Advisory Circular

CAA-AC-AGA501
October 2022

ESTABLISHMENT OF SURFACE MOVEMENT GUIDANCE AND CONTROL SYSTEMS (SMGCS)

1.0 PURPOSE

This Advisory circular has been developed to provide guidance to aerodrome operators on the establishment of a Surface Movement and Guidance Control System. It provides guidance on the design, installation and specifications of the visual aids and procedures in compliance with the requirements provided for surface movement guidance movement control system (SMGCS).

The AC provides guidance to aerodrome operators on the design installation and specifications of the visual aids and procedures in compliance for the establishment of the surface movement guidance movement control system (SMGCS) with the aim of reduction of runway occurrences including incursions and excursions at the movement area that may caused, in some cases, by low visibility operational conditions.

2.0 REFERENCES

2.1 The Civil Aviation (Aerodromes) Regulations.

2.2 ICAO Annex 14 – Volume I

2.3 Manual of Surface Movement Guidance and Control Systems (SMGCS) (Doc 9476)

2.4 Air Traffic Services Planning Manual (Doc 9426).

3.0 REGULATORY REQUIREMENTS

The Civil Aviation (Aerodromes) Regulations require that a Surface Movement Guidance and Control System be provided at an aerodrome. The design of a SMGCS takes into account the density of air traffic, the visibility conditions under which operations are intended, the need for pilot orientation, the complexity of the aerodrome layout and movement of vehicles. The

SMGCS is designed to assist in the prevention of inadvertent incursions of aircraft and vehicles onto an active runway and to assist in the prevention of collisions between aircraft, and between aircraft and vehicles or objects, on any part of the movement area.

4.0 GLOSSARY OF TERMS

Aerodrome is a defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft.

Aerodrome traffic density is;

Light where the number of movements in the mean busy hours is not greater that 15 per runway or typically less than 20 total aerodrome movements;

Medium where the number of movements in the mean busy hour is of the order of 16 to 25 per runway or typically between20to35totalaerodromemovements;

Heavy where the number of movements in the mean busy hour is of the order of 26 or more per runway or typically more than 35 total aerodrome movements;

Apron is a defined area, on an aerodrome, intended to accommodate aircraft for purposes of loading or unloading of passengers, mail or cargo, fuelling, parking or maintenance;

Apron management service is a service provided to regulate the activities and the movement of aircraft and vehicles on an apron;

Hot spot is a location on an aerodrome movement area with a history or potential risk of collision or runway incursion, and where heightened attention by pilots/drivers is necessary.

Taxiway is a defined path on a land aerodrome established for the taxiing of aircraft and intended to provide a link between one part of the aerodrome and another, including -

(a) **aircraft stand taxi lane** which is a portion of an apron designated as a taxiway and intended to provide access to aircraft stands only;

(b) **apron taxiway** which is a portion of a taxiway system located on an apron and intended to provide a through taxi route across the apron;

(c) **rapid exit taxiway** which is a taxiway connected to a runway at an acute angle and designed to allow landing aircrafts to turn off at higher speeds than are achieved on other exit taxiways thereby minimizing runway occupancy times;

Taxiway intersection is a junction of two or more taxiways;

Low Visibility Operations is the movement of aircraft or vehicles on the airport paved surfaces when visibility conditions are reported to be less than 350m RVR.

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.

Runway Excursion is any occurrence at any aerodrome involving the departure, wholly or partly, of an aircraft from the runway in use during take-off, a landing run, taxiing or maneuvering.

Runway Incursion is any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and takeoff of aircraft.

Runway Safety Team is a team comprised of representatives from [the aerodrome operator], air traffic service providers, airlines or aircraft operators, pilot and air traffic controllers' associations and any other group with a direct involvement in runway operations [at a specific aerodrome,] that advise the appropriate management on the potential runway [safety] issues and recommend mitigation strategies.

Runway Visual Range (RVR) is an instrumentally derived value based upon standard calibrations that represents the horizontal distance a pilot will see down the runway from the approach end.

5.0 DESCRIPTION OF THE SYSTEM

A SMGCS 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 to 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 smoothly and freely.

A SMGCS plan (see Sample in Appendix 1) facilitates the safe movement of aircraft and vehicles on the airport by establishing more rigorous control procedures and requiring enhanced visual aids. It should established for an aerodrome in accordance with the Civil Aviation (Aerodromes) Regulations. It clearly identifies the responsibilities of those involved (e.g., airport operator, ATC, ARFF, air carriers, and ground vehicle operators).

An SMGCS system provides guidance to, and control or regulation of, an aircraft from the landing runway to the parking position on the apron and back again to the take-off runway, as well as other movement on the aerodrome surface such as from a maintenance area to an apron, or from apron to apron. In other words, the SMGC system extends over both the "manoeuvring" and "apron" areas.

A 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 to 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.

SMGC system comprises an appropriate combination of visual aids, non-visual aids, procedures, control, regulation, management and information facilities. The system selected for an aerodrome should be appropriate to the operational environment in which that aerodrome will operate.

6.0 REQUIREMENTS AND CONDITIONS FOR THE SMGCS

The SMGC system to be provided at an aerodrome depends primarily on the traffic density and the visibility conditions under which the aerodrome plans to maintain operations. The system should provide the following;

6.1 General requirements.

a) communication capability between the appropriate control unit(s), between the appropriate control unit(s) and aircraft and between the appropriate control unit(s) and ground vehicles;

b) acceptable work-loads on the users of the SMGC system for example Pilots, ATC and Airport Operations personnel;

c) optimum use of aids and procedures already specified in ICAO regulatory documents;

d) compatibility between individual elements of the guidance and control systems; and

e) current and forecast meteorological conditions.

6.2 Requirements for pilots

a) orientation, guidance and control beginning at the end of landing roll-out on arrival, to the parking.

b) position, and from the parking position up to alignment for take-off on departure;

c) information on the route to be followed;

d) information on position along the route being followed;

e) guidance along the route being followed and parking guidance;

f) warning of:
    i. changes in direction;
    ii. stops and other speed adjustments;
g) identification of areas to be avoided;
h) information to prevent collision with other aircraft, ground vehicles or obstacles; and
i) information on system failures affecting safety.

6.3 Requirements for appropriate control units

a) information on the identity, position and progress of aircraft including aircraft under tow;
b) information on the identity, position and progress of ground vehicles whose movements might conflict
c) with aircraft movements;
d) information on the presence of temporary obstacles or other hazards;
e) information on the operational status of elements of the system; and
f) facilities appropriate to the control to be exercised.

