areas such as the terminal area, aircraft storage, or maintenance areas may be more appropriate and can prove to be just as effective. The physical security barrier provided by a fence provides the functions listed in the following table.

Wildlife and Security Fencing Primary Functions	
A	Gives notice of the legal boundary of the outermost limits of a facility or security sensitive area.
B	Assists in controlling wildlife intrusion and or screening authorized entries into a secured area by deterring entry elsewhere along the boundary.
C	Supports surveillance, detection, assessment, and other functions by providing a zone for installing detection equipment and closed-circuit television (CCTV).
D	Deters wildlife and/or casual intruders from penetrating a secured area by presenting a barrier to the airfield.
E	For security it demonstrates the intent of an intruder by their overt action of gaining entry.
F	Creates a psychological deterrent.
G	Demonstrates a corporate concern for facility security.
H	Provides a cost effective method of protecting facilities.

Following are fencing features that address wildlife and/or enhance security.

Security Fencing Enhancements	
A	***Height*** – The higher the barrier, the more difficult and time consuming to breach.
B	***Barbed Wire*** – Adding barbed wire at the top of the fence increases the level of difficulty.
C	***Eliminating Handholds*** – Omitting a rail at the top of the fence makes the fence more difficult to climb.
D	***Burying the Bottom of the Fencing*** – Eliminates the possibility of forcing the mesh up so that wildlife or individuals can crawl under.
E	***Signage*** – Installed along the fence line, signs are important to indicate private secured areas and the presence of security patrols, alarms, or monitoring systems.
F	***Clear Areas*** – Security effectiveness of perimeter fencing is materially improved by the provision of clear areas on both sides of the fence, particularly in the vicinity of the terminal and any other critical facilities. Such clearance areas facilitate surveillance and maintenance of fencing and deny cover to wildlife and trespassers. Suggested clear distances range from 10 to 30 feet, within which there should be no climbable objects, trees, or utility poles abutting the fence line nor areas for stackable crates, pallets, storage containers, or other materials. Likewise, the parking of vehicles along the fence should also be minimized. In addition, landscaping within the clear area should be minimized or eliminated to reduce potential hidden locations for persons, objects, fence damage, and vandalism.

For the purposes of constructing security fencing at state-managed airports, WSDOT Aviation shall utilize the design specifications detailed in FAA AC 150/5370-10, *Standards for Specifying Construction of Airports*, Item F-162 – *Chain Link Fences*. For wildlife issues, WSDOT Aviation should consult with the USDA and other wildlife agencies on the best method to wildlife impacts to the airport.

Access Points/Gates

Access points for personnel and vehicles through security fencing and lines, such as gates, doors, and electronically controlled or monitored access points should not only be able to control or prevent access, but also the number of access points should be minimized for both security and cost efficiency. As may be appropriate for the security plans/requirements for each of the individual state-managed airports, the following provides general construction guidance for access gates.

Gates are the only moveable part of a fence and therefore should be properly constructed with appropriate fittings. Gates should be constructed and installed to the same or greater standard of security as any adjacent fencing in order to maintain the integrity of the area. All gates should have self-closures and be equipped so that they can be secured should enhanced security conditions require it. All gates should be sufficiently lighted. Swing gate hinges should be of the non-liftoff type or provided with additional welding to prevent the gates from being removed. Security provided by gates can be improved if they are designed and installed with no more than 4 to 6 inches of ground clearance beneath the gate and minimal gaps on both sides of the gate.

For vehicle access, limiting the size of the opening increases security, reduces the possibility of one vehicle passing another and shortens the open close cycle time. The cantilever slide gate is the most effective for vehicle security, especially one that is electrically operated and tied into an access control system.

Pedestrian/personnel gates can be constructed using a basic padlock or designed with an electrical or mechanical lock or a keypad/card key system tied into an access control system. Pre-hung pedestrian gates/portals installed independent of the fence line are available to isolate the gate from fence lines containing sensor systems, thus reducing possible false alarms.

For the purposes of constructing access gates at the state-managed airports, WSDOT Aviation shall utilize the design specifications detailed in FAA AC 150/5370-10, *Standards for Specifying Construction of Airports*, Item F-162 – *Chain Link Fence*s.

Guardrails

WSDOT Aviation will also utilize guardrails as another means of establishing a security perimeter around the state-managed airports. Due to the remote nature of many of these airports, the cost/benefit of security fencing construction and maintenance is sometimes deemed to be excessive. Under such circumstances, WSDOT Aviation has elected to utilize guardrails as a means of establishing a perimeter that prevents access to unauthorized vehicles to the airport. These have proven to be particularly effective in preventing access to vehicles that are common within these remote areas (i.e., four-wheel drive trucks, all-terrain vehicles, motorcycles) and that have occasionally been found to be operating on state-managed airport property.

For the purposes of constructing guardrails at the state-managed airports, WSDOT Aviation shall utilize the design specifications detailed in WSDOT *Design Manual* M 22-01.

5.3 What Are the Airport Design Guidelines for Airside Facilities

This section includes design guidelines applied to the construction and alteration of facilities directly tied to aircraft operations on the airfield itself, including the following:

- Airfield Surface Design and Grades
- Runway and Taxiway Surfaces (Pavement)
- Runway and Taxiway Surfaces (Turf and Gravel)
- Runway Marking
- Runway Lighting
- Runway Markers

- Additional Visual Aids for Airmen
- Aircraft Parking and Tie-Downs
- Heliports

Airfield Surface Design and Grades

The layout and design of the various airport surfaces are subject to the standards established within FAA AC 150/5300-13, *Airport Design*. WSDOT Aviation shall utilize this standard for all NPIAS state-managed airports. For those non-NPIAS state-managed airports, WSDOT Aviation will utilize those FAA standards to the greatest extend practicable. Questions related to the FAA standards applicability to non-NPIAS state-managed airports will be resolved through coordination with the Airport Manager, the WSDOT Aviation Planner, as well as all other relevant WSDOT Aviation stakeholders.

Surface gradient standards include standards for runway and runway safety area grades, taxiway and taxiway safety area grades, apron grades, and line of sight. WSDOT Aviation utilizes the standards established within FAA AC 150/5300-13, *Airport Design*, which are generally discussed in the following table.

WSDOT Aviation Standard Procedures
1. Runway Grades
The current longitudinal and transverse gradient standards for runways are presented below. • The maximum longitudinal grade is +2 percent. It is desirable to keep longitudinal grades to a minimum. • The maximum allowable grade change is +2 percent. Use longitudinal grade changes only when absolutely necessary. • Vertical curves for longitudinal grade changes are parabolic. The length of the vertical curve is a minimum of 300 feet for each 1 percent of change. No vertical curve is necessary when the grade change is less than 0.4 percent. • The minimum allowable distance between the points of intersection of vertical curves is 250 feet multiplied by the sum of the grade changes (in percent) associated with the two vertical curves. • Figures are presented within FAA AC 150/5300-13 that reflect the maximum and minimum transverse grades for runways. In all cases, transverse grades must be kept to a minimum, but consistent with local drainage requirements.

2. Runway Safety Area Grades

Longitudinal grades, longitudinal grade changes, vertical curves, and distance between changes in grades for that part of the runway safety area between the runway ends are the same as the comparable standards for the runway. Exceptions are allowed when necessary because of taxiways within the area. In such cases, modify the longitudinal grades of the runway safety area by the use of smooth curves. For the first 200 feet of the runway safety area beyond the runway ends, the longitudinal grade is between 0 and 3 percent, with any slope being downward from the ends. For the remainder of the safety area, the maximum longitudinal grade is such that no part of the runway safety area penetrates the approach surface. The maximum allowable negative grade is 5 percent. Limitations on longitudinal grade changes are plus or minus 2 percent per 100 feet. Use parabolic vertical curves where practical.

