AIRFIELD TRAINING PROGRAM

AIR MOVEMENT AREA
RUNWAY, TAXIWAY, &
NON-MOVEMENT AREA
STUDY GUIDE

SEA Seattle-Tacoma International Airport

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INTRODUCTION

Recognizing the need to provide familiarization and testing for non flight-crew personnel who are involved with operations on the airport, the Port of Seattle (POS) has established the *Airfield Drivers Training Program*. This program presents guidelines and procedures designed to enhance the safety and efficiency of all aircraft movement area operations. The POS *Airfield Drivers Training Program* consists of three program types; *Movement Area (AMA) and Non-Movement Area (AOA).* Each of these programs is designed to provide the appropriate level of training required to conduct operations in those areas. **This manual covers the Air Movement Area or AMA.**

In addition, the implementation of this program is intended to assist in the elimination of runway incursions. **A runway incursion** is defined as "*any occurrence at an airport involving an aircraft, vehicle, person or object on the ground, that creates a collision hazard or results in loss of separation with an aircraft taking off or intending to takeoff, landing or intending to land*."

Runway incursions can result in a collision with an aircraft. Such aircraft collisions, when occurring in the runway environment, are often catastrophic. An example of this collision hazard is the accident which involved two Boeing 747 aircraft which collided on a runway in the Canary Islands, resulting in the worst accident in the history of commercial aviation, in terms of lives lost in a single non-terrorist incident.

In order to minimize the risk of a runway incursion, it is extremely important that all persons who conduct air movement area operations have a thorough understanding of the runway and airfield layout at Seattle-Tacoma International Airport (SEA) as well as familiarity with applicable Air Traffic Control Tower (ATCT) procedures.

Participation in this program and successful completion of a mandatory test is required for all personnel who are involved with operations on the airport movement areas at SEA. Successful completion of the *Airfield Drivers Training Program* process will result in the issuance of an *"AMA" Driver Identifier* on the POS Identification Badge.

Following program implementation, only individuals who have successfully completed *Airfield Drivers Training Program's for Movement and Non-movement areas* will be permitted to conduct aircraft movement area operations at SEA. Any violation of the POS Rules & Regulations, especially pertaining to movement area operations may result in the loss of your driving privileges on your airport badge and/or retraining and testing. **See the POS Rules & Regulations for more details.**

The objectives of this program are...

- ✓ *To identify proper methods and procedures for the safe movement of aircraft at SEA.*
- ✓ *To distribute information which provides aircraft movement area operators with familiarization and knowledge of acceptable aircraft movement practices.*
- ✓ *To test for knowledge to ensure that all personnel who are involved with operations on the airport movement surfaces at SEA have a basic understanding of acceptable procedures.*

This study guide contains basic information, which should be thoroughly understood by all persons who intend to operate on the Air Movement Area. This guide is divided into three sections:

- ✓ **Section one** contains information regarding proper aviation terminology, phraseology and communications on aviation VHF radio equipment.
- ✓ **Section two** contains information regarding movement/non-movement areas and a map of these areas.
- ✓ **Section three** contains information specific to SEA, including the vehicle control line, surface markings, airfield signage and lighting.

SECTION ONE

❖ *Air Traffic Control Procedures and Radio Phraseology*

It is essential to safety that personnel responsible for operations on all airport movement areas at SEA be thoroughly familiar with ATCT procedures and radio phraseology. Correct phraseology and radio technique should be used in all communications with ATC. Use of correct radio techniques will reduce frequency congestion, allow a more expeditious flow of aircraft movements and reduce miscommunications.

When using an aviation VHF radio, it is important to communicate in a clear and concise manner so that ATCT understands your transmission. ***Use of slang, CB or police jargon must be avoided.*** Transmissions should be brief yet complete enough to adequately convey the message to ATCT.

ICAO Phonetic Alphabet

To minimize confusion between similar sounding letters, a standardized aviation phonetic alphabet has been adopted for use by the International Civil Aviation Organization (ICAO). ATCT will use this alphabet during all transmissions to identify taxiways. The phonetic alphabet is shown below, and must be memorized:

ICAO Phonetic Alphabet

A	**Alfa**	**N**	**November**
B	**Bravo**	**O**	**Oscar**
C	**Charlie**	**P**	**Papa**
D	**Delta**	**Q**	**Quebec**
E	**Echo**	**R**	**Romeo**
F	**Foxtrot**	**S**	**Sierra**
G	**Golf**	**T**	**Tango**
H	**Hotel**	**U**	**Uniform**
I	**India**	**V**	**Victor**
J	**Juliett**	**W**	**Whiskey**
K	**Kilo**	**X**	**X-Ray**
L	**Lima**	**Y**	**Yankee**
M	**Mike**	**Z**	**Zulu**

