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Australian Government
Civil Aviation Safety Authority

ADVISORY CIRCULAR
AC 139.C-15 v1.0

Safe planning and conduct of aerodrome works

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Acknowledgement of Country

The Civil Aviation Safety Authority (CASA) respectfully acknowledges the Traditional Custodians of the lands on which our offices are located and their continuing connection to land, water and community, and pays respect to Elders past, present and emerging.

Artwork: James Baban.

Advisory circulars are intended to provide advice and guidance to illustrate a means, but not necessarily the only means, of complying with the Regulations, or to explain certain regulatory requirements by providing informative, interpretative and explanatory material.

Advisory circulars should always be read in conjunction with the relevant regulations.

Audience

This advisory circular (AC) applies to:

- aerodrome owners/operators
- aerodrome personnel involved in the planning and execution of aerodrome works
- appointed Works Safety Officers (WSOs)
- consultants engaged in planning and conducting aerodrome works
- aircraft operators
- Air Traffic Control (ATC)
- Instrument flight procedure designers

Purpose

The purpose of this AC is to assist aerodrome operators to plan and implement works to be carried out at an aerodrome and not create any hazard to aircraft operations or confusion to pilots.

For further information

For further information or to provide feedback on this AC, visit CASA's contact us page.

Status

This version of the AC is approved by the National Manager, Flight Standards Branch.

Table 1: Status

Version	Date	Details
v1.0	September 2025	Draft release for consultation purposes. This AC replaces AC 139-20(0) Safe planning and conduct of aerodrome works.

Unless specified otherwise, all subregulations, regulations, Divisions, Subparts and Parts referenced in this AC are references to the *Civil Aviation Safety Regulations 1998 (CASR)*.

Contents

1 Reference material

1.1 Acronyms

The acronyms and abbreviations used in this AC are listed in the table below.

Table 2: Acronyms

Acronym	Description
AC	advisory circular
AFRU	aerodrome frequency response unit
AIC	aeronautical information circular
ARC	aerodrome reference code
ARFFS	aviation rescue fire-fighting service
AROC	aeronautical radio operator certificate
ATC	air traffic control
ATIS	automated terminal information service
CAR	*Civil Aviation Regulations 1988*
CASA	Civil Aviation Safety Authority
CASR	*Civil Aviation Safety Regulations 1998*
CTAF	common traffic advisory frequency
FOD	foreign object debris
LDA	landing distance available
LVP	Low visibility procedures
MOS	Part 139 (Aerodromes) Manual of Standards
MOWP	method of working plan
NOTAM	(Note: NOTAM is now a noun and no longer an acronym).
OLS	obstacle limitation surfaces
PAL	pilot activated lighting
RESA	runway end safety area
RMP	risk management plan
RTAO	restrictions to aircraft operations
RTIL	runway threshold identification lights
SMS	safety management system
STODA	supplementary take-off distance available
TLW	time limited works

Acronym	Description
TODA	take-off distance available
TORA	take-off run available
WSO	works safety officer

1.2 Definitions

Terms that have specific meaning within this AC are defined in the table below. Where definitions from the civil aviation legislation have been reproduced for ease of reference, these are identified by 'grey shading'. Should there be a discrepancy between a definition given in this AC and the civil aviation legislation, the definition in the legislation prevails.

Table 3: Definitions

Term	Definition
aerodrome facilities and equipment	means facilities and equipment, inside or outside the boundaries of an aerodrome, that are installed or maintained for use by aircraft operating at the aerodrome.
aerodrome facility (from Part 139 MOS)	means any of the following physical things at an aerodrome as mentioned in this MOS for an aerodrome: a. the physical characteristics of any movement area including runways, taxiways, taxilanes, shoulders, aprons, primary and secondary parking positions, runway strips and taxiway strips: b. infrastructure c. structures d. equipment e. earthing points f. cables g. lighting h. signage i. markings j. visual approach slope indicators k. any other similar thing that is physical matter and is used for the operation of aircraft at the aerodrome. **Note 1:** Aerodrome facilities are physical matter. For example, a safety management system is not an aerodrome facility. Management and administrative processes do not constitute an aerodrome facility. **Note 2:** The expression aerodrome facilities and equipment is defined in the CASR Dictionary. The different expression aerodrome facility is defined in this MOS and has a different meaning.
Aerodrome Operator	means: (a) for a certified aerodrome—the person who holds the aerodrome certificate for the aerodrome; or (b) otherwise—the person who is responsible for the operation and maintenance of the aerodrome.
aerodrome works	means any construction or maintenance work on or near the movement area of an aerodrome that may create an obstacle or hazard, or restrict the normal take-off and landing of aircraft, at the aerodrome.

Term	Definition
Aeronautical Information Circular (Refer PANS-AIM Doc 10066).	A notice containing information that does not qualify for the origination of a NOTAM or for inclusion in the AIP, but which relates to flight safety, air navigation, technical, administrative or legislative matters.
Alternate Aerodrome **Note:** Definition from Annex 2 of the Convention on International Civil Aviation.	An aerodrome to which an aircraft may proceed when it becomes either impossible or inadvisable to proceed to or to land at the aerodrome of intended landing where the necessary services and facilities are available, where aircraft performance requirements can be met and which is operational at the expected time of use. Alternate aerodromes include the following: • Take-off alternate. An alternate aerodrome at which an aircraft would be able to land should this become necessary shortly after take-off and it is not possible to use the aerodrome of departure. • En-route alternate. An alternate aerodrome at which an aircraft would be able to land in the event that a diversion becomes necessary while en-route. • Destination alternate. An alternate aerodrome at which an aircraft would be able to land should it become either impossible or inadvisable to land at the aerodrome of intended landing. **Note:** The aerodrome from which a flight departs may also be an en-route or a destination alternate aerodrome for that flight.
Airside (from Part 139 MOS)	means the following areas, access to which is restricted by the aerodrome operator, or by a Federal or State authority, to authorised persons only: a. the movement area of the aerodrome; b. where their purpose and use is to directly support aircraft operations — the terrain and buildings adjacent to the movement area, or particular portions of such adjacent terrain and buildings. **Note:** The word “landside” is used colloquially to denote areas of an aerodrome that are not airside, for example, passenger terminals.
air transport operation	Definition of air transport operation (1) An air transport operation is a passenger transport operation, a cargo transport operation, or a medical transport operation, that: (a) is conducted for hire or reward; or (b) is prescribed by an instrument issued under regulation 201.025. (2) Despite subclause (1), an air transport operation does not include an aerial work operation.
controlled aerodrome	an aerodrome is a controlled aerodrome at a particular time if, at that time, an air traffic control service is provided to aerodrome traffic.
declared distances (from Part 139 MOS)	means the following: a. take-off run available (TORA), being the length of runway declared available and suitable for the ground run of an aeroplane taking off; **Note:** TORA may include additional length available from a starter extension if provided. b. take-off distance available (TODA), being the length of the take-off run available plus the length of the clearway, if provided; c. accelerate-stop distance available (ASDA), being the length of the take-off run available plus the length of the stopway, if provided; d. landing distance available (LDA), being the length of runway which is declared available and suitable for the ground run of an aeroplane landing.

Term	Definition
Department	has the meaning given in item 1 in subsection 19A (1) of the Acts Interpretation Act 1901. **Note:** "Department" means the Department of State of the Commonwealth that is administered by the Minister who, from time to time, administers CASR. At the date of making, this is the Department of Infrastructure, Regional Development, Cities and Arts but may change from time to time in accordance with Administrative Arrangements Orders made by the Governor-General.
manoeuvring area	means that part of the aerodrome to be used for the take-off, landing and taxiing of aircraft, excluding aprons.
method of working plan (from Part 139 MOS)	means a plan to ensure that aerodrome works do not present a hazard to aircraft operations.
movement area	means that part of an aerodrome to be used for the take-off, landing and taxiing of aircraft, consisting of the manoeuvring area and the aprons.
NOTAM (Part 139 MOS)	a notice distributed by means of telecommunications containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations.
scheduled air transport operation	means an air transport operation, other than a medical transport operation, that is conducted: (a) in accordance with fixed schedules to and from fixed terminals over specific routes with or without intermediate stopping places between terminals; and (b) in circumstances in which the accommodation in the aircraft is available for use by persons generally.
time-limited works (Part 139 MOS)	means aerodrome works that may be carried out if normal aircraft operations are not disrupted and the movement area can be restored to normal safety standards in not more than 30 minutes.
Works Safety Officer (this AC)	A person who has been suitably trained with necessary qualifications and is appointed with the function of ensuring the safe conduct of aerodrome works. aerodrome manual procedures and any applicable method of working plan during works on the movement area an aerodrome.

1.3 References

Legislation

Legislation is available on the Federal Register of Legislation website https://www.legislation.gov.au/

Table 4: Legislation references

Document	Title
Part 139 of CASR	Aerodromes
Part 139 (Aerodromes) Manual of Standards (MOS)	Aerodromes
Part 172 Manual of Standards (MOS)	Air Traffic Services

Document	Title
Airports (Protection of Airspace) Regulations 1996	Airports (Protection of Airspace) Regulations 1996

International Civil Aviation Organization documents

International Civil Aviation Organization (ICAO) documents are available for purchase from http://store1.icao.int/

Many ICAO documents are also available for reading, but not purchase or downloading, from the ICAO eLibrary (https://elibrary.icao.int/home).

Table 5: ICAO references

Document	Title
ICAO International Standards and Recommended Practices	Annex 14 to the convention on International Civil Aviation - Aerodromes Volume I
Doc 9981	Procedures for air navigation services Aerodromes (PANS Aerodromes)

Advisory material

CASA's advisory materials are available at https://www.casa.gov.au/publications-and-resources/guidance-materials

Table 6: Advisory material references

Document	Title
AC 139.C-02	Aerodrome personnel
AC 139.C-03	Serviceability inspections
AC 139.A-04	Applying for aerodrome authorisations, exemptions and approvals
AC 139.C-09	Visual Aids, Markings, Signals and Signs.
AC 139.C-18	Aerodrome emergency planning
AC 139.C-20	Disabled aircraft removal
AC 139.C-22	Runway safety teams
AC 139.C-26	Safety management systems for aerodromes
AC 139.C-27	Risk management plans for aerodromes

Other

Table 7: Other references

Document	Title
C-MAN0276	Airservices NOTAM Data Quality Requirements for Aerodrome Operators

2 Introduction

2.1 Aerodromes can be complex environments, and procedures and conditions associated with maintenance and construction activities have the potential to affect aircraft operations and can jeopardise operational safety. Safety considerations are paramount and may make operational impacts unavoidable. The careful planning, scheduling, and coordination of construction activities can minimise disruption of normal aircraft operations and avoid situations that compromise the airport's operational safety.

2.2 Aerodrome operators are likely to need to carry out works that affects the physical characteristics of the aerodrome. Aerodrome works may affect the intended operation of aircraft using the aerodrome, or a portion of the movement area of the aerodrome, or the touchdown or lift-off of aircraft.

2.3 The aerodrome operator needs to understand how construction activities and aircraft operations affect one another to be able to develop an effective plan to complete the project. The guidance in this AC aims to ensure construction operations, and day-to-day maintenance activities, such as lighting maintenance and rubber or contaminant removal operations, do not negatively affect aircraft operations.

2.4 Aerodrome works is a defined term that refers to any construction or maintenance on or near an aerodrome's movement area that could create hazards or limit normal aircraft operations. These activities may render parts of the movement area unusable, potentially restricting or fully closing the aerodrome for aircraft operations.

2.5 Construction and maintenance works involve building new infrastructure, upgrading or replacing existing structures, and performing routine maintenance. The work activities may be performed by the aerodrome operator themselves, contractors that are familiar with the aerodrome and its operations, or third-party contractors, that are not familiar with the aerodrome.

2.6 When aerodrome works disrupt regular operations, the risk to aircraft movement on the manoeuvring area or to people may increase. If works are located on or near a runway, safety risks can become higher. This is due to changes from usual routines at the aerodrome, requiring those at the site—such as visiting pilots and workers—to adjust their procedures or adapt to a changed operating environment.

2.7 Construction or maintenance works are activities that may also be labelled 'works' or 'works in progress' (WIP). The steps for planned works differ from those for emergency works, which are unpredictable by nature.

2.8 Regulation 139.070 of the *Civil Aviation Safety Regulations 1998* (CASR) states that certified aerodrome operators must conduct any aerodrome works in a manner that avoids creating hazards for aircraft or causing confusion to pilots.