3. Taxiway and Taxiway Safety Area Grades

The longitudinal and transverse gradient standards for taxiways and taxiway safety areas are as follows:

- The maximum longitudinal grade is 2 percent. Minimum longitudinal grades are desirable.
- Avoid changes in longitudinal grades unless no other reasonable alternative is available. The maximum longitudinal grade change is 3 percent.
- When longitudinal grade changes are necessary, the vertical curves are parabolic. The minimum length of the vertical curve is 100 feet (30 m) for each 1 percent of change. The minimum distance between points of intersection of vertical curves is 100 feet (30 m) multiplied by the sum of the grade changes (in percent) associated with the two vertical curves.
- At any point on a taxiway centerline, the allowable difference in elevation between the taxiway and the corresponding point on the associated runway is 1.5 percent of the shortest distance between the points.
- Figures are presented within FAA AC 150/5300-13, *Airport Design*, that reflect the maximum and minimum transverse grades for taxiways and taxiway safety areas. In all cases, transverse grades must be kept to a minimum, but consistent with local drainage requirements.

4. Aprons

To ease aircraft towing and taxiing, apron grades should be at a minimum, consistent with local drainage requirements. The maximum allowable grade in any direction is 2 percent. Where possible, design apron grades to direct drainage away from any building, especially in fueling areas.

5. Runway Line of Sight

An acceptable runway profile permits any two points five feet above the runway centerline to be mutually visible for the entire runway length. However, if the runway has a full length parallel taxiway, the runway profile may be such that an unobstructed line of sight will exist from any point five feet above the runway centerline to any other point five feet above the runway centerline for one-half the runway length.

6. Taxiway Line of Sight
There are no line of sight requirements for taxiways. However, the sight distance along a runway from an intersecting taxiway needs to be sufficient to allow a taxiing aircraft to enter safely or cross the runway.

Runway and Taxiway Surfaces (Pavement)

Runway and taxiway pavements can be designed using the American Association of State Highway and Transportation Officials (AASHTO) or FAA methodologies. Specifically, the FAA design methodology employs design curves in FAA AC 150/5320-6, *Airport Pavement Design and Evaluation*, the FAA pavement design computer program, *Flexible Pavement Design*, and FAA AC 150/5370-10, *Standards for Specifying Construction of Airports*.

WSDOT Aviation will utilize the FAA methodology, specifications and standard materials for all NPIAS state-managed airports. For the non-NPIAS state-managed airports, WSDOT Aviation will utilize the FAA design methodology, but will utilize AASHTO/WSDOT standard materials. This has been decided since aircraft design weights can be used directly without converting from highway axle loads to aircraft loads. Additionally, the FAA methodology is less complex and easier to use. However, pavements designed using the FAA methodology while utilizing AASHTO/WSDOT standard materials will require the following thickness adjustments.

Thickness Adjustment for WSDOT Materials	
Aircraft Weight Category	Recommended Equivalent Pavement Section when using State Highway Materials and Specifications
12,500 lb. and Under	• AC = FAA design thickness plus ¼ inch • 50-blow Marshall equivalent • Base = FAA design thickness plus 1 inch • Subbase = thickness required to meet FAA design total thickness

Also note that there are several inputs into the AASHTO methodology that are not easily obtained for airport design.

Pavement Design for Grant Application

The following table considers pavement sections for three different soil conditions: poor, average, and good. Poor soils would have a California Bearing Ratio (CBR) of 3 and would be characterized as fine graded, clay and organic

soils, poorly drained and very susceptible to moisture. Average soils would have a CBR of 7, would consist of sandy silt, and would be somewhat poorly drained. Good soils would have a CBR of 13, would be fairly well drained and would consist of silty, gravelly sand. This table can be used to approximate a pavement design section for preliminary cost estimating and grant application purposes.

Estimating Pavement Section Thickness for Grant Application Purposes			
Design Weight	***Soil Bearing Capability***	***Pavement Section***	
12,500 lb. (SWG)	3	WSDOT Class B Asphalt	2¼ inches
		WSDOT Crushed Surfacing Base Course	14 inches
	7	WSDOT Class B Asphalt	2¼ inches
		WSDOT Crushed Surfacing Base Course	9 inches
	13	WSDOT Class B Asphalt	2¼ inches
		WSDOT Crushed Surfacing Base Course	6 inches

Contract Document Pavement Design

Design of airfield pavement is a complex process that includes design considerations that vary widely and interact with and affect each other. Pavement sections for contract and construction purposes therefore need to be designed by a professional engineer with experience in airfield pavement design.

There may be loads on the pavement that are more demanding than the 12,500 lb. aircraft loads, such as snow plows and emergency vehicles. If this is the case, the pavement must be designed for these heavier loads.

It is also important to take seasonal frost effects into account in the pavement design. The designer should refer to FAA AC 150/5320-6, *Airport Pavement Design and Evaluation*, for seasonal frost considerations.

Runway and Taxiway Surfaces (Turf and Gravel)

Most of the state-managed airports are based on turf or gravel/aggregate runway and taxiway surfaces. Due to the unique nature of these surfaces and their associated uses, WSDOT Aviation will utilize FAA AC 150/5370-10, *Standards for Specifying Construction of Airports*, Item P-217, *Aggregate-Turf Pavement*, for all such runway and taxiway construction design specifications.

Runway Pavement Markings

WSDOT Aviation will utilize the most current FAA standards for pavement markings with respect to the state-managed airports. FAA AC 150/5340-1J, *Standards for Airport Markings*, provides the standards for surface markings used on paved airfield pavements (runways, taxiways, aprons) and paved airfield roadways. The promulgated standards for the surface markings assume that runways, taxiways, and aprons are built in accordance to the dimensions and layouts (e.g., clearances, fillets) in FAA AC 150/5300-13, *Airport Design*. Otherwise, the Airport Manager should expect difficulties when painting surface markings on non-standard infrastructure, such as a runway with a non-standard width. To offer assistance to airport operators, this advisory circular offers workable solutions for a few situations. ***Note:*** FAA also intends to establish surface markings for unpaved airfield runways in additional chapters at a future date.

Runway Lighting

WSDOT Aviation will utilize the most current FAA standards for runway lighting with respect to those state-managed airports that have runway lighting. Specifically, lighting fixtures utilized on the state-managed airports shall comply with the requirements of FAA AC 150/5345-46, *Specification for Runway and Taxiway Light Fixtures*. Any such lighting fixtures at any of state-managed airports shall be installed in compliance with FAA AC 150/5340-30, *Design and Installation Details for Airport Visual Aids*, as well as FAA AC 150/5370-10D, *Standards for Specifying Construction of Airports*.

It should be noted that compliance with these advisory circulars is the standard goal of WSDOT Aviation with respect to the state-managed airports. However, it is also understood that achieving this goal at some of these airports may not be deemed to be practicable. Therefore, under those circumstances, the Airport Manager shall coordinate with the WSDOT Aviation Planner and Airport Engineer to establish a reasonable alternative.

Runway Markers

Those state-managed airports without a runway lighting system utilize runway retroreflective markers instead. For those airports with runway markers, WSDOT Aviation will utilize the most current FAA standards for runway retroreflective markers, FAA AC 150/5345-39, *Specification L-853, Runway and Taxiway Retroreflective Markers*.

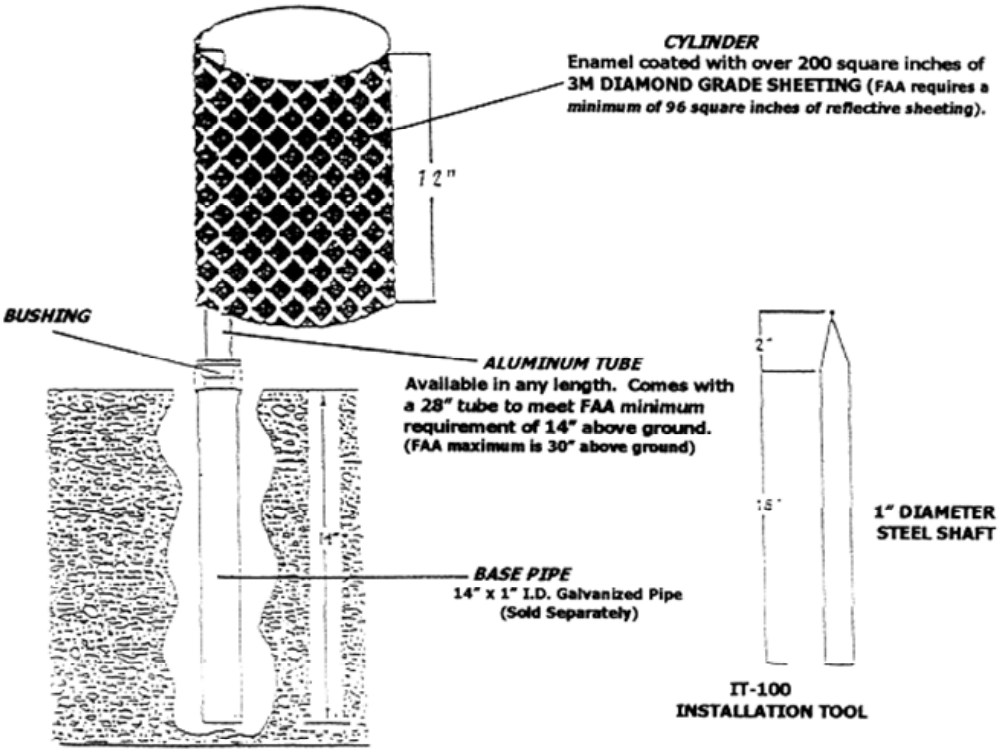
Specifically, WSDOT Aviation has adopted the following marker as being the standard for the state-managed airports:

AR100 Retroreflective Airport Marker L-853
Valley Illuminators
PO Box 3001
Federal Way, WA 98063-3001
Phone: 253-833-3016
Fax: 253-735-5414

The following figure provides a description of the standard installation procedure for these markers. It should be noted that several of the state-managed airports still utilize older, large wooden markers on their runways. WSDOT Aviation is currently in the process of eliminating those wooden markers and will replace them with the AR100 Retroreflective Airport Marker L-853.

Retroreflective Airport Marker Installation

VALLEY ILLUMINATORS
AR-100 RETROREFLECTIVE MARKER INSTALLATION
L-853



THE BASE PIPE IS EASILY INSTALLED, USING THE IT-100 INSTALLATION TOOL. MOST SURFACES CAN BE EASILY PENETRATED, EITHER DRIVING IT WITH A SLEDGE HAMMER OR WITH THE AID OF AN AIR HAMMER. SIMPLY INSERT THE TOOL IN THE BASE PIPE AND DRIVE THEM BOTH INTO THE GROUND AT THE SAME TIME. REMOVE THE INSTALLATION TOOL AND PUT ASSEMBLED ILLUMINATOR AND BUSHING IN BASE PIPE.

USING 3 STAINLESS STEEL NUTS, BOLTS AND WASHERS, ATTACH THE CYLINDER TO THE ALUMINUM TUBE BY LINING UP THE 3 PRE-DRILLED AND PRE-PUNCHED HOLES IN CYLINDER AND ALUMINUM TUBE, SLIP ON BUSHING AND SET IN BASE PIPE. THE BUSHING ALLOWS THE ILLUMINATOR TO WEATHERVANE, OR ROTATE RELATIVE TO WIND DIRECTION AND JET BLAST. THE ALUMINUM TUBE ACTS AS THE BREAKAWAY COUPLING, DESIGNED TO FLATTEN, RATHER THAN SPREAD DEBRIS (FOD) ON THE AIRPORT.

THERE WILL BE 1 TO 2 FULLY ASSEMBLED REFLECTORS IN EVERY BOX TO USE AS A VISUAL AID OR FIELD GUIDE. REFLECTORS ARE SHIPPED 25 PER BOX WITH 2 FULLY ASSEMBLED AND 23 UNASSEMBLED.

Additional Visual Aids for Airmen

At the state-managed airports, additional visual aids for airmen generally include wind cones and segmented circles.

Wind Cones

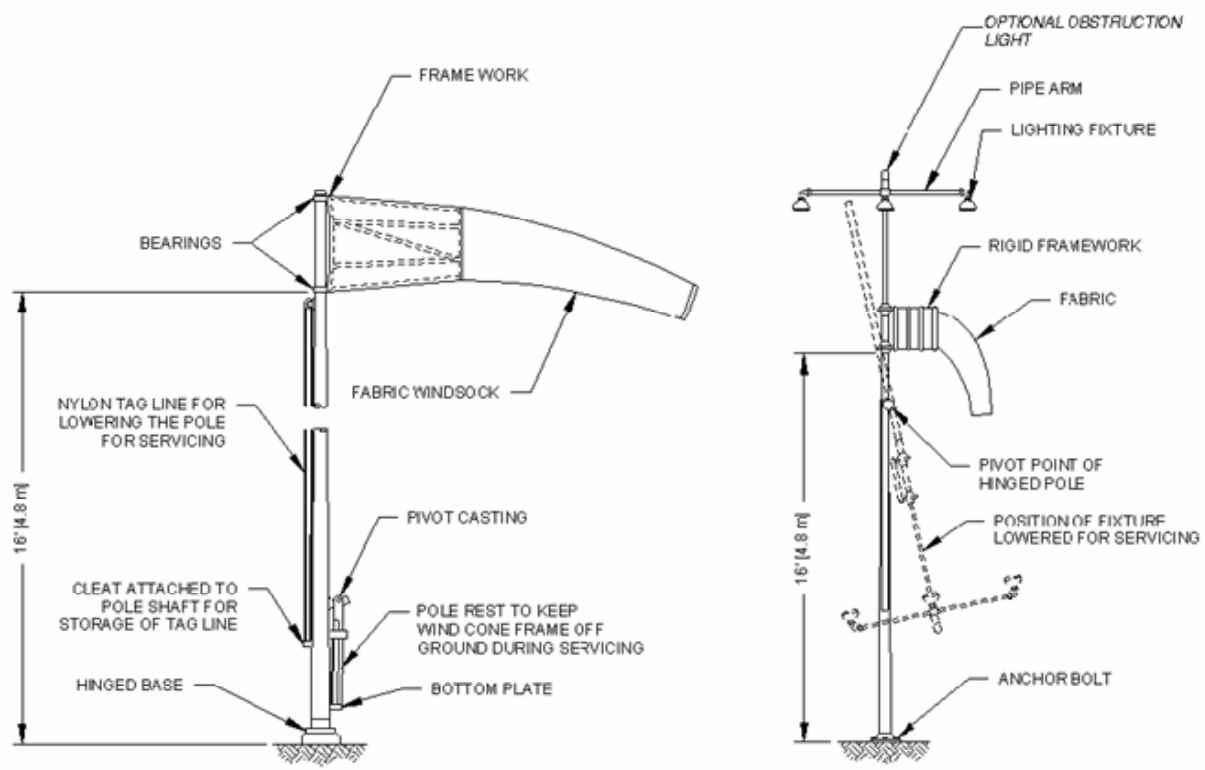
Wind cones are used to visually indicate wind direction at airports and heliports and can include both a primary wind cone, as well as supplemental wind cones (depending on the local need and wind variability). ***Note:*** The primary wind cone should be installed so that it is readily visible to pilots and will likely be located within a segmented circle. In addition, the primary wind cone should be installed so there is no conflict with airport design criteria requirements in FAA AC 150/5300-13, *Airport Design*, or CFR Part 77, *Objects Affecting Navigable Airspace*.

WSDOT Aviation will utilize the current FAA specifications and requirements for the installation of wind cones as detailed in included in the following:

- FAA AC 150/5340-30D, *Design and Installation Details for Airport Visual Aids*
- FAA AC 150/5345-27D, *Specification for Wind Cone Assemblies*

Locally fabricated or commercially available supplemental wind cones may be used, provided they meet the criteria in FAA AC 150/5345-27. For reference purposes, the following figure represents a typical wind cone installation as currently defined by the FAA.