6.4 Requirements for ground vehicles on the movement area

a) emergency vehicles
    i. information on the route to be followed;
    ii. guidance along the route being followed;
    iii. capability to locate the site of an emergency;
    iv. information to prevent collision with aircraft and ground vehicles; and
b) other ground vehicles
    i. information on the route to be followed;
    ii. guidance along the route being followed;
    iii. information to prevent collision with aircraft and ground vehicles.

7.0 DESIGNING A SMGCS FOR AN AERODROME

The following criteria should be followed in designing a SMGCS for an aerodrome.

7.1 Infrastructure/Equipment Requirements.

The equipment required at a particular aerodrome for provision of an SMGC system will depend both on the density of traffic and the visibility conditions in which the operations take place. However, the following infrastructure/equipment is fundamental to any SMGC system and should therefore be provided at all aerodromes:

a) Markings:

   Runway centre line, taxiway centre line, taxi-holding position, taxiway intersection, apron, restricted use areas.

b) Lighting:

   Runway edge, taxiway edge, obstacle lights, restricted use areas.

c) Signs:

   Mandatory signs for example taxi-holding position, NO ENTRY and STOP signs. Information signs for example location and destination signs.

d) Other:

   Aerodrome chart, aerodrome control service, signaling lamp, radiotelephony equipment.

7.2 Procedural/ Administration Requirements.

Procedures are an important and integral part of an SMGC system. Procedures should be developed for the aerodrome operator, the Air Traffic Control Unit and the Air Operator (pilot). The procedures to be employed at a particular aerodrome will be dictated by both traffic density and visibility conditions.

The following procedures are fundamental to any SMGC system and should therefore be implemented at all aerodromes:

a) designation of taxiways;

b) movement area inspections;

c) regulation of ground staff conduct on the movement area;

d) regulation of ground staff radiotelephony procedures;

e) periodic electrical monitoring of SMGC aids;

f) initiation of amendment of aerodrome chart as necessary;

g) apron management.

7.3 Functions and Responsibilities for the operation of SMGCS

In the surface movement guidance and control (SMGC) system, as in any other system, one needs to identify who is responsible for what and when, why and how.

The following departments must be involved with surface movement guidance and control;

7.3.1 Air Traffic Services.

a) Use of radiotelephony procedures and phraseology. Radiotelephony will be the primary method of communication between ATS and aircraft, surface vehicles and rescue and fire fighting vehicles operating on the manoeuvring area. It is important that radiotelephony (RTF) communications be conducted in the standard manner with regard to phraseology, procedures and language. At busy aerodromes the work-load on the controller can be extremely high and SMGC systems should be designed with a view to minimizing the need for RTF communication.

b) When aircraft and vehicles operate outside the manoeuvring area but under the guidance of an ATS unit it is preferable that detailed written procedures governing their operation be employed.

c) Issue of taxi clearance to facilitate SMGC.

d) ATS and the aerodrome authority should determine jointly the routings to be taken by aircraft and vehicles. The aim should be to achieve the most expeditious and orderly traffic flow possible.

e) Determination of taxi routes to be followed.

f) Monitoring of SMGCS aids. As the bodies responsible for operating the SMGC system, the appropriate ATS unit and the aerodrome authority should be aware of the need to monitor the system and to have any failures rectified as soon as is practicable.

g) Operation of visual guidance and control aids.

h) Control of traffic other than aircraft on the manoeuvering area.

i) Prevention of collision is a joint pilot/ATS responsibility with the controller always responsible for the resolution of intersection conflicts.

j) Initiation and termination of low visibility procedures is the responsibility of the air traffic control unit.

7.3.2 Aerodrome Operator

a) The aerodrome operator is responsible for conducting movement area inspections.

b) The aerodrome operator and ATS will be responsible for the regulation and control, respectively, of ground staff on the movement area.

c) In addition, the aerodrome operator will be responsible for ensuring that ground staff are properly trained particularly in RTF and monitored in its use.

d) The aerodrome authority will normally be responsible for ensuring that all visual components of the SMGC system are kept serviceable.

e) In conjunction with the ATS, the aerodrome authority will be responsible for the designation of taxiways and for the establishment of standard taxi routes applicable to the types of operations expected to take place at the aerodrome.

7.3.3 Apron management service

There should be an apron management service responsible for ensuring the safe movement of aircraft on the apron.

7.3.4 Pilots

The pilot will respond to the instructions given by the apron management service and the air traffic control unit and follow the designated taxiway route.

7.3.5 Ground vehicle drivers

Drivers of ground vehicles must comply with aerodrome regulations and ATC instructions. Notwithstanding this, drivers are responsible for exercising due care and attention so as to avoid collisions between their vehicles and aircraft, and between their vehicles and other vehicles.

7.3.6 Tenant Organizations

Airport tenants will be responsible for adherence to the SMGCS plan and will correct such deficiencies that are observed or brought to their attention.

7.4 Matching Aids to Aerodrome Conditions

Table 1 below lists the aids considered appropriate for each of the nine possible combinations of traffic and visibility conditions. It will be observed that the table includes not only the basic aids but also the additional aids needed to ensure safe and expeditious movement of aircraft under different traffic and density conditions.

TABLE 1

Aid	Traffic Conditions	Light			Medium			Heavy		
	Visibility Conditions	1	2	3	1	2	3	1	2	3

Apron markings		X	X	X	X	X	X	X	X	X
Runway centre line marking		X	X	X	X	X	X	X	X	X
Taxiway centre line marking		X	X	X	X	X	X	X	X	X
Taxi-holding position marking		X	X	X	X	X	X	X	X	X
Visual aids for denoting restricted use areas		X	X	X	X	X	X	X	X	X
Runway edge lights		X	X	X	X	X	X	X	X	X
Taxiway edge lights		X	X	X	X	X	X	X	X	X
Obstacle lighting		X	X	X	X	X	X	X	X	X
Signs		X	X	X	X	X	X	X	X	X
Taxiway intersection marking		X	X	X	X	X	X	X	X	X
Charts (aerodrome, movement, apron)		X	X	X	X	X	X	X	X	X
Aerodrome control service		X	X	X	X	X	X	X	X	X
Signaling lamp		X	X	X	X	X	X	X	X	X
Radiotelephony equipment		X	X	X	X	X	X	X	X	X
Taxi-holding position lights				X		X	X	X	X	X
Clearance bars				X		X	X		X	X
Electrical monitoring system for lights			X	X		X	X	X	X	X
Taxiway centre line lights				X			X			X
Stop bars				X		X	X		X	X
Selective switching capability for taxiway centre line lights							X			X
Selective switching capability for apron taxiway centre line lights							X			X
Surface Movement Radar (SMR)							X		X	X
Aircraft stand manoeuvring guidance lights				X			X			X
Runway clearance aid				X			X		X	X
Secondary power supply				X		X	X		X	X
Visual docking guidance system							X		X	X