SEA-ATC Frequencies

Ground Control	**121.70**
Tower – East (RWYs 16L/34R & 16C/34C)	**119.90**
Tower - West (RWYs 16R/34L & TWY T)	**120.95**
Weather & Airport Information	118.00

❖ *Phraseology*

Use of correct radio phraseology enhances safety and saves time. Listed below are examples of some of the most common terms:

ACKNOWLEDGE - Let me know that you have received my message.
ADVISE INTENTIONS - Tell me what you plan to do.
AFFIRMATIVE - Yes.
CONFIRM - My version is…is that correct?
CORRECTION - An error has been made in the transmission and the correct version follows.
GO AHEAD - Proceed with your message. Not to be used for any other purpose.
HOLD - Stop where you are.
HOLD SHORT OF… - Proceed to, but stop before reaching a specific point.
NEGATIVE - No, or permission not granted, or that is not correct.
PROCEED - You are authorized to begin or continue moving.
READ BACK - Repeat my message back to me.
ROGER - I have received all of your last transmission. It should not be used to answer a question requiring a yes or a no answer.
SAY AGAIN - Used to request a repeat of the last transmission. Usually specifies transmission or portion thereof not understood or received.
STAND BY - Means the controller or pilot must pause for a few seconds, usually to attend to other duties of a higher priority. Also means to wait as in "stand by for clearance." If the delay is lengthy, the caller should reestablish contact.
UNABLE - Indicates inability to comply with a specific instruction, request, or clearance.
VERIFY - Request confirmation of information; e.g. "verify cleared to cross runway one six left."
WILCO - I have received your message, understand it, and will comply with it.

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ATCT Light Gun Signals

In the event that communications are lost with ATCT, the controllers have light guns to signal aircraft and vehicles.

STEADY GREEN
Cleared to cross, proceed or go
FLASHING GREEN
Cleared for taxi
STEADY RED
STOP
FLASHING RED
Clear the taxiway/runway
FLASHING WHITE
Return to starting point on airport
ALTERNATING RED/GREEN
Exercise extreme caution

- ✓ If not on a movement area, **DO NOT ENTER**.
- ✓ If on a runway, continue across but **DO NOT CROSS ANOTHER RUNWAY**.
- ✓ Watch for light gun signals or wait for an escort.

WHO you are calling
WHO you are
WHERE you are on the airport
WHAT you are requesting or intending to do

❖ *Transmitting on Aviation VHF Frequencies*

There are a few simple measures, which should be taken before transmitting on the aviation VHF radio:

- ✓ Prior to transmitting, the radio should first be checked by verifying that the correct frequency has been selected.

- ✓ Next, the frequency should be **monitored** to determine that no one else is transmitting or waiting for a read-back. Monitoring the frequency prior to transmitting helps in establishing a mental picture of the current situation, commonly called ***situational awareness***. This procedure will also eliminate instances of transmitting at the same time as someone else.
- ✓ Then, verify that the microphone selector switch is set to the proper radio. This will help reduce the number of instances where one frequency is being monitored and another is being inadvertently transmitted on.

- ✓ Prior to transmitting, consider what you are going to say, and use the following:
  - ***WHO** you are calling*
  - ***WHO** you are*
  - ***WHERE** you are on the airport*
  - ***WHAT** you are requesting, or intending to do*

Here is a detailed example:

Your job requires you to operate on the haul road in between taxiway's DELTA (D) and HOTEL (H) on the north end of the airport. The airport is in south flow meaning the runways in use are 16 Left, 16 Center, and 16 Right. You first proceed on the NON-MOVEMENT area down to Cargo Area 1. While you remain on the NON-MOVEMENT area you contact Seattle Ground Control and request access...

Seattle Ground, Foxtrot 99 - (wait for a response)
Foxtrot 99, Seattle Ground…
Seattle Ground, Foxtrot 99 is at CARGO 1 would like to conduct operations on the haul road between taxiways Delta (D) and Hotel (H) referencing aircraft.
Foxtrot 99, Seattle Ground, you are cleared to cross taxiways ALPHA (A) and BRAVO (B); hold short of Runway 16L (Left) at taxiway DELTA (D), and contact Tower.
Seattle Ground, Foxtrot 99 is cleared to cross taxiway ALPHA (A) and BRAVO (B), hold short of Runway 16L (LEFT) at DELTA (D) and contact Tower.

It is very important that you listen closely and follow the controller's instructions. In the above example you have a need to cross active taxiways ALPHA and BRAVO and an active runway 16L. You are cleared to cross the active taxiways, ***but not cleared to cross the runway.*** You must hold short of runway 16L and contact tower once you have reached the hold short line on taxiway DELTA in order to proceed further.

If in doubt, ASK QUESTIONS!