Typical Wind Cone Installation (L-807)

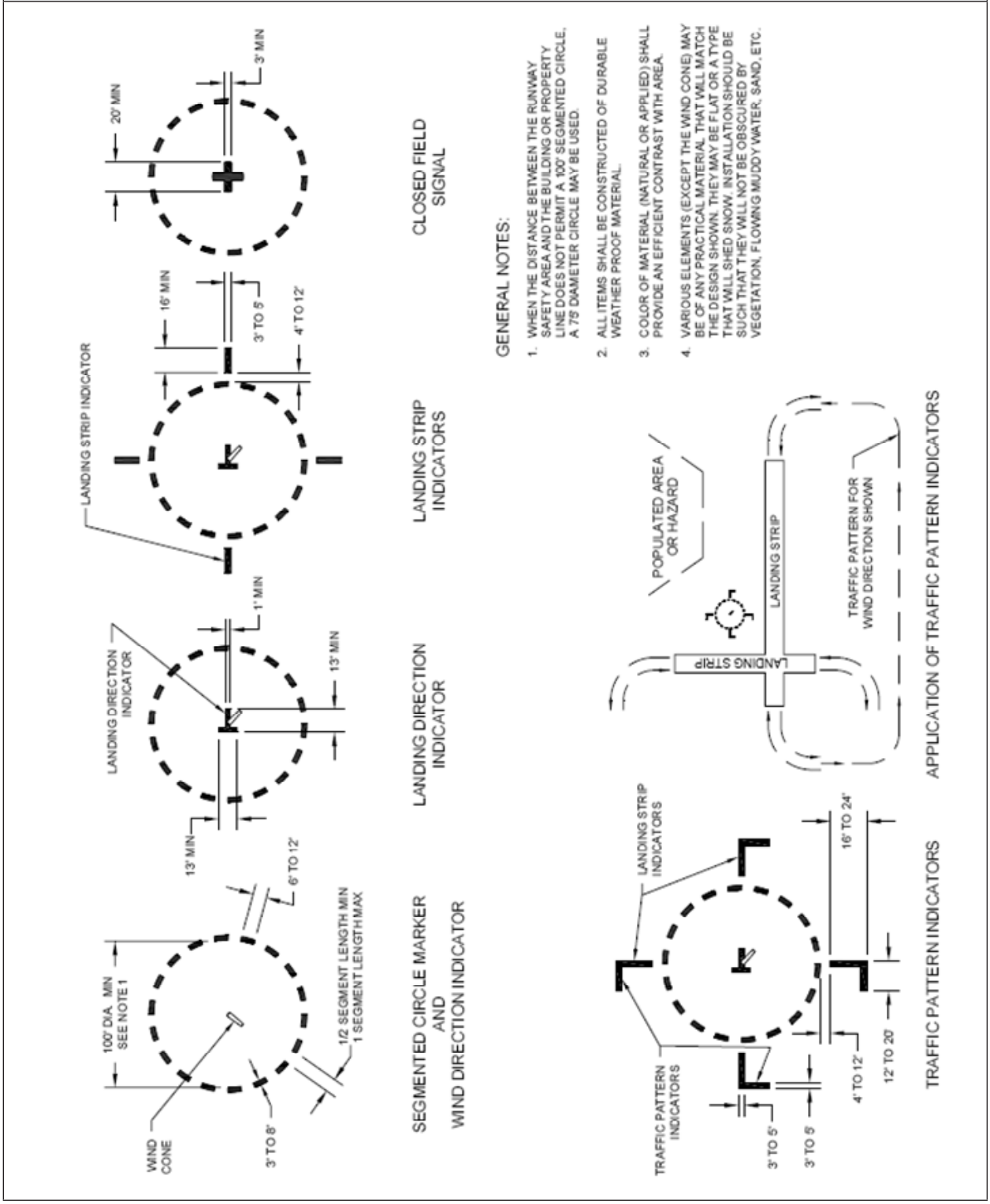


Segmented Circle Airport Marker System

Segmented circles provide for a minimum installation consisting of a segmented circle located off the traffic area with a conventional wind cone located at its center. To this minimum installation, other pilot aids and traffic control devices are added as required to meet the conditions existing at a particular airport. The types of devices to be used, the purpose they must serve, and their construction and installation must be as described in the following table.

WSDOT Aviation Standard Procedures
Segmented Circle
The segmented circle is the basic element of the system and performs two primary functions: it aids the pilot in locating obscure airports, and it provides a centralized location for such indicators and signal devices as may be required on a particular airport. Installation of the circle should be in a position that affords maximum visibility to pilots in the air and on the ground. Segmentation of the circle is necessary so that from a reasonable distance it can be readily distinguished from a solid circle, which is sometimes used to mark the center of a landing area. (See figure below for standard installation description.)
Wind Direction Indicator
Install a conventional wind cone (as described above and shown below) to be used as the wind direction indicator.
Landing Direction Indicator
When conditions at an airport warrant its use, install a landing direction indicator, as located on the drawing, for the purpose of showing pilots in the air and on the ground the direction in which landings and takeoffs are to be made. This indicator may be so designed that it can be made free-swinging when left unattended.
Landing Strip Indicators
Landing strip indicators are used to show the orientation of landing strips and/or to give a positive indication of the strip specified for use. When used, they must be arranged in pairs as shown on the drawing.
Traffic Pattern Indicators
Install these indicators for the purpose of controlling the direction of the traffic pattern when there is any variation from the normal left-hand pattern. When the traffic pattern indicators are included in an installation, they must be arranged in pairs in conjunction with landing strip indicators.
Right-Turn Indicators
The use of the segmented circle airport marker system is encouraged.
Closed Field Signal
Place panels in the center of the circle in the form of a cross to signify that a field is permanently closed to all traffic. When this signal is used, the wind cone and the landing direction indicator are removed from the circle. Other indicators may remain in place.

Segmented Circle Installations



WSDOT Aviation shall utilize the specifications and requirements for the installation of segmented circles at the state-managed airports as detailed by FAA AC 150/5340-5C, *Segmented Circle Airport Marker System*.

Aircraft Parking and Tie-Downs

As noted above, the design and layout of aircraft parking areas shall be dictated by the requirements of FAA AC 150/5300-13, *Airport Design*. Additionally, surface grades and surface construction shall reflect those of runways and taxiways, described above.

With respect to the furnishing and installing aircraft tie-down anchors, these assemblies shall have a minimum tensile breaking strength of 6,000 pounds and minimum field pull-out capacity of 3,000 pounds. Each anchor assembly shall include a 1½-inch inside diameter by ⅜-inch lap link connector attached to a ⅜-inch galvanized chain.

- Soil anchors shall be Duckbill model 88-DB1 or Manta Ray model MR-88, as manufactured by Foresight Products, Commerce City, CO, or an approved equal.
- Rock anchors shall be ½-inch diameter Williams Solid Bar Spin Lock Rock Bolts, Williams Titan Injection Anchor 30/16, or an approved equal.
- Temporary tie-down anchors shall provide a minimum 500 pounds of resistance to uplift per anchor.

See following graphic for example of typical tiedown installation.

Tie-Down Anchors (Typical)