2.9 Due to the safety risks and hazards associated with aerodrome works, certified aerodromes should apply their Safety Management System (SMS) or risk management plan (RMP) as appropriate to ensure hazards, and the risks associated with them, are treated with appropriate controls to reduce the risks to as low as reasonably practicable (ALARP).

2.10 Aerodromes vary in their movement area arrangements, types of aircraft using the facility, terminal area arrangements, aviation and non-aviation infrastructure. To ensure the ongoing serviceability of the aerodrome, the introduction of new infrastructure or services, and reduce the impact aerodrome works to normal aerodrome operations, the aerodrome operator needs to determine the level of impact or restriction to normal operations, and the most effective and efficient way to undertake intended activities.

3 Aerodrome works alternatives and considerations

3.1 When planning aerodrome works, the aerodrome operator, contractors or third parties will determine desired goals and objectives of the work activity. When planning works on the movement area, a primary objective is to ensure activities do not create a hazard to aircraft operations or cause confusion to pilots.

3.2 To assist with planning aerodrome works, the aerodrome operator should consider the procedures for planning and safely carrying out works as documented in their aerodrome manual.

3.3 From time to time, events occur that will require the aerodrome operator to perform emergency works. Emergency works includes aerodrome works that are required to return an aerodrome facility to a serviceable condition.

3.4 Emergency works includes the repair and rectification of aerodrome lighting failures and outages, pavement surface damage, cleanup after an incident, accident or natural event, off aerodrome event resulting in impact to the aerodrome or any other matter that could cause a hazard to aircraft operations or cause confusion to pilots.

3.5 The aerodrome operator should ensure procedures and contingencies to manage emergency works are documented in the aerodrome manual, included details of the individuals or positions responsible for the arrangement and notification of emergency aerodrome works.

Notes:

1. Emergency aerodrome works may be an element of returning the aerodrome to normal operations after an emergency (Refer to AC 139.C-18v1.1Aerodrome emergency planning) or disabled aircraft removal event (Refer to AC 139.C-20v1.0 Disabled aircraft removal).
2. Planned upgrade and replacement aerodrome works are unlikely to be considered emergency works.
3. Where restrictions to aircraft operations (RTAO) result from emergency aerodrome works, and the facility is not otherwise already subject to a NOTAM, a NOTAM1 should be issued to notify of the emergency work activities.

3.6 Safety in all its forms, maintaining intended aircraft operations, and construction or maintenance costs are all interrelated. Since safety must not be compromised, the aerodrome operator must strike a balance between maintaining aircraft operations and construction costs. This balance will vary widely depending on the operational needs and resources of the aerodrome and will require early coordination with airport users and stakeholders.

Note: Nothing in this AC prevents the aerodrome operator including safety considerations intended to ensure the safety of people in the MOWP. The focus of this AC is on the aviation safety requirements under the aerodrome certificate.

3.7 As the project design and construction methodology progresses, the necessary construction locations, activities, and associated costs will be identified and their impact to aerodrome operations must be assessed. Adjustments are made to the proposed construction program, often by staging the project, and to aerodrome operations to maintain operational safety.

3.8 The aerodrome operator must determine the geographic areas of the airport affected by the construction project. Depending on the intended outcome of the project, the location will be defined by the project, such as the construction of new taxiways, pavement rehabilitation

projects of aerodrome lighting upgrades. Others may be variable, such as the location of worksite access routes, security considerations and worksite compounds.

3.9 Options available to manage work activities may include one or more of the following alternatives:

a. Full or partial closure:

i. full aerodrome closure - the aerodrome operator temporarily closes the aerodrome to aircraft traffic

or

ii. partial aerodrome closures – parts of the movement area may be closed

iii. a full or partial closure may be for:

A continuous period – i.e., the aerodrome could be closed from a defined start date and time to a defined finish time and date;

or

B periodic closures – i.e., the runway is open to facilitate planned aircraft movements and then closed for aerodrome works.

Note: A NOTAM[1] is required at least 14 days prior to the commencement of works.

b. Time limited works (TLW):

i. works where the movement area can be restored to normal safety standards (recalled) in a period not greater than 10 mins

ii. works where the movement area can be restored to normal safety standards recall with more than 10 mins recall but not greater than 30 mins but need to be reported to the NOTAM Office (NOF).

Notes:

1. A NOTAM1 should be requested prior to the commencement of time-limited works where a recall of greater than 10 mins is required. A NOTAM should be requested not less than 24 hrs[2] prior to the commencement of time-limited work activities.
2. TLW may continue where the work activity is in an area not intended to be used for the manoeuvring of aircraft.

3.10 Procedures and arrangements for the planning and conducting TLW should be included in the aerodrome manual[3].

3.11 The operator of a certified aerodrome is required to ensure that such work activities and changes to airside infrastructure:

- are planned in accordance with the Part 139 (Aerodromes) Manual of Standards (MOS) and aerodrome manual
- sufficient notice of planned aerodrome works is promulgated in accordance with the Part 139 MOS and aerodrome manual, including:

[1] NOTAM should be requested by the Aerodrome Operator's NOTAM Authorised Person in accordance with Airservices NOTAM Data Quality Requirements for Aerodrome Operators and aerodrome manual procedures. (*Hyperlink - NOTAM-Data-Quality-Requirements-for-Aerodrome-Operators.pdf (airservicesaustralia.com)*)

[2] Refer Section 15.03(2) of the Part 139 MOS

[3] Refer Section 11.07 for the Part 139 MOS

– where the aerodrome is temporarily closed

or

– where portions of the movement area are temporarily or permanently closed to facilitate works

or

– when information about changes to the movement area is to be published.

Note: This AC does not remove the need to observe the relevant regulatory standards specified in the Part 139 MOS.

3.12 Subject to certain circumstances, aerodrome operators must not carry out or otherwise permit aerodrome works without a Method of Working Plan (MOWP). An MOWP is a plan that accurately sets out the arrangements for the carrying out of aerodrome works so that work activities do not present a hazard to aircraft operations. Refer to Section 15.01 (2) of the Part 139 MOS for further information on each circumstance.

3.13 Circumstances where an MOWP is not required include:

- works are TLW
- the aerodrome is closed during the works
- works are of an emergency nature
- works do not require any RTAO.

3.14 The aerodrome operator should not carry out aerodrome works without a MOWP, other than TLW, where the aerodrome:

- is used by scheduled air transport operations

or

- has emergency services aircraft based at the aerodrome, and

Notes:

1. See definitions for meaning of scheduled air transport operations.
2. Emergency services aircraft include fixed-wing aeroplanes and helicopters used for: aeromedical services (air ambulance, medical evacuations, patient transport and urgent organ transport) e.g., the Royal Flying Doctor Service (RFDS), fire-fighting response and support, search and rescue missions, and police air wing activities.

- any construction or maintenance work on or near the movement area of an aerodrome has the potential to create an obstacle or hazard, or restrict the normal take-off and landing of aircraft, at the aerodrome,

Notes:

1. Although works on the aerodrome may not affect the safe operation of aircraft, other aerodrome users such as, inter alia, emergency response and first responders, ground handling including refuelling and other agencies may need to be aware of change that could affect their normal operations.
2. Aerodrome operators may choose to develop and implement MOWP when otherwise not required. Nothing limits the aerodrome operator's choice to implement an MOWP for aerodrome works.

3.15 Where the intended work activities require any restrictions to aircraft operations on the manoeuvring area, or in the approach and take-off areas, or if aircraft types are affected differently, a section containing details of the RTAO must be recorded in the MOWP. It is good practice to include RTAO on apron areas (including apron edge taxilanes) in an RTAO section of the MOWP where applicable.

3.16 TLW is a work activity that is carried out in between aircraft movements without affecting aircraft operations. TLW do not require the preparation of a MOWP. However, TLW may be included in an MOWP as part of a planned works program providing TLW activities do not result in RTAO. Refer to sSection 15.03 of the Part 139 MOS for further information.

3.17 A checklist of the matters to be dealt with and procedures for ensuring safety during aerodrome works is outlined in Appendix A - Aerodrome works safety considerations, of this AC.

3.18 Aerodrome capability

3.18.1 The ongoing capability of the aerodrome may be affected by restrictions and limitations required for the planned work activities. Seasonal weather conditions, known community events, planned changes to airline schedules, emergency services aircraft operations or other aircraft operator operations, unforeseen events or climatic events may impact the ongoing capability of the aerodrome.

3.18.2 Examples of activities that could impact the capability of an aerodrome may include, and should be considered, when planning aerodrome works include:

- work activities requiring the introduction of a temporary displaced threshold rendering the instrument landing system (ILS) unavailable during periods prone to fog and low visibility events
- pavement overlay works being performed in periods prone to rain may impact the return to service or remarking of the surface prior to making the area serviceable for aircraft
- closing a runway to facilitate works that cannot be recalled in a reasonable timeframe in periods prone to cross wind or other events, where the runway is required, may impact intended aircraft operations.

3.18.3 In determining aerodrome capability, the intended operation of aircraft should be considered. Intended operations refers to the specific activities that aircraft will undertake while operating at a particular airport or aerodrome. The range of intended operations may include details such as:

- **Type of operating aircraft** – the size and type of aircraft the facility will be used by (current or future use by fixed wing, helicopters or rotary aircraft, other forms of aircraft, turbine, piston, electric or other forms).
- **Mode of aircraft operations** – the nature of flights (e.g., take-off, landing, ground taxi, air-taxi, ground handling etc.) .
- **Nature of aircraft operations** – air transport, emergency medical services, private, training or itinerant .
- **Flight schedules** – timetables for arrivals and departures, scheduled and unscheduled, of airlines and other aerodrome users.
- **Manoeuvring area use** – designated runways, landing site and taxi paths for specific departure and arrival operations.
- **Weight and performance limitations** – adhering to the limitations advised by the aerodrome operator based on aircraft weight and performance characteristics to ensure safety.
- **Regulatory compliance** – following of air traffic control (ATC) instructions or airport operating instructions.
- **Safety protocols** – implementing safety measures for all operations involving aircraft and the aerodrome.

3.18.4 Intended operations refers to the operational planning and logistics for aircraft activities at a specific location to ensure efficiency, safety and adherence to aviation regulations.

3.18.5 Where aerodrome capability has the potential to impact the operation of other aerodrome users, such as fixed based operators, those impacted should be engaged.

3.19 Consultation with aerodrome users

3.19.1 When aerodrome works has the potential to impact the facilities at an aerodrome or aircraft operating environment, the risk to aircraft operations can be significantly increased if the disruption is not managed properly. Effective safety management extends beyond the safe operation or aircraft to those engaged in the work activities, routine operations at the aerodrome, and any other person that may be affected by the works.

3.19.2 Where aerodrome works could affect the timely movement of aircraft on the movement area, the aerodrome operator should liaise with the aircraft operators that may be affected prior to the commencement of works. The aerodrome operator should ensure safety measures are in place to assure the safe operation of aircraft and the safety of those performing work activities.

3.19.3 Organisations such as airlines and ATC often need sufficient time to plan for changes to their schedules or planned operations. Where the proposed work activity is likely to affect aircraft operations, it is prudent to initiate dialogue with organisations concerned at an early stage.

3.19.4 Aerodromes that are designated by airlines as an Alternate Aerodrome4 should ensure that those airlines known to be nominating the aerodrome as an alternate are advised of any works that could affect the ability to use the aerodrome.

3.19.5 As mentioned in the note to paragraph 3.1 of this AC, if the nature of work is likely to affect the regulatory compliance with a relevant aerodrome standard, the aerodrome operator should liaise with a CASA during the planning phase so that the effect of any non-compliance with the standard can be properly assessed, and mitigating measures developed, where appropriate.

3.19.6 Where aerodrome works may change the operating nature of a runway, for instance, temporary suspension of terminal instrument flight procedures, the aerodrome operator should liaise with aerodrome users to understand the impact of the change. Seasonal weather patterns, special events such as public holidays or school holiday periods may have significant impact on the aircraft operator, and the poor planning of aerodrome works may result in significant reputational impact to the aerodrome operator.

Note: Aircraft performance capability is likely to be a factor in determining whether proposed minimum reduced length runway operations required to facilitate construction or maintenance activities may affect aircraft scheduling by aircraft operators (i.e., certain intended aircraft can operate on reduced length runways in certain conditions and aircraft operators may need to determine whether their aircraft are configured for that capability, or whether limitations to their intended operations can be sustained).

3.19.7 Established safety committees, such as local runway safety teams (LRSTs), safety committees or working groups established to consider the aerodrome works may be forums to consider proposed aerodrome works. Planned works and works in progress have the potential to increase the risk of runway incursions. Safety assessments may be considered to reduce the risk of runway incursion. Refer to AC 139.C-22 Runway safety teams for further information.