General Rules to Follow While on the Air movement area (AMA)

Ensure that all available pertinent information regarding airport construction, movement area closures and applicable VHF frequencies has been reviewed. ***Know where you are, where you are going, and how to get there.***

- ✓ Is operation on the movement area absolutely necessary?
- ✓ Can the operation be delayed until a less busy time?
- ✓ Listen before you transmit. When you are ready to transmit, pause, listen, and make sure the frequency is clear.
- ✓ Use the correct radio technique and phraseology. Read back ATCT instructions before proceeding and read back all hold short and runway crossing instructions ***verbatim***.
- ✓ Maintain a "**sterile cockpit**". Do not become absorbed in unrelated tasks or non-essential conversations while on movement areas.
- ✓ Look in all directions before proceeding onto the movement area and then move in an expeditious manner.
- ✓ Report when off the movement area.
- ✓ Be alert to the sounds or the **lack of sounds** in your receiver. Check your volume, recheck your frequency, and make sure that your microphone is not stuck in the transmit position.
- ✓ If you are unsure of your position on the airfield, ***stop and ask for assistance***.
- ✓ Continuously monitor the appropriate ATCT frequency and acknowledge all transmissions.
- ✓ Ensure that you fully understand your instructions. If you are unsure, ask for clarification and **do not move** until you completely understand.
- ✓ Report any deteriorating/confusing airfield signs, surface markings or lighting to SEA Airfield Operations, or FAA at an appropriate time.

SECTION TWO

❖ *Movement Areas*

Movement areas are defined as the runways, taxiways, and other areas of the airport which are utilized for the taxiing, takeoff, and landing of aircraft, exclusive of loading ramps and parking areas. Here at SEA, specific approval for entry onto the movement area must be obtained from ATCT.

Identified below are the types of movement areas found on the airfield at SEA.

- ✓ **Runway** – A defined rectangular surface on an airport prepared or suitable for the landing or takeoff of airplanes.
- ✓ **Taxiway** – A defined path established for the taxiing of aircraft from one part of an airport to another.

Movement areas at SEA are shown on the map on the next page in RED

❖ *Non-Movement Areas*

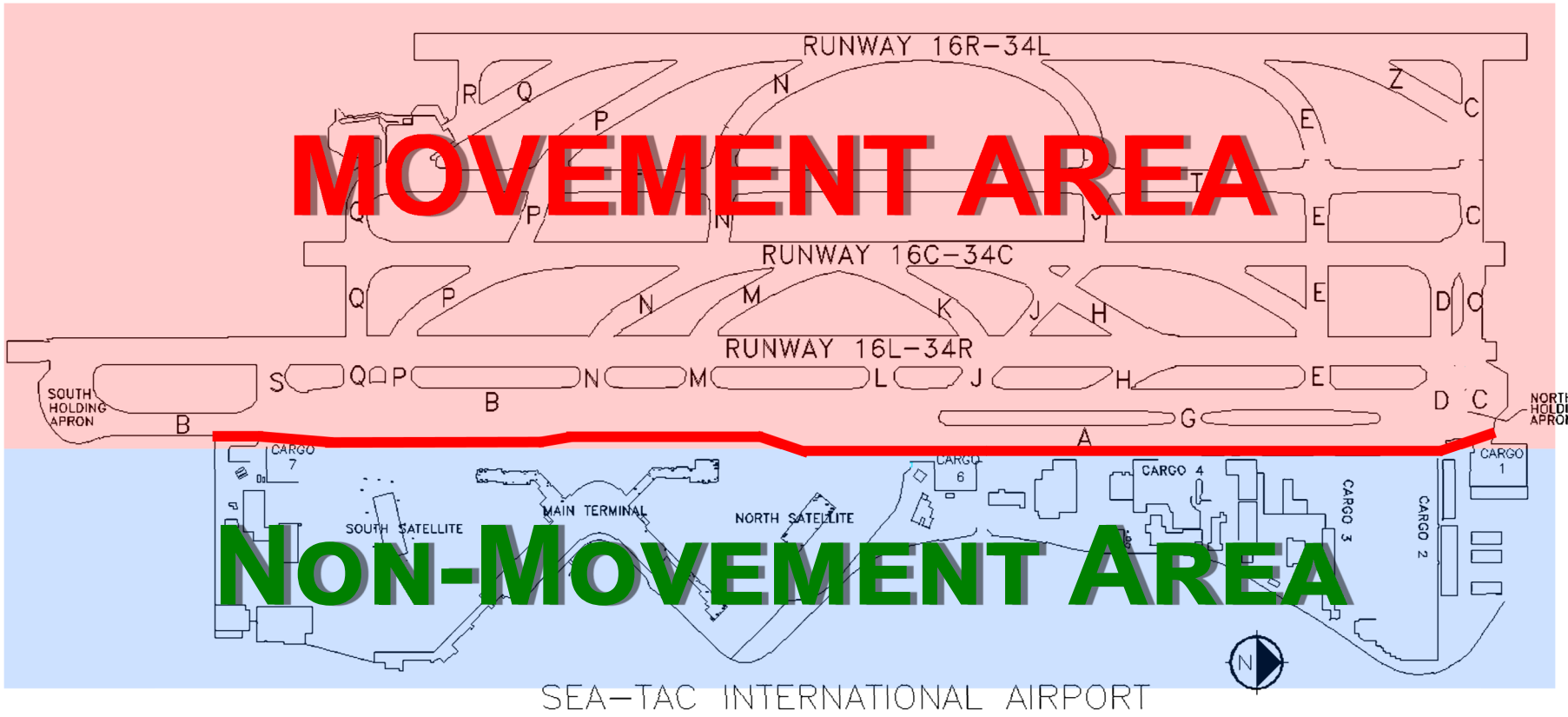
Non-movement areas are defined as the taxilanes and apron/ramp areas not under the control of ATCT, but Aircraft Operations and some vehicle operations require SEA Ramp Tower Authorization. At SEA the non-movement area is controlled by Seattle Ramp Tower.