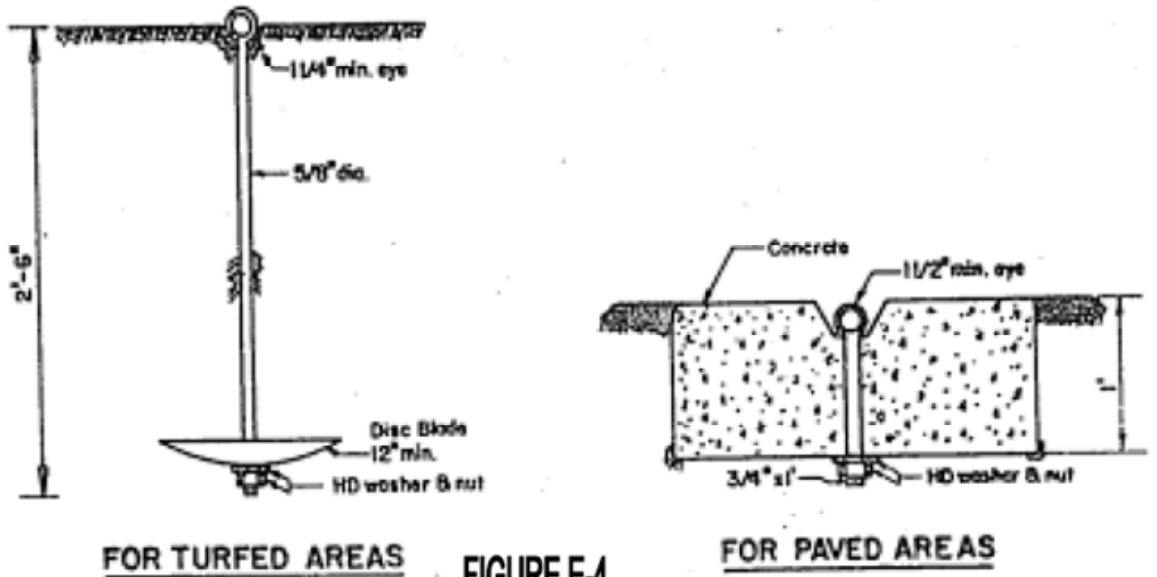


FIGURE E-4

Heliports

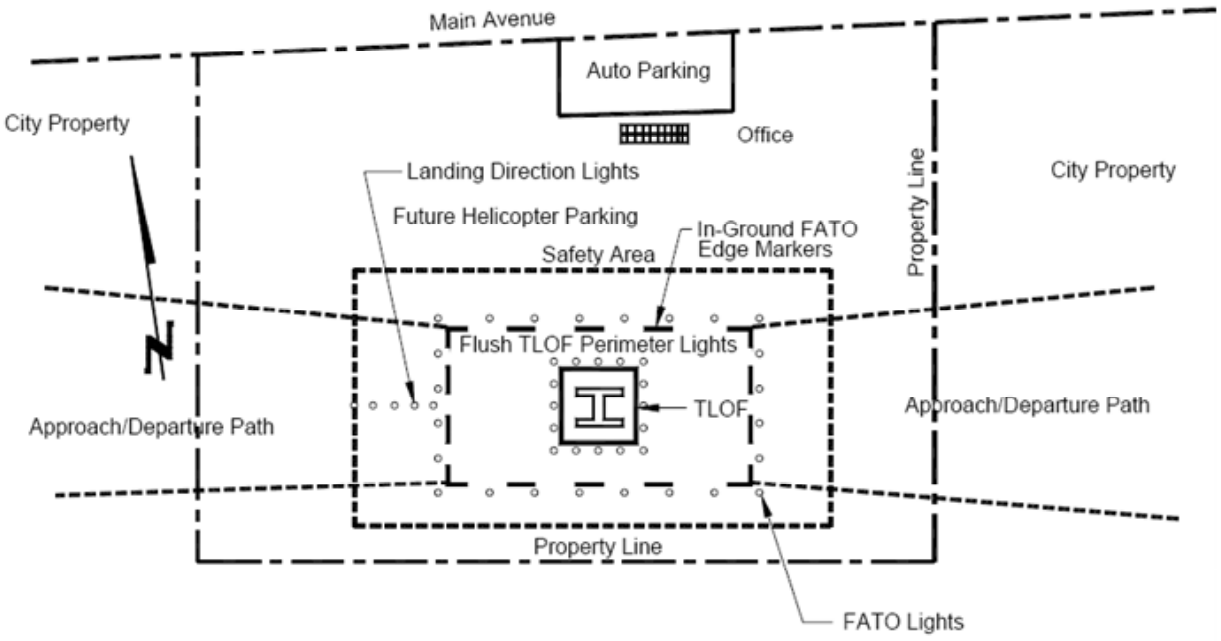
A heliport is defined as an area of land, water, or a structure used or intended to be used for the landing and takeoff of helicopters, together with appurtenant buildings and facilities. Heliports are frequently co-located with airports, since they share many of the same characteristics and requirements needed to accommodate aircraft. This is the case with the state-managed airport system where WSDOT Aviation, as required and appropriate, will typically designate specific areas on a given airport for helicopter operations.

Heliport design and construction requriements for the state-managed airport system should follow the specifications detailed in FAA AC 150/5390-2, *Heliport Design*, to the greatest extent practicable. Similar to aiports and runways, heliports have a variety of setback standards and airspace requirements (see Chapter 6 for WSDOT Aviation heliport design standard dimensions). For the purposes of this section, three of the primary heliport design components are defined below:

- **Touchdown and Lift-off Area (TLOF)** – A load bearing, generally paved area, normally centered in the FATO, on which the helicopter lands or takes off.
- **Final Approach and Takeoff Area (FATO)** – A defined area over which the final phase of the approach to a hover, or a landing is completed and from which the takeoff is initiated.
- **Safety Area** – A defined area on a heliport surrounding the FATO intended to reduce the risk of damage to helicopters accidentally diverging from the FATO. This area should be free of objects, other than those frangible mounted objects required for air navigation purposes.

The following figure provides an example of a typical heliport design.

Example Heliport Layout



Heliport Gradients and Pavement Design

This section provides guidance on designing heliport pavements, including design loads, and addresses soil stabilization as a method of treating non paved operational surfaces. Operational surfaces such as the TLOF, FATO, and Safety Areas should present a reasonably smooth, uniformly graded surface. The surfaces of a heliport should be designed to provide positive drainage.

Heliport Gradients
TLOF Gradients
To ensure drainage, the TLOF should have a minimum gradient of 0.5 percent and a maximum gradient of 2.0 percent.
FATO Gradients
The recommended gradients for a load bearing FATO range from a minimum of 0.5 percent to a maximum of 5.0 percent. FATO grades in any areas where a helicopter is expected to land should not exceed 2.0 percent. To ensure TLOF drainage, gradients of rapid runoff shoulders should range between 3.0 and 5.0 percent.
Safety Area Gradients
The surface of the Safety Area should not be steeper than a downward slope of 2:1 (2 units horizontal in 1 unit vertical). In addition, the surface of the Safety Area should not be higher than the FATO edge.

With respect to design loads, the TLOF and any load-bearing surfaces should be designed and constructed to support the weight of the design helicopter and any ground support vehicles. Loads are applied through the contact area of the tires for wheel-equipped helicopters or the contact area of the skid for skid equipped helicopters.

Pavements distribute the helicopters' weight over a larger area of the subsurface as well as provide a water-impervious, skid-resistant wearing surface. Paving TLOFs and FATOs is encouraged to improve their load carrying ability, minimize the erosive effects of rotor wash, and facilitate surface runoff. Stabilizing unpaved portions of the FATO and taxi routes subjected to rotor wash is recommended. It should be noted that the majority of heliports within the state-managed system are non-paved and therefore should be subject to the following soil stabilization practices:

- **Turf** – A well-drained and well-established turf that presents a smooth, dense surface is generally considered to be the most cost-effective surface stabilization available. In some combinations of climates and weather conditions, turf surfaces are capable of supporting the weight of many of the smaller helicopters for low frequency use by private and corporate operators during much of the year. Turf surfaces also provide reasonable protection against wind, rotor wash, or water erosion. Climatic and soil conditions dictate the appropriate grass species to use at the site.
- **Aggregate Turf** – Heliports located on soils that have poor load-carrying capabilities when wet may be able to overcome this deficiency by mixing selected granular materials into the upper 12 inches of the soil. Suitable granular materials for this purpose are crushed stone, pit-run gravel, coarse sand, or oyster shells. The ratio of aggregate to soil should be sufficient to improve the stability of the soil yet retain the soil's ability to support grass.

