CIVIL AVIATION AUTHORITY OF FIJI

GUIDANCE MATERIAL

Operational Safety During Works on Aerodrome

SD - OSDWA

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PREFACE

This Guidance Material (GM) is published by the Civil Aviation Authority of Fiji for purposes of promulgating supplementary material to that published in the Authority's Standards Documents.

This GM is intended for the applicants for and holders of an aerodrome operator certificate.

This GM provides guidance to aerodrome operators on the acceptable means of compliance with the requirements relating to operational safety during works on the aerodromes under SD Aerodromes.

This GM explains certain regulatory requirements by providing interpretive and explanatory material.

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Theresa Levestam
Chief Executive

Table of Contents

1. CONTROL OF WORK

1.1. Introduction

1.1.1 Standard Documents Aerodromes (SD- Aerodromes) refers to the requirements the applicant must meet before a certificate is issued. In this guidance material, reference may be made to the certificate holder because the holder must continue to comply with the same requirements that were met before the certificate issuance. A safety assessment must be conducted by the Aerodrome Operator(s) to support the introduction of a proposed change to the aerodrome facilities or the aerodrome system that impacts operations at a certified aerodrome.

In this context, a safety assessment is an essential element of the risk management process within the CAAF – approved Safety Management System of the Aerodrome Operator(s). It evaluates safety concerns arising from deviations from standards, applicable regulations, identified changes at an aerodrome or any other safety-related issues. The assessment ensures that the necessary remedial actions are implemented to maintain safety and continuous improvement of overall aerodrome safety.

Safety issues addressed in this guidance material are primarily related to aerodrome operations. They are not intended to cover general workplace health and safety requirements for personnel.

1.1.2 There are a number of matters that need to be considered to ensure adequate control of works on an aerodrome. These include;

a) Developing a work programme; and
b) Scheduling work for minimal disruption to aerodrome operations; and
c) Identifying potential safety issues and developing mitigations plans; and
d) Establishing a structure to oversee activities; and
e) Developing a programme to monitor work activities; and
f) Carry out the work; and
g) Continuing oversight for compliance with established plans and procedures; and
h) Implementing remedial actions where necessary; and
i) Reviewing plans and processes periodically for effectiveness; and
j) Inspecting the work and work-site to verify completion, and to ensure no hazard exists.

1.1.3 The magnitude of works on aerodromes can vary from major (eg. Runway re-construction), to minor (eg. Grass cutting), and application of requirements may be less formal for smaller activities.

1.1.4 Regardless of the size and complexity of the work, it must always be carried out safely and with minimal disruption to operations.

1.2 Minor Construction and Maintenance Work

1.2.1 The aerodrome operator should develop procedures to control access to active parts of the aerodrome movement area, and all personnel entering these areas should be required to comply with these procedures.

1.2.2 All personnel involved in minor construction maintenance work should be fully briefed on the aerodrome operator's requirement that control working on the aerodrome, including obtaining clearance from an aerodrome air traffic unit, if present.

1.2.3 The aerodrome operator can authorize personnel regularly carrying out routine maintenance (eg. grass cutting), to work on the aerodrome without further briefing, subject to continuing compliance with work control requirements/procedures.

1.2.4 The aerodrome operator work control system should be developed to ensure that;

a) No work takes place on an active movement area without the knowledge of either the aerodrome operator or, where applicable the aerodrome air traffic services unit; and
b) Permitted times of work are strictly followed; and
c) All individual taking part in the work are briefed in detail on the following-
   i. Precise areas in which the work may be done; and
   ii. The routes to be followed to and from the work area; and
   iii. The radiotelephone or other control procedures to be used, the maintenance of a radio listening watch, and the use of look-outs; and

iv. The safety precautions to be observed; and
v. The reporting procedure to be followed on completion of the work; and

d) At the conclusion of the work, the aerodrome operator inspects the work area to ensure that it has been left in a safe condition.

1.3 Major Construction and Maintenance Work

1.3.1 Before commencing any major construction or maintenance work on the aerodrome the aerodrome should;
a) Conduct risk assessment and establish a safety case; and
b) Establish a method of work plan (MOWP); and
c) Appoint a project manager with overall responsibility for maintaining the MOWP and ensuring the work is carried in accordance with its requirements.

1.3.2 When preparing MOWP, major aerodromes users, the aerodrome air traffic service unit if provided, contractors, relevant stakeholders, regulatory authority and other involved or affected parties as necessary should be consulted.

1.3.3 The work plan should address the items detailed in Appendix A.

1.4 Management and Control of Major Works

1.4.1 The project manager has responsibility to coordinate all works and should;
a) Make arrangements and establish procedures for the safety of aircraft operations while the works are in progress; and
b) Ensure arrangements and procedures are published in the MOWP; and
c) Ensure works is carried out according to the MOWP; and
d) Coordinate with the AIS office 90 days prior for the issuance of the AIP Supplement or NOTAM.
e) Appoint a person (or persons) as work safety officers to carry out the functions set out in Appendix B; and
f) Periodically review the MOWP, and adjust when necessary to maintain its effectiveness.