Identified below are the types of non-movement areas found on the airfield at SEA.

- ✓ **Taxilane** – The portion of the aircraft parking area used for access between taxiways and aircraft parking positions.
- ✓ **Apron/Ramp** – A defined area on an airport intended to accommodate aircraft for purposes of loading or unloading passengers, mail or cargo, refueling, parking or maintenance.

Non-movement areas at SEA are shown on the map on the next page in Blue

Always Maintain Your Situational Awareness


MOVEMENT AREA
NON-MOVEMENT AREA
RUNWAY 16R-34L
RUNWAY 16C-34C
RUNWAY 16L-34R
SOUTH HOLDING APRON
NORTH HOLDING APRON
CARGO 7
SOUTH SATELLITE
MAIN TERMINAL
NORTH SATELLITE
CARGO 6
CARGO 4
CARGO 3
CARGO 2
CARGO 1
SEA–TAC INTERNATIONAL AIRPORT
= Vehicle Control Line

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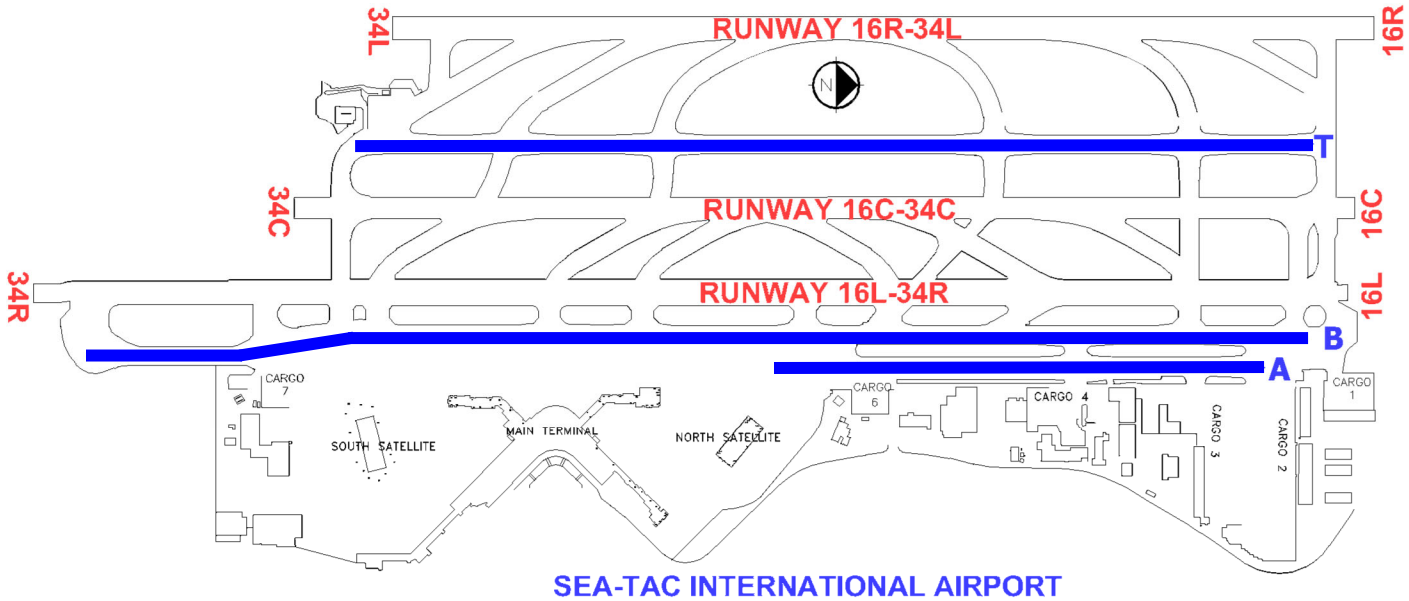
SECTION TWO - MOVEMENT AREA