The need for the following equipment can be determined taking into account;

a) Visual docking guidance system

In evaluating the need for a visual docking guidance system, the following factors merit consideration:

i. number of aircraft using the aircraft stand
ii. weather conditions
iii. space available on the apron
iv. precision required at the parking position

v. availability and cost of alternative means.

b) Signs

Signs are a basic aid. They serve an important function in informing a pilot and reducing RTF communications. The number signs provided at an aerodrome is a variable which is not reflected in the table. As traffic increases or visibility decreases improvements in the signs provided as well as the lighting and electronic aids used for guidance and control are required.

c) Charts

Charts are another aid which cannot be precisely specified. A ground movement chart is specified and when this too is incapable of showing all information an apron parking/docking chart is required. As the provision of these charts is related to the complexity of the aerodrome and not visibility or traffic conditions only one entry, "Charts", is included in Table 2 below. The aerodrome operator should assess the number of charts required in accordance with the amount of information required to be shown.

Table 2

Procedure	Traffic Conditions	Light			Medium			Heavy		
	Visibility Conditions	1	2	3	1	2	3	1	2	3
Aerodrome authority										
Periodic electrical monitoring of SMGC aids		X	X	X	X	X	X	X	X	X
Designation of taxiways		X	X	X	X	X	X	X	X	X
Movement area inspections and reporting		X	X	X	X	X	X	X	X	X
Regulation of ground staff conduct on the movement area		X	X	X	X	X	X	X	X	X
Initiation of amendment of aerodrome charts as necessary		X	X	X	X	X	X	X	X	X
Regulation of ground staff radiotelephony procedures		X	X	X	X	X	X	X	X	X
Establishment of standard taxi routes				X		X	X	X	X	X
Low visibility movement area protection measures				X			X			X
Continual electrical monitoring of SMGC aids				X			X			X
ATS										
Visual monitoring of SMGC aids		X	X	X	X	X	X	X	X	X
Use of radiotelephony procedures and phraseology		X	X	X	X	X	X	X	X	X
Use of signaling lamp		X	X	X	X	X	X	X	X	X
Control of other than aircraft traffic on the		X	X	X	X	X	X	X	X	X

manoeuvring area									
Operation of lighting aids	X	X	X	X	X	X	X	X	X
Determination of the taxiway route to be followed			X		X	X	X	X	X
Application of sequencing procedure			X	X	X	X	X	X	X
Initiation and termination of low visibility procedures			X			X			X
Application of separation criteria			X			X			X
Continual electrical monitoring of SMGC aids			X			X			X
Monitoring of surface movement on SMR						X		X	X
Adherence to ground movement traffic rules and regulation	X	X	X	X	X	X	X	X	X
Use of radiotelephony procedures and phraseology	X	X	X	X	X	X	X	X	X
APRON MANAGEMENT									
Apron regulations and procedures	X	X	X	X	X	X	X	X	X
Emergency procedures	X	X	X	X	X	X	X	X	X
Communication procedures with ATS	X	X	X	X	X	X	X	X	X
Stand allocation and information	X	X	X	X	X	X	X	X	X
Apron security procedures	X	X	X	X	X	X	X	X	X
Operation of lighting and docking aids			X			X			X
Provision of discrete RTF channel						X	X	X	X
Low visibility procedures			X			X			X

8.0 REVIEW OF SYSTEM AND IMPROVEMENT

Regular reviews of the SMGCS should be carried out to ensure that the system is fulfilling its intended task, and to assist the aerodrome authority in planning ahead for the orderly introduction of a more advanced system and the necessary supporting facilities, as and when warranted.

Ideally, a master plan will have been prepared for the aerodrome in the early stages of its development, in which case a review of the system at regular intervals will serve to monitor the development of the aerodrome in relation to the time frame employed in the master plan.

In all cases, the SMGC system will need to be reviewed under one or more of the following circumstances:

a) the volume of traffic increases significantly;

b) operations in lower visibility conditions are planned; and

c) the aerodrome layout is changed, that is new runways, taxiways, or aprons are brought into operation.

Apart from traffic movement counts, the extent to which increased traffic volume is causing a deterioration of the effectiveness of the SMGC system may be determined by the following indicators:

a) a marked need for increased vigilance in the visual surveillance of surface traffic movements, generated by the number of movements occurring simultaneously throughout the aerodrome complex;

b) a marked increase in the loading on the communications channels used for SMGCS;

c) an increase in the number of problems occurring at crossing points and runway/taxiway intersections, requiring intervention by the controller and thereby contributing to the increase in radio communications; and

d) the occurrence of bottlenecks, congestion and delay in surface traffic movements.

Director Safety, Security and Economic Regulation

APPENDIX 2: SAMPLE SURFACE MOVEMENT GUIDANCE AND CONTROL SYSTEM PLAN

SURFACE MOVEMENT GUIDANCE AND CONTROL SYSTEM PLAN FOR (Name) INTERNATIONAL AIRPORT

DATE

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1.0 INTRODUCTION

1.1 This Surface Movement Guidance and Control System (SMGCS) Plan describes enhancements, procedures and actions at _ International Airport (_____) that are applicable to the airport operator, air traffic control (ATC), airlines, and other tenants of the Airport during lowvisibility conditions.

1.2 These enhancements, procedures, and actions are in accordance with the guidance set out in Advisory Circular on Surface Movement Guidance and Control System. A SMGCS Plan is necessary for airports where scheduled air carriers conduct takeoff or landing operations in visibility conditions of less than 350m runway visual range (RVR).

1.3 The procedures contained in this plan were developed by the at _ International Airport Runway Safety Team.

1.4 This document does not supersede established policies, procedures, rules, or guidelines for

airports, aircraft or vehicle operators, or air traffic control. It does prescribe certain airport lighting and marking improvements and operating procedures that have been designed to enhance the safety and efficiency of aircraft and vehicle movements.

1.5 To enhance the safety of low visibility operations, Operators should follow the guidance in this plan to the maximum extent possible and expect follow-me assistance to and from the runway environment.

1.6 This plan addresses both current and future enhancements to support low visibility takeoff, landing, and taxiing operations at the airport. The work of the Runway Safety Team/ SMGCS Working Group will continue after the initial plan is approved by the Authority. The SMGCS working group should meet as necessary, but not less than once a year to assess low visibility operations,and to modify the plan as necessary.

2.0 DEFINITIONS

2.1 Aerodrome. That portion of the Airport intended to be used wholly or in partfor the arrival, departure, and movement of aircraft.