1.5 Liaison

1.5.1 Before the commencement of any substantial work on the aerodrome, a liaison process should be established between representatives of ;
a) The aerodrome operator; and
b) Major aerodrome users; and
c) The aerodrome air traffic services unit, if provided; and
d) Contractors; and
e) Regulatory authority; and
f) Other involved or affected parties as necessary.

1.6 General Working Rules

1.6.1 Before works commences agreement should be established on general rules for working on the aerodrome: These should include;
a) The permitted time of work; and
b) The routes to be followed to and from work areas; and
c) The areas in which work may be done; and
d) The control of vehicles; and
e) The permitted heights of vehicles and equipment and the limitations to be placed on operating heights of tall equipment's such as crane jibs, etc; and
f) Any limitation on the use of electrical or other equipment that might interfere with navigation facilities or aircraft communications or pose any other risk to aircraft safety.

2. OPERATIONAL ISSUES

2.1 Introduction

2.1.1 When planning any work on aerodrome a number of matters to be considered to ensure the work can be completed with minimal disruption to aerodrome operations. The issues considered below should generally cover most work, but further items may be identified during detailed planning process.

2.2 Isolation of Work Area

2.2.1 As far as practicable working areas should be blocked off from the active movement areas by physical barriers. These barriers warn pilots and prevent work vehicles and personnel from inadvertently straying onto active movements areas.

2.2.2 The barriers should be marked for day use and adequately lit for night use. The lights of taxiways leading into working areas should permanently off during work period.

2.2.3 Guidance on the marking of unserviceable area is contained SD Aerodromes Appendix 7 Visual Aids for Denoting Restricted Use Areas.

2.3 Paved Area Cleanliness

2.3.1 Where work is conducted on, or involves traversing paved areas, the paving should be thoroughly inspected before being opened for aircraft use. Particular attention should be given to ensuring general cleanliness of the surface and to the removal of debris.

2.3.2 Where aircraft are constantly using areas open to construction activity, regular inspection should be made to ensure that the necessary cleaning has been carried out.

2.3.3 A Foreign Object Debris (FOD) Management program should be established, accepted by the authority. All personnel involved in the project should be well informed of the FOD management program.

2.4 Marking and Lighting

2.4.1 Tall equipment such as crane should be marked and if the aerodrome is opened for night operations, lit.

2.4.2 If work is prolonged duration, an on going watch should be maintained to ensure that the marking and lighting of obstacles and unserviceable areas remain fully functional. This is particularly important for marking and lighting indicating a displaced threshold.

2.4.3 NOTAM should be issued for pilot awareness of crane operations in or near the vicinity of the aerodrome.

3. OPERATIONAL SAFETY

3.1 Introduction

3.1.1 Safety issues addressed in this guidance material are primarily related to aerodrome operations. They are not intended to cover workplace health and safety requirements for personnel.

3.2 Personnel Safety

3.2.1 Construction personnel should be warned, in writing, of possible hazards when working on aerodromes. Jet blast and noise can be aerodrome – specific hazards to be taken into account for managing personnel safety, if necessary; look-outs should be posted to warn approaching aircraft.

3.2.2 Protective equipment including high visibility clothing must be worn by all personnel.

3.3 Safety Considerations

The following is a partial list of matters that could affect operational safety during aerodrome works. These, plus any other matters that may be identified, should be considered when planning and carrying out work.

i. Minimum disruptions of standard operating procedures for aircraft operations.
ii. Clear routes for rescue and fire fighting to all active aerodrome movement areas.
iii. Procedures for notification and authority to change safety-oriented aspects of the construction plan.
iv. Initiation, currency and cancellation of NOTAM.
v. Suspension or restriction of aircraft activity on aerodrome movement areas.
vi. Runway end and threshold displacement and appropriate temporary lighting and marking,
vii. Installation and maintenance of temporary lighting and marking for closed or diverted aircraft routes on the aerodrome movement areas.
viii. Revised vehicular control procedures, including additional
ix. Revised vehicular control procedures, including additional equipment and personnel.
x. Marking and lighting of construction equipment.
xi. Parking of construction equipment, and storage of material when not in use.
xii. Designation of responsible representatives for all involved parties, and their availability.
xiii. Location for construction personnel vehicle parking, and their transportation to and from the work site.
xiv. Marking and lighting of construction areas and temporary obstructions.
xv. Location of the construction offices.
xvi. Location of the contractor plant.
xvii. Designation of waste areas and disposal of waste.
xviii. Debris clean-up responsibilities and schedule.
xix. Conspicuous identification of construction personnel and equipment.
xx. Location of haulage roads.
xxi. Security control of temporary gates and relocated fences.
xxii. Noise pollution.
xxiii. Regulation and control of explosives.
xxiv. Dust, smoke, steam, and vapor controls.
xxv. Location and protection of utilities.
xxvi. Provision of temporary services or immediate repairs in the event of disruption to
xxvii. established utilities
xxviii. Location of power and control lines for electronic and visual aids to navigation.