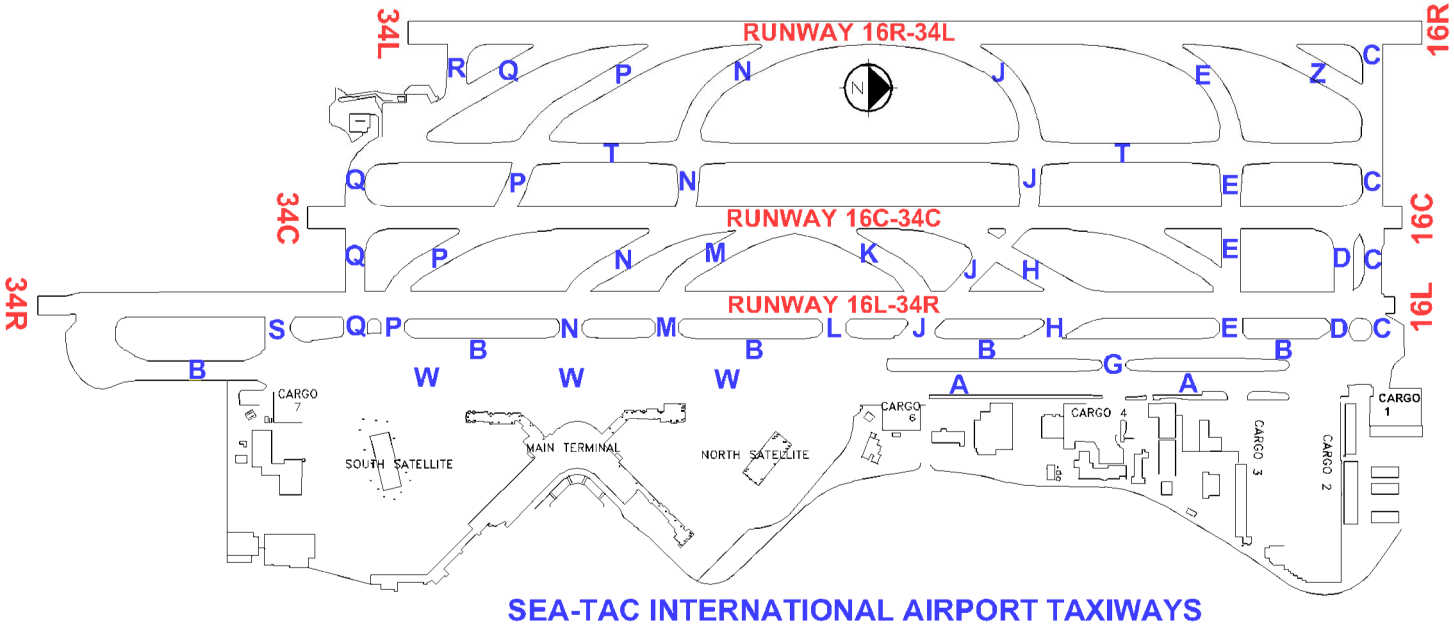
❖ *Taxiways*

SEA has three North-South oriented taxiways. These are Alpha (A), Bravo (B) and Tango (T). Taxiway Alpha (A) begins north of the North Satellite and continues to the North Apron where it meets with Taxiway Delta (D). Taxiway Bravo (B) is east and parallel to the full length of 16 Left (L)/34 Right (R). Taxiway Tango (T) is west and full length of 16 Center (C). All taxiways are in the movement area and require ATCT clearance before entering. **NEVER ENTER** onto a taxiway without clearance even if you think it is safe or clear to do so.



SEA-TAC INTERNATIONAL AIRPORT
North/South Taxiways

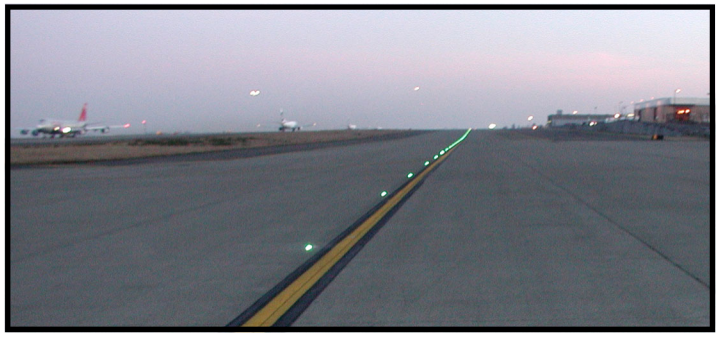
SEA also has ***many*** inter-connecting taxiways. These are Charlie (C), Delta (D), Echo (E), Foxtrot (F), Golf (G), Hotel (H), Juliett (J), Kilo (K), Lima (L), Mike (M), November (N), Papa (P), Quebec (Q), and Sierra (S). These taxiways are sequenced alphabetically from the north, and may cross both runways, connecting the west side of the airfield to the east (terminal and ramp areas). In addition the new third runway has two new taxiways, Romeo (R) located on the far south of Runway 16R/34L and Zulu (Z) located on the north end of Runway 16R/34L