2.2 Airport apron controller. The term "airport apron controller" refers to personnel from the airlines and Airport operations providing joint control ofthe concourse non-movement area.

2.3 Airport Operations. The term "Airport Operations" refers to personnel assigned from the Airport Operations Department who are responsible for the overall management of the airfield. This may include Airport security,technical services; apron control, air cargo area, airport operations and safety; and other activities.

2.4 Apron (Ramp). A defined area on an airport intended to accommodate aircraft for purposes of loading or unloading passengers or cargo, refueling,parking, and maintenance. The apron area includes the following components:

(1) Aircraft Parking Positions. Intended for parking aircraft toenplane/deplane passengers, load or unload cargo.

(2) 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.

(3) Taxilanes. Apron areas which provide taxiing aircraft access to and from parking positions.

(4) Vehicle Roadways. Identified rights of way on the apron areadesignated for service and ARFF vehicles.

2.5 Clearance bar. A clearance bar consists of three in-pavement steady-burning yellow lights.

2.6 Controlling region. Refers to the State geographic Region in which anairport is located.

2.7 Geographic position marking. Pavement markings used to identify the location of aircraft or vehicles during low visibility conditions. They arereferred to as "spots" by air traffic control (ATC).

2.8 Low Visibility Operations. The movement of aircraft or vehicles on the airport paved surfaces when visibility conditions are reported to be lessthan 350m RVR.

2.9 Movement area. Refers to the runways, taxiways, and other areas of an airport that are used for taxiing or hover taxiing, air taxiing, takeoff, and landing of aircraft, exclusive of loading ramps and aircraft parking areas.

2.10 Non-movement Area. Refers to taxiways and apron areas that are not under air traffic control.

2.11 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. Their function is to confirm the presence of an active runway and assist in preventing runway incursions.

2.12 Runway Guard Lights--(In-pavement). Fixtures 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.

2.13 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 holdingposition 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.

2.14 Surface Movement Guidance and Control System (SMGCS). A 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 to find their way on the aerodrome, and to keep the aircraft or vehicles on the surfaces orwithin 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.

2.15 Surface Painted Holding Position Sign. Pavement marking which is used to identify a specific runway. These markings are configured the same as theassociated sign.

2.16 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.

2.17 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 the pilot in confirming the designation of the taxiway on which the aircraft is located.

2.18 Taxi route. A specific sequence of lighted taxiways used by aircraft during low visibility operations.

3.0 FACILITIES, SERVICES AND EQUIPMENT

3.1 Runways. The Airport has one runway that is used, individually or in combination, for both takeoffs and landings in a northerly flow direction for this plan. Runway 35L and Runway 35R are usable for takeoffs and landings down to 600 RVR. The runway is [3600m] long and are served by [Category I] instrument landing systems; touchdown, midpoint, and rollout RVR equipment; runway centreline markings; touchdown zone and centerline lighting, and high intensity edge lighting.

3.2 Taxiway lighting. Continuous green taxiway centerline lights and blue taxiway edge lights are installed on all taxiways leading to and from the runways.

Taxi routes and taxi procedures are described in paragraph 6, AIR TRAFFIC CONTROL PROCEDURES.

3.3 Runway Guard Lights. Elevated runway guard lights are located at all runway access points and may be illuminated at all times to prevent runwayincursions.

3.4 Stop bars. Lighted stop bars are installed at all runway access points. During low visibility operations the stop bars, located on the first two taxiways that are used as runway entrances for departure aircraft on Runway 35L and Runway 35R, are controlled by ATC.

3.5 Taxiway clearance bars. Taxiway clearance bars are located at various locations throughout the Airport. These clearance bars occur at the edges ofrunway protection zones where aircraft tail heights or vehicles might penetrate runway operational surfaces, and where taxiway-to-taxiway intersections warrant additional caution. Clearance bars are illuminated whenever the taxiway centerline lights are illuminated. Aircraft are not required to hold at a taxiway clearance bar unless directed to do so by ATC.

3.6 Taxiway guidance signing and marking inspections. Taxiway guidance signing and marking are inspected routinely as part of the Airport operations airfield inspection program. Electronic monitoring is provided for all signs and lights associated with low visibility taxi routes. This monitoring alerts ATC whenever threshold outage levels are exceeded. Airport maintenance is also notified by an alarm and will take corrective action.

3.7 Non-movement area control. Control of the non-movement area between and around the concourses is administered by the airlines and/or the AirportOperations Department. Other non-movement areas are controlled by the tenants of those respective areas. Appropriate

movement/non-movement area markings are installed on apron edges.

3.8 Surface movement surveillance. The Airport has a system for airport surface detection equipment (CCTV). The aerodrome operator utilizes this equipment to monitor the geographical position of aircraft and vehicles during reduced visibility conditions and at night.

3.9 Follow-me service. The Airport Operations Department will provide "follow-me" service for air carrier aircraft upon request, subject to availability of equipment and the need to accomplish higher priority duties. To enhance safe operations in low visibility conditions, part 91 operators should expect follow-me services to and from the runway environment. The Airport operations follow-me vehicle is identified by yellow flashing emergency lights. A follow-me request may be initiated by the pilot, ATC, or the airport apron controller.

3.10 Aircraft docking. The airline assumes control of the aircraft in the vicinity of the gate, as directed by the airport apron controller, and provides aircraft docking by the use of wing walkers, follow-me vehicles, tugs or other appropriate means as set out in the airline's operations manual.

4.0 AIRCRAFT RESCUE AND FIRE FIGHTING (ARFF)

4.1 ARFF coverage. Each of the ARFF stations provide primary coverage during low visibility operations, depending on runway use configuration. ARFF Station #1 is located at the intersection of Taxiway [AA] and Taxiway [G] and provides primary coverage to the west airfield. ARFF Station #2 is located adjacent to Runway 17R on Taxiway [CS] and provides primary coverage to the east airfield. Equipment and personnel will remain on alertstatus at these stations when low visibility operations are in progress.

4.2 ARFF coordination. Coordination between ATC and ARFF is accomplished annually to ensure effectiveness of ARFF services. This coordination is accomplished as part of the [annual] airport emergency plan review.

5.0 VEHICLE CONTROL

5.1 Vehicle access. Vehicle access to the Airport is controlled by a system of perimeter fencing and gates. All Airport and tenant vehicles entering the airport operations area (AOA) are identified by a mandatory apron access permit, displayed on the windshield of the vehicles, which is obtained from the Airport Operations Department and enforced by Airport Security. Vendors and contractor vehicles are also identified through the apron permit system or are escorted by authorized personnel. Airport security shall insure that all vehicles operating on the AOA are properly marked and lighted.