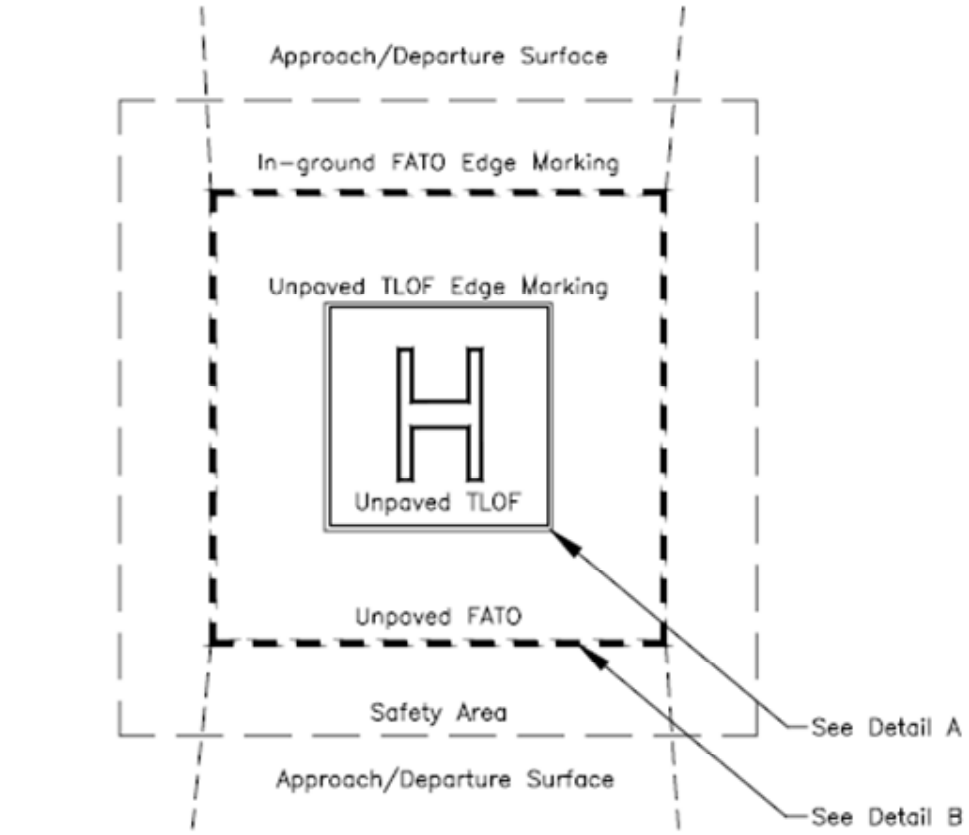
Heliport Markings

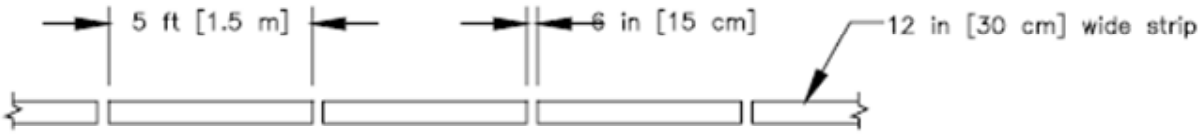
Markers and/or surface markings should identify the facility as a heliport. Surface markings may be paint, reflective paint, reflective markers, or preformed material. Lines/markings may be outlined with a 6-inch-wide line of a contrasting color to enhance conspicuity. The following markers and markings should be used:

- **TLOF and FATO Perimeter Markings** – The perimeter of the TLOF and/or the FATO should be marked. The perimeter of the FATO should be defined with markers and/or lines. It is suggested that the TLOF perimeter should also be defined with markers and/or lines since this provides a greater safety margin than marking only one perimeter.
- **Standard Heliport Identification Symbol** – A white H marking with a contrasting border if required should mark the TLOF.

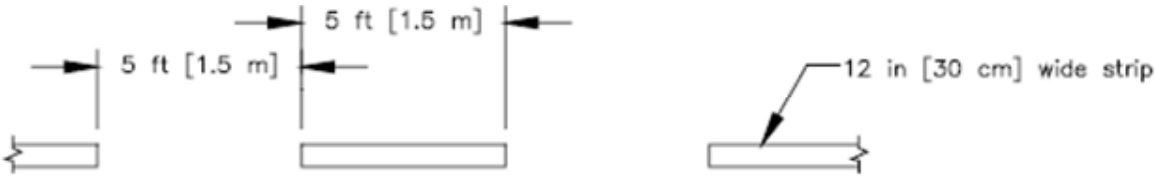
The following graphic shows example heliport markings. Refer to FAA AC 150/5390-2, *Heliport Design*, for more specific information.

Example Heliport Markings (Unpaved)





Detail A TLOF Flush Inground Marking Detail



Detail B FATO Inground Marking Detail

5.4 What Are the Airport Design Guidelines for Landside Facilities

This section includes general airport design guidelines applied to the construction and alteration of landside facilities on the airport, which are unrelated to the airside or airfield itself, including the following:

- Airport Signage
- Hangar Construction
- Irrigation and Sprinkler Systems
- Stormwater Management
- Fuel Systems
- Airport Access and Auto Parking

Airport Signage

Airport signage at the state-managed airports meets a diverse mix of needs ranging from airfield to airside operations. As such, there are several sources of design specifications that must be considered, including federal (FAA), state (WSDOT), and possibly local. ***Note:*** The FAA specifications related to on-airport signs shall take president over any WSDOT or other state/local specifications.

For the state-managed airports, all sign design and installation shall conform to the specifications and requirements of each of the following:

- FAA AC 150/5340-18E, *Standards for Airport Sign Systems*
- WSDOT *Traffic Manual* M 51-02, Chapter 2
- WSDOT *Sign Fabrication Manual* M 55-05
- Any applicable state and local standards and requirements.

Similar to that of the sign maintenance process described in Section 4.3, those signs that require installation, the Airport Manager shall observe the procedures in the following table.

Sign Installation Procedures	
1	Airport Manager identifies/establishes specifications for sign to be installed. *Note:* Due to the potentially wide variety of signs in use at the state-managed airports, it will be incumbent upon the Airport Manager to utilize appropriate sign design specifications. These may be found within WSDOT Aviation, WSDOT, or FAA (see references above).
2	Airport Manager or WSDOT Region Maintenance contacts WSDOT Yakima Sign Shop, places order and supplies shipping information.
3	WSDOT Yakima Sign Shop completes order and ships to WSDOT Region Maintenance or local airport caretaker/sub-contractor.
4	WSDOT Region Maintenance or local airport caretaker/sub-contractor replaces sign.

Hangar Construction

Hangar construction at state airports is dependent on a number of factors which include:

- Airport has an approved ALP.
- There is sufficient developable land area set-aside on airport for hangar development.
- The airport has established rates and charges.
- The airport has established minimum standards.
- The airport has established rules and regulations.

Construction of hangars can be driven by a variety of forces at an airport and typically a hangar developer will have their own design specifications. Regardless of this, all hangar building and associated construction at the state-managed airports is subject to WSDOT review and approval, and shall conform to the specifications and requirements of each of the following:

- Federal standards of the 2006 (or most recent) International Code Council (ICC) International Building Code (IBC), as adopted by the state of Washington.
- National Fire Protection Association (NFPA) 409 – *Standard on Aircraft Hangars*.
- WSDOT *Standard Specifications for Road, Bridge, and Municipal Construction* M 41-10.
- Any applicable state and local standards and requirements.

Note: WSDOT Aviation intends to establish parameters for hangar construction specifications and requirements that will reflect the federal and state codes. This WSDOT Aviation specification will supplement the requirements noted above. The following represents an example of hangar specifications that could be utilized by WSDOT Aviation until such time as official specifications and requirements are established.

WSDOT Aviation Specifications and Requirements for Hangar Construction

The following specifications must be adhered to when constructing aircraft hangars on any WSDOT Aviation owned/operated airport.

Hangar Design and Construction – General Standards	
1	Buildings must be of steel design, including primary and secondary structural framing, walls and roofing, and placed on concrete slabs (see Concrete and Steel Structure requirements in this document).
2	Electrical, if installed shall be installed in accordance with local, state, and federal requirements and comply with the National Electric Code (NEC); all work must be performed by an electrician currently licensed to do work in the state of Washington.
3	All hangars must be a minimum size of 50′ wide x 40′ deep, with a maximum size of 60′ wide x 50′ deep. Hangars will not be approved on airports operated via easements or leases from other governmental agencies unless expressly permitted by that agency.
4	Aircraft access bay doors may be of the slider, overhead, stack, or bi-fold type, and must be at least 40′ wide. Height of hangar doors cannot exceed 14′.
5	No living quarters shall be constructed within hangars, nor will hangar owners, lessees, or others be permitted to live in such hangars.
6	Site preparation, drainage, and ongoing site maintenance will be the responsibility of the proponent.
7	No individual septic tanks or drain fields shall be constructed on any state-managed airport property without prior approval of WSDOT Aviation.
8	Hangars are permitted to be constructed for indoor storage of aircraft and aviation related items only. In no instance will outside storage of personal items be allowed.
9	No commercial operations shall be permitted on state-managed airports without written approval of WSDOT Aviation.
10	Plowing of snow to gain access to hangars during winter months must have prior written approval from WSDOT Aviation.

