U.S. Department
of Transportation
Federal Aviation
Administration

Advisory Circular

Subject: Low Visibility Operations / Surface Movement Guidance and Control Systems (LVO/SMGCS)

Date: MM/DD/YY **AC No:** 120-57C
Initiated By: AFS-400

This Advisory Circular (AC) provides an acceptable means, but not the only means, for United States airports who choose to develop and maintain an accepted voluntary Federal Aviation Administration (FAA) Low Visibility Operations/Surface Movement Guidance and Control Systems (LVO/SMGCS) Plan under Title 14 of the Code of Federal Regulations (14 CFR) part 91 and 139. The LVO/SMGCS program focuses on enhancing safe taxi operations during visibility conditions of less than Runway Visual Range (RVR) 1200 feet (350 meters).

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CHAPTER 1. GENERAL INFORMATION

1.1 Purpose.

This AC provides guidance for Airport Operators (A/O) when developing an LVO/SMGCS Plan. There may be valid safety and operational reasons for a specific LVO/SMGCS Plan to vary from the AC 120-57 (current edition) guidance due to unique local issues, environmental factors, or volume of traffic operations. This AC contains specific examples some airports have used to meet the intent of the AC.

1.2 Applicability.

This AC provides guidance to assist A/O who choose to develop an FAA LVO/SMGCS Plan to support surface movement operations below Runway Visual Range (RVR) 1200 feet (350 meters).

1.3 Related References, Definitions, and Cancellation.

1.3.1 Related References. See Appendix A for related references.

1.3.2 Definitions. See Appendix B for definitions and acronyms.

1.3.3 Cancellation. AC 120-57B, Surface Movement Guidance and Control System, dated 08/25/2020, is cancelled.

1.4 Background.

1.4.1 In 2012, the FAA revised low visibility operations policy to align with international low visibility operations (LVO) in several ways. Some changes included the term Low Visibility Operations/Surface Movement Guidance and Control System (LVO/SMGCS) replaced Surface Movement Guidance and Control System (SMGCS), and meter equivalencies were added for RVR values. Additionally, following a Safety Management System (SMS) evaluation, lower visibility limits were established which aligned taxi RVR policy with International Civil Aviation Organization (ICAO).

1.4.2 LVO/SMGCS achieves improved safety through the increased control of aircraft and ground vehicles during low-visibility conditions. The FAA encourages all airports that operate in visibility less than RVR 1200 ft (350 m) to have an LVO/SMGCS Plan. Implementing a proper LVO/SMGCS operation provides a safety benefit for all airport operations and involves tenants, major carriers, and other airport and National Airspace System (NAS) stakeholders.

1.5 Major Changes in this Revision.

1.5.1 This AC identifies LVO/SMGCS operations in the following three visibility levels:

- Less than RVR 1200 ft (350 m) to RVR 500 ft (150 m)

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- Less than RVR 500 ft (150 m) to RVR 300 ft (75 m)
- Less than RVR 300 ft (75 m). There is currently no guidance for taxi below RVR 300 ft (75 m); this is at the discretion of the A/O (see Chapter 4).

1.5.2 In addition, this AC has several changes in terminology. For example, the terms working group and LVO/SMGCS Team are now Airport LVO/SMGCS Working Group (see paragraph 2.1) and FAA LVO/SMGCS Team (see paragraph 3.1). The term "inspection" will apply to either the ARP representative conducting a 14 CFR Part 139 required airport inspection or a separate "lighting inspection" that is the responsibility of the A/O. The LVO/SMGCS Plans will have a "review" and "initial evaluation" for new plans and a "review" and periodic "exercise" for existing or amended plans.

1.5.3 This AC also promotes consideration of emerging technologies as mitigations for detection capabilities.

1.5.4 Lastly, this AC emphasizes the voluntary nature of the program. The FAA encourages all airports with low visibility operations to have an accepted LVO/SMGCS Plan. However, it is at the discretion of the A/O to develop and implement the plan. The A/O is the final authority for plan implementation.

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CHAPTER 2. IMPLEMENTATION STEPS FOR LVO/SMGCS

2.1 Airport LVO/SMGCS Working Group.

The A/O should establish an Airport LVO/SMGCS Working Group to develop an LVO/SMGCS Plan. The Airport LVO/SMGCS Working Group should include the following representatives:

- The A/O, including airfield operations staff, lighting personnel, aircraft rescue and firefighting (ARFF), security/traffic control, deicing operators and any other appropriate entities.
- FAA - including ATO (local and/or regional), Airport District Office (ADO) or Regional Office, the Flight Standards Flight Procedures and Airspace Group (FPAG) appropriate representative with necessary local airport experience, an FAA Tech Ops Check Sector office representative, and National Air Traffic Controllers Association (NATCA) representative.
- The local airport tenants - including air carriers, general aviation, military, contract-support groups, interested labor organizations, and other industry stakeholder groups.

2.2 Airport Evaluation.

The Airport LVO/SMGCS Working Group should accomplish an airport evaluation to determine the feasibility of an LVO/SMGCS program. The airport evaluation should include an analysis of the safety factors and associated operational benefits as well as a cost benefit analysis. Safety Management System (SMS) principles, which focus on identifying hazards and analyzing risk can be an effective tool to aid in airport evaluations. (Refer to FAA Order 8000.367, Aviation Safety (AVS) Safety Management System Requirements.)

2.3 Location Analysis.

The location analysis should review the existing airport layout, facilities, instrument flight procedures minima, airplane type, size categories, instrument capabilities, and operational procedures. This analysis will help ascertain the number of aircraft taxi operations that would benefit in terms of safety, throughput, and efficiency with an LVO/SMGCS Plan. Comparison of the existing and potential operating capability will also assist the Airport LVO/SMGCS Working Group in determining what additional measures and SMS mitigations are appropriate to achieve the desired low visibility operations. Flight Technologies and Procedures Division representatives can refer an A/O to other similar size airports with comparable LVO/SMGCS operations as benchmarks for their consideration in determining airport needs. The location analysis should include consideration of at least the following:

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- Airport layout and surface traffic patterns. (Includes runways, taxiways, fillets, and taxi lanes used for current low visibility operations and those needed to achieve new low visibility operations.)
- Details on limiting operations to certain LVO/SMGCS designated taxiways.
- Possible low visibility taxi operations utilizing emerging technologies.
- Air traffic procedures used for current low visibility operations, and changes or additional infrastructure needed to support new low visibility operations.
- Surface lighting, marking, and signs used for runways, taxiways, taxi lanes and gate lead-in markings. (Identify additional needs in support of low visibility operations, i.e., stop bars, runway guard lights, clearance bars, taxiway centerline lighting, reflectors, geographic position markings, etc.) Additionally, review of the capability to electronically monitor and/or inspect lighting systems.
- Equipment, procedures, and training to support Aircraft Rescue and Firefighting (ARFF) services in low visibility operations.
- Ground support vehicle operations during low visibility conditions. (Review any restrictions, controls, or training needed, and whether airport operations or tenants will provide, if necessary, follow-me or towing services on the movement area.)
- Protection of ILS critical areas and obstacle free zones.
- Protection of Approach Holding areas.
- Protection of Runway Safety Areas.
- Snow removal equipment routing and priorities during low visibility conditions.
- The number of low visibility taxi chart(s) needed based upon airport layout complexity.
- All non-movement areas and ramp areas, ground personnel movement, support equipment operation, and mitigations needed for safe conduct during low visibility operations.

2.4 LVO/SMGCS Operations Minimums Selection.

The Airport LVO/SMGCS Working Group should establish the lowest visibility minimums desired for the LVO/SMGCS Plan. The levels to be determined are below RVR 1200 ft (350 m) to RVR 500 ft (150 m), less than RVR 500 ft (150 m) to RVR 300 ft (75 m) and below RVR 300 ft (75 m). There is currently no guidance for taxi

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operations below RVR 300 ft (75 m). This minimum selection would be at the discretion of the A/O, see Chapter 4 of this AC. The determination of operation minimums should consider at least the following:

- An evaluation of historic low visibility weather data for the airport. The data should include RVR values, time of day, and duration that the airport is in LVO/SMGCS to compare the amount and frequency of affected aircraft operations (actual or potential). Obtain weather data from the National Oceanic and Atmospheric Administration – National Center for Environmental Information (https://www.ncei.noaa.gov), the local National Weather Service (https://www.weather.gov), or other private industry sources.

- A determination of which users are capable of using the low visibility takeoff and landing procedures.

- Costs for the desired RVR level of operation. These costs may include:

    - Taxiway centerline lights
    - Taxiway edge lights
    - Runway guard lights
    - Stop bar lights (controlled and uncontrolled)
    - Clearance bar lights
    - Lead on and lead off lights
    - Associated hardware and software
    - Taxiway/ramp markings
    - Airport Surface Detection Equipment (ASDE) or equivalent
    - Expanded communications facilities/ramp control
    - Paving (taxiway fillets)
    - Ground equipment/vehicles (follow-me, tow or ARFF vehicles)
    - Charting
    - Operation and Maintenance (O & M)
    - Training
    - Personnel

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- Other advanced technologies

2.5 LVO/SMGS Plan Development.

The A/O is responsible for engaging the Airport LVO/SMGCS Working Group. The Airport LVO/SMGCS Working Group should assist the A/O in developing a written LVO/SMGCS Plan that describes operational procedures when operating with visibility lower than RVR 1200 ft (350 m). At a minimum, the plan should include:

- A description of each part of the low visibility operation and taxi route(s), a detailed account of the airport's supporting facilities and equipment and clearly identify the responsibilities of participating airport parties (e.g., A/O, airport operations group, ATC, ARFF, air carriers, and ground vehicle operators).
- The local weather conditions that trigger LVO/SMGCS preparations, entry and exit for all or a portion of the airport. Clearly identify how and when LVO/SMGCS event responsibilities will be carried out for each of the RVR values. Identify all additional equipment, markings, lighting, and signage needed.
- A chart(s) representation depicting LVO/SMGCS routing, lighting, markings, signage, hotspots, non-movement area hold position markings, other pertinent non movement markings, pertinent guidance notes, and chart legend.
- The procedures for preparing, entering, and exiting LVO/SMGCS including the notification of tenants, operators, and broadcasting initiation of LVO/SMGCS operations on ATIS. Procedures for taxi, deicing, vehicle movement, vehicle restrictions, baggage cart loading/unloading, aircraft maintenance repositioning in the movement area, restrictions on vehicles, personnel airport access, airport maintenance and construction.
- The procedures to be employed in the event the surface movement surveillance system (SMSS) becomes inoperative during visibility less than RVR 500 ft (150 m).
- Standard Operating Procedures (SOPs), checklists and associated Letter of Authorization (LOA(s)).
- Documentation of training, qualification, and certification, as necessary, for all airport and tenant personnel. The training should include the LVO/SMGCS emphasis areas identified below:
  - Apron (ramp) operations
  - ILS critical areas, runway safety areas, and obstacle free zones
  - Stop bar lights
  - Taxiway centerline lights, including ILS critical area alternating green and yellow lights from runway centerline
  - Clearance bar lights
  - Runway lead-on lights and lead-off lights

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- Geographic position markings
- Runway hold, Intermediate hold, approach hold and ILS critical hold markings
- Movement/non-movement boundary marking
- Other pertinent surface painted signs and markings at the local airport
- Use of low visibility taxi route(s) chart(s), and symbology (see Chapter 8)
- Personnel operating follow-me vehicles and maintenance repositioning should be trained in taxi procedures requiring judgmental oversteering
- Non movement area hold position markings, other pertinent non-movement area markings, and vehicle and aircraft movement markings
- Any unique location specific subject areas requiring participant familiarization

2.6 LVO/SMGCS Plan Submission.

When an A/O completes an LVO/SMGCS Plan, the A/O should submit the plan, the LOA(s) between the Airport Authority and Air Traffic Control Tower (ATCT), and the low-visibility taxi charts(s) to the Flight Technologies and Procedures Division for acceptance. The Flight Technologies and Procedures Division will assign a FAA LVO/SMGCS Team for review and consultation.

2.7 LVO/SMGCS Plan Acceptance.

The assigned FAA LVO/SMGCS Team will review the plan and evaluate the operational concept of the plan and associated charts for proper content and accuracy during an initial evaluation. The FAA LVO/SMGCS Team can accomplish the evaluation in stages due to airport budget or construction schedules as necessary. The FAA LVO/SMGCS Team will work in a consulting role with the Airport LVO/SMGCS Working Group for any recommended changes or improvements to the plan. When all members of the FAA LVO/SMGCS Team concur with the plan, the Flight Technologies and Procedures Division will issue a letter of acceptance to the A/O. For revisions to existing LVO/SMGCS Plans, see paragraph 2.9.

2.8 LVO/SMGCS Plan Implementation.

The A/O, as the final authority, coordinates LVO/SMGCS Plan implementation. The A/O maintains a copy of the LVO/SMGCS Plan, FAA acceptance letter, and other appropriate documentation to include personnel training. The A/O should notify the FAA LVO/SMGCS Team Lead of the LVO/SMGCS implementation date once the following items are complete:

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1. An initial evaluation of the LVO/SMGCS Plan (see paragraph 3.1.4). Address needed revisions identified during the evaluation prior to implementation. The A/O may elect to implement the LVO/SMGCS Plan and exercise(s) in stages.
2. The LOA(s) between A/O and local ATCT is signed and included in the plan. All associated SOPs, LOAs, and checklists should be made available to all airport stakeholders with associated responsibilities.
3. The LVO/SMGCS taxi chart(s) are published and available to all airport tenants, including ground and air operator personnel, who will participate in LVO/SMGCS operations.

2.9 LVO/SMGCS Plan Revisions and Suspensions.

The Airport LVO/SMGCS Working Group may revise the LVO/SMGCS Plan at any time. A revision, due to construction or modifications to the standards, may include interim procedures not normally used by the airport (for example, a follow-me vehicle might be used to substitute for the absence of or for incomplete procedural or infrastructure guidance requirements during the temporary condition). The FAA LVO/SMGCS Team will consult with the A/O on amended portions of the LVO/SMGCS Plan and any needed changes. The A/O should submit revised plans to the FAA LVO/SMGCS Team for review. In some cases, a review/exercise (see paragraph 3.1.4) may be warranted. The A/O may need to accomplish temporary charting of amended or adjusted taxi routings and/or NOTAMs. When the A/O is ready to conduct alternative operations and the FAA LVO/SMGCS Team has concurred, the A/O may implement the revised plan. It is up to the Airport Authority on how they want to handle construction during LVO/SMGCS. Some major airports have elected to incorporate the escort of construction crews and equipment to and from the site in their LVO/SMGCS Plan. Alternatively, the A/O may elect to suspend their LVO/SMGCS Plan during major construction (see paragraph 3.2). The Airport LVO/SMGCS Working Group and the FAA LVO/SMGCS Team should be advised in writing of the intent to suspend LVO/SMGCS operations.

2.10 LVO/SMGCS Plan Cancellation.

If the A/O elects to discontinue an accepted LVO/SMGCS Plan, the A/O should advise the Flight Procedures and Airspace Group in writing. The A/O should consider the following items:

- Other mitigations that could be used in lieu of an LVO/SMGCS Plan for LVO operations. (i.e., Airport Surface Detection Equipment Model X ASDE-X).
- Notification of Airport LVO/SMGCS Working Group, tenants, and operators.
- Discontinue Chart publication.
- Remove from airport and tenant records all references of existing LVO/SMGCS Plan documentation and training.

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- If returning to LVO/SMGCS operations, a new LVO/SMGCS Plan will need to be developed, submitted, and accepted.

2.11 LVO/SMGCS Operations RVR 600 feet reducing to RVR 500 feet (150 meters).

2.11.1 A Safety Management System (SMS) evaluation of LVO/SMGCS enabled the new lower-limit visibility of RVR 500 ft (150 m). This change allows for airports with an LVO/SMGCS floor of RVR 600 ft to reduce the floor visibility to RVR 500 ft (150 m).

2.11.2 Airports that have an accepted LVO/SMGCS Plan with a floor of RVR 600 ft that desire to make the change to RVR 500 ft (150 m) should contact Flight Technologies and Procedures Division to request the Job Aid for accepting a reduced LVO/SMGCS floor from RVR 600 ft to RVR 500 ft (150 m). The job aid will help in the identification of hazards and mitigations of resultant risks to permit the airport to make the change.

2.11.3 The completed Job Aid concludes one of two findings:

- If the Airport Working Group agrees the evaluation that the previously authorized operations down to LVO/SMGCS RVR 600 ft will maintain an acceptable level of risk now at RVR 500 ft (150 m), the A/O should update the LVO/SMGCS Plan and advise the Flight Technologies and Procedures designated representative. Additionally, the A/O is responsible to coordinate with chart providers to amend the taxi chart(s) to reflect the RVR 500 ft (150 m) change.

- If the Airport LVO/SMGCS Working Group agrees that additional SMS evaluation and safety mitigations are necessary, the Job Aid process concludes with what additional requirements and analysis are required.

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CHAPTER 3. RESPONSIBILITIES

3.1 FAA Roles and Responsibilities.

The Air Traffic Organization (ATO), Airports Division (ARP), and Flight Standards (FS) share responsibility for policy and conduct of the national LVO/SMGCS program. These three lines of business will provide a representative to participate as a member of a FAA LVO/SMGCS Team.