During low visibility conditions, vehicles requiring access from outside the restricted security area must be cleared by Airport Operations through a security gate before entrance is gained to the [AOA].

5.2 Vehicle service roads. Except for the necessary movement in leased areas, vehicles must be operated within the clearly marked system of vehicle service roads. These service roads are identified by solid white edge lines with a dashed white line used as centerline divider. Where a service road intersects a taxiway, a solid white stop line is provided across the vehicle lane at a point that assures adequate clearance from taxiing aircraft. Standard stop and yield signs are installed in line with the stop line, on the right side of the road, at each entrance. Dashed white lines may be provided across certain taxiways where driver reference is needed, because of the width of the intersecting taxiway and the possibility of the driver becoming lost in low visibility conditions.

5.3 Driver training. Vehicles driven on the AOA during low visibility conditions will only be operated by drivers that have completed SMGCS driver training. All personnel authorized to drive on the airfield in movement or non-movement areas are provided driver training by the Airport Operations Department. Exception: Qualified tenants may provide training to their employees under the supervision of the Airport Operations Department. Construction crews and other temporary access personnel are provided individual instruction by Airport Operations. All Airport and tenant driver training courses use video training aids which include SMGCS lighting, signing, marking, and procedures and include written tests. Drivers are instructed to pay particular attention to striped and dashed yellow lines used in combination with one another, i.e., a single stripe and single dash, or two stripes and two dashes. These markings, denote runway holding positions or the movement/non-movement area boundary and must not be crossed without authorization from ATC. The driver training programs are reviewed annually by Airport Operations to ensure that they are current.

5.4 Access restrictions. Only vehicles operated by the Airport or those authorized by the airport operator are allowed on the Airport movement area. All other access to the movement area will be coordinated and approved by Airport Operations. In low visibility conditions, no vehicles are permitted in the movement area that are not in direct support of the SMGCS plan.

6.0 AIR TRAFFIC CONTROL PROCEDURES

6.1 Background and operating concept. The SMGCS plan provides guidance and control of aircraft between various apron locations and the runways in a safe and efficient manner during low visibility conditions. The coordinated efforts of ATC and Airport Operations are all focused on assuring safe movement and avoiding inadvertent or unauthorized entry onto

the movement area during low visibility conditions. When one portion of the Airport is in a low visibility condition, i.e., visibility less than 350m RVR, the entire Airport is considered to be in low visibility conditions and SMGCS procedures and restrictions are placed in effect.

The concept for accomplishing these objectives is to only use the north- south runways in a northerly flow direction only. The principal arrival runway is Runway 35R while Runway 35L is predominately used for departures. In certain instances, both runways may be used for arriving anddeparting aircraft.

6.2 Visibility reporting. ATC will coordinate with Airport Operations when lowering ceiling and visibility conditions indicate that visibility less than 350m RVR is imminent and SMGCS procedures are going into effect. Airport Operations will in turn will advise the airlines, service companies, other airport tenants, and air cargo operators by telephone. Individual airlines will notify service companies or vendors, which are not notified by Airport Operations that the SMGCS plan is in effect.

These procedures are terminated by ATC when no longer deemed necessary due to prevailing weather conditions. ATC will also advise Airport Operations when the SMGCS plan is no longer required, and Airport Operations will advise the airport tenants and other organizations noted above that the SMGCS plan is no longer in effect. The airlines will make appropriate notifications when the SMGCS plan has been terminated.

6.3 Departures. Each airline or aircraft operator is responsible for positioning aircraft at the movement area boundary. This may be accomplished with a tug, signalman, follow-me vehicle or other appropriate means, including unassisted taxi, if visibility on the apron permits. When established at the movement area boundary, the aircraft will contact ATC ground control for taxi instructions. ATC may provide RVR readings to pilots prior to taxiingin the movement area.

When visibility is less than 350m RVR, down to and including 600 feet RVR, all taxiway lighting may be illuminated. Taxiway edge lights, without centerline lighting, may be illuminated at various times for snowremoval or other operational reasons.

The ground controller may use pilot position reports to monitor the aircraft position prior to its entry into the movement area. The controller will then provide taxi instructions and traffic advisories appropriate to the route. The north-south parallel taxiways in the movement area are operated in opposing directions, with Taxiways G and L used as the primary departures taxiways to Runways 35L and 35R, respectively.

6.4 Departure routings. Aircraft routings for departure will vary depending on the initial location of the aircraft. Aircraft must have ATC clearance prior to entering Taxiway G, Taxiway L, or Taxiway M.

(1) Runway 35L departures.

a. Aircraft departing on Runway 35L from the concourse apron proceed west on the lighted apron taxiways to Taxiway G, and continue north on Taxiway G to Taxiway CN. Aircraft proceed west on Taxiway CN and continue west onto Taxiway F1 to reach Runway 35L. ATC may require aircraft taxiing on Taxiway G to hold at the intersection of Taxiway CN.

b. Aircraft departing on Runway 35L from the south air cargo apron proceed east on the cargo Taxiway SC to Taxiway SA, and south on Taxiway SA to Taxiway A. Aircraft then proceed east on Taxiway A to the Runway 35R holding position movement area boundary marking, where contact is established with ATC.

c. Aircraft departing on Runway 35L from the general aviation area proceed north on Taxiway M to Taxiway CN, west on Taxiway CN onto Taxiway F1 to reach Runway 35L. Departures must contact ATC for taxi clearance before leaving the general aviation ramp. ATC may require aircraft to hold on the ramp prior to entering Taxiway M, when exiting on Taxiway M, or when reporting clear of the Runway 35R approach area located between Taxiway M5 and Taxiway M6.

(2) Runway 35R departures.

a. Aircraft departing on Runway 35R from the concourse apron proceed east on lighted apron taxiways to the Taxiway L holding position (movement area boundary) marking. Prior to entering the movement area, the aircraft should contact ATC for taxi instructions. Aircraft will proceed southbound on Taxiway L. ATC may require aircraft taxiing on Taxiway L to hold at apron taxiway intersections for sequencing. Aircraft will continue south on Taxiway L to its intersection with Taxiway AA, east on Taxiway AA to Taxiway M, and then south on Taxiway M to Taxiway A, continuing east on Taxiway A to reach Runway 35R.

b. Aircraft departing on Runway 35R from the south air cargo apron proceed east on cargo Taxiway SC to Taxiway SA, and south on Taxiway SA to Taxiway A. Aircraft then proceed eastbound on Taxiway A to the Taxiway M holding position (movement area boundary) marking where contact is established with ATC. Aircraft continue east on Taxiway A to reach Runway 35R.

c. Aircraft departing on Runway 35R from the general aviation area proceed south on Taxiway M and follow the same routing as described in paragraph 6.4(2)a. above. Departures must contact ATC for taxi clearance before leaving the general aviation ramp. ATC may require aircraft to hold on the ramp prior to entering Taxiway M.

d. When departure and arrival operations are conducted on Runway 35R, Taxiway CN is used in a westbound direction favoring arrivals. Departures going to Runway 35R from the north

side of Concourse C proceed west on Taxiway CN to Taxiway H, south on Taxiway H to the apron taxiway designated by ATC for transition east to Taxiway L, and then south on Taxiway L as described in paragraph 6.4(2)a. above.