SEA-TAC INTERNATIONAL AIRPORT TAXIWAYS

❖ *Taxiway Markings & Lighting*

Taxiway painted surface markings are yellow with a black background. Taxiway painted surface markings includes a yellow centerline and double black edgelines. Taxiways have green centerline lights or reflectors and/or blue edge lights or reflectors.



In-pavement runway guard lights are amber and parallel to and in front of the runway holding position line.

Elevated runway guard lights (amber, alternating flashing lights) are placed to the sides of a runway/taxiway intersection adjacent to the painted hold lines.

SECTION TWO - MOVEMENT AREA

Runways

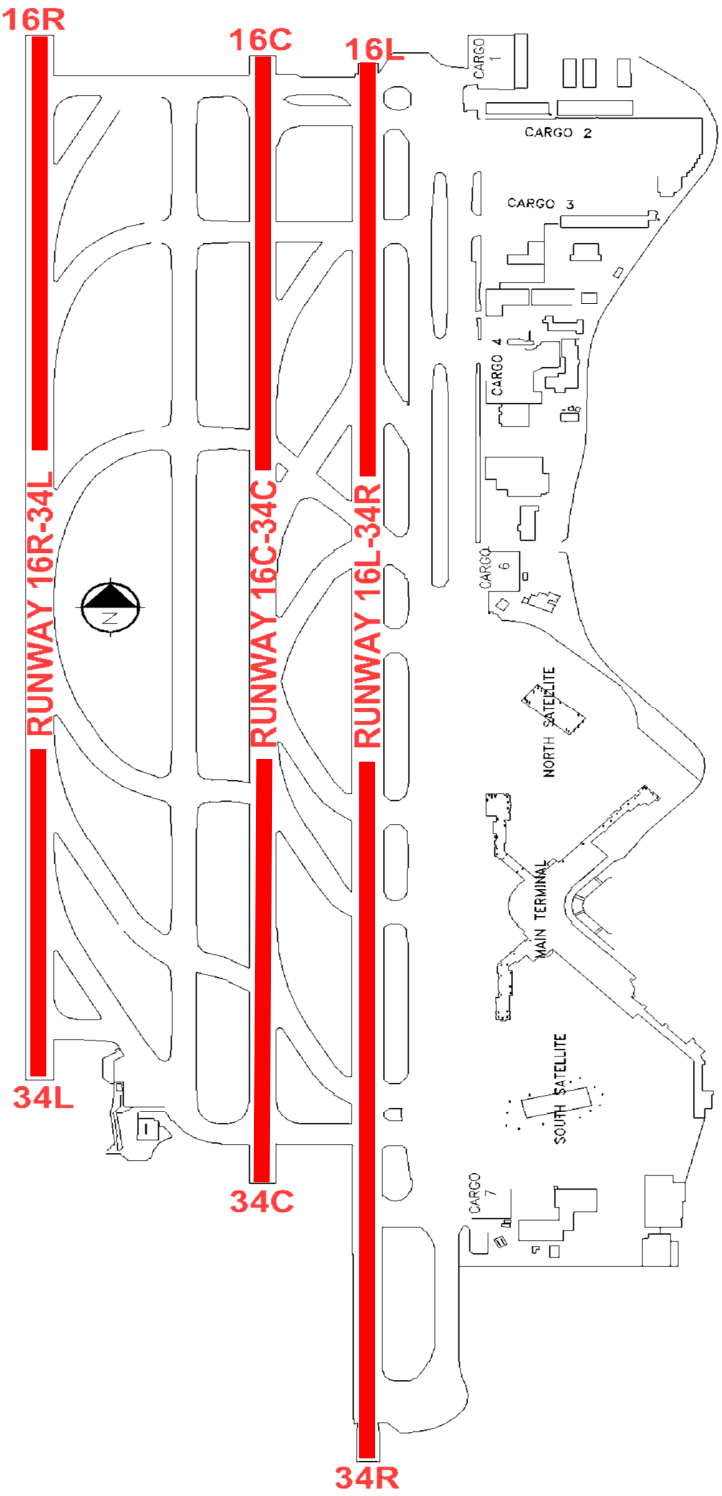
Runway designations are based on a runway's magnetic heading, using the 360-degree compass system. Runways may be used in two (opposite) directions, resulting in two runway designations, which are 180 degrees different from one another.