3.1.1 Flight Standards (FS). FS provides guidance and training for FS inspectors to support a technical assessment of the operational safety, acceptance, and implementation of the LVO/SMGCS Plan. FS, through the Flight Technologies and Procedures Division will designate representative(s) to lead the FAA LVO/SMGCS Team(s) as needed to review new or amended LVO/SMGCS Plans and conduct initial evaluations and periodic LVO/SMGCS exercises.

3.1.2 Air Traffic Organization (ATO). ATO provides implementation, acceptance and collaboration through Service Centers, ATC district offices, local ATCT and other field and service areas. An ATCT representative and/or terminal service area/district representative will participate as member(s) of the FAA LVO/SMGCS Team.

3.1.3 Airports Division (ARP). ARP provides A/O with equipage engineering specifications and installation requirements for LVO/SMGCS. They support LVO/SMGCS Plans by providing the necessary ground infrastructure for low visibility operations through the Airport Improvement Program (AIP) or other grant funding programs when suitable. ARP provides airport certification policy and guidance for input to the LVO/SMGCS planning, acceptance, review, and exercise activities. The ARP through the Regional ARP Divisions will designate a Regional ARP Airport Certification Safety Inspector (ACSI) as a member of the LVO/SMGCS Team.

3.1.4 FAA LVO/SMGCS Team Responsibilities. The FAA LVO/SMGCS Team will work collaboratively with the Airport LVO/SMGCS Working Group. The FAA LVO/SMGCS Team should:

1. Participate in Airport LVO/SMGCS Working Group meetings. The FAA LVO/SMGCS Team provides guidance for determining LVO/SMGCS airport routes, layout, equipage, and other necessary infrastructure. The FAA LVO/SMGCS Team assists the Airport LVO/SMGCS Working Group as they consider safe alternatives as possible risk mitigations when conditions exist that have not been considered in this AC.

2. Review and evaluate LVO/SMGCS Plans/operations. The FAA LVO/SMGCS Team ensures the plan meets the intent of the AC to the extent the airport configuration permits and describes conditions that trigger implementation for all or parts of the airport. The FAA LVO/SMGCS Team may identify areas where improvements to the plan can be made and will collaborate with the Airport LVO/SMGCS Working Group to help identify alternative solutions as needed.

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3. Perform an initial evaluation. An initial evaluation should be accomplished for all LVO/SMGCS airports and can be completed in stages, as a specific event, or associated with the airport 14 CFR Part 139 certification inspection. Noted areas of improvement and other recommendations will be provided to the A/O and other appropriate organizations. The evaluation should be complete prior to beginning initial LVO/SMGCS operations. The initial evaluation should:

   a. Evaluate the operational concept of the plan and review the LVO/SMGCS taxi chart(s) for proper content and accuracy.

   b. Evaluate alternative procedures for inoperative components such as stop bar and taxiway centerline lighting systems and Surface Movement Radar.

   c. The evaluation should also examine appropriate communications between ATC, A/O, and other required parties (addressed in the LOA(s) and/or SOP(s)) on the initiation and termination LVO/SMGCS procedures.

Note: The initial evaluation will be accomplished as a table-top exercise. However, with manager approval, the initial evaluation may be accomplished on-site. If accomplished on-site, a portion of the evaluation should be accomplished at night, to the maximum extent possible, to simulate restricted visibility conditions and will include evaluation of lighting, markings, procedures, etc. as denoted in the LVO/SMGCS Plan.

4. Conduct periodic review/exercises. The Flight Technologies and Procedures Division will direct additional periodic review/exercises of accepted LVO/SMGCS Plans. The interval between review/exercises should not exceed 36 months. An LVO/SMGCS review/exercise consists of:

5. Comparing accuracy of the chart to the airport geometry and geographic position markers (GPM) locations, and other appropriate LVO/SMGCS markings.

6. A review/exercise of the LVO/SMGCS Plan will be accomplished as a table-top exercise. However, with manager approval, the review/exercise may be accomplished on-site. The team will evaluate the overall plan, observing functionality, serviceability checks, communication, etc.

7. Out-brief to discuss any potential changes needed to the LVO/SMGCS Plan.

3.2 Airport Operator Responsibilities.

The A/O is the final acceptance authority for the implementation of the LVO/SMGCS program. The A/O should adopt self-evaluation procedures unique to their location as required to support ongoing safe LVO. Periodic Airport LVO/SMGCS Working Group meetings can be helpful in evaluating LVO/SMGCS performance and making adjustments/improvements to the program. The A/O should:

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1. Chair (or designate a representative) Airport LVO/SMGCS Working Group meetings. The Airport LVO/SMGCS Working Group should meet at least annually to review the LVO/SMGCS Plan, procedures, and operations. The FAA LVO/SMGCS Team is available to help an airport with resolution of discrepancies or incidents determined during these meetings. Oversee LVO/SMGCS Plan development, acceptance, and implementation. Coordinate the drafting, submission, publication, distribution, and revision of LVO/SMGCS Plan. Complete final LVO/SMGCS implementation once the airport is ready for LVO/SMGCS operations.

2. Maintain Taxi Chart Production. Coordinate the specific contents of the LVO/SMGCS taxi chart(s). Chart contents should be appropriate for the LVO/SMGCS operations conducted at that airport. The A/O should comply with changes or additional details determined to be appropriate by the FAA LVO/SMGCS Team members during the initial evaluation or subsequent plan reviews.

3. Maintain Training/Qualifications for Airport Support Groups. Assure initial and recurrent training of LVO/SMGCS procedures is accomplished and documented for appropriate airport operations personnel, ARFF personnel, airport vehicle operators, and tenant vehicle operators.

4. Develop Airport Lighting System Inspections. The specifics of timely inspections suitable to the airport in question will be established in collaboration with the FAA LVO/SMGCS Team. The inspection responsibility includes lights, signs, and markings to ensure timely confirmation of lighting systems reliable operation. Timing may vary depending on many unique airport factors. The airport may have LED lighting systems, other advanced lighting technologies, or electronic monitoring capabilities. Depending on the known reliability of lighting systems, the A/O will determine what will be a timely inspection cycle of airfield visual aids. Include a means of assuring prompt issuance and cancellation of appropriate NOTAMS regarding outages of airport facilities and equipment which support low visibility operations.

5. Establish procedures for entering and exiting an LVO/SMGCS event. Notify tenants of ATC's impending initiation and termination of LVO/SMGCS procedures.

6. Handle construction and non-standard/abnormal operations. Most LVO/SMGCS construction issues can be addressed using NOTAM(s). Advise ATC of airfield condition or non-standard/abnormal operation that may impact LVO/SMGCS operations (i.e., construction, accidents, specials events, deicing abnormalities, snow removal issues, airport equipment issues that impact lighting and signage, etc.).

3.3 Tenant Responsibilities.

Airport tenants will be responsible for adherence to their area of responsibility within the overall LVO/SMGCS Plan. The tenants will work with the A/O to correct any

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deficiencies that are observed or brought to their attention. The tenants should, as needed:

- Participate in LVO/SMGCS meetings.
- Participate in training and certification as required by the A/O.
- Maintain pertinent completion records of personnel training.
- Report risks, accidents, and incidents during LVO/SMGCS events to assist ATCT when tower visibility is restricted.

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CHAPTER 4. EMERGING TECHNOLOGIES

4.1 Emerging technological gains to enhance LVO/SMGCS operations.

Technological gains in new aircraft avionics systems such as Enhanced Vision System (EVS), Enhanced Flight Vision System (EFVS), Synthetic Vision System (SVS), Synthetic Vision Guidance System (SVGS), Combined Vision System (CVS), Head-Up Display (HUD), Head-Down Display (HDD), and Head-Worn Display (HWD) are rapidly moving forward. Advanced accurate moving maps, better-quality own-ship positioning capabilities, and auto land systems are also improving precise aircraft positioning in very low visibility conditions. These innovative technologies can potentially increase the level of safety during airport ground operations during periods of reduced visibility.

Systems are currently under development that will greatly improve parking assistance to aircraft at gate and in ramp areas. Low visibility gate and ramp area parking has previously been dependent on ground marshalling and follow-me capabilities. The A/O may want to consider what advanced parking/ramp movement assistance capabilities are available. The FAA LVO/SMGCS Team should be open to evaluating such options.

These capabilities can improve aircrew positional awareness and decrease the risk of ground navigation errors. As advances in technology continue to evolve, many of these new technologies could be used in the future to support ground operations at airports with LVO/SMGCS Plans. The Airport LVO/SMGCS Working Group may consider operators that are employing these new technologies.

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CHAPTER 5. SIGNS, MARKINGS, AND VISUAL AID REQUIREMENTS

5.1 Overview.

During low visibility operations, adequate visual cues to pilots and vehicle operators are necessary for ground taxiing that is dependent solely on navigating with the unaided eye. These visual aid cues assist pilots in maintaining their situational awareness and ensure the continuation of safe, efficient ground operations. Signs, markings, and visual aids should be installed and inspected in accordance with the standards set forth in the AC 150/5340 series.

5.2 Taxiway Lighting.

The tables below outline taxiway lighting recommendations. Taxiway lights should be turned off, to the maximum extent possible, on those taxiways or runway exits that are not part of a low visibility taxi route.

Table 5-1. Taxiway Lighting Less than RVR 1200 ft (350 m) to RVR 500 ft (150 m)

	Movement Area	Non-Movement Area
	One of the following should be installed along each taxi route: • **Taxiway edge lights.** **Note**: Taxiway edge lights should be installed at intersections along the taxi route where an aircraft is expected to turn and the taxiway width or pavement fillet does not meet the design standards of the current edition of AC 150/5300-13, Airport Design. or • **Taxiway centerline lights supplemented with raised edge reflectors on curves and turns.** **Note:** Centerline lights are more effective than edge lights in low visibility operations; however, at airports where ice and snow could obscure centerline lights, it may be advantageous to install edge lights.	• **Neither lighting nor reflectors are required.** **Note:** The installation of centerline lights, or secondarily, centerline reflectors, is recommended along taxiway and taxi lane centerlines to provide improved guidance.

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Table 5-2. Taxiway Lighting Less than RVR 500 ft (150 m) to RVR 300 ft (75 m)

	Movement Area	Non-Movement Area
	• Taxiway centerline lights supplemented on curves and turns with edge lights should be installed along each taxi route. The taxiway centerline lights should extend continuously from the runway centerline to the non-movement area. When the taxi route crosses or extends onto a runway, centerline lights, or lead-on lead-off lights should be installed.	• Taxiway centerline lights should be installed or, • The LVO/SMGCS Plan must contain provisions for taxiing assistance for pilots, for example, a follow me vehicle, towing by a tug or ground marshalling.

5.3 Lights at Access to Active Runways.

5.3.1 Operations below RVR 1200 ft (350 m).

- Except as described in the following paragraph, all taxiways that provide access to an active runway (regardless of whether they are part of the low visibility taxi route) should have runway guard lights installed at the runway holding position on the taxiway. If both a runway holding position and ILS critical area holding position marking are present, runway guard lights should be installed at the runway holding position only.

- In certain instances, the Airport LVO/SMGCS Working Group may determine that at some taxiway/runway intersections runway guard lights may not be necessary. In making such an evaluation, the Airport LVO/SMGCS Working Group should consider if the intersection and runway environment is safeguarded from the inadvertent entry of aircraft and vehicles through other means (e.g., barricades, signs, closed runway, airport configuration).

- The new installation or upgrading of elevated runway guard lights may not be needed if in-pavement runway guard lights or stop bar lights are installed at the same location.

5.3.2 Operations below RVR 500 ft (150 m).

- In addition to the criteria specified in paragraph 5.3.1, all illuminated (i.e., centerline and/or edge lights turned on) taxiways that provide access to an active runway (regardless of whether or not they are part of the taxi route) should have stop bar lights installed at the runway holding position.

- If both a runway holding position and an ILS critical area holding position marking are present, the stop bar should be installed at only the ILS critical area holding position.

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- Stop bars on taxiways which are used to enter or cross an active runway should be capable of being operated individually. Such stop bars are termed "controlled stop bars." The remaining "uncontrolled" stop bars may be operated by a single switch.

- Stop bar lights are used to positively control access to an active runway. At the approach end of a runway, in-pavement alternating yellow-green lead-on lights should illuminate to provide a secondary visual confirmation of clearance onto the runway by ATC personnel.

- All non-illuminated taxiways (i.e., centerline and edge lights turned off) should be considered not available for taxiway or runway access, and do not need stop bars installed. However, the Airport LVO/SMGCS Working Group should evaluate the need for any additional "uncontrolled" stop bars.

5.4 Runway Guard Light (RGL) Selection.

There are two configurations of runway guard lights. The following criteria should be used to determine which configuration should be installed at a specific runway holding position.

- Elevated runway guard lights should be installed at the runway holding position if the taxiway does not have taxiway centerline lights installed and is 150 feet wide or less. However, if the taxiway has a stop bar installed at the runway holding position, elevated runway guard lights should be co-located with the stop bar, regardless of taxiway width or the presence of taxiway centerline lights.

- In-pavement runway guard lights should be installed at the runway holding position if the taxiway has centerline lights installed, or the taxiway is greater than 150 feet wide, or a stop bar is installed at the ILS critical area holding position.

- In-pavement combination stop bar/runway guard light fixtures (dual red/yellow lens) may be installed at the discretion of the A/O. The yellow in-pavement lights should not be turned on when the stop bar is in operation. If the stop bar is located at an ILS critical area holding position, dual red/yellow fixtures should not be selected. (This would result in the installation of two sets of runway guard lights at different locations which serve the same intersection.)

Note: At airports where ice and snow could obscure in-pavement runway guard lights, it may be advantageous to also install elevated runway guard lights.

5.5 Clearance Bars/Holding Position Markings.

Intermediate hold points along taxi routes should be appropriately denoted by the following:

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- For operations below RVR 1200 ft (350 m), taxiway intermediate holding position markings should be painted to denote hold points.

- For operations below RVR 500 ft (150 m), clearance bar lights should be installed at intermediate hold position markings.

5.6 Taxi Guidance Signing and Marking.

5.6.1 Operations below RVR 1200 ft (350 m).

Taxi guidance signs should be installed at taxiway intersections. Surface painted signs should be located on the pavement where they will enhance the operation as determined by the Airport LVO/SMGCS Working Group, or where it is not feasible to install guidance signs.

- Paint markings that are bright and provide good contrast with the pavement are a significant low visibility guidance aid. These markings along low visibility taxi routes should receive special attention and be repainted when the conspicuity is degraded through wear and tear. Taxiway centerline markings, outlined with black borders, should be painted on light-colored pavements.

- The use of reflective or glass beaded paint should be used for geographic position markings. Glass beads should not be added to black paint.

- The LVO/SMGCS taxi route centerline for low visibility taxi is expanded to either 12 inches, or a standard at 12 inches width. It is depicted with yellow highly reflective paint, reflective glass beads where necessary, and on light colored pavement outlined in black.

5.6.2 Operations below RVR 500 ft (150 m).

Geographic position "pink spot" markings identifying hold points, and collocated with a lighted clearance bar light, should be painted on the taxiway pavement. A geographic position marking located without a taxiway clearance bar light can also be used for positioning information where an Airport LVO/SMGCS Working Group determines a particular need, or where location verification or additional guidance is needed. These markings should be at locations in the movement area where they enhance low visibility operations as determined by the Airport LVO/SMGCS Working Group.

5.7 Monitoring and Visual Inspection of Lighting Aids.

Controlled stop bars should be electronically monitored with a status indication provided in the ATCT. It is recommended that all other lighting systems, which support low visibility operations, be electronically monitored.

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5.7.1 Operations below RVR 1200 ft (350 m).

- An initial visual inspection of stop bar lights, runway guard lights, clearance bar lights, taxiway centerline lights, and taxiway edge lights installed on the low visibility routes or taxiways that intersect the low visibility runway(s) should be conducted by the A/O prior to the implementation of LVO/SMGCS procedures. This visual inspection is conducted to ensure that the lighting systems are "serviceable" as described in paragraph 5.8, and that the lighting system status indicated on any associated electronic monitoring systems reflect the actual operating condition of the lights. All controlled stop bars should be checked for proper function (i.e., operation of sensors, lead-on lights, etc.). Taxiway centerline lights which lie beyond all uncontrolled stop bars are not part of a standard stop bar system and therefore, need not be visually inspected.

- A periodic visual inspection need not be conducted for lighting systems, described above, which are electronically monitored except when meteorological conditions may render them unserviceable (e.g., snow, blowing snow, sand, etc.). Those lighting systems which are not electronically monitored should be periodically inspected every four hours.

5.7.2 Operations below RVR 500 ft (150 m).

- A visual inspection of stop bar lights, runway guard lights, clearance bar lights, taxiway centerline lights and taxiway edge lights installed on the low visibility routes or taxiways that intersect the low visibility runway(s) should be conducted by the airport operator prior to the commencement of operations below RVR 500 ft (150 m). Exceptions: Meteorological conditions may render the lights unserviceable (e.g., snow blowing snow, sand, etc.). The status of any of the aforementioned lighting systems which are electronically monitored may be determined from the lighting status indication on the monitor, provided that the monitor is capable of remotely detecting the unserviceability conditions in paragraph 5.8.

- An inspection conducted within two hours prior to commencement of operations below RVR 500 ft (150 m) would be acceptable for this inspection. This visual inspection is conducted to ensure that the lighting systems are "serviceable" as described in paragraph 5.8. Because controlled stop bars are checked for proper function at the initial visual inspection and because of continuous use by aircraft, re-inspection of stop bars for functionality need not be performed.