6.5 Arrivals. Landings may be conducted on Runway 35L or Runway 35R. The apron taxiways are operated in an alternating east and west flow pattern to minimize taxi time to the gate. Taxiways F and M are used as theprimary arrival taxiways.

When visibility is less than 350m RVR all taxiway lighting should be illuminated. Taxiway edge lights without centerline lighting, may be illuminated at various times for snow removal or other operational reasons.

At various times, ATC may ask arriving aircraft to report "clear" of therunway or ILS critical area.

6.6 Arrival routings. Aircraft arrival routings vary depending on the particularrunway used for arrival, the airfield operating configuration and the destination of the aircraft on the airport.

(1) Runway 35R arrivals.

a. Aircraft arriving on Runway 35R will use mid-field Taxiways M6 or M7 to exit the runway, or continue to roll out to the end of the runway (Taxiway M10). Upon exiting the runway, aircraft will use Taxiway M to go north to the assigned apron taxiway to access the concourse apron, or to access Taxiway L to go south to the general aviation area or the south cargo area. ATC may require aircraft taxiing south on Taxiway L to hold at apron taxiway intersections.

b. Aircraft exiting at the end (Taxiway M10) and going to the general aviation area or the south cargo area, will continue south on Taxiway L to Taxiway AA, proceed east on Taxiway AA to Taxiway M and southbound on Taxiway M. ATC may require aircraft taxiing on Taxiway L to hold at apron taxiway intersections. Aircraft accessing the south cargo area will use cargo Taxiway SC west from the intersection with Taxiway M. ATC may require aircraft taxiing west on Taxiway SC to report "clear" of Taxiway L.

c. Upon receipt of an appropriate ATC clearance, aircraft exiting on Taxiways M6 and M7 may immediately turn south on Taxiway M to access the south air cargo apron or general aviation area. The taxiway routing from Taxiways M6 and M7 south to the south air cargo apron or general aviation area is as described above.

(2) Runway 35L arrivals.

a. Aircraft arriving on Runway 35L will use mid-field Taxiway F9 to exit the runway, or continue to roll out to the end of the runway (Taxiway F12).

b. Upon exiting the runway, aircraft will use TaxiwayF to go south to Taxiway Z. Aircraft proceed east on Taxiway Z to Taxiway L.

c. Access to the concourse apron, general aviation, and south cargo area on Taxiways L and M is conducted as described above. ATC may require aircraft taxiing southbound on Taxiway Lto hold at intersecting apron taxiways.

6.7 Mixed operations. Effective air traffic management coordination is essential when departures are conducted on Runway 35R in mixed operations. ATC should ensure that arrivals and departures originating andterminating in the south cargo area are managed to prevent congestion (i.e.,"nose to nose operation") on Taxiway M. All aircraft departing the south cargo area should contact ATC prior to entering the movement area on Taxiways A or SC.

When mixed operations are being conducted on Runway 35L, aircraft arriving or departing Runway 35L will use the routings as described above.

7.0 AIRLINE PROCEDURES DURING LOW VISIBILITY CONDITIONS

7.1 General. Pilots conducting low visibility operations at_ are required to have a copy of the low visibility taxi route chart. Low visibility taxi routes are depicted on the appropriate NOS and Jeppesen charts.

The airport apron controller will resolve aircraft and vehicle movement conflicts in the non-movement area. This will be accomplished through the use of two-way radio communication, ground movement control procedures, follow-me vehicles, and ground marshalling. ATC will monitor and control aircraft in the movement area.

7.2 Departures. Departing aircraft will follow company procedures for pushback, engine start, and initial taxi to the movement area boundary at the apron taxiway holding position. If appropriate, the pilot should requestfrom the ground handling agency taxiing assistance such as signalman and wing walkers, follow-me service, or towing to the apron taxiway holding position. In all cases, aircraft must have ATC clearance prior to entering the movement area.

7.3 Arrivals. Arriving aircraft will follow company procedures for taxi to the gate on the apron concourse or to other parking areas as appropriate. The airline assumes control of the aircraft in the vicinity of the gate and provides aircraft docking by the use of signalman and wing walkers, follow- me service, towing or other appropriate means as set out in the airline's operating instructions.

7.4 Taxi routing. The principal taxi flow direction on the parallel taxiways between concourses in the concourse apron area is from east to west. Thisdirection is established on the basis that Runway 35R is predominately an arrival runway in low visibility conditions

while Runway 35L is predominately used for departures. The westbound flow provides for arrivals on the east airfield to flow into the concourses to the aircraft parking position and out the other side to the west airfield for departure. When Runway 35L is used for mixed operations or as an arrivals only runway, aircraft are routed east on Taxiway Z to the east north-south taxiway complex and enter the concourse apron area from the east, thereby retaining the westbound direction of flow between adjacent concourses.

During the limited periods when Runway 35R is used for departures, an adjustment is made to the westbound flow direction so that all aircraft exiting the concourse apron area can more readily access Runway 35R for departure. The southern taxiway of the two taxiways between parallel concourses is routed in an eastbound direction. This routing effects the flow direction of Taxiway AA, Taxiway AN, and Taxiway BN, which are used to access Taxiway L. All other taxiways in the concourse apron area maintain the westbound flow direction.

8.0 RESPONSIBILITIES

8.1 Airport operator.

(1) Serve as the point of contact for the SMGCS plan, holdmeetings of the SMGCS Working Group/Runway safety team and maintain documentation of proceedings.

(2) Coordinate a review of the SMGCS plan and airfield activities on at least an annual basis, and amend, publish, anddistribute the initial and revised SMGCS plan.

(3) Monitor adherence to the sections of the SMGCS plan thatare under the Airport's control and take action to correct deficiencies.

(4) Conduct inspections, report failures and provide maintenance of lighting aids associated with the SMGCS plan.

8.2 Air Traffic Control Tower.

(1) Initiate and terminate the SMGCS procedures specified in paragraph 6, AIR TRAFFIC CONTROL PROCEDURES.