Hangar Design and Construction – Concrete Standards	
1	Concrete design shall be by a professional engineer registered in the state of Washington.
2	Portland cement concrete shall meet the requirements of class 30 with 3000 PSI minimum compression strength. • Minimum Cement Content 560 lb • Maximum Water Cement Ration .49 • Maximum Slump Inches 5 • Air Content Percent 6.5 + 1.5%
3	Vapor barrier shall be 10 mil polyethylene film (Visqueen) or approved equal. Lap 3″ minimum and tape tight at all seams and protect from damage. Vapor barrier shall provide total underslab coverage.
4	All floor slabs must be a minimum of 4″ thick.
5	Interior concrete slabs shall receive a smooth steel trowel finish. Exterior concrete slabs shall receive a surface finish using a soft bristle broom. Concrete slabs shall be water cured a minimum of one day.
6	The dimensions of exterior aprons or ramps must be pre-approved by WSDOT Aviation.

Hangar Design and Construction – Steel Structure Standards	
1	The building manufacturer shall furnish complete erection drawings showing anchor-bolt settings, sidewalls, roof framing, transverse cross-sections, covering and trim details, and accessory installation details to clearly indicate the proper assembly of all building parts. The manufacturer shall also furnish a letter of certification by a registered professional engineer, verifying that the building design meets the specified loading requirements. The erection of the metal building and the installation of accessories shall be performed in accordance with building manufacturer's erection drawings using proper tools and equipment.
2	The materials furnished and installed shall include, but not be limited to the structural rigid framing, end wall columns, anchor bolts, rafter extensions, girts, purlins, window and door frames, canopy frames, wind bracing rods, eave struts, girt sag rods, purlin bridging, diaphragm bracing, stirrups, flange bracing, webb stiffeners, roofing, siding, exterior trim, fasteners, bolts, sealants, caulking, and any other component parts as needed for the metal building as specified.
3	The following standards and criteria (of most recent issue) shall be used where applicable in the structural design of the building covered by these specifications: • RECOMMENDED DESIGN PRACTICES MANUAL – Metal Building Manufacturers Association • STEEL CONSTRUCTION MANUAL – American Institute of Steel Construction • COLD FORMED STEEL DESIGN MANUAL – American Iron and Steel Institute • CODE FOR WELDING IN BUILDING CONSTRUCTION – American Welding Society

4	High Profile (HP) or straight column designates a clear span rigid frame building with a gabled roof slope of 4:12 minimum for hanger building.
5	Exterior roof covering shall be 24 gauge minimum thickness, galvanized, factory painted panels, and standing seam with concealed clips.
6	Exterior wall covering shall be 26 gauge minimum thickness, galvanized, factory painted, and steel ribbed panels. All panels shall be attached to secondary frame with #14 Type A self- tapping screws with cadmium plated carbon steel head and shank and domed washer with neoprene sealing element. Panels shall be properly fastened to every girt and purlin. The minimum spacing of the panel fasteners on the girt and purlin lines shall be 12″ on centers. The minimum spacing of the side lap fasteners shall be 24″ on centers, but properly designed and variable spaced to meet the snow and wind load requirements. Heads of all fasteners for colored panel and trim shall be pre-painted to match color of adjacent surface.
7	Exterior building color is limited to Ivory with Kelly or Forest Green trim. Shades of each color must be pre-approved by WSDOT Aviation.

Irrigation and Sprinkler Systems

Irrigation and sprinkler system installation efforts at any of the state-managed airports will likely be unique to each airport. As such, design and construction specifications will depend on the specific airport under consideration. All irrigation and sprinkler systems design and installation at the state-managed airports should consider the specifications and requirements of each of the following:

- WSDOT *Standard Specifications for Road, Bridge, and Municipal Construction*, 8-03 Irrigation Systems
- FAA AC 150/5370-10D, *Standards for Specifying Construction of Airports*
- Any applicable state and local standards and requirements.

Note: Any construction of an above-ground system shall consider the requirements of FAA AC 150/5300-13, *Airport Design*, in terms of maintaining appropriate clearances of relevant safety areas, object free areas, obstacle free areas, threshold siting surfaces, etc.

Stormwater Management

The construction of all stormwater management facilities at the state-managed airports shall meet the requirements and specifications as detailed in the following:

- WSDOT *Aviation Stormwater Design Manual*, 2008, M 3041
- FAA 150/5370-10D, *Standards for Specifying Construction of Airports*
- Any applicable state and local standards and requirements.

Note: The *Aviation Stormwater Design Manual* provides design guidance for best management practices (BMPs) for stormwater flow control and water quality treatment at or near airports (within the airport influence areas) that protect receiving waters and meet federal and state water quality standards in a safe manner.

Specifically, the manual was developed to assist with the planning and design of stormwater management facilities on and around existing and new airports in the state of Washington, including those owned or operated by WSDOT. Airports are required to comply with federal, state, and local regulations to protect water resources by treating and controlling flow rates of stormwater runoff for new development and facility upgrades. However, airports are different from other industrial or commercial sites and must manage stormwater in a way that will not compromise aircraft safety. Many traditional stormwater BMPs, such as ponds, attract wildlife that may be hazardous to aircraft. As a result, some traditional BMPs must be altered for use in the airport environment. This manual was developed to identify ways to treat and control stormwater without creating hazardous wildlife attractants. The manual focuses on technical issues related to stormwater management within the airport environment.

Obstruction Marking and Lighting

All marking and lighting installation and construction associated with airspace obstructions at the state-managed airports shall conform to the specifications and requirements of each of the following:

- FAA AC 70/7460-1K, *Obstruction Marking and Lighting*
- FAA AC 150/5345-43F, *Specification for Obstruction Lighting Equipment*
- FAA AC 150/5340-1J, *Standards for Airport Markings*
- Any applicable state and local standards and requirements.

Note: The FAA specifications related to airport-related obstruction marking and lighting shall take president over other state/local specifications due to their critical nature with respect to aviation activities.

Fuel Systems

Construction of a fueling system at an airport is an extremely complicated and rigorous endeavor that would have to be addressed on an airport-by-airport basis. This would also require extensive coordination with a wide variety of stakeholders, each of which could have their own design specifications/requirements. However, generally speaking, any fuel system design and installation at the state-managed airports shall conform to the specifications and requirements of each of the following:

- FAA AC 150/5230-4A, *Aircraft Fuel Storage, Handling, and Dispensing on Airports*
- National Fire Protection Association (NFPA) 30 – *Flammable and Combustible Liquids Code*
- National Fire Protection Association (NFPA) 415 – *Standard on Airport Terminal Buildings, Fueling Ramp Drainage, and Loading Walkways*
- National Air Transportation Association (NATA) Refueling and Quality Control Procedures for Airport Service and Support Operations
- Air Transport Association Specification 103: *Standards for Jet Fuel Quality Control at Airports*
- American Petroleum Institute – Standard 1581: *Specifications and Qualification Procedures for Aviation Jet Fuel Filter/Separators*
- American Petroleum Institute – Standard 1500: *Storage and Handling of Aviation Fuels at Airports*
- Any applicable state and local standards and requirements.

Airport Access and Auto Parking

Automobile access drives andparking areas are fundamental elements of an airport's landside component. However, if these elements are removed from the aircraft operations area, the FAA does not have any specifications for auto access and parking other than the basic requirements involved with construction on an airport. Therefore, for the state-managed airports, WSDOT Aviation will primarily

utilize the specifications and requirements established by WSDOT and applicable local standards and requirements. As such, the following specifications and requirements shall be considered with respect to automobile access and parking at the state-managed airports:

- WSDOT *Standard Specifications for Road, Bridge, and Municipal Construction*
- WSDOT *Roadside Manual*
- WSDOT *Traffic Manual*
- FAA AC 150/5370-10D, *Standards for Specifying Construction of Airports*
- Any applicable state and local standards and requirements.

5.5 What Are the Airport Vegetation Design Guidelines

In order to preserve and gentrify the airport landscape, WSDOT has certain guidelines regarding the installation of vegetation. Each new species of plant life introduced into the airport property should be thoroughly reviewed to ensure that proper environmental conditions will allow growth and not pose a safety threat by attracting unwanted wildlife. In considering vegetative design, vegetative maintenance must also be high priority as it will be WSDOT's responsibility.

Additionally, there are times on and around airports where vegetation that is incompatible with the airport environment must be removed. Such incompatibility typically results from conflicts with designated airport safety and object free areas, as well as with airport airspace surfaces. Ideally, the identification of such incompatible vegetation will be part of a Vegetation Management Plan (VMP) established by WSDOT Aviation (see Section 6.4) and wildlife management plans as approved by the department.