- The serviceability of lighting systems described in paragraph 5.7.2 except taxiway edge lights, which are electronically monitored with a system capable of remotely detecting the unserviceability conditions in paragraph 5.8, should be determined every two hours from the lighting status indication on the monitor. Lighting systems which are not electronically monitored with a system of the same capability should be periodically inspected every two hours to ensure that the lighting systems remain "serviceable." The periodic inspection of controlled

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stop bars need not include a check for proper function. Taxiway centerline lights which lie beyond all uncontrolled stop bars need not be visually inspected.

5.7.3 With LED light and halogen technologies, there are other flexible means of achieving acceptable checks on light reliability. The Airport LVO/SMGCS Working Group may elect to determine lighting inspection interval options based on the following options:

- Conduct LVO/SMGCS lighting inspections at established intervals when entering and during LVO/SMGCS events [i.e., four hours for RVR 1200 ft (350 m) to RVR 500 ft (150 m) and every two hours for operations below RVR 500 ft (150 m)].

- Review the reliability and outage history for lights and signs on runways and taxiways using a risk analysis process to determine that a Part 139 daily inspection fulfills this requirement at an equivalent level of safety.

- Conduct a reliability history review which would support increasing the recommended time interval between periodic inspections. For the purposes of this paragraph a risk analysis based on the reliability of airport lighting systems may be used to lengthen lighting inspection intervals. Applying such risk-based safety analysis can enhance safety with proven reliable lighting systems by reducing the need for ground inspection vehicle traffic in low visibility conditions.

5.8 Maintenance Criteria for Lighting Aids.

Taxiway edge lights, taxiway centerline lights, clearance bar lights, runway guard lights, and stop bar lights supporting low visibility operations that are not electronically monitored should be included in a system of preventive maintenance that has the following objectives:

- Taxiway edge lights, taxiway edge reflectors and taxiway centerline lights along the low visibility taxi route -- no two adjacent lights or reflectors unserviceable.

- Stop bar lights or in-pavement runway guard lights -- no more than three lights per location unserviceable or two adjacent lights unserviceable.

- Elevated runway guard lights -- no more than one light in a fixture unserviceable.

- Clearance bar lights -- no more than one light unserviceable.

- The Airport LVO/SMGCS Working Group should consider the options below for inclusion in the LVO/SMGCS Plan when any of the lighting aids do not meet the maintenance objectives above:

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- Traffic should be rerouted to areas where the visual aids are operating normally, or
- Alternative procedures should be implemented to accommodate the operations, or
- Low visibility operations should be terminated until the lighting aids are returned to normal service.

- Lighting aids along the low visibility taxi route(s) that are inoperative should be repaired promptly with minimal disruption of service. If warranted, appropriate NOTAMS should be issued or canceled expeditiously.

5.9 Maintenance Criteria for Lighting Signs.

5.9.1 Inspection Interval. Mandatory instruction signs at entrances to the active low visibility runway(s), and location and direction signs, along low visibility taxi routes where aircraft will be required to hold or turn, should be inspected prior to implementation of LVO/SMGCS operations. While LVO/SMGCS operations are in effect, inspections should continue as outlined in the LVO/SMGCS Plan.

5.9.2 Outage During LVO/SMGCS Events. When any required sign is not illuminated, unserviceable, or missing it should be repaired promptly with minimal disruption of service. If warranted, appropriate NOTAMS should be issued or cancelled expeditiously and:

- Traffic should be rerouted to areas where the visual aids are operating normally, or
- Alternative procedures should be implemented to accommodate the operations, or
- If rerouting or other alternatives will not suffice to maintain an adequate level of safety, low visibility operations may need to be terminated until the sign(s) are returned to normal service.

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CHAPTER 6. SURFACE MOVEMENT SURVEILLANCE SYSTEMS (SMSS) AIRPORT FACILITIES AND SERVICES

6.1 Overview.

SMSS is a broad, general term that refers to surface surveillance provided by a specific system. Surface surveillance can be successfully provided by means as simple as a marshaller or follow-me vehicle, whereas, a full system could be as sophisticated as dual ASDE-X systems with dual repeater systems covering miles of airport surface movement and non-movement areas.

Emerging technologies are leading to Automatic Dependent Surveillance Broadcast (ADS-B) flight deck-centric surface movement surveillance capabilities that are comparable to ASDE-X and other surface radar systems. As advanced aircraft surface tracking technologies improve, the options available for position awareness at or above the level of accuracy currently provided by ASDE-X will expand, and with less expensive alternatives. These systems allow ATC to establish the geographic position of all aircraft and vehicles. Advancing technologies will enable all moving vehicles and aircraft to monitor each other's progress electronically.

6.1.1 Operations in conditions below RVR 1200 ft (350 m). A surface movement radar (SMR), such as airport surface detection equipment (ASDE-3 equivalent), or alternative technologies, although not required are highly desirable.

6.1.2 Operations in conditions below RVR 500 ft (150 m). SMR, or an equivalent SMSS mitigation, should be installed and operational. If not installed, a similar system or one of the emerging technologies that provides comparable surveillance and separation should be in place. In the event that the SMR becomes inoperative during operations below RVR 500 ft (150 m), operations may continue utilizing accepted geographic positioning procedures until operations below RVR 500 ft (150 m) are terminated. The SMR should be operational before resuming operations below RVR 500 ft (150 m).

6.2 Operational Considerations.

This section focuses primarily on airport facilities and services that are oriented to ground surface operations dependent on the unaided eye.

6.2.1 Aircraft Rescue and Fire Fighting (ARFF). During reduced visibility conditions, the role of ATC in notifying and assisting ARFF services increases in significance. Procedures, systems and/or techniques should be established and reviewed annually, in coordination with the Airport LVO/SMGCS Working Group, to ensure that aircraft requiring assistance can be located and ARFF services expeditiously provided. For operations below RVR 500 ft (150 m), the pre-positioning of ARFF equipment (so as not to create a new obstacle) is considered. Airports that have Forward Looking Infrared (FLIR) or other accepted alternative technologies should include the routing/positioning within the LVO/SMGCS Plan.

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6.2.2 Taxiway Configuration. The Airport LVO/SMGCS Working Group should examine the airport for adequacy of fillets and landing gear and/or wingtip clearances along taxiways used in low visibility conditions.

6.2.2.1 **Operations Below RVR 1200 ft (350 m) Visibility.** Recommend inadequate taxiway fillets be upgraded to meet current standards. Depict those locations without upgrades on appropriate LVO/SMGCS low visibility taxi route charts. The notation may be in the form of a symbol identifying specific turning points or a general note such as "judgmental oversteering required along the taxi route."

6.2.2.2 **Operations Below RVR 500 ft (150 m) Visibility.** Inadequate taxiway fillets and clearances at turning points or other locations along taxi routes should be upgraded to meet the current standard.

6.3 Airport Operations/Participating Tenants LVO/SMGCS Procedures. LVO/SMGCS procedures should be developed for each LVO/SMGCS airport authorized for low visibility operations. The procedures should include a method of notifying key personnel of participating organizations that LVO/SMGCS procedures have been initiated or terminated by ATC. Copies of the accepted LVO/SMGCS Plan and any revisions should be provided to all parties involved. ATCT will normally have a LOA(s) and SOP(s) set up with airport operations.

6.3.1 Training. All vehicle operators should receive LVO/SMGCS training in subjects such as airport lights, signs, and markings. Include procedures to assist in navigating ground vehicles in the aircraft movement area. The training should incorporate, if applicable, radio telephone procedures, including lost-communication procedures. Drivers that keep a window partially open can hear aircraft approaching long before they see it in low visibility conditions. The A/O should review driver training programs to ensure that low visibility procedures are included and the training is documented. Vehicle operators supporting LVO/SMGCS operations should have a low visibility taxi route chart or equivalent available.

6.3.2 Non-Routine Procedures. Procedures should be developed for situations such as construction activities, snow removal, and deicing events. Include such procedures in the LVO/SMGCS Plan and determine any limitations that are needed for those vehicle activities when the LVO/SMGCS Plan is implemented.

6.3.3 Vehicle Access. Procedures should be developed for vehicular traffic in the movement areas. Include how to restrict vehicles to only those areas essential to supporting low visibility operations. The Airport LVO/SMGCS Working Group should review vehicle control and, if necessary, identify additional marking, lighting, restrictions, or other measures recommended to control vehicles in non-movement areas. For example, this may include such mitigations as barriers, gates, signs, markings, traffic lights, and "road guards."

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6.4 Apron Traffic Management. The LVO/SMGCS Plan should include apron traffic management procedures for all non-movement apron areas used by aircraft or vehicles. These procedures should indicate the party or parties who will coordinate the traffic movement in the apron area. The apron management entity(s) must limit access to the apron area to ensure the safe movement of all aircraft and vehicles operating within the area. Roadways which cross taxi lanes must be kept clear by positive control methods, such as radio communications, when aircraft are using the apron area.

6.5 Taxiing Assistance in Non-Movement Areas. For operations below RVR 500 ft (150 m), where centerline lights are not installed, the LVO/SMGCS Plan should provide for taxiing assistance. Taxiing assistance may include such measures as follow-me vehicles, wing-tip marshallers, or towing with an aircraft tug. The assistance should be provided by a method agreed upon by the Airport LVO/SMGCS Working Group. Ground marshalling may be used to assist aircraft from the intersection of the taxi lane centerline and the gate lead-in line.

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CHAPTER 7. AIRPORT CONDITION REPORTING

7.1 LVO Support Infrastructure Outages. Problems with LVO/SMGCS infrastructure may adversely affect aircraft operations, overall safety, and airport capacity. There are a number of critical components such as stop bar lights, centerline lights, etc. which, if inoperative, may have an immediate impact on availability of LVO operations. This type of component loss is especially critical below RVR 500 ft (150 m). The Airport LVO/SMGCS Working Group should develop a method that will ensure timely transmittal of the outage information to dispatch centers, operational control, and interested parties such as ATC and local tenants. A process for loading the proper information onto ATIS, to the FAA NOTAM system and/or FAA Traffic Management System is advisable.

7.2 RVR System Coverage and Gaps. The layout distribution of RVR sensor systems at an airport should be evaluated. The A/O should determine if there are any resultant coverage gaps of effective visibility for the proposed LVO/SMGCS portion of an airport. Analyze and develop mitigations for the effects of the relationship to the non-movement and movement surface areas that will be included in the LVO/SMGCS operations. If a participating parking ramp is miles away from any RVR data reporting location, then a means of determining useable visibilities at the pertinent remote parking location should be conducted. The Airport LVO/SMGCS Working Group should establish procedures as to how the visibilities will be determined or other mitigations for coverage gaps.

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CHAPTER 8. AIRPORT LOW VISIBILITY, TAXI ROUTE(S) CHART

8.1 Use of Charts. A low visibility taxi route(s) chart will be provided, or an electronic equivalent, for use by flight crews. ATC personnel, ARFF personnel, ground support vehicle operators, and ground marshalling crews should have charts or diagrams when LVO/SMGCS operations are being conducted. The airport low visibility taxi route chart, when possible, should be limited to one page. The A/O normally develops the low visibility taxi route chart in coordination with the Airport LVO/SMGCS Working Group and ATC. When finished with this process, and the FAA LVO/SMGCS Team has accepted the proposed taxi route chart, the A/O will send it to the commercial chart company of their choosing for publication.

8.2 General Chart Information. The chart(s) should provide at least the following information:

- Designated low visibility taxi route(s) for operations below RVR 1200 ft (350 m) down to and including RVR 500 ft (150 m)
- Designated low visibility taxi route(s) for operations below RVR 500 ft (150 m), if applicable
- Legend depicting appropriate symbology and terminology
- Location of runways, taxiways, aprons, concourses, buildings, and other taxi obstacles
- Location of runway and taxiway centerline lights, including lead-on and lead-off lights
- Location of runway hold points
- Location of approach hold points
- Location of stop bar lights
- Location of geographic position markings, adjacent intermediate hold marking, and clearance bars
- Location of any intermediate hold position markings (not included with other LVO/SMGCS markings/lights)
- Location of taxiway hold points
- Location of clearance bar lights
- Location of movement area boundaries

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- Location of non-movement area boundaries
- Location of inadequate fillets on taxiway turns and the need for judgmental oversteering by pilots
- Location of de-icing pads
- Location of ARFF stations
- Unique airport characteristics and/or procedures

8.3 Flight Operations Chart Training Factors for Aircraft Operators. The LVO/SMGCS Plan should identify any aspects of the following list of items that are specific or unique to the airport, relative to low visibility operations. Aircraft operators and ground support/vehicle operators should address these items in appropriate training programs. All ground support personnel involved in LVO/SMGCS operations should have the training documented. Training items to be included, but not limited to, are:

- Apron (ramp) operations
- ILS critical areas, runway safety areas, and approach holds
- Stop bar lights
- Runway guard lights (RGL)
- Combination RGLs and stop bars
- Taxiway centerline lights, including ILS critical area alternating green and yellow lights from runway centerline
- Clearance bar lights
- Runway lead-on and lead-off lights
- Geographic position markings, adjacent intermediate hold markings, and clearance bars
- Taxiway and runway hold position markings
- Location of deicing pads and pertinent notes
- Movement/non-movement boundary marking
- Non-movement area line up points (normally linked with transition Ramp to Ground Control)
- Single direction low visibility routes appropriately annotated

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- Bi-directional routes if necessary for clarification
- Other pavement markings such as surface painted signs
- Use of low visibility taxi route(s) chart(s)
- Taxi procedures at turns requiring judgmental oversteering

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APPENDIX A. REFERENCES

A.1 Regulations.

- Reference Part 139, Certification and Operations: Land Airports Serving Certain Air Carriers
- 14 CFR Part 91.175 Takeoff and Landing Under IFR
- 14 CFR Part 91.176 Straight-in landing operations below DA/DH or MDA using an enhanced flight vision system (EFVS) under IFR
- 14 CFR Part 121.651 Takeoff and landing weather minimums: IFR: All certificate holders
- 14 CFR Part 125.325 Instrument approach procedures and IFR landing minimums
- 14 CFR Part 135.225 IFR: Takeoff, approach and landing minimums

A.2 Advisory Circulars.

Advisory Circulars related to LVO/SMGCS are listed below (and available online):

- AC 120-118, Criteria for Approval/Authorization of all Weather Operations for Takeoff, Landing, and Rollout
- AC 150/5300-13, Airport Design, current edition
- AC 150/5340-1, Standards for Airport Markings
- AC 150/5340-18, Standards for Airport Sign Systems
- AC 150/5340-30, Design and Installation Details for Airport Visual Aids
- AC 150/5320-12, Measurement, Construction, and Maintenance of Skid Resistant Airport Pavement Surfaces.
- Other applicable 150-series ACs

A.3 FAA Orders.

FAA Orders related to LVO/SMGCS are listed below (and available online):

- FAA Order 5100.38, Airport Improvement Program Handbook
- FAA Order 6560.10, Runway Visual Range (RVR)
- FAA Order 6750.16, Siting Criteria for Instrument Landing Systems.
- FAA Order 6750.24, Instrument Landing System, and Ancillary Electronic Component Configuration and Performance Requirement.

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- FAA Order 8000.94, Procedures for Establishing Airport Low-Visibility Operations and Acceptance of Low Visibility Operations/Surface Movement Guidance and Control System Operations

A.4 **Operations Specifications (OpSpec), Management Specifications (MSpec), and Letters of Agreement (LOA).**

- C048, Enhanced Flight Vision System Operations
- C060, Category II and Category III Instrument Approach and Landing Operations
- C078, IFR Lower Than Standard Takeoff Minima, All Airports
- C079, IFR Lower Than Standard Takeoff Minima, All Airports (14 CFR Part 135 Airplane Operations)

A.5 **Foreign (ICAO, EASA).**

- Annex 11 to the Convention on International Civil Aviation, Air Traffic Services
- Annex 14 to the Convention on International Civil Aviation, Volume I, Aerodrome Design and Operations
- ICAO Doc 9476-AN/927, Manual of Surface Movement Guidance and Control Systems (SMGCS)
- ICAO Doc 9830-AN/452, Advanced Surface Movement Guidance and Control Systems (A-SMGCS)
- ICAO EUR Doc 013, European Guidance Material on All Weather Operations at Aerodromes

A.6 **Other Guidance and References.**

- Low Visibility Operations/Surface Movement Guidance and Control System (LVO/SMGCS) Chart Usability: An Examination of Flight Crew Position Awareness in Homogeneous RVR 300 ft (75 m) RVR Conditions, Final Report, September 2014, DOT-VNTSC-14-14
- Low Visibility Operations/Surface Movement Guidance and Control System (LVO/SMGCS) Chart Symbology, Final Report — February 2016, DOT-VNTSC-FAA-16-05, DOT/FAA/TC-16/25
- Use of an Enhanced Flight Vision System (EFVS) in Lieu of Low Visibility Operations/Surface Movement Guidance and Control System (LVO/SMGCS) Infrastructure, October 2019, DOT/FAA/AM-20/03

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APPENDIX B. DEFINITIONS AND ACRONYMS

This appendix contains the definition of terms and acronyms used within this AC. The appendix also contains certain terms that are not used in this AC but are used in related ACs and are included for convenient reference. Certain definition of terms and acronyms are also provided to facilitate common use of this appendix for other related ACs.