3.19.8 At aerodromes that support low visibility operations (LVO)with low visibility procedures (LVP), works in progress may need to be suspended, and work sites evacuated. The aerodrome operator should consider consulting with aerodrome users, and works organisations, and determine whether portions of the movement area may remain closed, what portions of the

[4] Refer to Section 1.2 Definition for description of Alternate Aerodromes.

movement area must be made serviceable, and what timeframes are needed to achieve such outcomes once LVP are declared.

3.19.9 If aerodrome works will or could include the temporary displacement of a threshold, the aerodrome operator should:

- assess the revised OLS
- recalculate the TODA, the critical obstacle gradient, and the STODA in the reciprocal direction from the displacement and
- report any changes resulting from the recalculation to the AIS provider and request that a NOTAM be issued.

Note: When planning aerodrome works that requires a temporary displaced threshold, and there is a penetration of the OLS, CASA is to be advised in writing of any new obstacles in the revised OLS. When planning for aerodrome works, sufficient time should be included in the planning process for CASA to assesses the obstacle penetrations.

3.19.10 When planning aerodrome works that include RTAO or full closure of the aerodrome, especially uncontrolled aerodromes, State Ambulance Services should be consulted early in the planning process as the ambulance service despatches air ambulatory aircraft.

3.20 Engagement with ATC, ARFFS and other on aerodrome stakeholders

3.20.1 To facilitate works, temporary short-term, long-term or permanent changes to the movement area and other areas of the aerodrome may be required. To ensure aerodrome operations, including the safe movement of aircraft, are not adversely affected, early engagement with key aerodrome stakeholders is essential.

3.20.2 The regulatory and safety requirements of other stakeholders such as ATC and Aerodrome Rescue Fire Fighting Service (ARFFS) need to be considered when determining and RTAO and MOWP stages. For instance, ATC line of sight and normal aircraft taxi routes, ARFFS response times and accessibility need to be assured, and sufficient time to seek alternatives provided, if necessary.

3.20.3 Other agencies such as security, border control, biodiversity and ground handlers may be affected by works on the movement area. The planning of works that require partial, alternative or temporary operating areas need to consider the ongoing safety of those involved in the works activity, those impacted, and the oversight of any implemented hazard mitigation or risk control.

3.20.4 Where a control measure includes the involvement of others to provide the required mitigation measure, they first need to be accepted by the applicable third party. This may include ATC broadcasts of essential aerodrome information on the Automatic Terminal Information Service (ATIS), works parties use emergency assembly areas to stage prior to or after the completion of work periods, or access gates require specific security requirements.

3.20.5 Where the aerodrome works could impact special arrangements such as aerodrome emergency response plans, such impact should be considered during the planning phase of aerodrome works, and alternative arrangements developed. Those potentially affected by the alternative arrangements should be engaged during the planning phase to ensure an acceptable level of safety during work activities can be guaranteed.

4 Planning of aerodrome works

4.1 When planning aerodrome works, the aerodrome operator, contractors or third parties will determine desired goals and objectives of the work activity. When planning works on the movement area, a primary objective is to ensure activities do not create a hazard to aircraft operations or cause confusion to pilots.

4.2 To assist with planning aerodrome works, the aerodrome operator should consider the procedures for planning and safely carrying out works as documented in their aerodrome manual.

4.3 Options available to manage aerodrome works are outlined in Chapter 3. The alternatives and considerations outlined in Chapter 3 are critical to the effective planning of aerodrome works.

4.4 Risks and hazards associated with all forms of work activities should be subject to the hazard identification and risk mitigation process in the aerodrome operator's SMS or RMP. Where the aerodrome operator does not have an SMS or RMP, identifying hazards related to aerodrome works could be achieved by following Chapter 4, Risk Management Process of AC 139.C-27 - Risk management plans for aerodromes.

Note: Risks and hazards associated with aerodrome works may extend beyond aviation safety requirements. Nothing in this AC limits risk assessments or hazard identification to aviation safety matters. However, this AC is focussed on aviation safety and the safe manoeuvring of aircraft on the movement area.

4.5 Method of working plan

4.5.1 Where there is a potential for aerodrome works to cause hazard to aircraft operations or confusion to pilots, appropriate risk mitigation should be considered, and an MOWP is required. The responsibility for ensuring safety during aerodrome works rests with the aerodrome operator.

4.5.2 The aerodrome manual should include procedures for planning, and safely carrying out, works (including TLW or emergency works). Procedures for developing a MOWP should be included in the aerodrome manual.

4.5.3 The specific standards for a MOWP are set out in Chapter 16 or the Part 139 MOS. The MOWP should clearly set out the following:

- introduction
- works information
- RTAO
- personnel and equipment
- aerodrome markers, markings, and lights
- special requirements
- administration
- authority
- drawings
- distribution list.

4.5.4 For routine and periodic maintenance, aerodrome operators may create a MOWP to cover ongoing activities over a set period. Long-term MOWPs are useful for works extending beyond TLW or where periodic facility closures improve the efficiency of maintenance activities.

4.5.5 Where the aerodrome works that includes RTAO are intended and the aerodrome is used by scheduled air transport operations or there are emergency services aircraft based at the aerodrome, the aerodrome operator will need to prepare a MOWP.

4.5.6 At aerodromes without scheduled air transport or on-site emergency services, a MOWP is not needed if work poses no hazard or confusion for pilots. Still, aerodrome operators should consult air ambulance and resident operators, along with other stakeholders, before proceeding.

4.5.7 An MOWP is not required if the aerodrome is closed if emergency services operators based at the aerodrome temporarily relocate to other aerodromes when aerodrome works is being undertaken.

4.5.8 A MOWP is not needed if work is limited to an aircraft parking apron and there are no impacts on aircraft operations.

4.5.9 To avoid confusion, a MOWP is required when aerodrome works are intended on the movement area, the aerodrome is open for aircraft operations, and:

- work activities have could result in RTAO

or

- the aerodrome supports scheduled air transport operations

or

- emergency services aircraft are based at the aerodrome, and
- the works are not confined to:
  - aircraft parking positions

  or

  - an apron area that does not contain at taxi route from one part of the aerodrome to another.

4.5.10 Where work activities necessitate facilities to be turned off or deselected, the aerodrome operator needs to consider the impact of any withdrawal of aerodrome facilities to its users. This may include instrument landing systems and aerodrome lighting systems such as stop bars.

4.5.11 The planning of work needs to ensure an adequate number of trained works safety officers (WSO) are made available for the works program, or stages of the works program, whichever is more demanding. See section 4.3 of this AC for further information.

4.5.12 If there are potential aerodrome safety regulation compliance issues identified in the preparation of the MOWP, aerodrome operators should liaise with CASA to have the compliance issues resolved before finalising the MOWP. Initial contact with CASA should be through www.casa.gov.au/about-us/contact-us[5].

4.5.13 The MOWP should be promulgated to those mentioned in section 15.02(2) and 15.02(3) of the Part 139 MOS. The initial MOWP, and any updates to the MOWP, is to be provided to CASA. MOWP distribution list should include CASA (by email at aerodromes@casa.gov.au).

4.5.14 An important consideration in the planning of staged work is to ensure that at the end of each stage of the work, and where the movement of aircraft is operationally required, the relevant part of the aerodrome facility should be restored to a serviceable state. Where necessary, this may involve the repainting of markings or reinstatement of aerodrome lighting systems. Information on RTAO or restrictions to works organisations unique to each stage should be included in the MOWP.

4.5.15 Any amendments or updates to the MOWP need to be provided to those provided with the original MOWP, and any additional recipients added, as required.

4.5.16 When drafting an MOWP, a critical activity is the development of NOTAM. However, NOTAM should not be considered the primary means of communicating the serviceability condition of

[5] Refer https://www.casa.gov.au/about-us/contact-us

the movement area. NOTAM is a tactical means of communicating information that provides pilots with situation awareness and knowledge of movement area serviceability changes. See section 5.2 of this AC for further information.

4.6 Restrictions to aircraft operations (RTAO)

4.6.1 There are occasions where portions of the movement area may be temporarily removed from service for the purpose of aerodrome works. To continue routine aircraft operations, work programs may be divided into stages.

4.6.2 Staging may facilitate the closure of parts of the movement area, reductions in capacity or reduction in capability or operational controls actively implemented. The scale, timing and impact of individual stages may vary, depending on the nature and potential impact to aerodrome operations.

4.6.3 Where a works program has been divided into stages, the dependency and interdependency of each stage should be determined, and the impact to aircraft or aerodrome operations ascertained. A table with stage limitations or dependencies may be included in the MOWP[6].

4.6.4 The MOWP should include a table that identifies the RTAO of each stage, or combination of stages, and the full text of all planned NOTAMs associated with the aerodrome works.

4.6.5 Where aerodrome works will include RTAO, planning for the aerodrome works needs to be documented in a MOWP[7].

4.6.6 The range of circumstances where aircraft operations may be affected by the planned closure, limited serviceability or reduction of capacity of aerodrome infrastructure and facilities varies considerably. The reasons that aircraft operations may be affected also vary considerably.

4.6.7 A MOWP is a planning tool that ensures any restriction to aircraft operations is considered, hazards to aircraft operations due to the undertaking of works are identified and risks related to those works are appropriately mitigated.

4.6.8 Examples of RTAO include:

- **Planned closure** - the runway or taxiway is closed for an appropriate period to undertake planned activities.
- **Limited serviceability** - the threshold of a runway is displaced, and the length of the reciprocating runway is reduced to allow an obstacle at one end of the runway.
- **Reduction of capacity** - the width of a taxiway strip is reduced, therefore the taxiway is only useable by smaller aircraft.

This is a small range of examples where RTAO may be planned by the aerodrome operator.

Note: The identification and inclusion of the geographical coordinate and elevation of any displaced threshold, or temporary runway end should be included where temporary reduced length runway operations are intended to be conducted.

4.6.9 The impact of RTAO may have on intended operations of aircraft may be significant if not planned and communicated effectively. Therefore, the early involvement of airlines, aircraft operators and pilot representatives when determining RTAO is critical to effective engagement.

4.6.10 In some cases, the range of activities to be completed may make the aerodrome unusable. Therefore, activities may be reduced to stages to ensure some degree of aerodrome functionality is maintained.

[6] Refer Section 16.02 of the Part 139 MOS.

[7] Refer Section 16.03 of the Part 139 MOS.

4.6.11 The aerodromes with a SMS, or RMP, should consider the ranges of hazards and risks associated with the proposed or planned works, and if RTAO are broken into stages, each stage should be risk assessed, as well as the dependencies and interdependencies to ensure the intended range of aircraft operations, and other aerodrome operations, can be achieved safely.

4.6.12 The range of safety assessment methodologies for aerodromes operators to use when considering the RTAO to their aerodrome operations and the impact stakeholders may experience ranges depending on the activity be considered. Further information is available in Appendix 4 - Safety assessment methodologies for aerodromes.

4.6.13 Information regarding RTAO should be provided to stakeholders in a timely manner so that those effected can consider the overall impact to their operation.

4.6.14 Providing stakeholders with information on RTAO in a completed MOWP may not allow sufficient lead time for them for contingency planning or undertake necessary actions. Forums such as LRST meetings, SMS meetings, and any other forum where operational impacts to stakeholders are discussed, provide useful opportunities for early engagement.

4.7 Works safety officer (WSO)

4.7.1 A works safety officer is a person appointed by the aerodrome operator with the function of ensuring the safe conduct of aerodrome works.

Note: Unless otherwise appointed for that function, the person appointed under Part 139 as a WSO has the responsibility of ensuring aerodrome safety while aerodrome works are being carried out at the aerodrome. Other forms of industrial safety and public safety are not a function under Part 139.

4.7.2 Prior to appointing a WSO, the aerodrome operator is to be satisfied that the person can perform the functions of a works safety officer. Accordingly, the WSO is to be suitably trained to conduct the task, in accordance with aerodrome manual procedures.

4.7.3 The aerodrome operator is to record the name, position and functions of each person performing the duties of WSO in the aerodrome manual, except where the person is nominated in the Administration section of any applicable MOWP[8].

4.7.4 The competence of persons appointed to carry out the duties of the WSO should be checked periodically, and at least as part of Aerodrome Technical Inspections or annual aerodrome manual validation programs.

4.7.5 An adequate number of WSOs should be provided to monitor the works activities. The aim is to ensure that the safety aspect of the works will be constantly monitored. The rostering of work activities and associated workforce should include the provision of sufficient works safety officers.