(a) Additionally security measures at a security designated aerodrome
(b) Marking and lighting of closed aerodrome movement areas.
(c) Phasing of work
(d) Protection of shutdown and electronic and visual aids to navigation.
(e) Notification to rescue and firefighting unit when working on water supplies.
(f) Provision of traffic directors, aircraft marshallers, wing walkers etc to assure clearance in construction areas.
(g) Provision of escort with Follow Me vehicles for route guidance.

4. OVERSIGHT OF WORK

4.1 Introduction

4.1.1 An oversight inspection programme for all aerodrome works should be implemented to;

i. Provide continuous monitoring to ensure on going compliance with established safety and other requirements; and
ii. Identify any safety hazards, or deviations from requirements; and
iii. Ensure remedial action to maintain safety and compliance with requirements is implemented.

4.2 Inspections

4.2.1 Frequent inspections should be made by the aerodrome operator or a representative during all phases of the work to ensure that the work is being carried out in accordance with the prescribed method of work plan (MOWP).

4.2.2 The inspections should also ensure that foreign object debris (FOD) is present on operational areas.

4.2.3 Any potential hazard should be brought to the attention of the responsible parties for immediate rectification. Where appropriate, the aerodrome air traffic services unit, if provided, or aircraft operators should be notified of the hazard.

4.3 Examples of hazards and marginal conditions

4.3.1 Analysis of past accidents and incidents have identified many contributory hazards and conditions. The most recurring threats to safety during constructions are –

a) Safety encroachments; and
b) Improper ground vehicle operations; and
c) Unmarked or uncovered holes and trenches in the vicinity of aircraft movement surfaces.

4.3.2 Some of the more commonly occurring conditions are –

a) Excavation adjacent to runways, taxiways and aprons and
b) Stockpiles of earth, construction material, temporary structures and other obstacles in proximity to aerodrome movement areas and runway approach and take-off surfaces and
c) Runway work resulting in lips greater than 25mm on the runway surface and greater than 76mm between old and new surfaces at runway edges and ends; and
d) Heavy equipment operating or idle near aerodrome movement areas; and
e) Equipment or material that may degrade the performance or integrity of radio navigation aids near the facility; and
f) Tall but relatively inconspicuous objects, such as cranes, drills etc. in critical areas, for example safety.
g) Areas and runway approach and take off surfaces; and
h) Improper or malfunctioning lights or unlighted aerodrome hazards; and
i) Holes, obstacles, loose pavement, rubbish, or other debris, on or near movement areas; and
j) Failure to maintain barriers and fences to prevent unauthorized access during construction; and
k) Improper marking or lighting of runways, taxiways and displaced threshold; and
l) Attractions for birds from exposed earthworks, rubbish, grass seeding ponded water etc. on or near the aerodrome; and
m) Inadequate or improper methods for making temporarily closed movement areas included improper and unsecured barricades; and
n) Obliterated markings on active movement areas.

APPENDIX A METHOD OF WORK PLAN (MWOP)

A.1 Introduction

The method of work plan should be written document, properly controlled and authorized, and made available to all parties involved with the works. The contents and level of detail should be adjusted as necessary to properly reflect the requirements for each project.

The following is an example of a MOWP contents page;

- Title Page
- Works Information
- Restriction of Aircraft Operations
- Restrictions of Works Organisation
- Administration
- Authority
- Drawing
- Distribution List

A.2 Title Page

The title page should include;

- The aerodrome name
- Title of the works; and
- A brief description of the work;
- The MOWP issue date and, if necessary, its amendment status.

A.3 Works Information

Works information should include;

- An outline of the full scope of works; and
- Which facilities are affected; and
- The planned date and time of commencement; and
- The duration of each stage; and
- The date and time of completion; and
- The following statement;

"The actual date and time of commencement will be advised by NOTAM, to be issued no less than 48 hours before the work commences."

This has to reflect what is practiced here in Fiji – Major works via the AIP Supplement and minor via NOTAM . Please coordinate with AIS and ANSI APC.

A.4 Restriction to aircraft operations and issue of NOTAM

This section of the MOWP should be in a form that allows its separate issue to aircraft operators to permit those operators to have east reference to the information that affects them.

Work Stages

Any restrictions to aircraft operations on the maneuvering area, or in the approach and take-off areas that are to be listed in the MOWP should be in drawings of each stage of the works. When appropriate, show wing tip clearance so that safety officers can readily identify risk areas during works.

When complex work are being undertaken, a table showing the restriction applicable to each stage of the works and for each type of aircraft operation should be included.