Table B-1. Definitions

Term	Definition
Aircraft Service Areas	On or adjacent to an aircraft parking position. Intended for use by personnel/equipment for servicing aircraft and staging of equipment to facilitate loading and unloading of aircraft.
Airport Certification Manual (ACM)	Manual containing operating procedures, equipment descriptions, responsibility assignments, and any other information needed by airport personnel to comply with subpart D of 14 CFR Part 139.
Airport LVO/SMGCS Working Group	Includes Airport Authority and key tenant groups that will participate in LVO/SMGCS or are impacted by LVO/SMGCS operations. Herein referred to as Working Group.
Airport Operator (A/O)	Airport Authority/Operator (A/O)
Airport Surface Detection Equipment, Model X (ASDE-X)	A surveillance system using radar, multi-lateration, and satellite technology that allows air traffic controllers to track surface movement of aircraft and vehicles. Airport Surface Detection Equipment, Model X.
Apron (Ramp)	A defined area on an airport intended to accommodate aircraft for purposes of loading or unloading passengers or cargo, refueling, parking, or maintenance.
Automatic Dependent Surveillance Broadcast (ADS-B)	ADS-B is an advanced surveillance technology where ADS-B-Out equipped aircraft share position, altitude, velocity, and other information with ATC and other appropriately equipped aircraft.
Clearance Bar	A clearance bar consists of three in-pavement steady-burning yellow lights that indicate a low visibility hold point. The fixtures are normally unidirectional but may be bidirectional depending upon whether the hold point is intended to be used in one or two directions.
Combined Vision System (CVS)	A system which combines information from an enhanced vision system and a synthetic vision system in a single integrated display.
Controlling Region	The FAA geographic region in which an airport is located.

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Term	Definition
Enhanced Flight Vision System (EFVS)	An installed aircraft system that uses an electronic means to provide a display of the forward external scene topography (the natural or manmade features of a place or region especially in a way to show their relative positions and elevation) through the use of imaging sensors, including but not limited to Forward Looking Infrared (FLIR), millimeter wave radiometry, millimeter wave radar, or low-light level image intensification. An EFVS includes the display element, sensors, computers and power supplies, indications, and controls.
Enhanced Taxiway Centerline	The enhanced taxiway centerline marking provides supplemental visual cues to alert pilots of an upcoming runway holding position marking for minimizing the potential for runway incursions.
Enhanced Vision System (EVS)	An electronic means to provide the flight crew with a sensor-derived or sensor-enhanced image of the external scene (e.g., millimeter wave radar or radiometry, forward looking infrared (FLIR), or low light level image intensifying).
Ft	Feet
Gate Designator Markings	Pavement markings used to identify an aircraft parking position/gate(s).
Geographic Position Markings	Pavement markings used to identify the location of aircraft or vehicles during low visibility conditions. They are referred to as “spots” by air traffic control (ATC).
Guided Takeoff (US)	A low visibility takeoff in conditions lower than RVR 500 ft (350 m) requiring HUD, Category III ILS localizer signal, operating Center Line (CL), Lights and High Intensity Runway Lights(HIRLS), and other requirements per operating rule.
Head Up Display (HUD)	An aircraft system that provides head-up guidance to the pilot during flight. It includes the display element, sensors, computers, power supplies, indications, and controls. It may receive inputs from an airborne navigation system or flight guidance system. This system allows the pilot to look for the outside visual references in the same location as they appear in the EFVS image.
Head-Down Display (HDD)	A display or suite of displays that provide control, performance, and navigation information that is presented to the pilot on conventional head-down instrumentation, or integrated electronic flight displays.
Judgmental Over-Steering	When the taxiway centerline does not provide an adequate turn radius, the pilot may intentionally over-steer the aircraft nose wheel to keep the aircraft's main gear within the defined edges of the taxiway.

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Term	Definition
Low Visibility Operations (LVO)	The movement of aircraft or vehicles on the airport paved surfaces when visibility conditions are reported to be less than RVR 1200 ft (350 m).
LVO/SMGCS	Low Visibility Operations/Surface Movement Guidance and Control Systems (Formerly SMGCS). A LVO/SMGCS system consists of the provision of guidance to, and control or regulation of, all aircraft, ground vehicles, and personnel on the movement area of an aerodrome. Guidance relates to facilities, information, and advice necessary to enable the pilots of aircraft or the drivers of ground vehicles find their way on the aerodrome and to keep the aircraft or vehicles on the surfaces or within the areas intended for their use. Control or regulation means the measures necessary to prevent collisions and to ensure that the traffic flows smooth and freely. (reference ICAO LVO/SMGCS Manual Doc 9476-AN/927)
LVO/SMGCS Taxi Route Centerline	A twelve inch wide highly reflective centerline for improved taxi visual reference during LVO/SMGCS on LVO/SMGCS taxi routes.
M	Meters
Mid-RVR	The RVR visibility readout values obtained from RVR equipment located midfield of the runway.
Movement Area	Refers to the runways, taxiways, and other areas of an airport which are used for taxiing or hover taxiing, air taxiing, takeoff, and landing of aircraft, exclusive of loading ramps and aircraft parking areas.
Non-Movement Area	Refers to taxiways and apron areas that are not under ATC.
Operational Safety Assessment (OSA)	Flight Standards uses the OSA as a safety-related, decision-making tool in meeting AVS SMS requirements. The OSA and Report evaluates Flight Standards considerations in addressing aviation-related operational hazards and risks. The OSA is an inclusive compilation of various safety risk management and system safety methods and techniques which enables risk-based and data-driven decisions.
Precision Obstacle Free Zone (POFZ)	A volume of airspace above an area beginning at the threshold elevation and centered on the extended runway centerline [200 feet (61 m) long by 800 feet (244 m) wide].
Rollout RVR	The RVR visibility readout values obtained from RVR equipment located nearest the rollout end of the runway.
Runway Guard Lights--Elevated.	Fixture consists of a pair of elevated flashing yellow lights installed on both sides of a taxiway, at the runway hold position marking.

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Term	Definition
	Their function is to confirm the presence of an active runway and assist in preventing runway incursions. (reference AIM)
Runway Guard Lights—In-pavement.	Fixture consists of a row of in-pavement flashing yellow lights installed across the entire taxiway, at the runway hold position marking. Their function is to confirm the presence of an active runway and assist in preventing runway incursions. (reference AIM)
Runway Visual Range (RVR)	An instrumentally derived value based upon standard calibrations that represents the horizontal distance a pilot will see down the runway from the approach end. (reference FAA Order 6560.10)
Stop Bar	Stop bar lights consist of elevated and in-pavement red fixtures that are installed at the runway holding position or instrument landing system (ILS) critical area holding position marking. Stop bars may be controllable by ATC and will include a system of in-pavement green taxiway centerline/lead-on lights at locations where aircraft will enter or cross a runway.
Surface Movement Radar (SMR)	Radar with a high update rate that is capable of providing surveillance of all aircraft and vehicles in an airport movement area.
Surface Movement Surveillance System (SMSS)	A system which provides positive identification and accurate positional information on all aircraft and vehicles.
Surface Painted Direction Sign	Pavement markings that are configured the same as the associated sign and provided when it is not possible to provide taxiway direction signs at intersections. (reference AC 150/5340-1)
Surface Painted Holding Position Sign	Pavement marking which is used to identify a specific runway. These markings are configured the same as the associated sign. (reference AC 150/5340-1)
Surface Painted Location Sign	Pavement markings that are configured the same as the associated sign and are used to supplement the signs located alongside the taxiway and assist the pilot in confirming the designation of the taxiway on which the aircraft is located. (reference AC 150/5340-1)
Synthetic Vision System (SVS)	An electronic means to display a synthetic vision image of the external scene topography to the flight crew. An SVS display does not provide an independent, real-time source of forward scene information.
Taxi lanes	Apron areas which provide taxiing aircraft access to and from parking positions.
Taxi Route	In this document, a specific sequence of lighted taxiways used by aircraft during low visibility operations.

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Term	Definition
Touchdown RVR	The RVR visibility readout values obtained from RVR equipment serving the runway touchdown zone.
Unserviceable	In this document, refers to equipment which is inoperative, obscured (i.e., by ice, snow, sand), degraded, not operating normally (e.g., abnormally low intensity), or not performing its intended function.
Airport LVO/SMGCS Working Group	The airport operator/authority's LVO/SMGCS planning group (including airport tenants, other airport operations and support personnel, and are interested stakeholders) that assists the airport in researching, developing, implementing an LVO/SMGCS Plan, and operating an LVO/SMGCS program.

Table B-2. Acronyms

Term	Definition
AC	Advisory Circular
ACM	Airport Certification Manual
ADO	Airport District Office
A/O	Airport Operator
ARFF	Aircraft Rescue and Firefighting Capability
ARP	Airports Division, FAA
ASDE-X	Airport Surface Detection Equipment, Model X
ATC	Air Traffic Control
ATCT	Air Traffic Control Tower
ATO	FAA, Air Traffic Organization
AVS	FAA, Aviation Safety Standards
CFR	Code of Federal Regulations
CVS	Combined Vision System
EFVS	Enhance Flight Vision System
FLIR	Forward Looking Infrared
FPAG	FAA, Flight Procedures and Airspace Group
FS	FAA, Flight Standards Service
HDD	Head Down Display
HUD	Head Up Display

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Term	Definition
HWD	Head Worn Display
ICAO	International Civil Aviation Organization
LOA	Letter of Agreement
LVO	Low Visibility Operations
LVO/SMGCS	Low Visibility Operations/Surface Movement Guidance and Control Systems
M, m	Meters
RGL	Runway Guard Light
RVR	Runway Visual Range (in feet)
SMR	Surface Movement Radar
SMS	Safety Management System
SMSS	Surface Movement Surveillance System
SVGS	Synthetic Vision Guidance System
SVS	Synthetic Vision System

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APPENDIX C. CHECKLIST FOR OPERATIONS BELOW RVR 1200 FT (350 M)

This sample checklist is provided for reference only for LVO/SMGCS operations below RVR 1200 ft (350 m) down to and including RVR 500 ft (150 m). We encourage you to use this checklist and tailor it to your specific airport and operational needs. Refer to Appendix E, Seattle-Tacoma International Airport LVO/SMGS Plan, for an example of an accepted LVO/SMGCS Plan.

C.1 Signs, Markings, and Visual Aids

C.1.1 Movement Area

- Runway guard lights
- Taxiway edge or centerline lights
- Taxiway signs
- Runway hold markings
- Surface painted direction or location signs
- Intermediate hold position markings and lights
- Geographic position markings

C.1.2 Non-movement Area

- No additional requirements

C.2 Guidelines and Review Items

C.2.1 Review Purpose of LVO/SMGCS Advisory Circular 120-57

C.2.2 Determine Applicability of LVO/SMGCS AC 120-57 to the airport

C.2.3 Review Pertinent FAA Regulations and Resources. (i.e., appropriate AC150 series, FAA Order 8000.94)

C.2.4 Review Definitions Pertinent to LVO/SMGCS

C.2.5 Take Actions to Establish Airport LVO/SMGCS Working Group

- Appoint chairperson of Airport LVO/SMGCS Working Group
- Establish Airport LVO/SMGCS Working Group
- Perform airport evaluation

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- Identify LVO/SMGCS low visibility taxi routes
- Identify and establish needed facilities
- Identify and establish needed procedures
- Identify responsibilities of participants
    - FAA:
        - Flight Standards (FS)
        - Airports (ARP)
        - Air Traffic Control (ATO)
    - Airport Operator
    - Airport Users
    - Airport Tenants
- Formulate LVO/SMGCS Plan

C.2.6 Considerations in Establishing and Maintaining a LVO/SMGCS Plan

C.2.6.1 Runways

- Minimum length and width
- Paved overruns or blast pads
- Gradients within standards
- High intensity runway lights
- Centerline lighting and marking
- Lead-on lighting and marking
- Lead-off lighting and marking
- Number of runway exits (2 or 3; plus runway end)

C.2.6.2 Taxiways

- Minimum width
- High speed exits, if appropriate

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- Connectors meet gradients standards
- Edge lighting, reflectors
- Determine if elevated lights are required due to snow or other factors
- Lighted connector taxiways must have the proper configuration of runway guard lights at the runway hold line (elevated or in-pavement)
- Taxiway centerline marking enhancements: 12-inch yellow reflective stripe with 6-inch black borders. Glass beads may be used to increase the conspicuity of markings (1.5 or 1.9 index of refraction)
- Taxiway designator markings
- Taxiway hold line markings and guidance signs
- Signs and marking denoting boundary of ILS critical area
- Surface painted holding position sign
- Vehicle roadway markings
- Movement area boundary markings
- Taxi guidance signs
- Taxi guidance markings

C.2.6.3 Aprons/non-movement areas

- Appropriate lighting
- Taxi lanes, properly marked (reflective) and identified
- Vehicle roadway markings

C.2.6.4 Inspection and monitoring of lights and visual aids

- Maintenance program within standards
- ATCT training for use of system
- Monitoring within standards
- Inspection before entering low visibility conditions
- Re-inspection every four hours down to RVR 500 ft (150 m)

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C.2.6.5 Airport Rescue and Fire Fighting (ARFF)

- Review existing procedures and determine if enhancements are required
- ARFF should have a LVO/SMGCS annual training program

C.2.6.6 Low Visibility Taxi Routes

- Determine primary and alternate exits from runway(s) and taxi route(s) in support of landing operations below RVR 1200 ft (350 m) down to and including RVR 500 ft (150 m).
- Determine taxi route(s) and entrance(s) to runway(s) for takeoff operations below RVR 1200 ft (350 m) down to and including RVR 500 ft (150 m). Consider exits and routes for runway abort.
- It is recommended not to have runway crossings at other than 90-degree intersections.
- Assure A/O coordinates development of the LVO/SMGCS low visibility taxi routes chart(s).

C.2.6.7 Snow Removal Equipment

- Routing
- Priorities

C.2.6.8 Re-Positioning of Aircraft

- Determine routes to be used
- Determine visibility limitations
- Determine taxi/tow/follow-me procedures for air carrier operators
- Determine follow-me procedures for Part 91 operators
- Determine specific operational limitations, i.e., no passengers on board
- Require personnel to have documented LVO/SMGCS training and use LVO/SMGCS low visibility taxi chart(s)
- Determine whether additional lighting; including stop bars, markings, signs, or restrictions are necessary

C.2.6.9 Air Traffic Control Procedures

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- Internal coordination procedures for monitoring visibility trends, and making decisions to initiate and terminate LVO/SMGCS operations down to and including RVR 500 ft (150 m)
- Procedures for notification of the airport operations and pilots of initiation or termination of specific LVO/SMGCS Plan operations, by landline, ATIS, NOTAM, or voice communication
- Procedures for surface movement surveillance
- Procedures for informing pilots of outages of required equipment by voice communications, ATIS, NOTAM, or TMS, as appropriate
- Review of procedures for coordinating ARFF response in low visibility conditions
- Procedures for coordinating airfield lighting inspections
- Procedures for use of emergency generator/alternate electrical source

C.2.6.10 Detailed Airfield Lighting/Marking/Signs Diagrams

- Submit as an attachment to the LVO/SMGCS Plan

C.2.6.11 LVO/SMGCS Low Visibility Taxi Routes Chart(s)

- Submit as an appendix to the LVO/SMGCS Plan

C.2.6.12 Ensure NOTAM System Procedures Are Established and Understood.

- It can be critical to aircraft operational safety and capacity that pilots and dispatchers are timely made aware of outages in the LVO/SMGCS system which might adversely affect the usability of the lowest published landing and/or takeoff minima for a runway or airport. NFDC NOTAM issuance is critical to enable wide area distribution.

C.2.7 Submit LVO/SMGCS Plan to FAA For Review and Acceptance through Flight Technologies and Procedures Division.

- Host initial inspection of LVO/SMGCS
- Correct discrepancies in plan/system
- Receive LVO/SMGCS Plan "acceptance" notification
- Correct specified conditions

C.2.8 Determine Readiness of LVO/SMGCS and Participants.

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- Training reported as complete and documented by participating responsible entities.

- LVO/SMGCS taxi route(s) chart(s) distributed and available for airport vehicle operators.

C.2.9 Accomplish Regular Reviews of the LVO/SMGCS Plan.

- Maintain documentation of training for inspection under Part 139.

- Correct discrepancies discovered or brought to the attention of the Airport LVO/SMGCS Working Group Chair.

- Carry out planning for future LVO/SMGCS operational capabilities as listed in the plan or as agreed upon by the Airport LVO/SMGCS Working Group.

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APPENDIX D. CHECKLIST FOR LVO/SMGCS OPERATIONS BELOW RVR 500 FT (150 M)

This sample checklist is provided for LVO/SMGCS operations below RVR 500 ft (150 m). We encourage you to use this checklist and tailor it to your specific airport and operational needs. Refer to Appendix E, Seattle-Tacoma International Airport LVO/SMGS Plan, for an example of an accepted LVO/SMGCS Plan.

D.1 **Signs, Markings, and Visual Aids.**

D.1.1 Movement Area.

- Stop Bar Lights
- Runway guard lights
- Taxiway centerline lights
- Clearance bar lights
- Taxiway hold markings
- Surface painted direction or location signs
- Geographic position markings

D.1.2 Non-movement Area.