4.7.6 If the WSO is required to operate an airside vehicle on the aerodrome's manoeuvring area and required to use an air band radio, the person should be certified under Part 64 of CASR for the use of radiocommunication equipment unless the person is otherwise qualified under Regulation 91.625 of CASR.

Note: Persons approved to transmit on an aviation safety radio frequency under Part 61 of CASR are not required to also hold an aeronautical radio operator certificate under Part 64 of CASR.

[8] Refer Section 15.01(9) of the Part 139 MOS.

4.7.7 A WSO is to always be present in the vicinity of the work area when aerodrome works are being carried out at an aerodrome while the aerodrome is open and available for any aircraft operations.

4.7.8 To cover the eventuality that there may be a period when the appointed WSO cannot be present, there should be arrangements in place to ensure that a competent person will be assigned the duty of the WSO to cover the period of the works safety officer's absence.

4.7.9 To ensure that the WSOs can effectively carry out their duties, the works contract needs to clearly require the works organisation, and all personnel engaged in aerodrome works, to comply with reasonable directions issued by the works safety officer.

4.7.10 Where the WSO is provided by the works contractor, the aerodrome operator's accountable manager or delegate person should establish a line of communication and ensure a reporting system is available to the WSO. The aerodrome operator remains responsible for the compliance of the externally provided WSO and needs to maintain oversight over their conduct.

4.7.11 The respective roles of the project manager and WSO need to be clearly defined. Where possible, the WSO should not be placed directly under a line manager controlling the work. This is to avoid the possibility of work expediency being given a higher priority than aerodrome safety.

4.7.12 It is important to ensure that the works safety officers are made aware of the planning of the works, particularly hazard assessments and risk mitigating measures. The WSO should have full knowledge of the work arrangements and be able to identify any deviations to the work arrangements.

4.7.13 Where an external WSO is provided as part of a works program, the aerodrome operator should ensure competence checks are made available, and any knowledge gap of local practices, aerodrome manual procedures and MOWP requirements are satisfied prior to appointing the person as a WSO for the aerodrome.

4.7.14 Where external WSO are provided as part of a works program, the aerodrome operator should induct the persons to the aerodrome manual and any appropriate standard operating procedure, and provide education of:

- the aerodrome and its terrain
- local hazards, for example, visual and radio blind spots

that are specific to that aerodrome.

4.7.15 The accountable person of the aerodrome, or their delegate, should ensure that WSO, irrespective of their organisation, is made aware that they are representative of the aerodrome operator.

5 Promulgating information on aerodrome works

5.1 Through an effective consultation process, airlines and other affected organisations should not be surprised by the aerodrome works. When a MOWP is finalised, information on the aerodrome works can be promulgated in the following manner, if desired, through the Aeronautical Information System[9] (AIS):

a. By producing an Aeronautical Information Circular (AIC) to provide early announcement of the work arrangements where the aerodrome works arrangements does not alter published operational data in the AIP.

b. Further information on AICs can be found at https://www.airservicesaustralia.com/aip/current/iaipchart/AIC-and-AIP-Supplement.pdf

or

c. By producing an AIP Supplement (Sup) to convey information on temporary changes to facilities, services, procedures, or hazards (e.g., runway closures, major events, or construction works). AIP Sups are issued for situations that last longer than a NOTAM would cover but are not permanent.

d. Further information on AIP Sups can be found at https://www.airservicesaustralia.com/aip/current/iaipchart/AIC-and-AIP-Supplement.pdf

Notes:

1. Depending on the information to be provided in an AIP or AIP Sup, a minimum of 28 days, or 56 days prior to its effective date and this effective date must also be a AIRAC date. The information provided should allow a reader to understand the staging of the work, and the specific aerodrome facilities and equipment, which will be affected by each stage of the work. Readers should also be advised that notification of the actual timing of each stage of the work will be carried out through NOTAM.

   All AICs and AIP Sups require a trigger NOTAM, to be issued by the Aeronautical Information Services (AIS).

2. When issuing AIC or AIP Sups, the Aeronautical Information Regulation and Control (AIRAC) cycle should be considered. Information on the AIRAC cycle and specific cut off dates can be found on the Airservices Australia website.

and

e. By the aerodrome operator publishing information about the works activities to be undertaken, and what the aerodrome works could mean to pilots, aircraft operators, and other aerodrome uses. This is supplementary to the requirement for an MOWP (where required) or NOTAM (where required).

or

f. By initiating NOTAM action before carrying out work activities. One NOTAM may suffice for simple work. However, if the works are carried out in stages, multiple NOTAMs will be required.

   The volume and complexity of NOTAM for aerodromes works may result in pilot information overload or unnecessary workload. To enhance understanding of NOTAM, consideration of

[9] Refer Airservices for more detail - Document and Chart Descriptions - Airservices (airservicesaustralia.com) - https://www.airservicesaustralia.com/aip/document_charts.asp.

NOTAM information should be considered by the NOTAM authorised persons, with each NOTAM providing specific information. For instance, NOTAM advising of changes to runway information should not include taxiway information. Two separate NOTAMs should be considered.

> **Note**: Complex and long NOTAM may result in the reader missing key detail or information. NOTAM should be as concise as possible

5.1.1 The timing of the NOTAM is important: if the NOTAM is issued too early, the announcement can cause confusion or be ignored, too late an announcement may not allow recipients time to notice changes or miss intended operators altogether.

5.1.2 For works where an MOWP is issued, certain NOTAM should be issued not less than 48 hours before commencement of the works or works stage, as required by section 15.01 of the Part 139 MOS.

5.1.3 To allow for orderly processing of the NOTAM, aerodrome operator's NOTAM authorised person should initiate NOTAM action in accordance with the Airservices NOTAM Data Quality Requirements for Aerodrome Operators[10] and aerodrome and manual procedures. NOTAM should clearly set out changes, including the following, where appropriate:

a. Actual aerodrome facilities such as portions of the manoeuvring area not available or otherwise restricted during aerodrome works (Note: this could be a stage that includes multiple portions of the aerodrome).

b. Aerodrome equipment is affected by the works. This could include key communications equipment maintained and operated by the aerodrome (i.e., AFRU or AWIS).

c. Permanent or temporary amendment of declared distances published in the Runway Distance Supplement (RDS).

d. The presence of obstacles penetrating the obstacle limitation surface (permanent, temporary or transient).

e. Changes to existing aerodrome facilities such as the short-term absence of markings or lighting, or the provision of new lighting.

f. The withdrawal of any facility used by pilots such as Visual Approach Slope Indicator (VASI) or wind direction indicator (WDI).

5.1.4 Where possible, drawings should be used to clearly illustrate the various stages of the works and the resulting changed situations of the aerodrome. Drawings included in the MOWP should be clearly legible and provide sufficient detail for the reader to be able to interpret information included, including any text.

5.2 Drafting NOTAM for aerodrome works

5.2.1 For every flight operation, pilots need to read and interpret NOTAM for each aerodrome. In some instances, the number of NOTAM published by an aerodrome operator may be extensive. Complex NOTAM with multiple key topics may be difficult for the pilot to interpret.

5.2.2 A key consideration when composing NOTAM is the ability by the reader to understand and interpret the information contained within the NOTAM.

5.2.3 Airlines and aircraft operators may have departments that monitor NOTAM for the aerodromes they service and summarise published NOTAM into an information package for the flight crew. Some operators use programs or artificial intelligence to interrogate published NOTAM, and others are done by people. The volume of NOTAM to be interrogated, incorrect information,

[10] Refer: https://www.airservicesaustralia.com/wp-content/uploads/NOTAM-Data-Quality-Requirements-for-Aerodrome-Operators.pdf

poorly constructed NOTAM, and complex NOTAM may result in information being overlooked, misinterpreted or excluded from the information being provided to pilots. For these reasons, aerodrome operators should ensure NOTAM are accurate, succinct and unambiguous.

5.2.4 If a runway or part of a runway is to be closed, a specific separate runway NOTAM must be issued to alert pilots of the critical safety nature of the NOTAM and runway length available for take-offs and landings.

5.2.5 The simplification of NOTAM not only assists airlines, aircraft operators and pilot's, it also assists the NOTAM Office code the Notam correctly. Information about NOTAM Coding is in Appendix 5 - NOTAM coding.

5.2.6 Five-letter NOTAM Code groups are formed in the following manner:

- FIRST LETTER
  - The letter Q.
- SECOND AND THIRD LETTERS
  - The appropriate combination of two letters selected from the Second and Third Letters section of the NOTAM Code to identify the facility, service or danger to aircraft being reported upon.
- FOURTH AND FIFTH LETTERS
  - The appropriate combination of two letters selected from the Fourth and Fifth Letters section of the NTAM Code to denote the status of operation of the facility, service or danger to aircraft reported upon.

5.2.7 Where the information in NOTAM is related to an entire runway, or portions thereof, being unserviceable such as reduced length runway operations, the detail in the NOTAM should focus on that topic only. Variations to runway length may include:

- all of runway closed
- the landing distance available is reduced due to
  - threshold is displaced
  - runway end is relocated.
- the take-off distance is reduced
  - the take-off threshold is relocated
  - the end of take-off run is relocated.
- landing not available
- landing (i.e., 01) and take-off (i.e., 19) (the reciprocating end) not available.

Table 8: Example NOTAM for the displacement of the threshold of Runway 01/19

Field	Description
Field A - Location	This is the location under which the NOTAM will be issue.
Field B - Start period	Specifies the beginning of the occurrence or activity in a ten-digit date-time group (YYMMDDHHMM).
Field C - End period	Specifies the end of the occurrence or activity in a ten-digit date-time group (YYMMDDHHMM).
Field D - Hours of Activation	Used if the NOTAM will not be active continuously from the start period to the end period. For example, if the NOTAM will only apply during daylight hours.

Field	Description
Field E - NOTAM summary:	RWY 01 THR DISPLACED 921M DUE WIP (QMTCM) **Note:** The Qualifier Code of QMTCM means: - Q - a code abbreviation for use in the composition of NOTAM. - MT - second and third letters means threshold. - CM - third and fourth letters means displaced.
Subject	THR RWY 01
Status	DISPLACED 921M
NOTAM text	WITH RWY XX/YY SHORTENED DECLARED DISTANCES CHANGED TO: **RWY TORA TODA ASDA LDA** 01R 2689 2809(1.6) 2749 2579 19L 2689 2749(3.6) 2689 2689 RWY 19L 871M S END CLSD REFER METHOD OF WORKING PLAN **** AND AIP-SUP **** **Note:** No other text to be included in this NOTAM.

Note: The sample demonstrates a need to keep the NOTAM to a singular topic. A separate NOTAM may provide information on amendments to aerodrome lighting configuration; taxiway closures related to the reduced length of the runway with a displaced threshold.

5.2.8 If the MOWP includes RTAO that is divided into stages, each stage may have a NOTAM, or multiple NOTAMs. Each Notam should ensure the stage it refers to in the MOWP is included.

5.2.9 NOTAM developed for MOWP should be drafted by NOTAM Authorised Persons, or any drafted NOTAM, checked by a NOTAM Authorised Person.

5.3 Broadcasted information

5.3.1 The primary source of information required for pilot situational awareness is the NOTAM. MOWP, AIP Sups. AIC and any other form of information intends to inform the airline, aircraft operator or pilot of planned activities at an aerodrome, and the RTAO that can be expected.

5.3.2 Where information essential to the safe navigation of aircraft is not covered by a NOTAM, the ATC is responsible for providing appropriate details including construction or maintenance work on, or immediately adjacent to, the movement area. For instance, where TLW such as when 'workers with hand tools' are operating.

5.3.3 Where movement area unserviceability or aircraft operating restrictions to facilitate works activities, the NOTAM consistent with the template NOTAM in the MOWP should be published and current.

5.3.4 To enhance pilot situational awareness of changes to the take-off or landing runway or other parts of the manoeuvring area, the following may be considered:

- Controlled aerodromes (Class C airspace) with 24-hour coverage:
  - Request ATC to include information about essential aerodrome information, such as works in progress, on the ATIS.

Note: Inclusion of alternative runway configurations including displaced thresholds should be arranged with ATC during the planning stages of aerodrome works.

- Controlled aerodromes (Class D airspace) without 24-hour coverage:
  - Request ATC to include information about changes to the runway configuration or other parts of the manoeuvring area or essential aerodrome information, such as works in progress, on the ATIS, and.
  - When ATC is not operating, coordinate inclusion of relevant information, such as works in progress, on ATIS ZULU

  or

Note: Inclusion of alternative runway configurations including displaced thresholds should be arranged with ATC during the planning stages of aerodrome works.