The table should outline the various work stages with start and completion dates and have a remark column to list details of special restrictions and the issue of NOTAM for the information of pilots before flight.

Emergency and Adverse Weather
Outline details, if any of special arrangement to be made during works if emergencies arise or adverse weather conditions occur.

NOTAM

The intended text of all planned NOTAM associate with the aerodrome works should be included.

A.5 Restrictions of Works Organisation

Provide details of any restrictions on the carrying out of aerodrome works and requirements for the restoration of normal safety standards.

Personnel Equipment

When personnel and equipment are required to vacate the movement area for aircraft movements, specific mention of this fact should be made. This should include withdrawal line or area personnel and equipment, and the limitation on stockpiling of material, excavations and the like.

Access
The MOWP should identify the routes to and from the work areas and the procedures for entering any work areas within the movement areas.

Particulars of routes to and from the work areas should be shown in drawings attached to the MOWP.

Aerodrome Markers, Markings and Lights
Details of arrangement for the installation, alteration, or removal of aerodrome markers and lights in the work areas and other areas affected by the aerodrome works should be shown on drawings attached to the MOWP.

Protection of Electrical Services

Provide details of any special requirements arising during on completion of aerodrome works. Examples are arrangements for leaving paved surfaces swept and clean before leaving the works area, leaving bare soil compacted or protected from erosion.

FOD Management
In this section discuss methods to control and monitor FOD; worksite housekeeping, ground vehicle tire inspection, runway sweeps and so on.

Wildlife Management
Discuss in this section wildlife management procedures. Describe the maintenance of existing wildlife mitigation devices, such as perimeter fence, and procedures to limit wildlife attractions. Include procedures to notify Airport Operations of wildlife encounters.

A.6 Administration

Provide the name of the project manager and works safety officers appointed by the aerodrome operator and the means to contact, including contact outside normal working hours.

A.7 Authority

Each MOWP should contain the following statement

"This MOWP is authorized by […..aerodrome operator name….] and all works shall be carried out in compliance with these requirements."

The MOWP should be signed by the following;

- ❖ Aerodrome operator representative
- ❖ Contractor representative

A.8 Drawings

Attach drawings which provide a visual reference for each stage of the work. The drawings should contain specific details including;

- Work areas; and
- Restrictions to aircraft; location of radio navigation aids and critical areas around these; and
- Exact location of visual aids and markings; and
- Details of the height and location of critical obstacles; and
- Location of temporary taxiways; and
- Access routes; and
- Storage/Parking areas for materials and equipment; and
- The location of utilities and other services which may be disturbed during the works.

A.9 Distribution List

- Project Manager
- Works Safety Officer
- Aerodrome security services
- Aerodrome air traffic service unit
- Regular air transport operators who might be affected by the works; and
- Aircraft operator based at the aerodrome
- The rescue and fire fighting services; and
- Contractor and subcontractor
- Regulatory authority

Refer Appendix E Generic Flow Chart to assist Certified Aerodrome Operators with planning of works within aerodrome vicinity.

APPENDIX B WORKS SAFETY OFFICER

B.1 Introduction

The works safety officer is responsible for monitoring all activities on and around the works area, identifying issued or potential issued for safe aircraft operations and initiating effective corrective actions.

B.2 Functions

The functions of the works safety officer are to;

a) Ensure the safety of aircraft operations in accordance with these directions and the MOWP; and
b) ensure that, where applicable, the aerodrome works are notified by issue of a NOTAM and that the text of the NOTAM is as set out in the applicable MOWP; and
c) where applicable, daily, advise the aerodrome air traffic service unit of whatever information is necessary for the safety of aircraft operations; and
d) discuss, daily, with the project manager any matters necessary for the safety of aircraft operations; and
e) ensure that unserviceable portions of the movement area, temporary obstructions, and the limits of the works area are correctly marked and lit in accordance with the applicable MOWP; and
f) ensure that vehicles, plant and equipment carrying out aerodrome works are properly marked and lit or are under works safety officer supervision or within properly marked and lit work areas; and
g) ensure that all other requirements in the MOWP relating to vehicles, plant and equipment and materials are complied with; and
h) ensure that access routes to work areas are in accordance with the applicable MOWP, are clearly identified, and that access is restricted to those routes; and
i) Ensure that excavation is carried out in accordance with the MOWP to –
   - Avoid damage to any utility or other services
   - Avoid loss of calibration of any precision approach or landing system, or and other aid to navigation; and
j) Report immediately, to the aerodrome air traffic services unti and the aerodrome operator, any incident, or damage to facilities that may affect air traffic services or the safety or aircraft; and
k) Remain on duty at the works area while work is in progress and the aerodrome is open to aircraft operations; and
l) Ensure that aerodrome air traffic service unit kept informed of the radio call signs of the vehicles used by the works safety officer; an
m) Require the immediate removal of vehicles, plant and personnel from the movement area where necessary for the safety of aircraft operations; and
n) Ensure that the movement area is safe for normal aircraft operations following removal of personnel, vehicles, plant, equipment and rubbish from the works area; and
o) Ensure that flooding or any other lighting required to carry out aerodrome works is shielding so as not to present a glare to pilots.