- Taxiway centerline lights or taxiing assistance

D.2 **Guidelines and Review Items listed below are in addition to Appendix C.**

D.2.1 Considerations in Establishing and Maintaining a LVO/SMGCS Plan.

D.2.1.1 Runways

- Grooved (saw cut) surface or porous friction course (PFC) surface
- Number of runway exits (1 or 2; plus runway end)

D.2.1.2 Taxiways

- Pavement fillets to enable over-steering on taxiway
- Centerline lighting recommended and should be continuous even when crossing a runway

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- Centerline lighted taxiways should be used unidirectional or be physically separated.
- Stop bar lights should be installed on all lighted taxiways at runway hold lines
- Determine stop bars which are to be controllable or non-controllable by ATCT
- Determine where lead-on lighting to the runway will be associated with a controllable stop bar
- At intersections offering a choice of routes, the angle of divergence must be clearly apparent, and distinct identification markings for each choice must be visible on the pavement, or the centerline lights must be controllable by the ATCT for channeling the aircraft in the cleared route direction
- Alternating yellow/green centerline lights within the ILS critical area
- Clearance bar lights and markings
- Geographic position "pink spot" markings
- Taxi assistance available by follow-me or tow
- Use of glass beads or retroreflective paint markings for at least geographic position markings

D.2.1.3 Aprons/non-movement areas

- Gate designators and lead in gate lead-in markings
- Apron Traffic Management Plan specifying restrictions, controls, ground support vehicle operations, training, and its documentation
- Taxi assistance available by follow-me, tow, and/or ground marshalling

D.2.1.4 Inspection and monitoring of lights and visual aids

- Maintenance program within standards
- Monitoring within standards
- Inspection before entering low visibility conditions
- Re-inspection every two hours

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D.2.1.5 Airport Rescue and Fire Fighting (ARFF)

- Review existing procedures and determine if enhancements are required
- Consider pre-positioning of ARFF vehicle(s) as an option

D.2.1.6 Surface Movement Surveillance System (SMSS)

- ASDE-X or equivalent installed in ATC Tower and functioning
- Backup system of geographical position "pink spot" markings, clearance bars, and hold markings associated with ATCT geographic positioning procedures

D.2.1.7 Low Visibility Taxi Routes

- Determine the exit from the runway(s) and the taxi route(s) in support of landing operations below RVR 500 ft (150 m)
- Determine taxi route(s) and entrance(s) to runway(s) for takeoff operations below RVR 500 ft (150 m)
- Determine taxi route(s) in support of re-positioning of aircraft from maintenance/parking areas to aprons
- Taxi routes should be physically separated or used unidirectional

D.2.1.8 Snow Removal Equipment

- Routing
- Priorities

D.2.1.9 Air Traffic Control Procedures

- Internal coordination procedures for monitoring visibility trends, and making decisions to initiate and terminate LVO/SMGCS operations below 500 ft (150 m)
- Procedures for geographic positioning of aircraft, using the system of geographic position "pink spot" markings, clearance bars, hold lines, and voice communications

D.2.1.10 Re-Positioning of Aircraft

- Determine routes to be used

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- Determine visibility limitations
- Determine taxi/tow/follow-me procedures for air carrier operators
- Determine follow-me procedures for Part 91 operators
- Determine specific operational limitations
- Document the LVO/SMGCS training and use LVO/SMGCS low visibility taxi chart(s) for ground personnel
- Determine whether additional lighting; including stop bars, markings, signs or restrictions are necessary

D.2.1.11 Air Traffic Control Procedures

- Internal coordination procedures for monitoring visibility trends, and making decisions to initiate and terminate LVO/SMGCS operations down to and including RVR 500 ft (150 m)
- Procedures for notification of the airport operations and pilots of initiation or termination of specific LVO/SMGCS Plan operations, by land-line, ATIS, NOTAM, or voice communication

D.2.1.12 Detailed Airfield Lighting/Marking/Signs Diagrams

- Include in LVO/SMGCS Plan/chart

D.2.1.13 Apron Management Plan

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APPENDIX E. EXAMPLE SEATTLE-TACOMA INTERNATIONAL AIRPORT LVO/SMGCS PLAN AND CHARTS

The FAA wishes to acknowledge Seattle-Tacoma International Airport (KSEA) for providing the following LVO/SMGCS Plan as an example.

LOW VISIBILITY OPERATIONS-
SURFACE MOVEMENT GUIDANCE AND CONTROL SYSTEM PLAN

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LVO/SMGCS Plan Revision Logs

Date of Revision	Revised Paragraph/Page
09/24/2014	2.23: Added statement regarding inoperative lights/signs, page 8
09/24/2014	6.5: Added statement regarding runway configuration, page 18
09/24/2014	Attachment 2: Corrected chart numbers
12/15/2014	Attachment 6: Letter of Agreement for LVO/SMGCS
09/17/2018	Temporary Amended SMGCS Plan for TWY B Closure, see separate page to be removed upon opening of TWY B. Submitted May 10, 2018
11/30/2018	Temporary Amendment Cancelled
10/09/2020	Change all references of 600 RVR to 500 RVR: Paragraphs 3.2, 3.4, 3.7, 3.8, 3.13, 4.0, 6.2, 6.5, 7.4, 7.5
10/09/2020	Miscellaneous typos throughout
10/09/2020	Paragraph 1.1: Update RVR and activation requirements
10/09/2020	Paragraph 2.1: Remove unnecessary text
	Paragraph 2.4: Change "start" box to "green" box
10/09/2020	Paragraph 2.15: Update RVR and activation requirements
10/09/2020	Paragraph 2.16: Add "alternating" and "yellow" to green lights
	Paragraph 2.23: Add in-pavement runway guard lights
10/09/2020	Paragraph 3.5: Update to in-pavement runway guard lights
10/09/2020	Paragraph 3.12: Update Opsnet to Communicator
10/09/2020	Paragraph 3.13: Update Opsnet to Communicator, Update ADM phone number
	Paragraph 6.1: Change Ramp Control to Seattle Ramp Tower
10/09/2020	Paragraph 6.2: Update new runway use configurations
	Paragraph 6.4: Change Weyerhaeuser to PACCAR
10/09/2020	Paragraph 6.5: Update new runway lighting configurations
10/09/2020	Paragraph 6.7: Add stop bar outage statement
10/09/2020	Paragraph 9.1: Add SMGCS Upgrade to Milestones
10/09/2020	Attachment 1: Update ADM phone number and Communicator
10/09/2020	Attachment 5: Update Airfield Lighting Exhibits
10/09/2020	Attachment 7: Remove Serviceability Inspection Maps

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Revisions Prior to November 2013

[1]Change 1 is an update and administrative rewrite of the October 1, 1992 plan to more closely conform to the SMGCS Advisory Circular and to reflect current airfield configuration. Change 1 also includes updates to include the addition of new taxiways, the re-designation of taxiways, completion of milestones, clarification of follow-me procedures, and clarification of the sample Airline Ground Movement plan. Other than the requirement for ASDE-3 to be operational prior to commencing below 600-foot RVR operations.

Change 2 is noted in the footnotes and is denoted in reference to the new AC120-57A. Changes are reflected only in definition and reflect no changes to philosophy or procedures established in the original plan. 4/97.

Change 3 includes the addition of definitions for Clearance Bar, Geographic Position Marking, Runway Guard Lights and Stop Bar. References to Gate Designator Boxes were deleted per SMGCS Working Group decision 3/98. Additional information regarding follow-me service availability on the movement area was added. Start/Termination Box section amended to for clarity on transition of responsibilities. 3/99.

Change 4 relates to taxiway designator changes of 10/16/00

Change 5 relates to changes in: 1) clarification that SMGCS operations commence when RVR is less than 1200, 2) NOTAM Procedures added, 3) Requirement for Cat III-qualified air carriers to maintain a SEA-specific Ground Movement Plan. 11/01

Change 6 includes the following changes: 1) Addition of controlled stopbars on Taxiways M, N, P, Q; 2) Deletes Low Visibility Arrival Route "Termination Boxes", which will be modified to Geographic Position Markings; 3) All non-Low Visibility taxiways extinguish lighting when SMGCS program is initiated; 4) Deletes reference to below 1200 RVR takeoffs on Runways 34R & 34L. 01/03

Change 7 includes the following changes: 1) Revision of taxiway designators in accordance with SEA TWY Designator change of 10/30/03; 2) "Start Box" added to definitions section; 3) Additional non-controlled stopbars on the east side of RWY 16L were added.

Change 8 includes the following changes: 1) North Apron "Island" was completed creating clear delineation between Taxiway C and Taxiway D. The hardware infrastructure was installed for a stop bar system for both Taxiway C and Taxiway D.

Change 9 includes the following change: 1) Incorporation of Runway 16L departures below 600 feet RVR; 2) SMGCS operational restrictions for operations west of RWY 16R.

Change 10 includes: ASDE-X replacing ASDE3; transponder operation requirement for vehicles and towed aircraft on the movement area; inclusion of Ramp Control Facility; RWY 16L upgrade to Cat IIIb in 1/07.

Change 11 includes: Formatting changes; incorporation of SMGCS surface use depictions; 3rd Runway Concept of Operations; Start Box color change; expanded definition of Stop Bars; additional ARFF vehicle deployment when RVR <600

Change 12 includes: Inclusion of language to address activation of Ryl6R as a part of the SMGCS system effective November 2008; modifications to General Aviation and Weyerhaeuser procedures.

Change 13: No change from previous Plan.

Change 14: Changes of terminology – 1) references to "Start Box" changed to Green Box; 2) references to AVINET changed to PASSUR

Change 15: Name change to LVO/SMGCS; Miscellaneous typographical updates; Added revision log; Removed reference to runways 34L, 34R and 34C; Added taxiway centerline marking description; Updated NOTAM procedures; Corrected taxiway lighting description; Added functionality and serviceability inspection descriptions; Added Attachment 6 LOA and Attachment 7 Serviceability Guide

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1. Introduction

1.1 This Low Visibility Operations/Surface Movement Guidance and Control System (LVO/SMGCS) Plan contains procedures and actions applicable to the airport operator, air traffic control, air carriers, and other tenants of the airport, as well as a description of airport enhancements planned for Seattle-Tacoma International Airport. These enhancements, procedures, and actions are in accordance with the guidance in the Federal Aviation Administration (FAA) Advisory Circular 120-57A, Surface Movement Guidance and Control System, and are necessary for FAA approval of takeoff and landing operations by air carriers in visibility conditions below 1200 feet runway visual range (RVR). When visibility conditions are less than 1,800 feet RVR down to and including 1,200 feet RVR, operations are conducted on a Category II basis. When visibility conditions are less than 1,200 feet RVR, operations are conducted in accordance with this plan. If the airport traffic control tower (ATCT) personnel determine that the visibility is below 1200 feet RVR for any runway in use and normal taxi routes to and from that surface are obscured from the tower, they will initiate less than 1200 feet RVR procedures.

1.2 The procedures and actions contained in the LVO/SMGCS Plan were developed by the LVO/SMGCS working group which consists of representatives of Port of Seattle Aviation Operation, Port of Seattle Fire Department, FAA Northwest Mountain Region Flight Standards and Airport Divisions, Seattle-Tacoma Airport Traffic Control Tower, Air Transport Association, Air Line Pilots Association, Alaska Airlines, Delta Airlines, Northwest Airlines, United Airlines, and other interested parties. This document does not supersede established policies, procedures, rules or guidelines for airports, operators, or air traffic. Federal Aviation Regulation (FAR) Part 91 operators are encouraged to utilize this plan or request follow-me service to enhance safe operations in low visibility conditions.

1.3 This plan addresses both current and future enhancements of the airport regarding low visibility takeoff, landing, and taxiing operations. The work of the LVO/SMGCS working group will continue after the initial approval process by the FAA. It will meet periodically to assess current low visibility operations, and it will develop enhancements and modify procedures as experience is gained and the number of low visibility operations increases.

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2. Definitions:

2.1 **Apron (Ramp):** The term "apron" comprises the area and facilities used for aircraft gate parking and aircraft support and servicing operations.

2.2 **Aircraft Parking Positions:** Used for parking aircraft to enplane and deplane passengers, load or unload cargo.

2.3 **Aircraft Service Areas:** On or adjacent to an aircraft parking position. These are used by airline personnel/equipment for servicing aircraft and staging of baggage, freight, and mail for loading and unloading of aircraft.

2.4 **Green Boxes:** Green boxes are green rectangles with black outlines painted on the taxilanes east of the vehicle control lane on the Non-Movement Area. A number is inscribed in the Green Box. Green boxes 1, 22, 44, 55, 66, 88, 99 are located nearby and are associated with the outbound Low Visibility Taxi Route. These specific green boxes indicate access points to the outbound/departure low visibility route, and delineate transition points from the Airline Aircraft Ground Movement Plan to taxi operation on the movement area or potential follow-me by Airport Operations. Refer to attachment 4- Sample Airline Aircraft Ground Movement Plan as an example for developing an airline specific movement plan.

2.5 **Taxilanes:** Reserved to provide taxiing aircraft with access to and from parking positions.

2.6 **Vehicle Roadway Markings**: Surface markings placed on portions of the Non-Movement Area to depict areas of travel designated for aircraft ground service vehicles and fire equipment.

2.7 **Clearance Bar:** A clearance bar consists of three in-pavement steady-burning yellow lights. (Reference AIM)

2.8 **Geographic Position Markings:** Pavement markings used to identify the location of aircraft or vehicles during low visibility conditions. They are referred to as "Spots" by ATC.

2.9 **Hold Point:** The term "hold point" refers to a location where the air traffic controller could be expected to hold a taxiing aircraft.

2.10 **Low Visibility Operations**: (LVO) For the purpose of this plan, Low Visibility Operations are considered to mean the movement of aircraft on the airport when the visibility conditions are reported to be less than 1,200 feet RVR.

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2. Definitions: (continued)

2.11 **Movement Area:** The term "movement area" refers to the runways, taxiways, and other areas of the airport that are used for taxiing or hover taxiing, air taxiing, takeoff, and landing of aircraft, and are exclusive of loading ramps and aircraft parking areas. Specific approval from the ATCT must be obtained prior to entering the movement area. This document does not change the definition or description of the area as contained in the Airport Certification Manual and Letter of Agreement between the Port of Seattle and Sea-Tac ATCT.

2.12 **Non-movement Area:** The term "non-movement area" refers to taxilanes and apron areas under control of Seattle Ramp Tower (SRT). Specific approval from SRT must be obtained prior to operating in the non-movement area.

2.13 **Runway Guard Lights-Elevated Flashing:** (**ERGL**) Fixture consists of a pair of elevated flashing yellow lights installed on both sides of a taxiway, at the runway hold position marking. Their function is to confirm the presence of an active runway and assist in preventing runway incursions. (Reference AIM)

2.14 **Runway Guard Lights-In Pavement Flashing:** (**IPRGL**) Fixture consists of a row of in-pavement lights installed across the entire taxiway; at the runway hold position marking. Their function is to confirm the presence of an active runway and assist in preventing runway incursions.

2.15 **Runway Visual Range** (**RVR**) an instrumentally derived value based upon standard calibrations that represent the horizontal distance a pilot will see down the runway from the approach end. RVR readings are taken at the touchdown, mid-point, and rollout sections of all runways. When any one RVR reading on any runway in use is below 1200' RVR and normal taxi routes to and from that surface are obscured from the tower, LVO/SMGCS operations are commenced by ATC and the Port of Seattle.

2.16 **Stop Bar:** Stop bar lights consist of elevated and in-pavement red fixtures that are installed at the runway holding position or ILS critical area holding position marking where applicable. Stop bars illuminate when the RVR is less than 1200.

a)**Controlled Stop Bars** are controlled by ATC via the lighting control panel in ATCT, and include a system of in-pavement alternating green and yellow taxiway centerline/lead-on lights at taxiway intersections that intersect runways and are part of the Low Visibility Taxi Routes.

b)**Non Controlled Stop Bars** are installed at selected taxiway intersections that intersect runways that are not part of the Low Visibility Taxi Routes. Once illuminated, Non-Controlled Stop Bars can only be turned off by use of a master stop bar override control feature of the airfield lighting control system located on the lighting control panel in ATCT.

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2. Definitions: (continued)

2.17 **Surface Movement Guidance Control System:** (SMGCS) This system consists of the provisions of guidance to, and control or regulation of, all pilots, ground vehicle operators, and personnel of the airlines or airport during low visibility operations, RVR below 1200 feet. Guidance relates to facilities and information necessary for pilots and ground vehicle operators to find their way about the airport. Control or regulation relates to the measures necessary to prevent collisions and ensure smooth and efficient traffic flows.

2.18 **Taxi Route:** Illuminated taxiways used by aircraft during low visibility operations.

2.19 **ASDE-X:** The surface movement surveillance system in use at SEA.

2.20 **Transponder-equipped vehicle:** Vehicles that have vehicle locator devices to assist in target acquisition on the ASDE system.

2.21 **Seattle Ramp Tower (SRT):** Facility that coordinates and assists the movement of aircraft on the non-movement area of the airport by providing traffic advisories on known aircraft movements.

2.22 **Functionality Inspection:** Performed weekly. This inspection is to confirm proper function of the controlled stop bar sensor system, and to confirm proper illumination of the lighting systems of the selected LVO/SMGCS runway/taxi routes and sign systems.