  - Include information about changes to the runway configuration on Aerodrome Frequency Unit (AFRU) (where available)
- Uncontrolled aerodromes (Class G airspace):
  - Include information about changes to the runway configuration on Aerodrome Frequency Unit (AFRU) (where available).

6 Aerodrome markings, markers and lighting

6.1 Aerodrome markers, markings and lighting provide pilots with the visual cues to pilots operating at the aerodrome. Where an existing marking or lighting is to be temporarily altered due to aerodrome works, new visual cues are normally provided. Careful consideration needs to be taken on how the new visual cues will be perceived by a pilot. This is particularly so with respect to markings.

Notes:

1. This Chapter should be read along with AC 139.C-09 Visual Aids, Markings, Signals and Signs.
2. Use of markings, markers and lighting in relation aerodrome works and movement area closures should be considered in accordance with an aerodrome's SMS, RMP or risk management strategies.

6.2 Existing markings may not be completely obliterated such as during short term temporarily displaced threshold or reduced length runway operations. Using additional markers and lights may be necessary to make the runway or taxiway closure or alternative arrangements more obvious, especially where pilots have become accustomed to landing and taxiing via standard routes. Markings, markers, lighting and signage needs to be clearly visible to pilots, not misleading or confusing.

Notes:

1. Compliance with the MOS may not be sufficient to ensure compliance with regulation 139.070 CASR. The aerodrome operator's determination to use temporary markings, markers and lights, although in compliance with the MOS, may not be sufficient to ensure that aerodrome works are carried out in a manner that is not a hazard to aircraft or cause confusion to pilots. This risk is elevated where permanent and temporary markings and markings may be visible.
2. The primary purpose of the Part 139 MOS and this AC is to ensure aerodrome works do not create a hazard or cause confusion. However, the aerodrome operator needs to ensure other forms of safety and security are appropriately considered. Nothing in this AC intends to limit the management of other forms or safety, or security, subject to aviation safety considerations being appropriately considered.

6.3 Chapter 8 of the Part 139 MOS specifies the standards on the treatment of existing markings. Where an existing threshold is to be displaced to facilitate aerodrome works, the main concern is with the existing threshold markings. This is because the threshold marking provides a strong visual cue to indicate the beginning of the runway. Where the existing threshold markings needs to be obliterated, aerodrome operators should choose the most effective method to carry out the task. Options include painting the markings with a paint of similar colour to that of the runway, cover the area with hessian or similar material, and if jet blast or prop wash is not a problem, dark coloured soil may be appropriate.

Note: Temporary displacement of runway thresholds should, as far as reasonably practical, be avoided. The displacement of runway thresholds may introduce risk to aircraft operators, aerodrome operators and persons on the unserviceable portion of the runway.

6.4 It is important to highlight the location of the new threshold. Besides marking the new location, it has been found that runway threshold identification lights (RTIL) or strobe lights can provide a very effective visual cue to pilots. The strobe light is a requirement for aerodromes used in international operations where a threshold has been permanently displaced and is required for temporarily displaced thresholds, but operators of other aerodromes are encouraged to use the strobe lights to enhance the sighting of the new threshold location.

6.5 It should be noted that markings and markers provide visual ques to pilots that may not be provided by RTIL. For instance, pilots may not be able to readily identify the landing threshold or temporary runway end when backtracking on the runway. For this reason, when determining whether to replace or supplement markings and markers with lights should be carefully considered and discussed in forums such as LRSTs.

6.6 Works on a runway end will result in changed declared distances and will require the provision of new markings and markers to delineate the works area. An example on how to calculate the position of the displaced threshold and revised declared distances is outlined in Appendix 2. See Chapter 7 for further information on displaced thresholds.

6.7 Extinguishing of aerodrome lighting

6.7.1 If a runway or taxiway, or a portion of a runway or taxiway, is closed, all aerodrome lighting on the closed facility, and any visual aids leading a pilot into the closed facility, must be extinguished or obscured except the lighting for visual aids used to warn pilots of the closed facility.

6.7.2 As far a reasonably possible, aerodrome the extinguishing of aerodrome lighting should be electrical isolation, unless maintenance of the lighting system requires the lights to be energised. Where assessed to be operationally satisfactory, and providing works activities are not otherwise put at risk by the lighting system remaining energised, lights may be obscured for a period not exceeding 5 consecutive days, providing the lights cannot be seen by pilots, or can cause misleading visual cues or confusion.

Note: When used, any covers used to extinguish lights should be sufficiently sturdy to block out light and not be blown away by wind, jet blast of propellor wash. A process should be instituted to ensure all covers used to cover lights are accounted for at the completion of works, or when the lights are reinstated.

6.7.3 Where aerodrome lighting systems are pilot activated, consideration should include the deactivation of the pilot activation systems.

6.7.4 In all cases where aerodrome lights have been deactivated, a process should be established to ensure all lights display the correct colour and intensity once reinstated, or any deactivated pilot activation system is functioning correctly.

6.7.5 Refer to section 9.127 Lighting associated with closed and unserviceable areas in the Part 139 MOS.

6.8 Unserviceability lights

6.8.1 If a closed runway or taxiway, or a portion of a closed runway or taxiway is intersected by a runway or taxiway which is used at night. Unserviceability lights must be placed across the entrance to the closed area at intervals not exceeding 3 m.

6.8.2 The actual number of lights to be used depend on the width of the entrance to be closed. Table 9: Unserviceability markers and lights for temporary taxiway closure provides information on the minimum number of unserviceability lights that could be used, unless otherwise determined through a risk assessment that more, or less lights are required. The entrance to a taxiway or apron is the space between the edge lines. Where the paved surface is wider due to sealed shoulders, additional lights may need further consideration.

6.8.3 The intensity of the lights must be sufficient to ensure conspicuity considering the intensity of the adjacent lights and the general level of illumination i.e. background lighting.

6.9 Use of Markings

6.9.1 Unserviceability markings may be used to delineate the boundary of work area beyond which aircraft are not to enter. Unserviceability marking must be:

a. when displayed on a runway — white

b. when displayed on a taxiway — yellow.

6.9.2 When a runway may be covered in snow or other contaminant, the aerodrome operator should choose a more conspicuous colour other than white for the unserviceability markings. Where this may occur, details of the alternative colour should be recorded in the aerodrome manual.

6.9.3 Where the aerodrome operator chooses to use unserviceability markings that are not applied to the pavement surface, such as paint or other comparable substance, the markings need to be secured to ensure the marking cannot become a hazard to aircraft, and to those in and within the vicinity or the closed or unserviceable area.

6.9.4 At uncontrolled aerodromes, or aerodromes where ATC is not in operation, and a runway, portion of a runway, taxiway or portion of a taxiway is closed, unserviceability markings should be used. Details of unserviceability markings are included in section 8.106 of the Part 139 MOS. Exceptions to the use of unserviceability markings are included in section 8.107 of the Part 139 MOS.

6.10 Use of markers

6.10.1 Unserviceability markers

6.10.1.1 Unserviceability markers that meet the requirements of Chapter 8, Division 2 of the Part 139 must be placed at the entrance to, and across any part of the movement area of an aerodrome (including a runway) that is not to be used by aircraft. The MOS mandates a minimum of 3 unserviceability markers must be displayed across the centreline of any portion of a taxiway, apron or holding bay that is unserviceable. However, on wide taxiways, or where multiple taxiways intersect, and multiple centrelines are visible, additional markers should be considered.

Note: The purpose of markers is to provide pilots with guidance and understanding of changes to the condition of the movement area. Notwithstanding the need to comply with the Part 139MOS, the markers should not introduce a hazard to aircraft or cause confusion to pilots.

6.10.2 Markers are required to be light weight and frangible. If the markers have to be placed at a spot which is subject to jet blast or prop wash, securing them firmly can be a problem. Under no circumstance should the marker be held down by weighty objects such as steel cage, length of steel rods, or other non-frangible weights as these can present a hazard to aircraft running over the markers.

6.10.3 Materials that have been found suitable include sandbags, tent pegs and other forms of weigh down devices. In some circumstance, markers on a heavier base may provide the necessary stability.

6.10.4 Each marker must be clearly visible against the background and environment in which it is placed. Additionally, unserviceability markers must be placed across the entrance to, and across, any part of the movement area of an aerodrome (including a runway or taxiway) that is not to be used by an aircraft.

Note: CASA recommends that unserviceability markers are displayed across the entire width of the runway, taxiway, apron or holding bay.

Table 9: Unserviceability markers and lights for temporary taxiway closure

Taxiway width	Number of markers/lights	Location
7.5m	3[1]	One unit on centreline, and one unit each side of centreline and spaced 3 m apart.
10.5 m	3[1]	One unit on centreline, and one unit each side of centreline and spaced 3 m apart.
15 m	5[1]	One unit on centreline, and two units each of centreline side and spaced 3 m apart.
23 m	7[1]	One unit on centreline, and three units each of centreline side and spaced 3m apart.

Notes:

1. [1] Where the width of the taxiway exceeds the minimum width, such as intersections with other taxiways, additional markers/lights should be considered.
2. The Part 139 MOS does not differentiate between the use of markers during daylight hours or night therefore markers should be used at night as well as unserviceability lights with additional consideration given to using reflective bands or stripes which are visible at night.

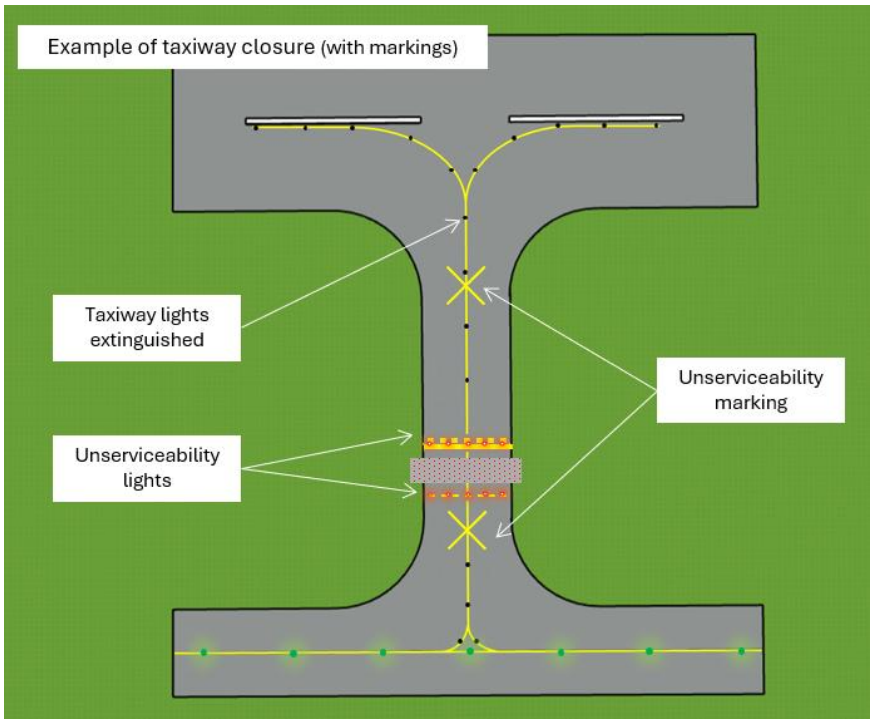


Figure 1: Example of visual aids for a taxiway closure using markings

Source: CASA.

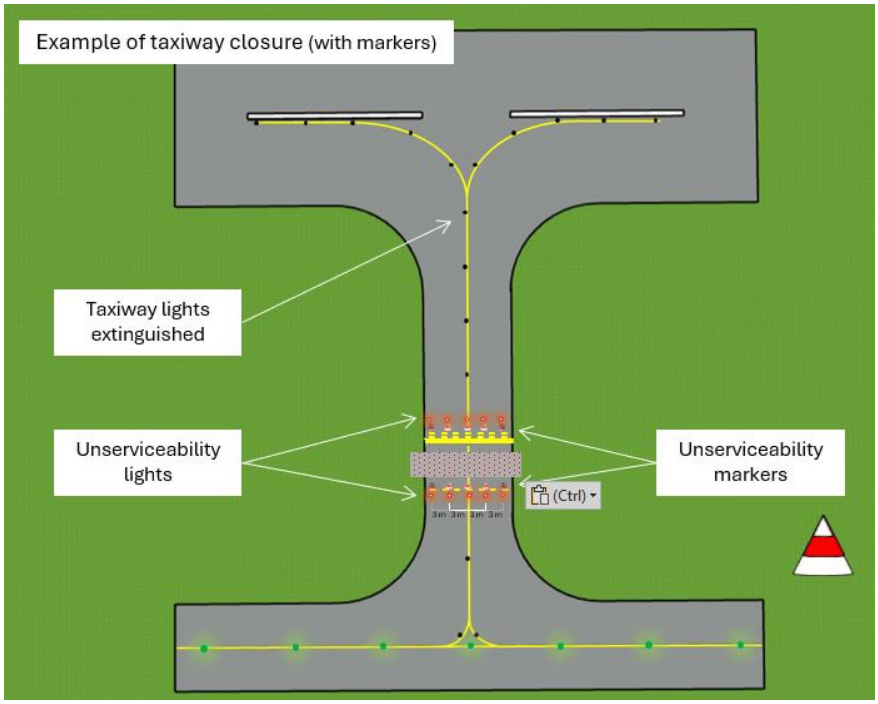


Figure 2: Example of visual aids for a taxiway closure using markers

Source: CASA.