APPENDIX C TEMPORARY HAZARDS

C.1 Introduction

This appendix contains requirements for dealing with temporary hazards on or adjacent to aerodrome movement areas.

The term temporary hazard includes construction and maintenance work in progress adjacent to aerodrome movement areas and any plant, machinery and material associated with such work. It also included aircraft immobilized near runways and works associated with their recovery.

The following guidelines are able to be adapted to the needs of a particular project and not incorporated verbatim into project specifications.

C.2 Responsibility

The prime responsibility for determining the degree of the hazards and the extent of acceptable obstacles rests with the aerodrome operator, who should take into account the following;

a) Available runway length and associated obstacle limitation surfaces.
b) Types of aircraft using the aerodrome and distribution of aircraft movements.
c) Whether or not alternative runways are available.
d) The possibility of cross-wind operations, bearing in mind seasonal variations.
e) Weather conditions likely to prevail at the time, such as visibility and precipitation. The latter is significant as it adversely affects the braking coefficient of the runway and thus an aircrafts controllability during ground run.
f) The possibility of a compromise between a reduction in runway length and some degree of obstacle infringement in the established take-off climb and approach surface.

Significant obstacles in the take-off flight path area and any reduction in the runway effective operational lengths must be promulgated by NOTAM.

C.3 Works Zone

The following work zones are established around runways, when use of the runway is permitted to continue whilst works are carried out. Outside the zones no restrictions need to be applied other than maintaining the normally required obstacle free surfaces.

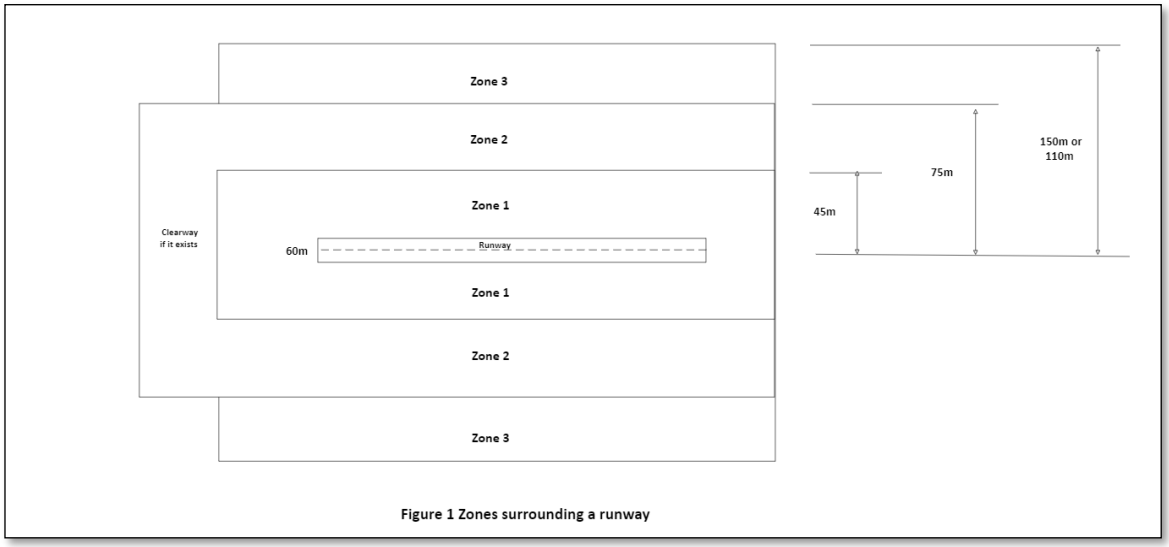

Figure 1 Zones surrounding a runway

Zone 1: This zone is rectangular. It symmetrically surrounds the runway. Its sides are 45 m from the runway centreline and its ends 60 m beyond the runway ends.

Zone 2: The ends coincide with the ends of Zone 1, except that where there is a clearway the end is extended to include it. The sides are 75 m from the runway centerline.

Zone 3: This zone is only required at aerodromes having a runway strip wider than 150 m. It extends to the edge of the runway strip, either 110 m or 150 m from the runway centreline where appropriate.

C.4 Control of Personnel, Equipment and Vehicles

All drivers and works personnel should be briefed on their responsibilities, and the procedures that must be followed. Consider whether it is appropriate to escort with “Follow Me” vehicles as an option.

Vehicles carrying gravel should be not permitted on runways or taxiways without prior permission and anything dropped should be immediately swept up and removed.

Vehicles should be suitably marked or lit.

Air traffic services should advise pilots on approach, or before take -off, when personnel will be working at a particular location within the runway strip area. This is an addition to normal NOTAM action.