2.23 **Serviceability Inspection:** Performed in advance and within two hours of below 1200 RVR operations, and every two hours that the airport is experiencing below 1200 RVR conditions. This inspection is to confirm that appropriate lighting elements/system are illuminated and serviceable/visible. These elements include the controlled and non-controlled stop bars; elevated runway guard lights associated with controlled stop bars; in-pavement runway guard lights dependent on runways in use; taxiway centerline and edge lights; and clearance bar lights.

In the event of inoperative or burned-out lights/signs, POS will initiate corrective action and/or publish the appropriate NOTAM and defer corrective action to a later time.

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3. FACILITIES, SERVICES AND EQUIPMENT - The following facilities services and equipment support the low visibility operations:

3.1 Runways

Runway 16L
Arrivals: Approved to 300 feet RVR (CAT III) for appropriately equipped aircraft and trained crews.
Departures: Approved to 300 feet RVR for appropriately equipped aircraft and trained crews.
Lighting: Approach Lighting System with sequenced flashers (ALSF-II)
Touchdown Zone Lights
Centerline Lights
High Intensity Edge Lights
Markings: Precision runway markings
RVR Equipment: touchdown, midpoint, and rollout modified for read out to 100' RVR

Runway 16C
Arrivals: Approved to 300 feet RVR (CAT III) for appropriately equipped aircraft and trained crews.
Departures: Approved to 300 feet RVR for appropriately equipped aircraft and trained crew.
Lighting: Approach Lighting System with sequenced flashers (ALSF-II)
Touchdown Zone Lights
Centerline Lights
High Intensity Edge Lights
Markings: Precision runway markings.
RVR Equipment: touchdown, midpoint, and rollout modified for read out to 100' RVR

Runway 16R
Arrivals: Approved to 300 feet RVR (CAT III) for appropriately equipped aircraft and trained crews.
Departures: Approved to 300 feet RVR for appropriately equipped aircraft and trained crews.
Lighting: Approach Lighting System with sequenced flashers (ALSF-II)
Touchdown Zone Lights
Centerline Lights
High Intensity Edge Lights
Markings: Precision runway markings.
RVR Equipment: touchdown, midpoint, and rollout modified for read out to 100' RVR

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3. FACILITIES, SERVICES AND EQUIPMENT (continued)

3.2 Taxiway Lighting

Taxiway Centerline Lights:
Taxiway Centerline Lights extend continuously along the designated low visibility routes. Where the low visibility route crosses a runway, the centerline taxiway lights extend across the runway.

Taxiway Edge Lights: Taxiway edge lights are installed on turns in the Low Visibility Taxi Routes used for below 500 RVR operations.

Lead-On Lights:
The lead on lights on Low Visibility Taxi Routes serving Runways 16L and 16C, and 16R extend to the runway centerline.

Lead-Off Lights:
The lead off lights on Low Visibility Taxi Routes exits from the runways commence at the runway centerline.

Attachment 5 of this plan details the locations of Low Visibility Taxi Route elements of the airport. These attachments depict the illumination of lighting facilities when the RVR is less than 1200.

3.3 Non-Controlled Stop Bars

Installed in co-location with the in-pavement flashing runway guard lights at the intersections on the east side of Runway 16L, except at the Taxiways C and D intersections. When the RVR is less than 1200, the in-pavement flashing runway guard lights at these intersections go off, and the non-controlled stop bars are illuminated.

3.4 Controlled Stop Bars

Controlled stop bars are located at the intersections of Low Visibility Taxi Routes and active runways.

The controlled stop bars on Taxiways M and N become non-controlled stop bars when the RVR is lower than 500 as those taxiways are not available at that point.

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3. FACILITIES, SERVICES AND EQUIPMENT (continued)

3.5 Runway Guard Lights

Runway Guard lights are installed at taxiway holdlines to runways. Two configurations are used; 1) elevated (wig-wags, referred to as ERGLs) at the taxiway edges and, 2) in-pavement across the taxiway (IPRGLs).

Runway Guard lights are installed to help prevent Runway Incursions, and operate continuously except during Low Visibility conditions. When in Low Visibility conditions, the elevated runway guard lights continue to operate on all intersections. When in Low-Visibility conditions, in-pavement guard lights will continue to operate at some intersections, depending on runway configuration in use.

3.6 Taxiway Clearance Bars

Clearance bars are installed along the low visibility taxi route at geographic position marks. (refer to attachment 2)

3.7 Geographic Position Markings/Clearance Bar Lighting

Geographic position markings – "GPMs" are a series of numbered markings painted along the low visibility taxi routes. These can be used by pilots and ATCT personnel to determine aircraft position and identify action points such as hold points and turn points. Clearance Bar Lights are located in conjunction with the GPMs. Bi-Directional GPMs are located at spots 5, 7, 9, 12, and 13. Northbound and southbound taxi operations will be coordinated by ATC by using these GPMs when the RVR is less than 1200' down to 500 RVR.

3.8 Surface Movement Surveillance

Surface Movement Surveillance is provided by airport surface detection equipment radar. ASDE-X is used at SEA by ATCT personnel to augment visual observations of aircraft and vehicles on runways and taxiways. ASDE-X operation is required prior to commencing below 500 RVR operations. If the ASDE-X fails while in below 500 RVR conditions, operations may continue until RVR increases above 500 RVR. ATCT procedures, in conjunction with use of Geographic Position Markings, provide geographic positioning of aircraft and vehicles if the ASDE-X is unserviceable.

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Port of Seattle

FACILITIES, SERVICES AND EQUIPMENT (continued)

3.9 Follow-Me Service

Airport Operations will provide follow-me service for aircraft at any time on the movement area, or for aircraft operating on Taxilane W. The Airport Operations follow me vehicle is identified by yellow flashing emergency lights. Any operator who is unfamiliar with the plan will be provided an escort on the movement area/Taxilane W. Any operator requesting an escort while operating on the Movement Area or Taxilane W will be provided one. A follow-me request may be initiated by the pilot, Seattle Ramp Tower or ATC.

3.10 Taxiway Guidance Signing and Markings

Lighted taxiway guidance signs are provided along the low visibility route.

Surface Painted Direction Sign: Pavement markings that are configured the same as associated sign and provided when it is not possible to provide taxiway directions signs at intersections. The markings are black letters and arrows within a yellow rectangle.

Surface Painted Location Sign: Pavement markings that are configured the same as the associated sign, and are used to supplement the signs located along side the taxiway and assist pilot in confirming the designation of the taxiway on which the aircraft is located. The markings are yellow letters within a black rectangle.

Taxiway Centerline Marking: The low visibility taxi route centerline marking will continue across all runway marking with the exception of the runway designation marking.

3.11 Communications

Telephone and radio communications are functional between all organizations involved in the execution of this plan (e.g., telephone and radio communications between ARFF and the ATCT).

3.12 Notification

All organizations involved in the execution of this plan are notified when the plan goes into effect. Additional notifications regarding impacts to facilities and equipment affecting SMGCS operations will be made via NOTAM, ATIS, and PASSUR Communicator systems.

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Port of Seattle

FACILITIES, SERVICES AND EQUIPMENT (continued)

3.13 NOTAM Procedures

When elements of the airport's facilities are unserviceable or out of service, NOTAMs will be issued. There are elements of the airport's facilities that have a secondary impact to landing minima, and LVO/SMGCS operations. These impacts may not be readily apparent by NOTAM issuance alone. For example, the NOTAMS "ASDE OTS", "SEA STOP BARS OTS", "Geographic Position Markings Obscured" all impact the airport's LVO/SMGCS minima by disqualifying <500 RVR operations. Typically, the U.S. NOTAM Office will not issue NOTAMs that raises the landing or takeoff minima on information provided from an airport operator.

To assure proper dissemination of information that impact LVO/SMGCS operations, NOTAMs disclosing the affected element of the program would be issued . POS will make notification of the NOTAM, with a description of the impact, via PASSUR Communicator system. SEA ATCT will include this information on ATIS. Users are encouraged to contact POS Airport Duty Manager (206-787-5229) with any questions regarding NOTAMs impacting LVO/SMGCS or any other airfield operations issues.

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Port of Seattle

4. AIRCRAFT RESCUE AND FIRE FIGHTING (ARFF)

Sea-Tac Airport has one ARFF station located near the south end of Taxiway A with personnel and equipment resources necessary to meet Index E and response time requirements of Part 139. When aircraft operations are being conducted below 500 feet RVR:

- One ARFF truck will be deployed in the vicinity of the South Satellite.
- A second ARFF truck will be deployed to the ramp area SW of the Taxiway T/Q intersection.

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5. VEHICLE CONTROL

5.1 Vehicle access to Sea-Tac Airport is controlled by a system of perimeter fencing and gates. All Port of Seattle and tenant vehicles entering the air operations area (AOA) are identified by mandatory markings on the side of the vehicles. Vendors and temporary use vehicles such as construction equipment are identified through a ramp permit system controlled by Airport Operations. Airport Security personnel check both the vehicle and the driver for appropriate identification prior to allowing the vehicle to enter the AOA. "Low Vis" will be activated through the access control system (will automatically deny access to unauthorized employees/personnel) to all card reader vehicle gates. Airport Operations personnel patrol all airside areas to ensure unauthorized vehicles are removed from the airport. The ID Access Control System includes specific restrictions during low visibility operations (see paragraph 5.5).

5.2 Except for necessary movement in leased areas, vehicles must be operated within a clearly marked system of vehicle drive lanes. Solid white lines with a broken white line used as a center divider identify the drive lanes. Additionally, the entire drive lane parallel to Taxiway B is painted with supplemental "zipper lines". A white-red-white line (vehicle control line) parallel to this line serves as a warning to vehicle operators not to enter the surfaces west of this line.

5.3 All vehicle drivers are required to have training prior to driving on the AOA. Airport employees and tenants are provided training by Airport Operations. A driver's test is administered to all vehicle drivers and must be passed before the driver is allowed to operate a vehicle on the airport. The driver-training course will be reviewed annually by airport operations to ensure the training programs are applicable to current low visibility operations.

5.4 Once this plan is implemented, access to the airfield is further restricted to essential vehicles. The Airport Identification Badge Access Control System contains restrictions that designate non-essential vehicles. On the movement area, only Airport Operations vehicles used to inspect the airfield, vehicles responding to an emergency, and approved tug drivers are authorized. All other access to the AOA will be coordinated and approved by Airport Operations. When the visibility is below 500 feet RVR, the ATCT will not allow any vehicle on the movement area that is not in direct support of the SMGCS plan or is responding to an emergency.

5.5 Prior to implementation of this plan, Airport Operations will analyze all construction activity and/or other specialized activity on the airport and determine the limitations to be imposed. These range from restrictions to elimination of the activity.

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Port of Seattle

6. AIR TRAFFIC CONTROL PROCEDURES

6.1 Implementation: Airport Traffic Control Tower and Port of Seattle Operations personnel monitor RVR values and coordinate the implementation of Low Visibility Procedures when the visibility is less than 1800 feet RVR and falling, and decreasing RVR values indicate visibility less than 1,200 feet RVR is imminent on the runways in use. These procedures are terminated by ATCT personnel when no longer deemed necessary, due to prevailing weather conditions.
Notes: 1)When the LVO/SMGCS program is initiated by ATCT, Airport Operations will notify Seattle Ramp Tower and the air carriers. The checklists in attachment 1 are used to implement Low Visibility Procedures. 2)SEA ATCT will announce when Low Visibility Procedures are in effect on the ATIS.

6.2 Airport Movement Area Procedures:

A. Responsibility: Aircraft and vehicles that are utilizing the Airport Movement Area (AMA) are the responsibility of SEA ATCT. These aircraft/vehicles will be in radio contact with ATCT.

B. Runway Use: SEA ATCT has four options for runway use when visibility is 1200 to 500RVR.

1) Inboard/Outboard: In this configuration, Runways 16R and 16L will be utilized. Runway 16C is not illuminated.
2) Inboard/Center: In this configuration, Runways 16C and 16L will be utilized. Runway 16R is not illuminated.
3) Center/Outboard: In this configuration, Runways 16C and 16R will be utilized. Runway 16L is not illuminated.
4) Inboard/Center/Outboard: In this configuration, Runways 16L, 16C, and 16R could be illuminated.

Only Inboard/Outboard (16L and 16R) and Inboard/Center (16L and 16C) configurations can be used below 500 RVR.

C. Arrivals – Movement Area:

Runway 16L

- RVR below 1200 to 500: Aircraft arriving this runway may use Taxiways M, N, P or Q and B-South Apron can be utilized to exit the runway.
- RVR less than 500: Below 500 RVR, only Taxiways P and B-South Apron can be utilized to exit the runway.

Runway 16C

- RVR below 1200 to 500: Aircraft arriving this runway may use Taxiways M, N, P or Q for exit. ATCT will operate the controlled stop bars on these taxiways to authorize aircraft to cross Runway 16L.
- RVR less than 500: Below 500 RVR, only Taxiways P and Q can be utilized to exit the runway. Taxiway M and Taxiway N are not available, and lead off lights to these 2 taxiways from Runway 16C are turned OFF. The controlled

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stop bars on Taxiways M & N revert to non-controlled stop bars to protect Runway 16L when the RVR is less than 500.

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Port of Seattle

6. AIR TRAFFIC CONTROL PROCEDURES (continued)

Runway 16R

- RVR below 1200 to 500: Aircraft using this surface may use Taxiways N, P, Q, and R for exit. Taxiway T, from the Taxiway N intersection south, may be used for southbound taxiing of these arrivals. ATCT will operate the controlled stop bars on Taxiways N, P and Q to authorize aircraft to cross Runway 16L.
- RVR below 500: Aircraft using this surface may use Taxiways Q and R for exit. Taxiway N and P are not available, and lead off lights to Taxiway N and P from Runway 16C are turned OFF. ATCT will operate the controlled stop bars on Taxiway Q to authorize aircraft to cross Runway 16L.

Once established on Taxiway B, ATCT will direct aircraft to the appropriate GPM that serves their parking position, and the aircraft will be instructed to contact Seattle Ramp Tower.

D. Departures – Movement Area: Departing aircraft will be directed along the LVO/SMGCS route to Runway 16L, 16C or 16R. Whenever possible, aircraft having takeoff minima of less than 500 feet RVR will be provided a clear route of access to the runway during this plan. Other aircraft will be directed to hold at a designated location. The ground controller will assign taxi routes that meet this requirement. (See attachment 2, LVO/SMGCS Taxi Routes.)

When applicable, ATCT will not utilize Taxiway B-north of Taxiway L, for aircraft with tail heights of 48' or greater.

E. Assistance for Movement - Follow Me Procedures (AMA-Taxilane W Only): Port of Seattle Airport Operations will provide follow-me escorts when requested, based on priority of workload. The pilot, Seattle Ramp Tower (Taxilane W) or ATCT (AMA), may initiate this request. Follow-me service is available only on the AMA or Taxilane W, and encouraged any time a pilot questions their position or requires additional guidance.

6.3 Non-Movement Area Procedures:

A. Responsibility: Aircraft that are utilizing the Non-Movement Area will be in contact with Seattle Ramp Tower to receive traffic advisories/instructions to assist in sequencing and ramp situational awareness. These aircraft are dependent on Seattle Ramp Tower advisories to resolve traffic conflicts.

B. Arrivals – Non-Movement Area: Seattle Ramp Tower will provide traffic advisories/instructions to aircraft parking.

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Port of Seattle

6. AIR TRAFFIC CONTROL PROCEDURES (continued)

C. Departures – Non-Movement Area: Departing aircraft will receive pushback instructions from Seattle Ramp Tower. These aircraft will be sequenced and given instruction to proceed to the appropriate green box for transfer to SEA ATCT.

D. Assistance for Movement - Company Procedures: Carriers are responsible for a company site specific plan which outlines procedures to aid flight crews when visibility warrants assistance (i.e. towing, wing-walking, etc.).

6.4 General Aviation/PACCAR Aircraft:

Arrivals:
General Aviation/PACCAR Aircraft that arrive when the reported visibility is below 1200' RVR will arrive Ry16R and taxi via Low Visibility Taxi Routes to the point on the route adjacent their ramp. At that point, these aircraft proceed visually or receive ground handling assistance. If these aircraft arrive on a surface other than Ry16R, they will receive a POS Follow Me to an appropriate parking location once the aircraft are established on a published SMGCS taxiway east of Runway 16L.

Departures:
General Aviation/PACCAR Aircraft requesting departures when the reported visibility is below 1200' RVR will contact ATCT and join the lighted Low Visibility Taxi Route on the surface adjacent their ramp. In event that the visibility dictates, POS Operations will provide a follow me for these aircraft to become established on the route.

6.5 Lighting:

Runways: SEA ATCT has four options for runway use when visibility is 1200 to 500RVR.

1) Inboard/Outboard: In this configuration, Runways 16R and 16L will be utilized. Runway 16C is not illuminated.
2) Inboard/Center: In this configuration, Runways 16C and 16L will be utilized. Runway 16R is not illuminated.
3) Center/Outboard: In this configuration, Runways 16C and 16R will be utilized. Runway 16L is not illuminated.
4) Inboard/Center/Outboard: In this configuration, Runways 16L, 16C, and 16R could be illuminated.

Only Inboard/Outboard (16L and 16R) and Inboard/Center (16L and 16C) configurations can be used below 500 RVR.

When LVO/SMGCS operations are anticipated, or experienced, POS will conduct a Serviceability inspection for the surface configuration ATCT has selected at the time of that inspection. If ATCT elects to select a different runway configuration, every effort will be made by ATCT to allow POS to conduct a Serviceability lighting inspection for the new configuration prior to use.