Therefore, a runway which is designated as runway 18/36 would be oriented in the north/ south direction, with compass headings of 180 and 360 degrees. If aircraft were conducting take-off of landing operations to the north, the runway in use would be designated as runway 36. If the same runway were being used by aircraft conducting take-off or landing operations to the south, then the same runway would be designated as runway 18. If there is more than one parallel runway, a letter is added to differentiate the left (L), right (R) or center (C) runway.

At SEA, the runways are oriented in a north/ south direction with designations of 16R/34L for the new western most third runway, 16C/34C for the center runway, and 16L/34R for the eastern most runway. You **MUST NEVER** enter a runway without prior ATCT clearance.

YOU MUST NEVER ENTER A MOVEMENT AREA WITHOUT PRIOR AIR TRAFFIC CONTROL CLEARANCE!

SEA-TAC INTERNATIONAL AIRPORT RUNWAY LAYOUTS



❖ *Runway Markings & Lighting*

Runway painted surface markings are white with a black background. Runway painted surface markings include centerline stripes, edge stripes, threshold/touchdown bars, and runway designation markings.

Runway edge lighting is white, and then it changes to amber at 2000 feet from the end of the runway. Runway touchdown zone lighting is white. Runway centerline lighting is white, and then changes to alternating red and white at 3000 feet remaining, and then finally red at 1000 feet from the end of the runway.

Note: The lights in this photo appear amber or red, however they are actually white.

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WAYS TO PREVENT INCURSIONS

See The Big Picture
Understand Signs, Lights, & Markings
Transmit Clearly
Listen, Listen, Listen
Know Your Location
Know What Is Going On Around You
NEVER ASSUME
ASK FOR HELP WHEN NEEDED
Follow all ATCT & RAMP Procedures

SECTION THREE - MOVEMENT/NON MOVEMENT AREAS

❖ *Pink Spots (GPM's)*

Geographic position markings (pink spots) are located along Alpha and Bravo Taxiways and are accompanied by clearance bars (three amber in-pavement lights) and an intermediate holding position markings (dashed yellow line with a black background). **Some of the GPM's are in Movement areas, while others are in Non-Movement areas.** Having knowledge of the pink spots and their locations can assist you with your position at the airport. It also makes for an easy way to communicate your location to ATCT and Ramp Tower at anytime, especially during SMGCS (Surface Movement Guidance & Control System - low visibility) times.

❖ *Green Start Boxes*

The Start Boxes associated/paired with Geographic Position Markings (GPM) at the entrance to the ramps are GREEN in color. Additionally, boxes 50 & 100, located on Taxilane WHISKEY (W) have also been painted GREEN. The intention of this is to draw a visual distinction between the Start Box and the nearby GPM. These green start boxes are in the **NON-MOVEMENT AREA.**

SECTION THREE - NON-MOVEMENT AREA

❖ *Taxilane "WHISKEY"*

Taxilane WHISKEY (W) runs parallel to the drive line on the east side of the airport from the just beyond the North Satellite down to Cargo 7. This taxilane is differentiated from taxi*way* BRAVO (B) by its color; a yellow centerline with lime-green side stripes or background (See photo below). The primary function of taxilane WHISKEY (W) is to support opposite direction of air traffic from taxiway BRAVO (B). Taxilane WHISKEY (W) is controlled by the RAMP TOWER.

❖ *Taxilanes*

Taxilanes, also referred to as alleys or alleyways, are situated at various locations at SEA, and have yellow centerlines with black backgrounds. Taxilanes are in the passenger terminal areas around the north and south satellites and in the cargo areas. Taxilanes at SEA are ***non-movement areas***.