C.5 Work on runways or runway strip

The following criteria relate to work on the runway and strip;

Zone 1 Personnel and light-weight frangible equipment used in the calibration of landing aids may be left in position clear to any aircraft movements. Vehicles and equipment should be moved to one side of the runway –

a) For turbojet movements, to the outer edge, or clear of Zone 2
b) For other aircraft movements, to the outer edge, or clear of Zone 1.

Zone 2 All equipment and personnel should be at the outer edge or clear of Zone 2 except that work may continue without interruption during the movement of aircraft other than turbojets when the crosswind is less than 10kts.

Zone 3 The only consideration in this zone is to identify whether the presence of work equipment and vehicles could interfere with the integrity of the electronic approach aids. If such an area is identified, equipment and vehicles should be cleared from the area when the aids are being used by an approaching aircraft.

C.6 Work on taxiway or taxiway strip

When the taxiway is in use, vehicles, equipment and personnel should be moved to give a wingtip clearance of at least 10m. The distance from a taxiway for wingtip clearance will vary significantly depending on aircraft type. For example, a Boeing 747 has a wingspan of 60m while a commuter aircraft may be 25m. When practical and appropriate, wingtip clearance (of expected aircraft) near works can be marked on site, or on plans, sufficient for works staff to be aware of the clearance required.

C.7 Work on Approach Lighting Area

The procedure for work in Zone 1 and 2 detailed in C.5 apply for work and approach lighting in those areas.

For work outside the zones, vehicles and equipment should not intrude above the plane of the approach lights. Any equipment intruding above the plan should be withdrawn when the runway is in use, unless the runway threshold has been displaced to allow for its height.

C.8 Trenching Work

The following requirements for trenching work are in addition to those detailed in section C.5.

Zone 1 Work should be limited to one side of the runway at a time, and excavation of any trench should be limited as follows;

a) A trench may be open with a maximum width of 300mm but the open area trench should not exceed $9m^2$. For example 300mm x 30m or 200mm x 45m.

b) When the trench lies almost parallel with a runway, or is within 10° either side of runway alignment, a second trench at right angles to, and extending from the first trench to Zone 2, may be open to a maximum width of 200mm.

c) During aircraft movements any open trenches within 10m of the runway edge should be covered with load bearing steel plates. They should be adequately held on the ground and marked by securely fixed cones at a maximum spacing of 6m. The plate covering should exceed the dimensions of the excavation by a minimum of 150mm on all sides. If this cannot be done the runway should be closed.

The following additional conditions apply if there are night operations ;

d) Any trench should be backfilled and consolidated before ceasing work for the day. A maximum length of 3m may be left unfilled but overnight as provided in paragraph (c) above, and marked with construction lights.

e) Any materials not associated directly with the work in progress should be removed from the zone during the period of aircraft operations.

f) Spoil removed from the trench should be located on the side away from the runway and the maximum height should not exceed 200mm. For trenches at right angle to the runway center line spoil should be placed on the side remote from the nearest landing threshold. If it is necessary to place spoil on both side of the trench the maximum height should not exceed 200mm.

At the runway end –

(a) Any trench across the end of the runway should not exceed 300mm in width. During daylight hours only, a maximum length of 3m may be left unfilled during an aircraft movement but should be covered with load bearing steel plates adequately held on the ground and marked by securely fixed cones at a maximum spacing of 6m. The plate covering should exceed the dimensions of the excavation by a minimum 150mm on all sides. If this cannot be done then the runway should be closed.

(b) Spoil removed from a threshold trench should be removed to a point at least 10m clear of the runway or displaced landing threshold should be declared by NOTAM and marked.

Zone 2 For a Code Number 4 runway which is dry with not more than 15kt crosswind component, or for other runways with 10kts crosswind component, the excavation of trenches in this zone should be limited to;

a) A trench parallel to the runway may be open with a maximum width of 300 mm and a length not exceeding 100 m:

b) Two trenches at right angles to the runway may be open with a maximum widthof 300 mm and a total length of 100 m provided that the trenches are at the sameend and same side of the runway; an

c) Spoil removed from a trench should be located on the side away from the runway, its maximum height should not exceed approximately 500 mm; and

d) For trenches at right angles to the runway centreline, the spoil should be located on the side remote from the closer landing threshold and the maximum height should not exceed approximately 300 mm. If it is necessary to place the spoil on both sides of the trench then the maximum height should not exceed approximately 300 mm.

C.9 Work on rapid exit or normal taxiway

Work on or close to any taxiway, should conform to the requirements relating to the zone which part of the taxiway it lies.

Where practicable, until work is complete, the taxiway should be closed to aircraft movements and pilots advised by radio and NOTAM.

If it is not practicable to close the taxiway while work is being carried out, pilots should be advised by a NOTAM and radio to reduce taxiing to walking speeds within 50m of the works.