6.10.5 Works limit markers and lights

6.10.5.1 Works limit markers and lights should be used to define the boundary of the allocated work area. Works limit markers and lights should not be used in the serviceable portion of the movement area. Although works limit lights should be clearly visible to a pilot approach the works area but not so great that it creates a hazard, the markers and lights should not be used to convey information to pilots about changes to the movement area. See Figure 6: Example taxiway closure for aerodrome works, using markings, lights and barriers and Figure 5: Sample taxiway closure for aerodrome works, using markings and lights for further information.

6.10.5.2 To ensure certainty, the works limits markers should be located at the boundary of the works area, or along access paths to the works areas. If the closed portion of the movement area is great in size, the works limit markers do not need to be expanded to the size of the works area.

6.11 Use of temporary lights

6.11.1 Occasionally, temporary lights may need to be used to delineate new locations, such as a temporary runway holding position locations, or intermediate holding positions, taxiway or apron edges. The lights selected for a function should be as close as possible to the specifications of the permanent lights, in terms of colour and intensity.

6.11.2 Where a section of a taxiway centreline lights are unserviceable, temporary taxiway edge lights are to overlap with the serviceable taxiway centreline lights for 2 light spacings within each end of the unserviceable area.

6.11.3 In all cases where temporary lights are used, and the lights are powered by battery or other source including solar power, a process should be introduced to ensure the lights remain operational and remain visible when they are in use.

6.11.4 Lighted visual aid to indicate a temporary complete runway closure

6.11.5 Where the full length of a runway is temporarily closed at a controlled aerodrome, and ATC is operating, a X-shaped cross with 2 lit arms may be used in lieu of day markings. Specifications

for lighted visual aids is included in sections 9.128 and 9.129 of the Part 139 MOS. A lighted visual aid cannot used on a partially closed runway or a runway with a displaced threshold.

6.11.6 If the aerodrome operator intends to use lighted visual aids in lieu of markings for runway closures of more than 24 hours duration, arrangements should be made with CASA during the planning stages of works. Refer to AC 139.A-04 Applying for aerodrome authorisations, exemptions and approvals for further information.

Note: Although the full length of the runway is closed, crossing or taxi along a portion of the closed runway by aircraft and vehicles is permissible subject to appropriate markings are installed that do create a hazard to aircraft or cause confusion to pilots, and ATC is appropriately advised of the contingency arrangements.

6.12 Ground signals in signal areas

6.12.1 If an aerodrome is closed, a total unserviceability signal should be displayed in a signal area. The use of a total unserviceability signal would require a NOTAM to be issued.

6.13 Visual approach slope indicator systems

6.13.1 Where a runway is equipped with visual approach slope indicator systems (VASIS), and the runway threshold is displaced, the VASIS is to be extinguished if the runway is not available for landing, or the threshold is displaced.

6.14 Temporary runway end markings and markers

6.14.1 In instances where the normal end of the runway has been temporarily relocated, the relocated end of runway should be marked. The preferred way to mark the runway end is with a 1.2 wide marking that extends the full width the runway.

6.14.2 If a painted marking is not practical (i.e., the change is not for more than 5 days) markers may be used. Markers such as white cones or white gable markers may be used. The number of markers used to mark the temporary runway end should be sufficient to ensure a pilot is aware of the purpose of the marker.

6.14.3 Markers used to mark a runway end will need to be tethered to withstand the effect of jet blast or propellor wash.

6.14.4 If the red runway end lights are available, temporary runway end markings and markers are not required, providing the lit lights are visible to pilots, and the lights are checked periodically to ensure ongoing serviceability.

6.15 Other markers, markings and lighting

6.15.1 The aerodrome operator is responsible for ensuring the safety of people, aircraft operations, and aerodrome operations. For this reason, other markers, markings and lighting may be required.

6.15.2 Barriers may be considered outside the boundary or the manoeuvring area, or to isolate aircraft parking positions. Barriers should not be located within the runway strip or taxiway strip unless that runway or taxiway is closed. The use of barriers to protect those within the work area or define the edge of areas that are excavated or where a fall could occur should be considered when undertaking risk analysis (refer Figure 6: Example taxiway closure for aerodrome works, using markings, lights and barriers). Where used, the barriers should be red and white, orange or white of some other colour that is conspicuous.

6.15.3 Where barriers are used on the apron to delineate the closure of one or more aircraft parking positions, the barrier cannot disrupt aircraft or ground servicing operations of any aircraft parking position that remains available for use. This does not mean that aerodrome operators cannot downgrade aircraft parking areas where the parking position can be used by smaller aircraft, or the use of the parking position can be achieved by other means, such as tow-on, tow-off operations.

6.15.4 Where barriers are used, permanent markings such as lead in lines should be obscured and lighting deenergised to reduce the potential for inadvertent use of the closed runway or taxiway.

Figure 3: Example of barriers used to adjacent to a taxiway

Source: CASA.

6.15.5 Barriers should not be located within the runway strip or taxiway strip unless that runway or taxiway is closed. The use of barriers to protect those within the work area should be considered when undertaking risk analysis. Where used, the barriers should be red and white, orange or white of some other colour that is conspicuous.

6.15.6 Depending on the type of works being undertaken, types of barriers may include frangible gable markers, or barriers typically used in routine construction activities such as water filled barriers, or flexible fencing. Where the use of more durable fencing is required for the protection of people or to reduce the likelihood of foreign object debris, such barriers outside the movement area, or within the closed portion of the movement area providing a risk assessment ensures that the risk to aviation safety is appropriately considered. Where such barriers are used, the barrier should be marked with low intensity steady red lights. Where the barriers are intended to be used for extended periods, the lights should, where possible be hardwired. See Figure 6: Example taxiway closure for aerodrome works, using markings, lights and barriers for more information.

6.16 Movement area guidance signs

6.16.1 At aerodromes equipped with mandatory and advisory movement area guidance (MAG) signs, information provided by the signs needs to be carefully considered. MAG signs may need to be treated by obscuring the sign, partially obscuring the sign or, where MAG signs are illuminated, extinguishing the sign at night.

6.16.2 Where information on the sign continues to provide necessary information, but some of that information is not correct, the sign should be partially obscured. The method of obscuring the sign will vary depending on the location of the sign, and product used to obscure the information. Care needs to be exercised to ensure that damage is not done to the sign.

6.16.3 Where new signs are installed as part of the works program, of the information on the sign is changed, the messaging on the sign needs to provide pilots with accurate information so that the risk of confusion is minimised.

6.17 Other information signs

6.17.1 Where other information signs are installed, such as distance to run signs, the information provided on the sign needs to be maintained as accurate. Where information becomes temporarily or permanently inaccurate, treatment of the sign as outlined in the previous section is required.

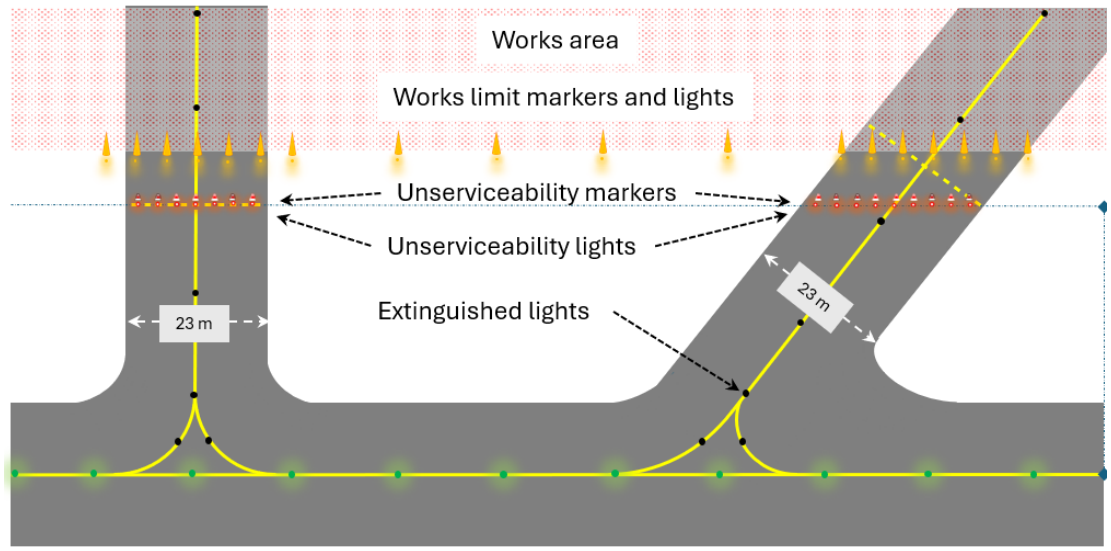


Figure 4: Typical taxiway closure for aerodrome works, using markers and lights

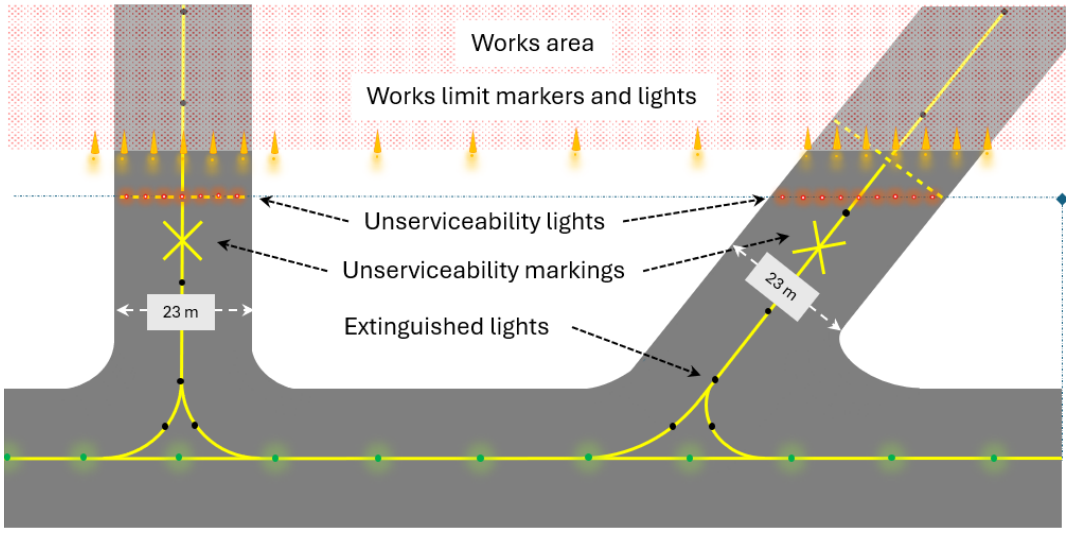


Figure 5: Sample taxiway closure for aerodrome works, using markings and lights

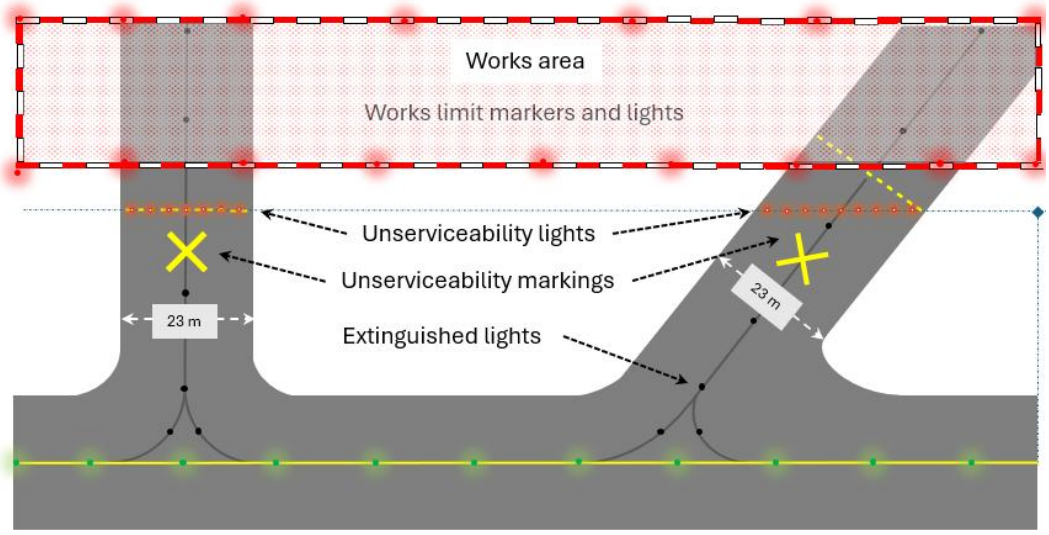


Figure 6: Example taxiway closure for aerodrome works, using markings, lights and barriers

7 Reduced length runway operations and temporarily displaced thresholds

7.1 Aerodrome works may require the threshold of a runway to be displaced or the permanent end to the runway temporarily relocated. A runway displacement may:

a. extend for a period in a single day (or night)

b. for an extended period, for the duration of the works.