(2) Coordinate with the Airport Operations Department prior to implementing the SMGCS plan.

(3) Provide directional assistance to ARFF units and other emergency equipment responding during an emergency inlow visibility conditions.

(4) Monitor and control aircraft and vehicles in the movementareas.

(5) Develop and coordinate the Low Visibility Taxi Route(s) chart(s).

8.3 Airport Tenants.

(1) Participate in the SMGCS Working Group/ Runway Safety team and disseminate low visibility procedures to company employees.

(2) Train personnel in low visibility procedures.

(3) Enforce SMGCS plan driving procedures and, if authorized, conduct driver training.

(4) Assure adherence to the sections of the SMGCS plan that are under airport tenant control, and take action to correct deficiencies.

8.4 Military Tenants.

(1) If required, request follow-me service from Airport Operations when the SMGCS plan has been implemented.

9.0 PLANS AND MILESTONES

9.1 Near term.

(1) Install runway guard lights at all runway/taxiway intersections.

(2) Ensure complete training of all personnel involved with the SMGCS plan.

(3) Coordinate and publish a low visibility taxi route chart.

9.2 Long term.

Consider the application of new ARFF technology and ground radar equipment to operate in low visibility conditions.

REVISION PAGE CONTROL CHART

Remove Pages	Dated	Insert Pages	Dated

DISTRIBUTION LIST

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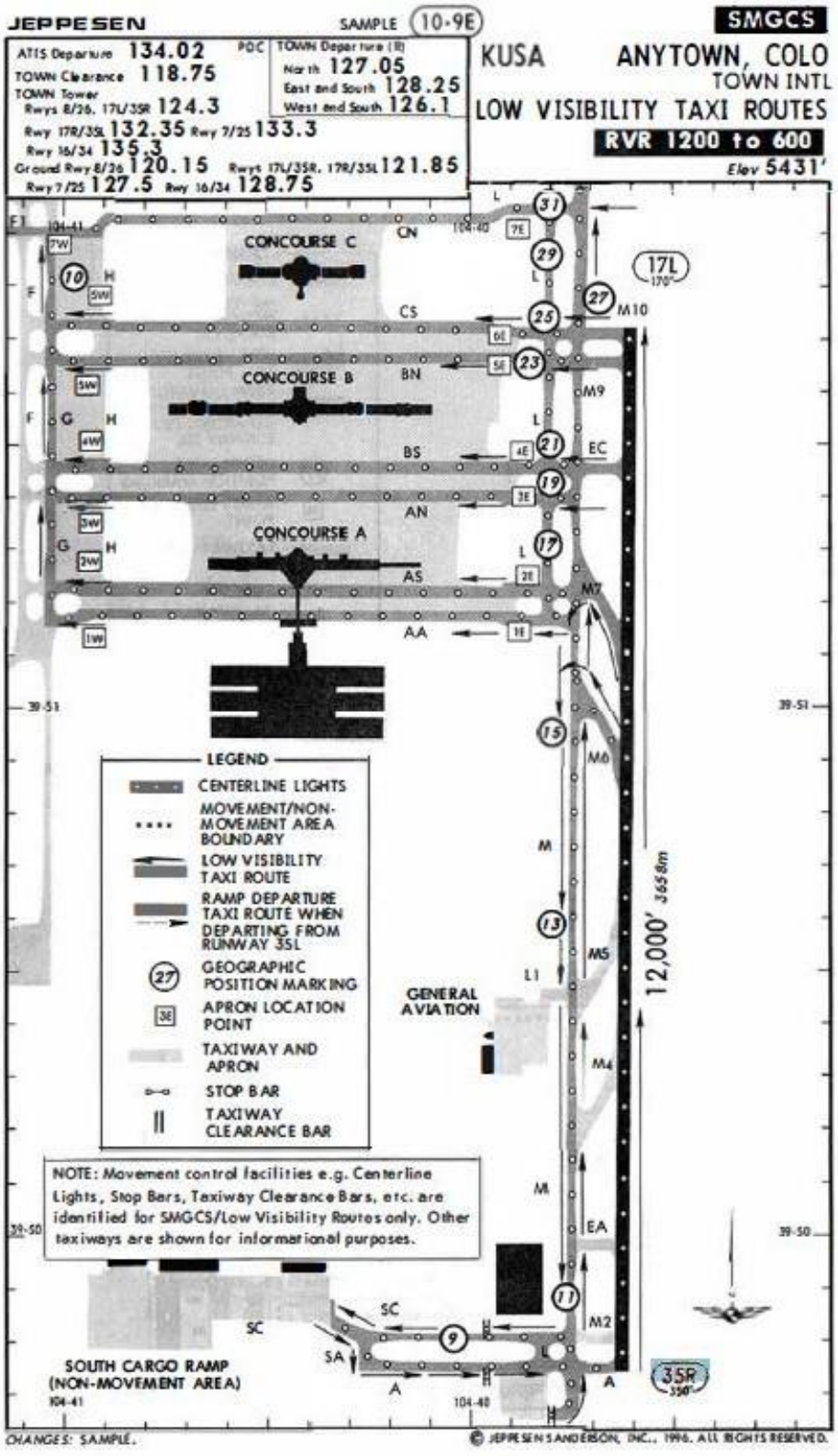

Figure 1 (East Side)