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Taxiways: When the RVR is below 1200', but equal to or greater than 500, the following lighting aids are extinguished: Taxiways D-west of 16L, E, F, H, J, K, L, S, and Z. The Taxiway B centerline lights become uni-directional and visible northbound only south of GPM 15. Taxiway T lights-north of Taxiway N are also extinguished.

When the RVR is below 500, the following lighting aids are also extinguished: Taxiways M, N, and P-west of Runway 16C.

6.6 Aircraft Location Aids:

The ground controller may use the ASDE-X or pilot position report to locate the aircraft prior to its entry into the aircraft movement area. The controller will then provide taxi instructions and traffic advisories appropriate to the route. Geographic position markings may be used for clearance limits as required.

6.7 Stop Bars:

Stop bars are used to control access to active runways in accordance with Air Traffic Control procedures. Stop bars will be operated when any RVR component reports visibility below 1,200 feet RVR.

If stop bars are not available for the runways in use, operations may continue down to 500 RVR.

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7. AIRLINE PROCEDURES DURING LOW VISIBILITY CONDITIONS

7.1 When the LVO/SMGCS plan is in effect (RVR <1200), the movement of aircraft on the ramp (the non-movement area) is the responsibility of the airline and will be conducted in accordance with the company's site specific LVO/SMGCS plan (see attachment 4 for an example). Aircraft will be in radio contact with Seattle Ramp Tower for aircraft movement in the non-movement area.

7.2 For outbound/departure movements from the gate or parking position, aircraft may be taxied or towed within the ramp area to green box 1, 22, 44, 55, 66, 88, 99. These green boxes are located on the non-movement area east of the main north-south Vehicle Lanes. The green box is that point in the outbound route where responsibility to resolve traffic conflicts transfers from the company/Seattle Ramp Tower to the ATCT. The green box also is a decision point for the aircrew to determine if there is sufficient visibility to taxi to the lighted LVO/SMGCS taxi route, or if the assistance of a follow me will be necessary. Airlines assume the responsibility for aircraft movement across the vehicle service road, and the airline site specific plan will address this. Aircraft must have ATCT clearance prior to entering the movement area. Pilots are expected to utilize the geographic position markings and relay position reports as required by ATCT. Low visibility taxi routes are depicted in the appropriate aviation charts.

7.3 For landing operations, pilots will follow ATCT instructions and taxi along the published Low Visibility Taxi Routes to their assigned Geographic Position Marking. At the GPM, the pilot will contact Seattle Ramp Tower. In the event visibility dictates that assistance is required, the aircraft will advise Seattle Ramp Tower, and contact their company for assistance according to the company's site specific LVO/SMGCS Plan. The airline is responsible for the movement of the aircraft across the vehicle service road, and will use designated taxilanes for movement to their parking location.

7.4 When the RVR is below 1200' and greater than or equal to 500, aircraft that require relocation on the movement area between ramps and gate areas are required to have an operating transponder. This is true for aircraft that are either taxied or towed.

7.5 When the RVR is less than 500, aircraft that require relocation on the movement area between ramps and gate areas must be taxied and have an operating transponder.

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RESPONSIBILITIES

8.1 ***Port of Seattle***

A. Serve as point of contact for this plan and host meetings of the LVO/SMGCS Working Group.

B. Coordinate an annual review of the plan.

C. Publish, distribute, amend, and coordinate the LVO/SMGCS Plan.

D. Monitor adherence to the plan and take appropriate action to correct deficiencies.

8.2 ***Airport Traffic Control Tower***

A. Initiate and terminate this plan as specified in section 6

B. Coordinate with Port of Seattle prior to implementing the plan.

C. Provide directional assistance to ARFF units responding to the scene of an emergency.

8.3 ***Seattle Ramp Tower***

A. Provide advisories/instructions to aircraft on the non-movement area, based on known traffic.

B. Participate in the LVO/SMGCS Working Group

8.4 ***Airport Tenants***

A. Participate in the LVO/SMGCS Working Group.

B. Disseminate LVO/SMGCS procedures to company employees.

C. Enforce LVO/SMGCS driving procedures and, if authorized, conduct driver training.

D. Carriers authorized for Cat III operations must maintain a Ground Movement Plan specific to LVO/SMGCS operations at Sea-Tac. (Example in Attachment 4).

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9. PLANS/MILESTONES

9.1 *Milestones*

A. Alaska Airlines was approved for 400 feet RVR departures with specially equipped aircraft in October 1990.

B. The SMGCS Plan, facilities and procedures were approved by the FAA. On December 10, 1992, Sea-Tac International Airport was approved to conduct takeoff and landing operations in visibility as low as 300 feet RVR.

C. United Airlines Flight 1400 made the first below 600 feet RVR landing on October 17, 1993.

D. Installation of additional taxiway lights that extend from the apron to the low visibility taxi route, and from the low visibility taxi route to the apron were installed in 1997.

E. Controlled stop bars added to Taxiways M, N, P, and Q on the west intersections with Runway 16L/34R were added in February 2003.

F. In-Pavement Runway Guard Lights operational 24/7 effective March 2003.

G. Non-Controlled stop bars were installed on the following taxiway intersections on the east side of Runway 16L in November 2003: B (S. Apron), S, Q, P, H, N, M, L, J, H, and E. Also in November 2003, taxiway centerline/edge lights were installed on Taxiway G.

H. North Apron "Island" was completed in October 2004 creating clear delineation between Taxiway C and Taxiway D. The hardware infrastructure was installed for a stop bar system for both Taxiway C and Taxiway D.

I. Controlled stopbars on Taxiways D & C-east of Runway 16L were commissioned on 11/4/05.

J. Below 600 RVR departures on Runway 16L were authorized on 11/4/05.

K. Category III ILS approach procedure was approved for Runway 16L on 12/22/05.

L. Category III ILS approach procedure was approved for Runway 16R on 11/20/08.

M. Change 600 RVR threshold to 500 RVR. All in-pavement runway guard lights will remain on except where co-located with stop bars. Add runway use availability for 16C-16R and 16L-16C-16R on October 9, 2020.

9.2 *Near Term Plan*

A. Evaluate and acquire enhanced vision capability for ARFF and Operations vehicles.

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Port of Seattle

ATTACHMENT 1

LOW VISIBILITY PLAN IMPLEMENTATION

AIR TRAFFIC CONTROL TOWER PROCEDURES:

1. Coordinate with Port Operations to implement or terminate the plan.
2. Notify Ramp Control when plan is implemented/terminated.
3. Relay pilot requests for "follow-me" service to Airport Operations.
4. Configure airfield lighting to meet operational requirements.

AIRLINE FLIGHT OPERATIONS PROCEDURES:

1. Resolve aircraft movement conflicts within the ramp/apron area in accordance with company procedures, and through radio communication with Ramp Tower.
2. Coordinate requirements for "follow me" service with the Airport Duty Manager (787-5229) if possible or notify ATCT of requirements.
3. Utilize "Low Visibility Operations Procedures" as previously coordinated with the Port of Seattle and Seattle Tower.
4. Advise the Airport Duty Manager when unscheduled low visibility operations are anticipated.

PORT OF SEATTLE OPERATIONS PROCEDURES

NOTE: These are general procedures only. Specific checklists for RVR 1,200 FEET AND DECREASING, RVR 500 FEET and TERMINATION are located in Sea-Tac Airport Operations and not disseminated with this plan.

1. Coordinate with the Tower to implement or terminate the plan.
2. Advise tenants of plan implementation, NOTAMS affecting LVO/SMGCS operations, via the PASSUR Communicator System.
3. Initiate/continue airfield lighting checks in accordance with established CAT II/III procedures.
4. Control vehicle access to the AOA; monitor movement areas for unauthorized vehicles.
5. Analyze construction activity and other special activity; reduce/eliminate these activities as necessary.
6. Consider this plan when setting snow removal priorities.
7. Provide "follow me" service as requested on AMA &/or Taxilane W.

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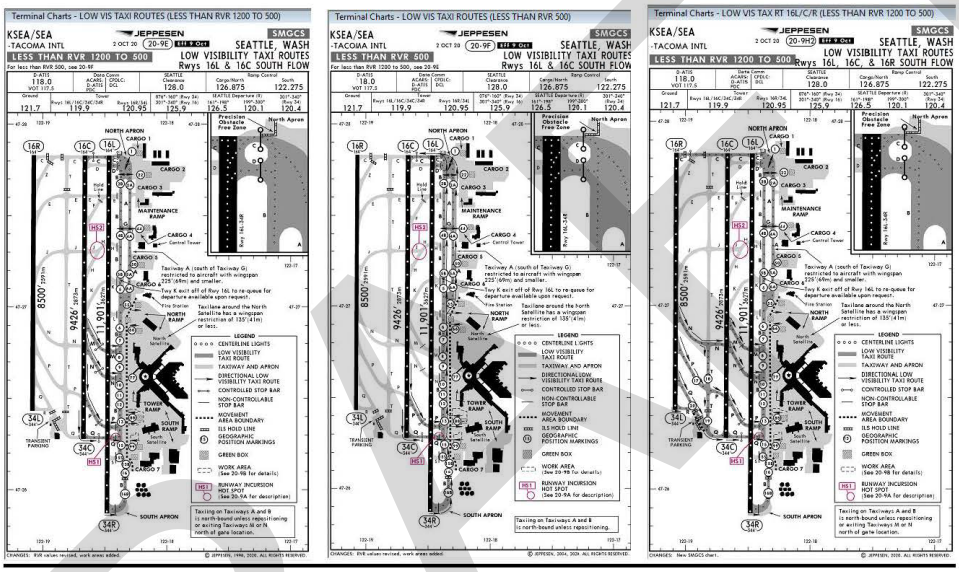
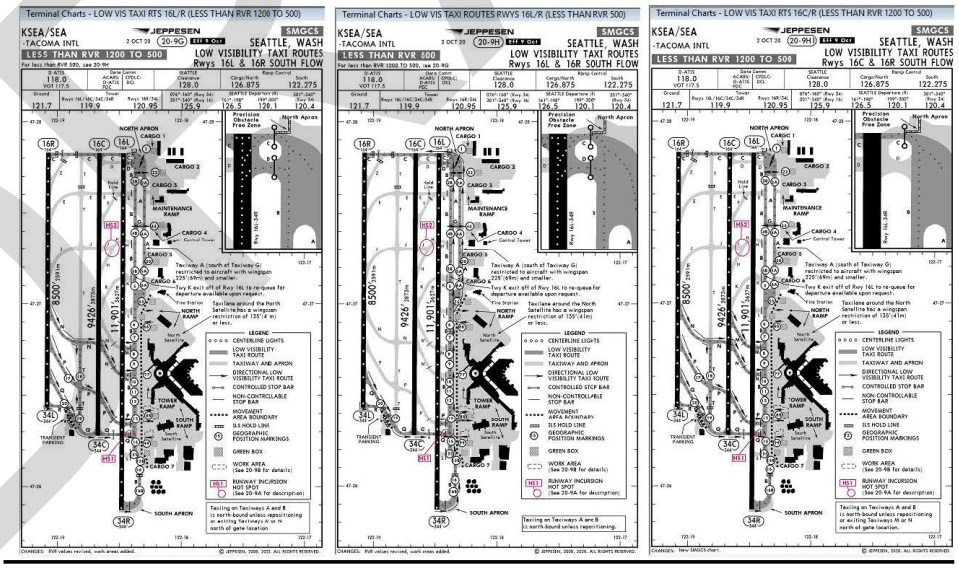
ATTACHMENT 2

(Insert current SEA Low Visibility Taxi Chart. Jeppesen pages 20-9E, 20-9F, 20-9G, 20-9H, 20-9H1, 20-9H2)





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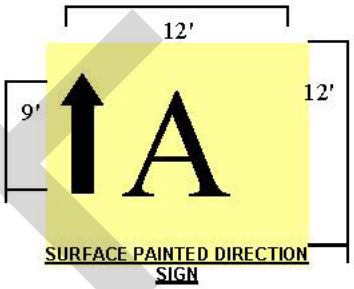
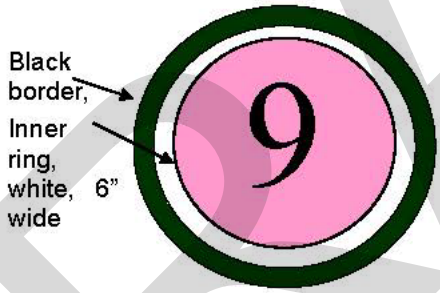
ATTACHMENT 3

SURFACE PAINTED GROUND MARKINGS

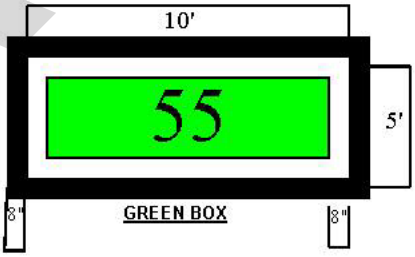
GATE ID BOX



SURFACE PAINTED DIRECTION SIGN



GEOGRAPHIC POSITION MARKING
Consists of a black inscription, 4' high, centered on a pink circle with a white inner ring & black border as shown.



GREEN BOX

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ATTACHMENT 4

LOW VISIBILITY PLAN IMPLEMENTATION

SAMPLE AIRLINE AIRCRAFT GROUND MOVEMENT PLAN

_____ AIRLINES

AIRCRAFT GROUND MOVEMENT PLAN

The Port of Seattle Low Visibility Operations/Surface Movement Guidance and Control System (LVO/SMGCS) Plan requires air carriers that operate in Low Visibility conditions at SEA to submit a Site Specific Low Visibility Movement Plan. Low Visibility operations are defined as those that occur for FAA approved air carriers when the Runway Visual Range (RVR) is less than 1200'.

Although the plan is required for operations below 1200', the reality of ramp operations is that a ramp movement plan relates to those movements when the visibility is in the vicinity of 600' or less. In these conditions it becomes more likely that the visibility could hamper a flight crew's ability to navigate from the Lighted LVO/SMGCS Route on the Movement Area to the parking position. These conditions historically occur at SEA for less than 20 hours a year on average.

The attached plan is a suggested format that establishes basic rules that are prescribed by POS and the LVO/SMGCS Working Group. Site specific plans are simply a procedure for companies to follow to assure safety, and establish basic expectations on where and how to manage ramp operations in extreme low visibility.

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PROCEDURES

Arrival Operations:

In the event that visibility restrictions prohibit taxi in operations to the gate, ATCT/Seattle Ramp Tower will assign the aircraft a Geographic Position Marking (GPM) to await assistance.

The flight crew will contact _____ Operations/Maintenance and request arrival assistance. This assistance is typically provided by an aircraft tug and ground crew.

_____ Airlines personnel and _____ ground handler will provide necessary assistance from the assigned GPM. The GPM (also referred to as "Pink Spot") where the arriving aircraft will be waiting will be either Pink Spot _____ (located _____) or Pink Spot __(located between terminals ___ and ___).

_____ Airlines staff and _____ ground handler are responsible for the movement of the aircraft from the Pink Spot (GPM) to the gate, including movement across vehicle use surfaces.

Arrival Rules:

- Personnel providing assistance will establish radio contact with Seattle Ramp Control on frequency 122.27 or 126.87 prior to proceeding to the Pink Spot. This radio contact **is required** for access to the aircraft and will be maintained for the duration of the assistance given to the gate.

- In the event that an arriving aircraft requests assistance from a Pink Spot other than __ or __ an escort from Port of Seattle (POS) Airport Operations **is required**. POS can be contacted at 206-787-5229.

- At no times will _____ Airlines personnel and _____ ground handler access an aircraft requesting assistance on any surface of the airfield without establishing proper radio contact and authorization by personnel trained and qualified to operate on the Movement Area (AMA).

*****Neither _____ Airlines personnel nor _____ ground handling personnel are allow to enter Movement Area (AMA) at any time for any reason *****
Please contact POS at 206-787-5229 with AMA issues and questions

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Departure Operations:

When an aircraft is conducting a pushback operation, the flight crew will make a decision if the visibility is sufficient to taxi to a lighted LVO/SMGCS taxi route, or if visibility dictates assistance will be needed to become established at the beginning of the lighted LVO/SMGCS route. This decision is typically made prior to the time of pushback tug disconnection. Assistance rendered is typically the aircraft being towed to a Non Movement Area Green Box. At this point the company assistance will end, and the tug will disconnect from the aircraft. At no time, will company vehicles enter the Movement Area. Any further assistance the flight crew needs outbound from the Green Box will be provided by a POS Follow Me vehicle.

The start of the LVO/SMGCS taxi route, and the termination of this ground handing plan will be at Green Box ___. _____ Airlines ground staff and _____ ground handler is responsible for the movement of the aircraft via standard pushback procedures from the gate to the point that the aircraft is positioned at Green Box _____, including movement across vehicle use surfaces.

Departure Rules:

- Aircraft will pushback from the gate using standard procedures via radio authorization by Seattle Ramp Tower on frequency 122.27 or 126.87. This communication is typically made by the flight crew.
- On completion of the pushback operation, the flight crew will advise both Seattle Ramp Tower and _____ Operations/Maintenance if they require ground assistance to move to the Green Box.
- Once reaching Green Box _____, the tug will disconnect and return t the ramp.
- In the event that the aircraft needs assistance to taxi to the lighted SMGCS Taxi Route, Ramp Tower will contact POS and POS will provide a follow me to this lighted route.