The work should be carried out as follows;

(a) A trench, with maximum width of 300mm, may be open on one side only to the edge of the taxiway, and the open area of the trench should not exceed 9m2 for example 300mm x 30m or 200m x 45m.

(b) If trenching is required on both sides of the taxiway, the trench on one side should be covered with load bearing steel plates which are adequately held on the ground and marked by securely fixed cones at a maximum spacing of 6 m. Where the trench is at right angles to the taxiway and its width is 300 mm or less, the trenches on both sides of the taxiway can remain open. The plate covering should exceed the dimensions of the excavation by a minimum of 150 mm on all sides.

The following additional conditions apply if there are night operation;

(c) Any trench should be backfilled and consolidated before ceasing work for the day except that a maximum length of 3 m can be left unfilled and covered overnight as provided in paragraph (c) above, and marked with red obstruction lights.

(d) Any materials not associated directly with the work in progress should be removed from the taxiway strip area during the period of aircraft operations.

C.11 Spoil removed from a trench in Zone 1 should be located on the side away from the runway and the maximum height should not exceed 200 mm. For trenches at right angles to the taxiway centre line, the spoil should be placed on the side furthest away from the nearest landing threshold. If it is necessary to place the spoil on both sides of the trench, the maximum height should not exceed 200 mm.

C.10 Work on Visual Approach Slope System

C.10.1 These requirements when working on visual approach slope systems are additional to those in section C.5.

C.10.2 During aircraft operations PAPI may be deactivated, however;

a) For all international arrivals, the normally available PAPI should be provided; and
b) For domestic operations by turbojet aeroplanes, one side of a PAPI should be provided.

C.10.3 The installation of lights bases for PAPI should be carried out as follows;

Zone 1

a) Only one base excavation, with a maximum area of $9m^2$ should be opened at any one time.
b) If the works is within 10m of the runway edge, then the concrete should be cast on the day that the excavation is made and covered with steel plates until it can withstand an aircraft running over it. A cover plate should then be placed and bolted in position. A further excavation may then be made.
c) Spoil within 10m of the runway edge should be removed. Spoil beyond this distance should be placed on the side away from the runway to a maximum height not exceeding 200mm.

The following additional conditions apply if there are night operations;

d) Any excavation should be backfilled and consolidated before ceasing work for the day except that a maximum excavation area of $3m^2$ may be unfilled but covered overnight as in paragraph (b) above, and marked with red obstruction lights.
e) Any material not associated directly with the work progress should be removed from the strip area during period of aeroplane movements.
f) Spoil removed from an excavation, the maximum height should not exceed 200mm.

Zone 2

a) Only one base excavation, a with a maximum area of $9m^2$ should be opened at any one time.
b) Spoil removed from the excavation should be placed on the side away from the runway, to a height not exceeding 500mm. If it is necessary to place spoil on both sides or at the ends of the excavation, the maximum height should not exceed 300mm.

C.10.4 Work on runway lights should be carried out as follows –

a) Excavations for not more than two bases should be made at any one time. During Aeroplane movements any hole within 10m of the runway should be covered by load bearing steel plates which adequately held on the ground and marked by securely fixed cones markers spaced at intervals of 6m. The plate covering should exceed the dimensions of the excavation by 150mm on all sides.
b) Concrete should be cast on the day that the excavation is made and covered with plates until it can with stand an aircraft running over it. A cover plate should then be placed and bolted in position. A further excavation may then be made.

C.11 Crashed or Immobilized Aircraft

C.11.1 In the event of a crashed or immobilized aircraft the following criteria should be used;

Zone 1. The runway should be closed when any part of a crashed or immobilized aircraft is in Zone 1.

Zone 2. When any part of a crashed or immobilized aircraft is in Zone 2 the runway may be in use during daylight hours in visual flight rule weather conditions provided the runway is dry and the crosswinds don't exceed 10kts.

The runway should be closed to all movements at night and in instrument flight rule weather conditions.

If the clearway is infringed by an obstruction, then the new effective operating length (EOL) will need to be calculated using the appropriate obstacle free gradient over the immobilized aircraft.

Zone 3. When any part of a crashed or immobilized aircraft is in Zone 3 instrument approaches should be limited to non-precision approach minima.

C.11.2 If the runway strip area infringement is such that a reduced runway be used, the new effective operating length (EOL) will be to be calculated.

C.11.3 The EOL which can be declared will depend on the location of the immobilized aircraft with the runway strip area and the residual portion of the runway that can be considered available aircraft.