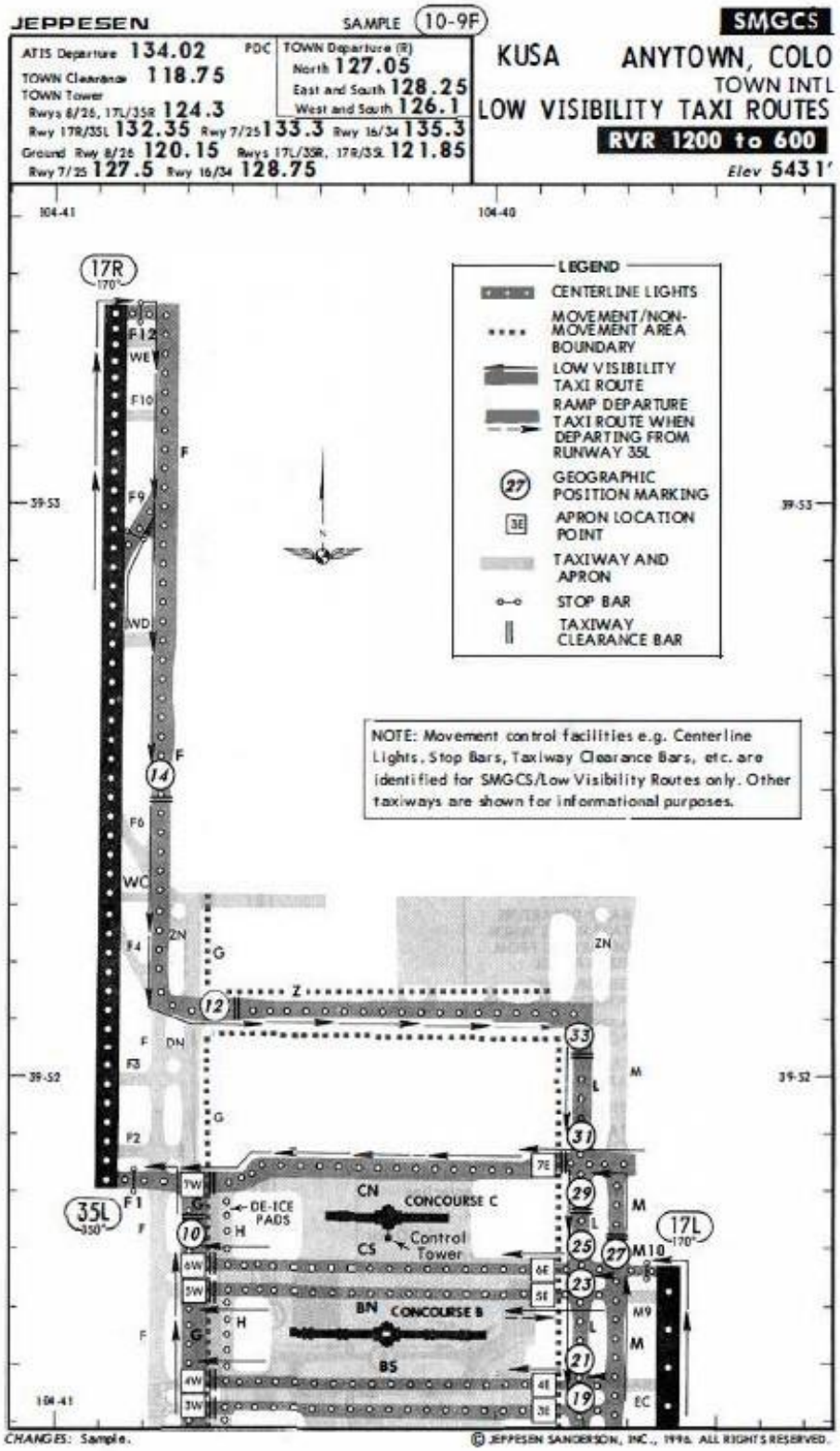

Figure 2 (West Side)

LOW VISIBILITY TAXI ROUTE CHART

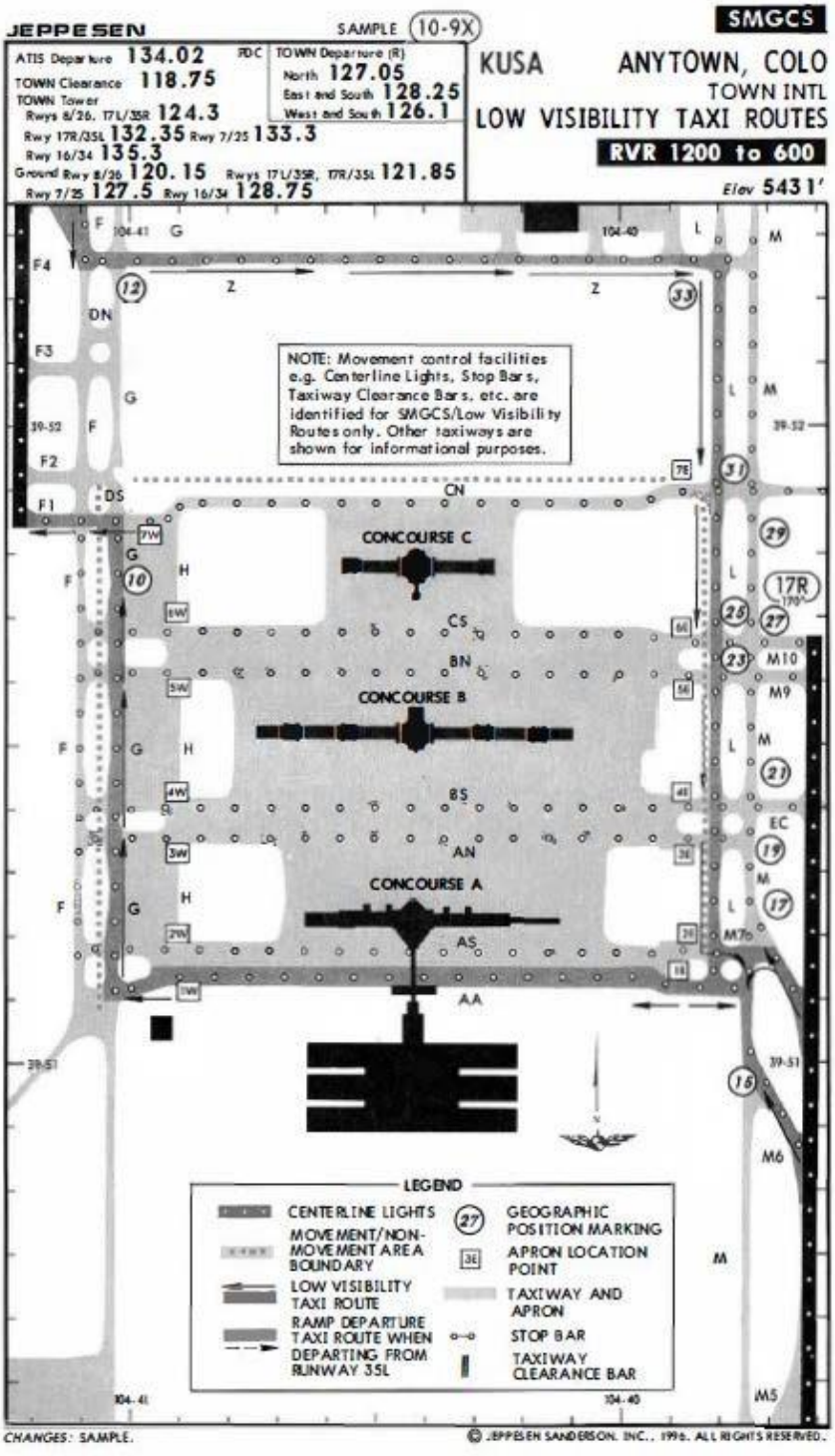

Figure 3 (Apron Area)