*****Neither _____ Airlines personnel nor _____ ground handling personnel are allowed to enter Movement Area (AMA) at any time for any reason*****

Please contact POS 206-787-5229 with AMA issues and questions

Attachment: Ramp diagram, Port of Seattle "Surface Movement Guidance and Control Plan"

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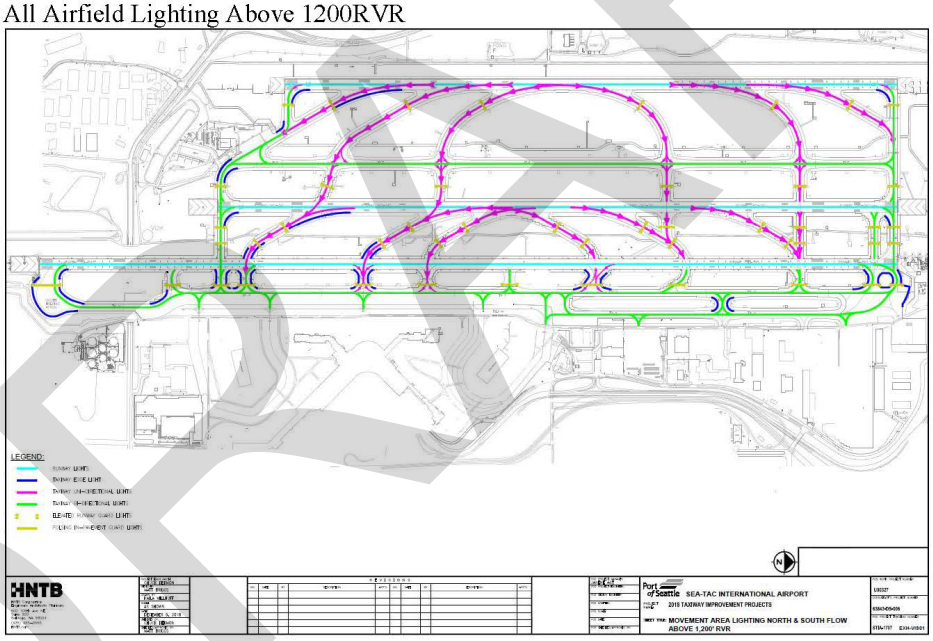
Port of Seattle

ATTACHMENT 5

Airfield Lighting Exhibits:

- Airfield Lighting Above 1200 RVR
- Inboard-Center Lighting <1200 to 500 RVR
- Inboard-Center Lighting <500 RVR
- Inboard-Outboard Lighting <1200 to 500 RVR
- Inboard-Outboard Lighting <500
- Center-Outboard Lighting <1200 to 500 RVR
- Inboard-Center-Outboard Lighting <1200 to 500 RVR

All Airfield Lighting Above 1200RVR



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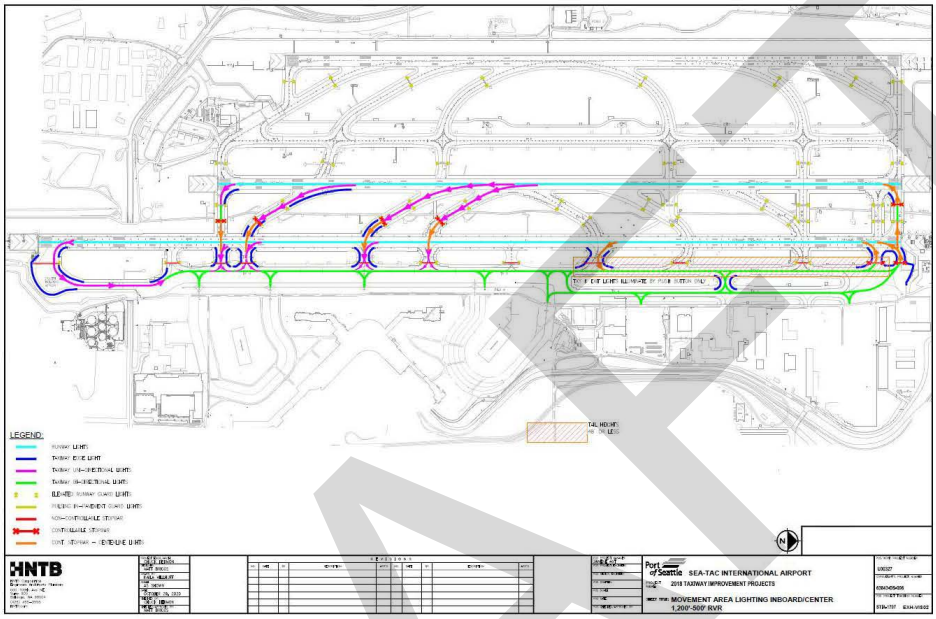
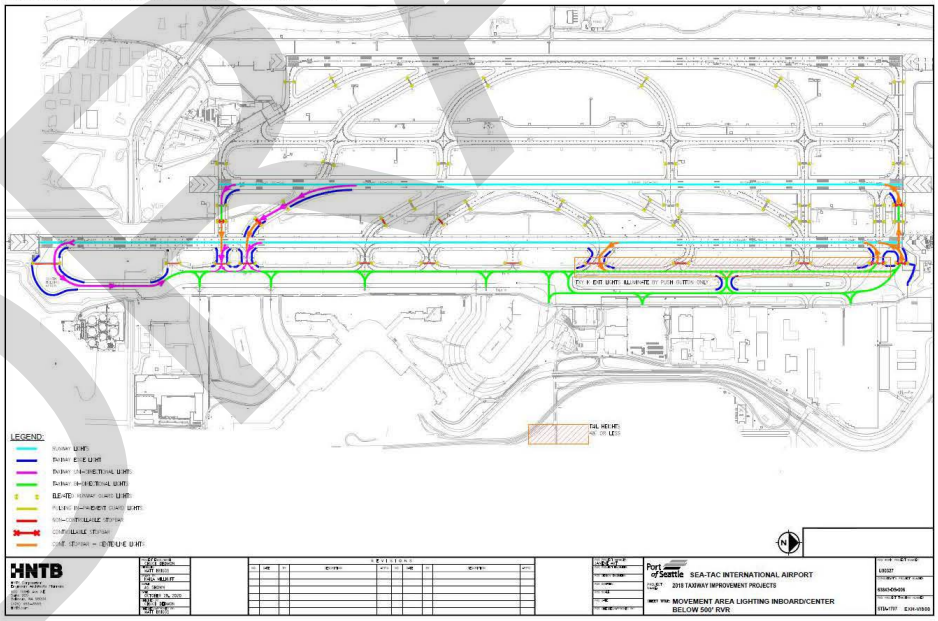
Inboard-Center 1200RVR-500RVR



Inboard-Center Below 500RVR



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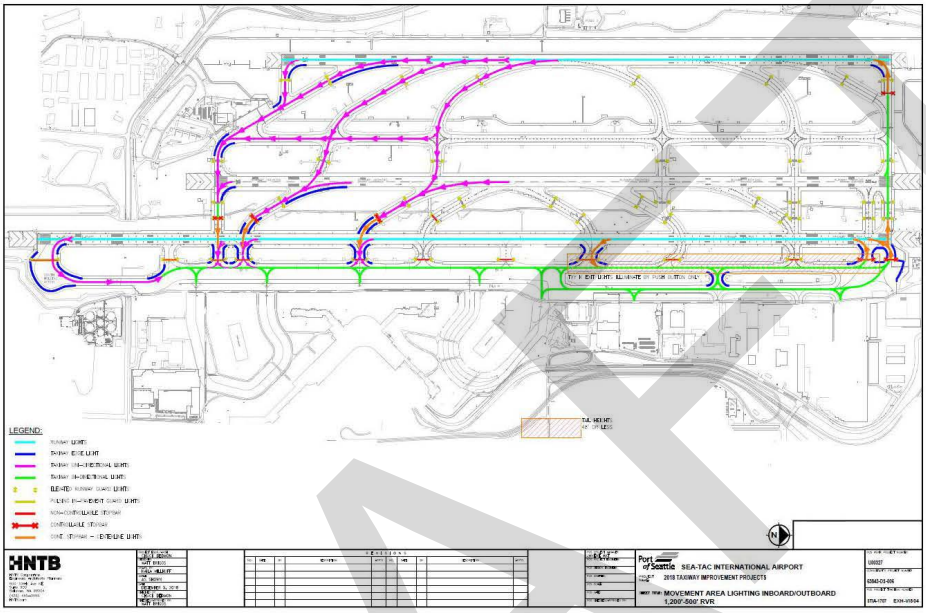
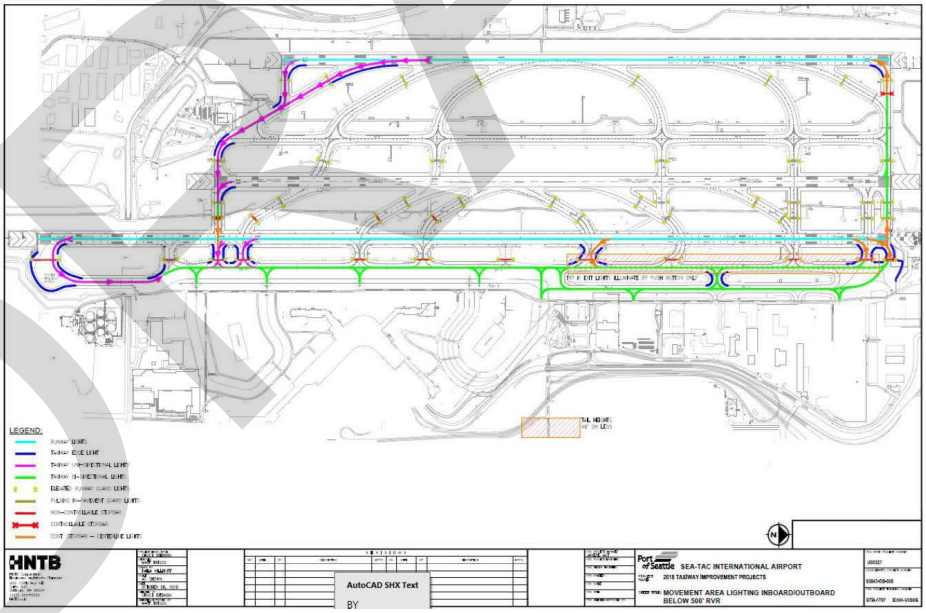
Inboard-Outboard 1200RVR-500RVR



Inboard-Outboard Below 500RVR



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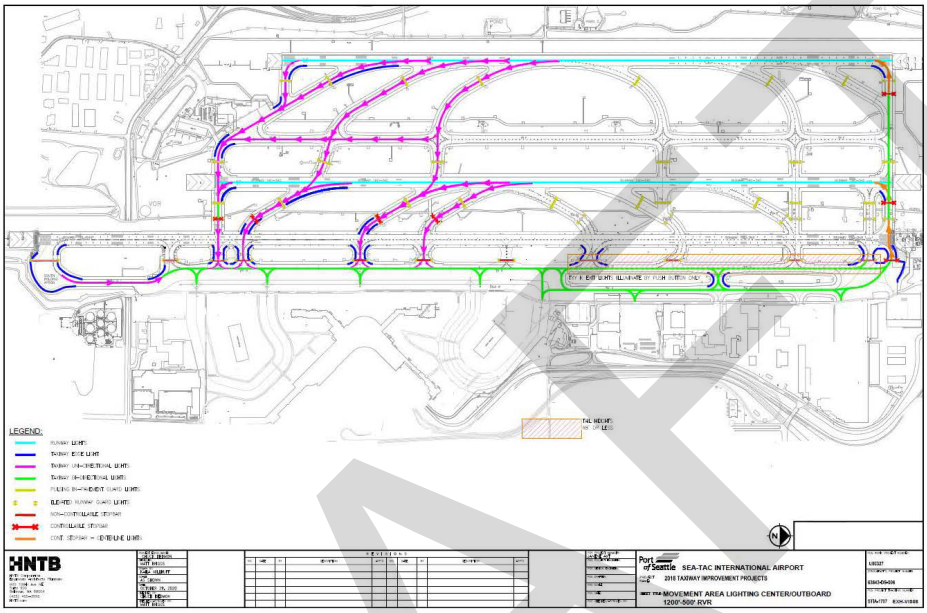
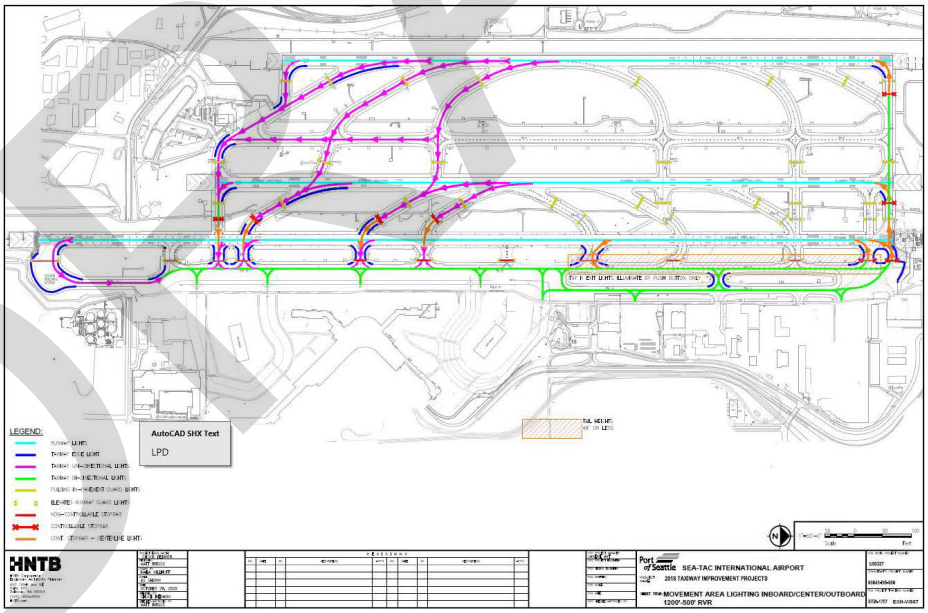
Center-Outboard 1200RVR-500RVR



Inboard-Center-Outboard 1200RVR-500RVR



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Attachment 6: Letter of Agreement: Low Visibility Procedures

Seattle Airport Traffic Control Tower and Port of Seattle

LETTER OF AGREEMENT

EFFECTIVE: December 15, 2014

SUBJECT: Low Visibility Operations/Surface Movement Guidance and Control System (LVO/SMGCS)

1. **PURPOSE:** To provide operating procedures for the movement of aircraft on the airport when the visibility conditions are reported to be less than 1,200 feet Runway Visual Range (RVR) consistent with the requirements of the Low Visibility Operations/Surface Movement Guidance and Control System (LVO/SMGCS) Plan.

2. **CANCELLATION:** Seattle ATCT and Port of Seattle Letter of Agreement Subject: Low Visibility Procedures dated April 1, 1995, and Seattle ATCT and Port of Seattle Letter of Agreement Subject: Required Visual Inspection of LVO/SMGCS Lighting during Category III Operations dated March 4, 2009.

3. **SCOPE:** The procedures contained herein apply when conducting LVO/SMGCS procedures at Seattle-Tacoma International Airport.

4. **RESPONSIBILITIES:** The Port of Seattle (POS) Operations and Seattle Airport Traffic Control Tower (Tower) must adhere to the provisions set forth within this agreement and the attached LVO/SMGCS Plan.

5. **PROCEDURES:**

   a. POS Operations and Tower must coordinate the implementation of LVO/SMGCS when visibility is less than 1800 feet RVR and falling, and decreasing RVR values indicate visibility less than 1,200 feet RVR is imminent on the runway in use.

   b. Tower must notify POS Operations that LVO/SMGCS procedures are in effect and when terminated.

   c. When visibility is less than 1200 feet RVR, Tower must operate LVO/SMGCS lighting for the runway configuration in use (e.g., controlled and uncontrolled stop bars, runway guard lights, taxiway centerline lights). Tower must report any alarms indicated on the Tower airfield lighting control panel to the Airport Duty Manager.

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Seattle Airport Traffic Control Tower and Port of Seattle

6. **ATTACHMENT:** LOW VISIBILITY OPERATIONS-SURFACE MOVEMENT GUIDANCE AND CONTROL SYSTEM PLAN, SEA-TAC INTERNATIONAL AIRPORT, current edition.

Steven L. Vale
Air Traffic Manager
Seattle ATCT

Ted J. Fick
Chief Executive Officer
Port of Seattle

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Advisory Circular Feedback

If you find an error in this AC, have recommendations for improving it, or have suggestions for new items/subjects to be added, you may let us know by emailing this form to 9-AWA-AFS400-COORD@faa.gov.

Subject: AC 120-57C, Low Visibility Operations / Surface Movement Guidance and Control Systems (LVO/SMGCS)

Please check all appropriate line items:

☐ An error (procedural or typographical) has been noted in paragraph Click here to enter text. on page Click here to enter text..

☐ Recommend paragraph Click here to enter text. on page Click here to enter text. be changed as follows:

Click here to enter text.

☐ In a future change to this AC, please cover the following subject:
(Briefly describe what you want added.)

Click here to enter text.

☐ Other comments:

Click here to enter text.

☐ I would like to discuss the above. Please contact me.

Submitted by: _____ Date: _____

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