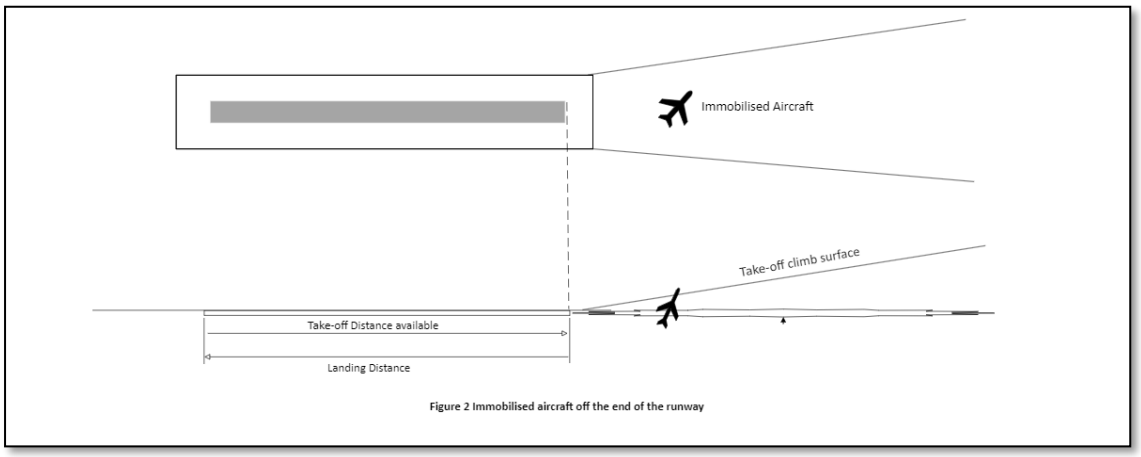

Figure 2 Immobilised aircraft off the end of the runway

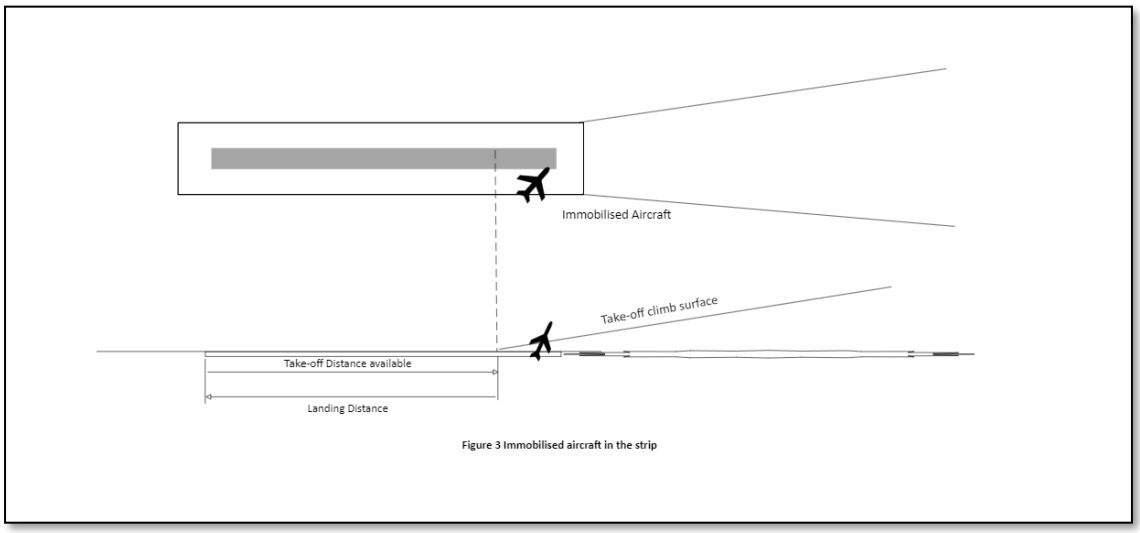

Figure 3 Immobilised aircraft in the strip

C.11.4 Consideration should be given to the type and size of aircraft which would use the remaining runway, for example, a crashed aircraft 100m from the end of a 3000m runway could leave an adequate operational length for many aeroplanes.

C.12 Grass mowing on runway strip

C.12.1 Mowing should be done in the upwind half of the runway strip. When the swaths nearest the runway are being cut, the mowing circuit should be towards the aircraft landing or taking off so that the driver can see the moving aircraft.

Zone 1. Mowing should not take place Zone 1 when runway is in use.

Zone 2. Mowing may be carried out in daylight hours during the operation of Code A, Code B or Code C aeroplanes provided crosswind component does not exceed 10kts and the runway is dry.

The mower should move to the outer edge or clear of the zone for movements of large aircrafts when the crosswind is greater than 10kts or the runway is wet.

Mowing in the area beyond the approach end of the runway should not be permitted during aircraft landings.

Mowing in the area beyond the take-off end of the runway should bot be permitted during aircraft take off.

APPENDIX D RELATED INFORMATION

D.1 Documents

ICAO

- Annex 14 – Part 1 Aerodrome Design and Operations
- Doc 9137 – Airport Services Manual Part 8 Airport Operational Services

CAAF

- SD Documents Aerodromes
- Guidance Material – Aeronautical Study and Safety Assessments

APPENDIX E FLOW CHART

SAFETY CASE ASSESSMENT FLOW CHART