7.2 The displacement of a threshold is a change to the movement area of the aerodrome and is therefore an impact to aerodrome users. The displacement of a threshold may be required for planned works, emergency works, or as the result of an emergency or disabled aircraft. Contingencies should be included in the aerodrome manual for emergency works, or for the facilitation of aerodrome emergency or disabled aircraft events.

7.3 Displaced thresholds have the ability to create a hazard to aircraft or cause confusion to pilots if the not appropriately considered and managed. Accordingly, aerodrome works require careful planning. The development of MOWP to facilitate works including displaced thresholds are likely to require the support of specialists, including survey consultants.

Notes:

1. Temporarily displaced thresholds have the potential to increase the risk of an aircraft experiencing a runway incursion, undershoot or runway excursion during landing or take-off. Thorough hazard identification and risk assessment process, in accordance with the Safety Management System (SMS) or Risk Management Plan (RMP), should be undertaken and appropriate risk management is required when considering the displacement of a threshold.
2. When considering a temporary displaced threshold, aerodrome operators should consider engaging with airlines, aircraft operators or pilot groups to determine whether the runway will remain useable for landing and/ or take-off.

7.4 Aerodrome markings and lighting systems may need to be altered to facilitate displaced threshold operations. When enacting a displaced threshold, and returning the threshold to its normal location, the aerodrome operator should consider developing a robust checklist or similar process to ensure all actions have been completed as per the works planning process.

7.5 A runway surface may have slopes which may include variations in runway surface elevation and grades, this introduces complexity when determining declared distances. Changes in runway elevation may result in signification variations in take-off distances, supplementary distances, and landing distances, which could impact the useability of the remaining runway, or the ability of an aircraft to use the runway.

7.6 The safe operation of aircraft is dependent on accurate published aeronautical information. Therefore, if the aerodrome operator is not confident in revising published information, it is highly recommended that the accountable person seeks appropriate advice from a suitably qualified or knowledgeable person prior to changing published information.

7.7 Temporary aerodromes works where a displaced threshold is required should include a runway end safety area (RESA). The dimensions of the RESA may vary depending on the intended use of the runway when the threshold is displaced. Specifications for RESA are included in section 6.26 of the Part 139 MOS.

Note: If aerodrome works includes the displacement of a runway threshold, obstacles that may or do penetrate the revised approach surface and take-off climb surface should be reported to CASA. Refer to sections 6.01(5)(a) and 7.19 of the Part 139 MOS for further information. Subject to paragraph 8.18, the aerodrome operator is to recalculate the TODA, the critical obstacle gradient, and the STODA in the reciprocal direction from the displaced threshold.

7.8 Notwithstanding the ability to introduce a runway starter extension (refer Section 6.04 of the Part 139 MOS), temporary markings, markers and lights used to identify the displaced threshold along with temporary markers, markings, and lights necessary to mark the runway starter extension has a likelihood to create a hazard to aircraft or cause confusion to pilots. Accordingly, runway starter extensions with temporarily displaced thresholds should be considered and avoided.

7.9 The obstacle limitation surfaces (OLS) approach surface gradients, and take-off climb surface gradients used when calculating declared distances for displaced threshold should be determined using Tables 7.15(1) Physical dimensions of the OLS for an approach runway and Table 7.16(2) Physical dimensions of the OLS for a take-off runway of the Part 139 MOS. In accordance with section 4.01 of the Part 139 MOS, the aerodrome reference code (ARC) of the reduced length runway shall be chosen by the aerodrome operator.

Note: Despite the comments in 8.1.9, operators of Leased Federal Aerodromes subject to the Airports (Protection of Airspace) Regulations 1996 should consideration liaising with the liaising with the Department responsible for the administration of the *Airports Act* 1996 and the associated regulations when planning work activities requiring amendments to the aerodrome's OLS.

7.10 Published terminal instrument flight procedures (TIFP) may be impacted by any threshold displacement. The planning of aerodrome works should include engagement with the applicable instrument procedure designer. Information of the procedure designer of each procedure is included in Departure and Approach Procedures, available through Airservices Aeronautical Information Package[11].

7.11 The procedure designer may determine it necessary to suspend the procedure or amend details of the procedure. The impact of procedure suspension or amendment may be significant to aerodrome users. Engagement and consideration of aerodrome works should be provided necessary time to facilitate appropriate stakeholder engagement.

7.12 Examples of determining declared distances

7.12.1 Declared distances are published in the En Route Supplement Australia (ERSA) Runway Distance Supplement (RDS). Using a principle where a runway usually consists of more than one set of specifications, declared distances should be determined based on the intended operation of the runway. Where a runway is intended to be used for approach (see Table 10: Approach runway configuration alternatives (where the runway is used for approach operations)) and take-off operations in both directions, the runway may consist of four sets of specifications.

[11] Refer: https://www.airservicesaustralia.com/aip/aip.asp

Table 10: Approach runway configuration alternatives (where the runway is used for approach operations)

Approach category to a runway	'Reciprocal approach category to a runway
Instrument – precision approach	Instrument – precision approach
Instrument – precision approach	Instrument – non-precision approach
Instrument – non-precision approach	Instrument – non-precision approach
Instrument – non-precision approach	Non instrument
Non instrument	Non instrument

7.12.2 For example:

- Example Runway 07/25 is available for approach to both ends, and take-off in both directions:
  - Take off runway x (i.e., Runway 07)
  - Landing runway x (i.e., Runway 07)
  - Take-off reciprocating runway x (i.e., Runway 25)
  - Landing reciprocating runway x (i.e., Runway 25)

Note: See Figure 7: Guide to determining declared distances for further information.

7.12.3 Variations to declared distance values may vary based on whether the following characteristics are provided:

- clearway
- stopway
- displaced threshold
- runway starter extension.

7.13 Determining declared distances

7.13.1 Declared distances are the specific lengths of each runway published for aircraft operators and are define allowable take-off and landing weights and speeds.

7.13.2 Where a runway direction is intended for take-off operations, the following information is published in the ERSA RDS:

a. take-off run available (TORA)

b. take-off distance available (TODA)

c. accelerate-stop distance available (ASDA).

7.13.3 Where a runway direction is intended for landing operations, the following information is published in the ERSA RDS:

a. landing distance available (LDA).

7.13.4 Where a runway is available for landing or take-off operations in both directions, the above information is to be published for each direction. However, where the runway is limited in its use, declared distances for that runway direction is either not published in ERSA RDS, or a NOTAM is published to temporarily amend permanent information.

7.13.5 Refer to illustrations in **Error! Reference source not found.** for further information.

7.13.6 Figure 8: Determining declared distances for landing to a temporary displaced threshold (temporary runway ends aligned) demonstrates the calculation of declared distances of an approach where the threshold is temporarily displaced, and the end of the reciprocating runway is aligned.

7.13.7 In this example, an object in the closed portion of the runway is used to demonstrate the calculation of an approach surface gradient over a temporary obstacle.

Note: The same principle may be applied to obstacles on the runway, runway strip, the RESA and any other location where the obstacle may affect the runway's published declared distances.

7.13.8 The example demonstrates landing to a displaced threshold, and take-off from a reduced length runway. In this instance, the start of take-off is from a temporary location.

7.13.9 For this example, the following information is published:

- Reduced length TORA.
- Reduced length TODA.
- Reduced length ASDA.
- Reduced length LDA.

7.13.10 The gradient marked y% should be selected from the Part 139 MOS, Table 7.15(1) physical dimensions of the OLS for an approach runway.

Note: Where the gradient subtends from its origin, the gradient always starts from a 0% (horizontal) surface.

7.13.11 The illustration demonstrates a 0% slope runway. Any change to the runway slope will need further consideration.

7.13.12 The illustration is for landing on Runway -- 25 only and does not include necessary information to support take-off from Runway 07.

7.13.13 Refer to Figure 8: Determining declared distances for landing to a temporary displaced threshold (temporary runway ends aligned) for further information.

7.13.14 Figure 10: Determining declared distances from a temporary displaced threshold (temporary runway ends not aligned) builds on the previous example and demonstrates declared distances for the reciprocating take-off runway (i.e., 07) where the runway end is aligned with a displaced threshold (i.e., Runway 25):

7.13.15 For this example, the following information is published:

- Reduced length TORA.
- Reduced length TODA.
- Reduced length ASDA.
- Reduced length LDA.

A portion of the eastern end of Runway 07/25 has been allocated as a temporary RESA. The length of the RESA will be dependent on the aerodrome operator's determination of section 6.26 of the Part 139 MOS.

The landing distance available (LDA) of Runway 07, the take-off run available (TORA) of Runway 07, and take-off distance available (TODA) of Runway 07 start from the permanent runway end and cease at the temporary runway end.

This example does not include supplementary take-off distances (STODA) for Runway 07, assuming the length of the runway is 800 m or longer. Care in calculating STODA is necessary where the elevation of the runway varies. See examples in Appendix 2 of this AC for further information.

7.13.16 Figure 8 demonstrates an example of Runway 07 take-off towards the displaced threshold and landing Runway 25 is to a temporarily displaced threshold.

7.13.17 Reduced length landing runway operations where a temporarily displaced threshold is in operation, and where take-off threshold for that same direction and landing threshold is not aligned demonstrates increased complexity.

7.13.18 The take-off run available (TORA) for Runway 25, and take-off distance available (TODA) for Runway 25 start from a difference temporary runway end to the temporary Runway 25 landing threshold.

7.13.19 Refer to Figure 8: Determining declared distances for landing to a temporary displaced threshold (temporary runway ends aligned) for further information.