SECTION THREE - NON-MOVEMENT AREA

❖ *Vehicle Control Lines*

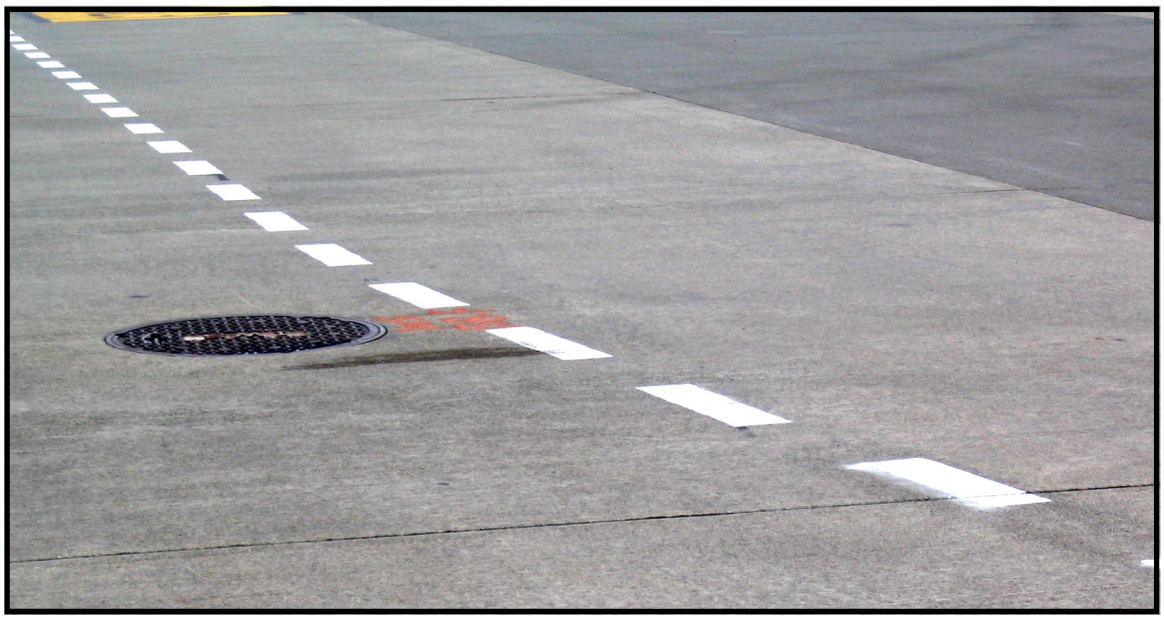
The Vehicle Control Line is a solid **RED** line with a white background or border. This line represents the boundary area between movement and non-movement areas. Vehicles and Pedestrians are NOT ALLOWED to cross this line without PRIOR authorization from SEA ATCT. If you cross over this line without being authorized it is then a taxiway incursion and serious penalties can result, not to mention potential interference with aircraft operations. When you see this line, always stop, think, and make sure you have prior clearance to cross it!

❖ *Ramp/Apron Areas*

Ramp/Apron areas are maintained by the individual airline, ground handling companies, or the POS. Surface markings and lighting, when present, will be similar to that of a taxilane. Ramps/Aprons at SEA are also ***non-movement areas***.

❖ *Object Free Line*

The Object Free Line is a white dashed line. This line is commonly found around the RAMP areas. When placing ground support equipment, vehicles, cargo, and other materials necessary for aircraft support, these items MUST never extend beyond this white line.

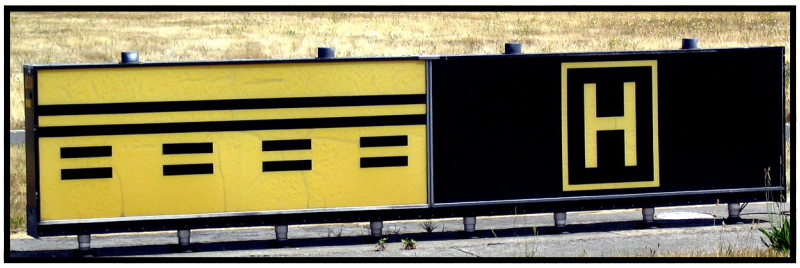


SECTION THREE - SIGNS AND MARKINGS

❖ *Airfield Signs and Surface Markings*

Airfield signs, surface markings, and lighting are visual aids designed to guide operations on movement areas. The colors and sizes of signs and painted surface markings are significant.
Mandatory instruction signs have a red background with white lettering. These signs denote the entrance to a runway, approach area, or critical area.

Location signs have a black background with yellow lettering and a yellow border. Location signs identify movement areas and are installed so as to be highly visible, usually on the left side of the movement areas. Location signs are often combined with other types of signs. Direction signs have a yellow background with black lettering and arrows. Direction signs are placed before an intersection to identify the intersecting taxiways. The arrows indicate the directions of the taxiways that lead out from the intersection. Information signs have a yellow background with black lettering. Information signs provide various types of advisories.



❖ *Surface Markings*

At the intersection where a taxiway meets a runway, painted surface markings called hold lines (holding position markings) are installed. Hold lines consist of two solid yellow lines followed by two segmented yellow lines. Operators must hold (STOP) on the side which has the two SOILD bars. This is also the location at the intersection where the mandatory instruction sign identifying the runway is placed. ATCT authorization is ***required*** to proceed beyond the hold lines.

Instrument Landing System (ILS) hold lines (ILS holding position markings) are painted onto the surface at locations where it is necessary to keep aircraft and vehicles on the ground from interfering with the signals transmitted from the ILS antennas. When ILS approaches are in progress, during periods of low-visibility, operators may be instructed by ATCT to "hold short of the ILS critical area". The ILS hold short area resembles a ladder, and ATCT might call it the ILS LADDER.

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