Vegetation Installation

Installation of vegetation (turf, shrubs, trees, etc.) at the state-managed airports may be required by a variety of projects. All such installation of vegetation shall conform to the specifications and requirements of any VMP established by WSDOT Aviation for the state-managed airports. Additionally, WSDOT Aviation will utilize the established specifications and requirements set forth by WSDOT

and the FAA when installing vegetation at the state-managed airports. These can be found in the following:

- WSDOT *Standard Specifications for Road, Bridge, and Municipal Construction*, 8-01.3(2) Seeding, Fertilizing and Mulching
- WSDOT *Standard Specifications for Road, Bridge, and Municipal Construction*, 9-14.6 Plant Materials
- WSDOT *Aviation Stormwater Design Manual*, 2008, M 3041, Appendix A, Vegetation Recommendations for Airport Settings
- FAA AC 150/5370-10D, *Standards for Specifying Construction of Airports*, Part X – Turfing
- Any applicable state and local standards and requirements.

Note: The FAA specifications related to airport-related obstruction marking and lighting shall take precedence over other state/local specifications due to their critical nature with respect to aviation activities.

Vegetation Control and Removal

Removal of existing vegetation on and around the state-managed airports may be required to ensure safe operations at the airport, obstruction clearance, and other construction efforts, etc. In all cases, vegetation removal efforts shall comply with applicable local, state and federal specifications and procedures. Additionally, WSDOT Aviation will utilize the established specifications and requirements established by WSDOT and the FAA when removing vegetation at the state-managed airports. These can be found in the following:

- WSDOT *Standard Specifications for Road, Bridge, and Municipal Construction*, 2-01 Clearing, Grubbing, and Roadside Cleanup
- FAA AC 150/5370-10D, *Standards for Specifying Construction of Airports*, Item P-151 Clearing and Grubbing
- Any applicable state and local standards and requirements.

Section 4.4, Vegetation Control Guidelines, also contains additional information and detail on vegetation control in terms of maintenance.

Note: The FAA specifications related to airport-related obstruction marking and lighting shall take precedence over other state/local specifications due to their critical nature with respect to aviation activities.

5.6 What Are the Airport Aids to Airman Design Guidelines

In the future, WSDOT Aviation may consider improving navigation and weather detection coverage at the state-managed airports. Several weather observation systems are available; however, an Automated Weather Observation System (AWOS) is the preferred option. Other systems may be used as appropriate for the level of activity at and around the airport.

Automated Weather Observation System (AWOS)

An AWOS automatically measures meteorological parameters, reduces, and analyzes the data via computer, and broadcasts weather reports which can be received by aircraft operating up to 10,000 feet above ground level and 25 nautical miles from the AWOS. Pilots may use weather information provided by the AWOS to partially fulfill the requirements of various FARs.

When WSDOT Aviation elects to install weather reporting facilities at one or more of the state-managed airports, it shall conform to the specifications and requirements of each of the following:

- FAA AC 150/5220-16C, *Automated Weather Observing Systems (AWOS) for Non-Federal Applications*
- FAA Order 6560.20B, *Siting Criteria for Automated Weather Observing Systems (AWOS)*
- Any applicable state and local standards and requirements.

Note: The FAA specifications related to the installation of automated weather obstruction systems shall take precedence over any WSDOT or other state/local specifications due to their critical nature with respect to aviation activities.

5.7 Chapter References and Supporting Documentation

Chapter References

The following tables include references for additional and/or supporting information with respect to the various sections of this chapter. This has been provided with the intent of providing the reader with a current listing of appropriate sources for additional information and research.

5.1 What Are WSDOT Aviation's General Design Development Considerations
• Washington State Department of Transportation. *Standard Plans* www.wsdot.wa.gov/publications/manuals/m21-01.htm

5.2 What Are the Airport Security Design Guidelines
• Transportation Security Administration. *Security Guidelines for General Aviation Airports*, 2004 www.tsa.gov/what_we_do/tsnm/general_aviation/airport_security_guidelines.shtm
• FAA AC 150/5370-10D, *Standards for Specifying Construction of Airports*. FAA. 29 September 2007
• WSDOT *Design Manual* M 22-01. WSDOT. 6 May, 2009 www.wsdot.wa.gov/publications/manuals/m22-01.htm

5.3 What Are the Airport Design Guidelines for Airside Facilities
• FAA AC 150/5300-13, *Airport Design*. FAA. 1 November 2008
• FAA AC 150/5320-6D, *Airport Pavement Design and Evaluation*. FAA. 23 June 2006
• FAA AC 150/5370-10D, *Standards for Specifying Construction of Airports*. FAA. 29 September 2007
• FAA AC 150/5340-1J, *Standards for Airport Markings*. FAA. 6 June 2008
• FAA AC 150/5345-46D, *Specification for Runway and Taxiway Light Fixtures*. FAA. 19 May 2009
• FAA AC 150/5340-30D, *Design and Installation Details for Airport Visual Aids*. FAA. 30 September 2008
• FAA AC 150/5345-39C, *Specification for L-853, Runway and Taxiway Retroreflective Markers*. FAA. 14 September 2006
• FAA AC 150/5340-18E, *Standards for Airport Sign Systems*. FAA. 12 September 2008
• FAA AC 150/5345-27D, *Specification for Wind Cone Assemblies*. FAA. 2 June 2004
• FAA AC 150/5340-5C, *Segmented Circle Airport Marker System*. FAA. 14 September 2007
• FAA AC 150/5390-2B, *Heliport Design*. FAA. 30 September 2004
• Washington Department of Transportation. *General Aviation Construction Guidelines*. WSDOT. 6 May 2009 www.wsdot.wa.gov/nr/rdonlyres/c0048f45-1ce3-46c8-87e7-bcf52bfd41f9/0/constguidelines.pdf
• Washington Department of Transportation. WSDOT *Pavement Guide*. WSDOT. 6 May 2009 www.wsdot.wa.gov/biz/mats/pavement/wsdot_volume1pavementpolicy.pdf

5.4 What Are the Airport Design Guidelines for Landside Facilities
• FAA AC 150/5340-18E, *Standard for Airport Sign Systems*. FAA. 12 September 2008
• FAA AC 70/7460-1K, *Obstruction Marking and Lighting*. FAA. 1 February, 2007
• FAA AC 150/5300-13 CHG 2, *Airport Design*. FAA. 1 November, 2008
• FAA AC 150/5370-10D, *Standards for Specifying Construction of Airports*. FAA. 29 September 2007
• FAA AC 150/5345-43F, *Specification for Obstruction Lighting Equipment*. FAA. 12 September 2006
• WSDOT *Traffic Manual* M 51-02.01. WSDOT. August 2008 www.wsdot.wa.gov/publications/manuals/m51-02.htm
• WSDOT *Sign Fabrication Manual* M 55-05. WSDOT. April 2007 www.wsdot.wa.gov/publications/manuals/m55-05.htm
• National Fire Protection Association. NFPA 409 – *Standard on Aircraft Hangars*. NFPA. 2004 www.nfpa.org
• WSDOT *Standard Specifications* M 41-10. WSDOT. 6 May, 2009 www.wsdot.wa.gov/publications/manuals/m41-10.htm
• WSDOT *Airport Stormwater Design Manual*. WSDOT. 6 May, 2009 www.wsdot.wa.gov/aviation/airportstormwaterguidancemanual.htm
• WSDOT *Roadside Manual* M 25-30. WSDOT. 6 May, 2009 www.wsdot.wa.gov/publications/manuals/m25-30.htm

5.5 What Are the Airport Vegetation Design Guidelines
• WSDOT *Standard Specifications* M 41-10. WSDOT. 6 May, 2009 www.wsdot.wa.gov/publications/manuals/m41-10.htm
• FAA AC 150/5370-10D, *Standards for Specifying Construction of Airports*. FAA. 29 September 2007

5.6 What Are the Airport Aids to Airman Design Guidelines
• FAA AC 150/5220-16C, *Automated Weather Observing Systems (AWOS) for Non-Federal Applications*. FAA. 13 December, 1999
• FAA Order 6560.20B, *Siting Criteria for Automated Weather Observing Systems (AWOS),* 20 July 1998

Supporting Documentation

None.