7.13.20 Where works require the runway length to be reduced below published declared distances, the aerodrome operator should:

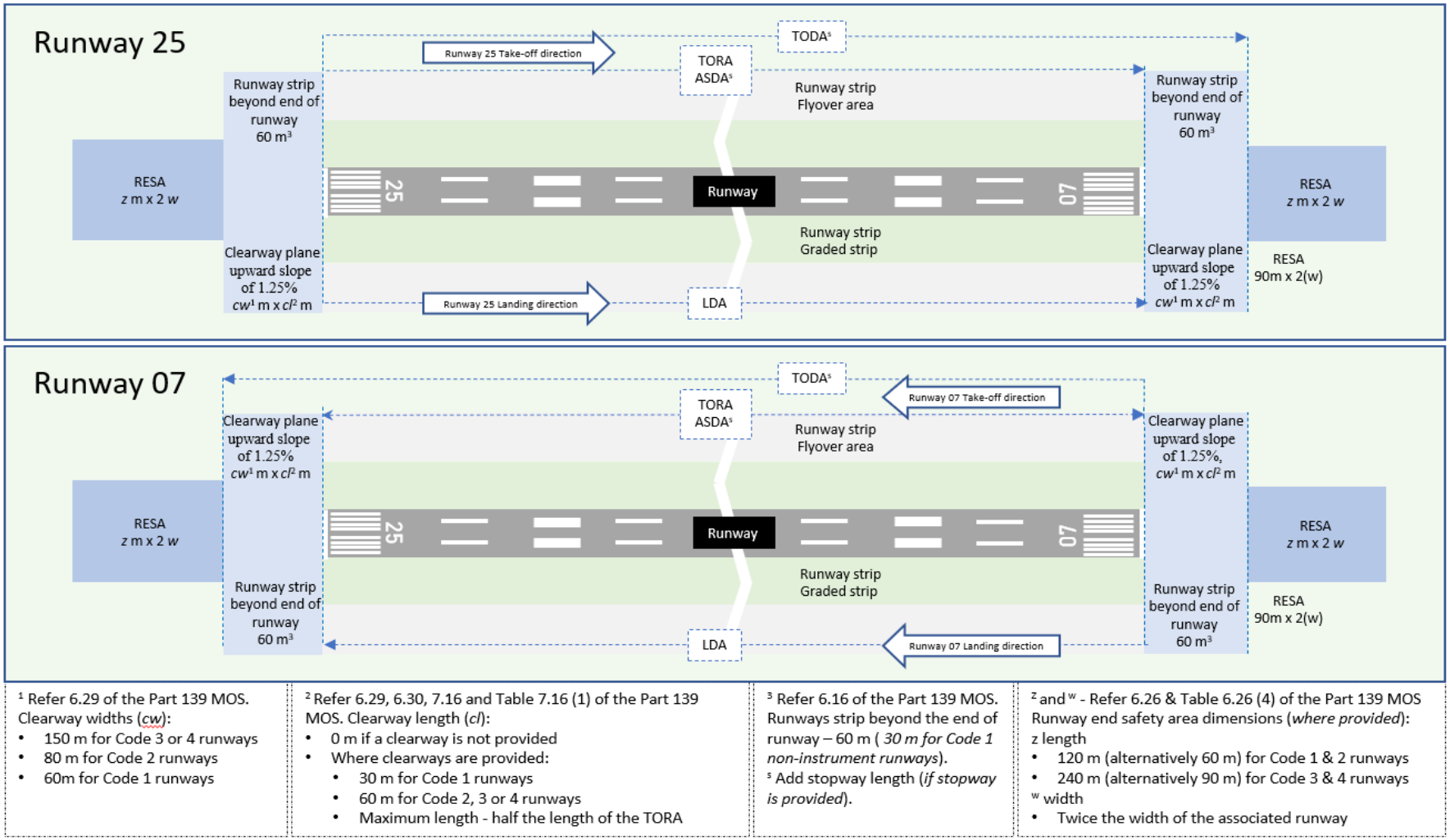
- identify and assess the associated risk and mitigate as necessary the potential hazards before, during, and on cessation of operations with reduced runway length available and/or WIP in order to ensure the safety of aircraft operations and works personnel.

Note: Risks to the safe operation of aircraft may result from inappropriate or potentially misleading displays of visual aids; inappropriate or potentially misleading navigational aids; adverse environmental conditions; or unusual meteorological conditions; and from restricted obstacle clearance and wingtip separation distances. It is important to recognise that the identified hazards may cover a wide range of topics, including those that do not pose a risk only to aircraft but also to personnel. For example, the potential risk from jet blast.

7.13.21 The monitoring the safety of the aerodrome and aircraft operations in proximity of the works should be conducted by the aerodrome operator, to ensure that timely and corrective action is taken when necessary for continued, safe operations. This is particularly important when operational changes or unprecedented or unpredicted events occur.

7.13.22 See section 6.2 of this AC for guidance in drafting NOTAM including changes to runway declared distances.

7.13.23 In Figures 8-11, the temporary end of the runway strip for 07 is marked with unserviceability markers. Those markers could be at any place between the end of the runway strip and the works area. The temporary end of runway 07 is marked by lit red runway end lights. This could also be achieved by a painted white line, or markers. The temporary start of take-off run available (TORA) for 25 is co-located with the temporary end of 07.



[1] Refer 6.29 of the Part 139 MOS. Clearway widths (*cw*):
- 150 m for Code 3 or 4 runways
- 80 m for Code 2 runways
- 60m for Code 1 runways

[2] Refer 6.29, 6.30, 7.16 and Table 7.16 (1) of the Part 139 MOS. Clearway length (*cl*):
- 0 m if a clearway is not provided
- Where clearways are provided:
  - 30 m for Code 1 runways
  - 60 m for Code 2, 3 or 4 runways
  - Maximum length - half the length of the TORA

[3] Refer 6.16 of the Part 139 MOS. Runways strip beyond the end of runway – 60 m (*30 m for Code 1 non-instrument runways*).
[s] Add stopway length (*if stopway is provided*).

[z] and [w] - Refer 6.26 & Table 6.26 (4) of the Part 139 MOS Runway end safety area dimensions (*where provided*):
z length
- 120 m (alternatively 60 m) for Code 1 & 2 runways
- 240 m (alternatively 90 m) for Code 3 & 4 runways

[w] width
- Twice the width of the associated runway

Figure 7: Guide to determining declared distances

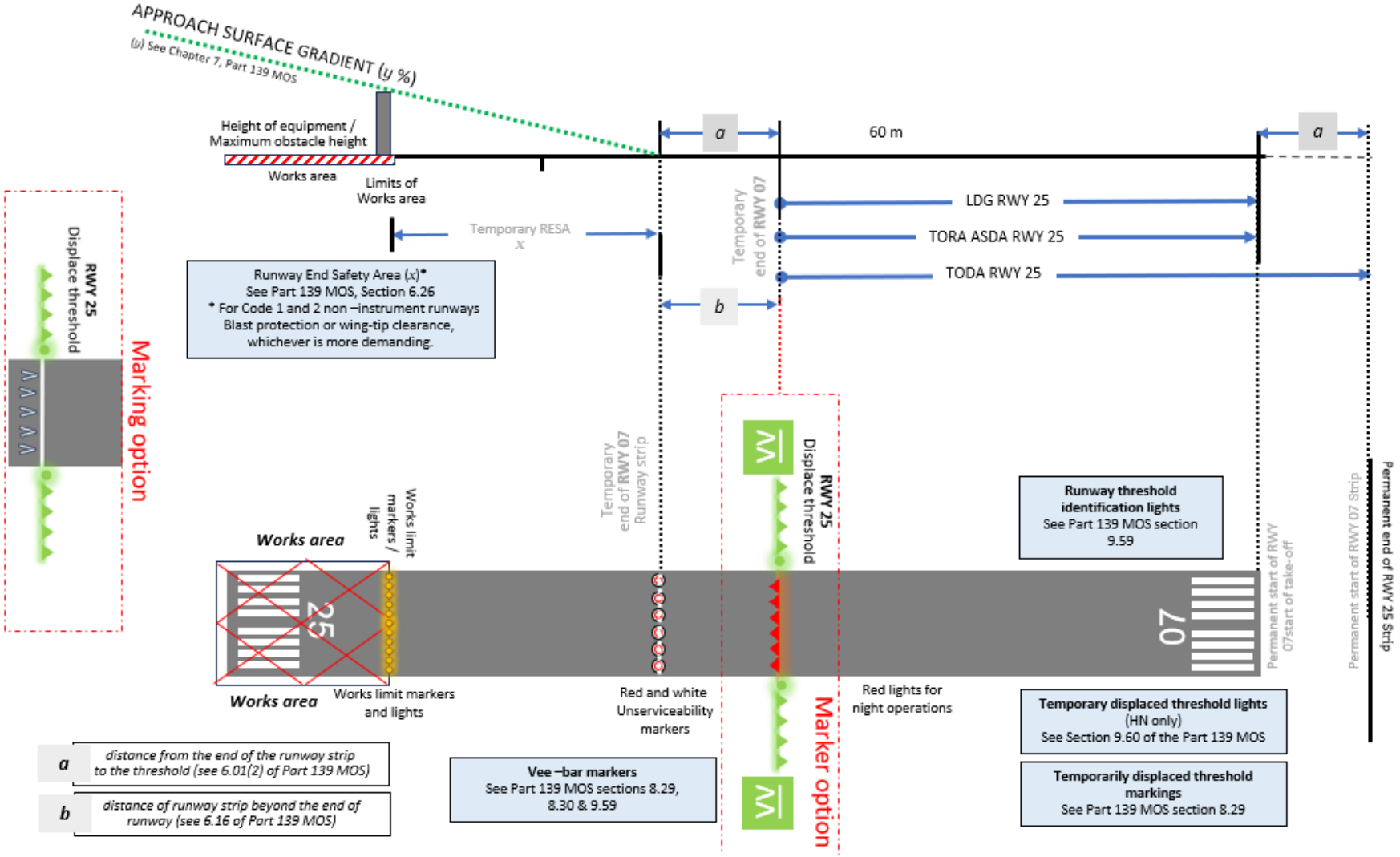


Figure 8: Determining declared distances for landing to a temporary displaced threshold (temporary runway ends aligned)

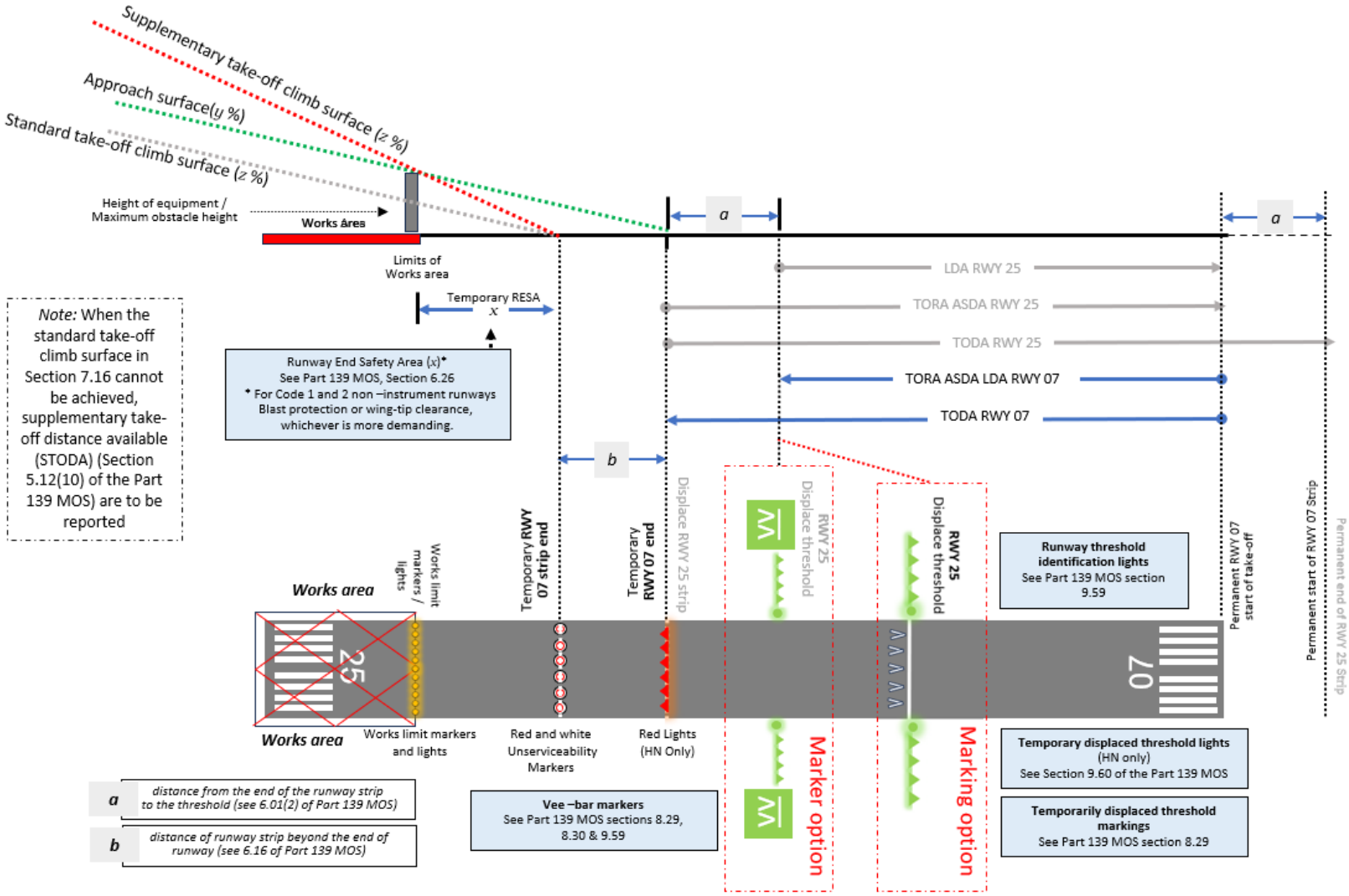


Figure 9: Determining declared distances for take-off climb towards a temporary displaced threshold (temporary runway ends not aligned)

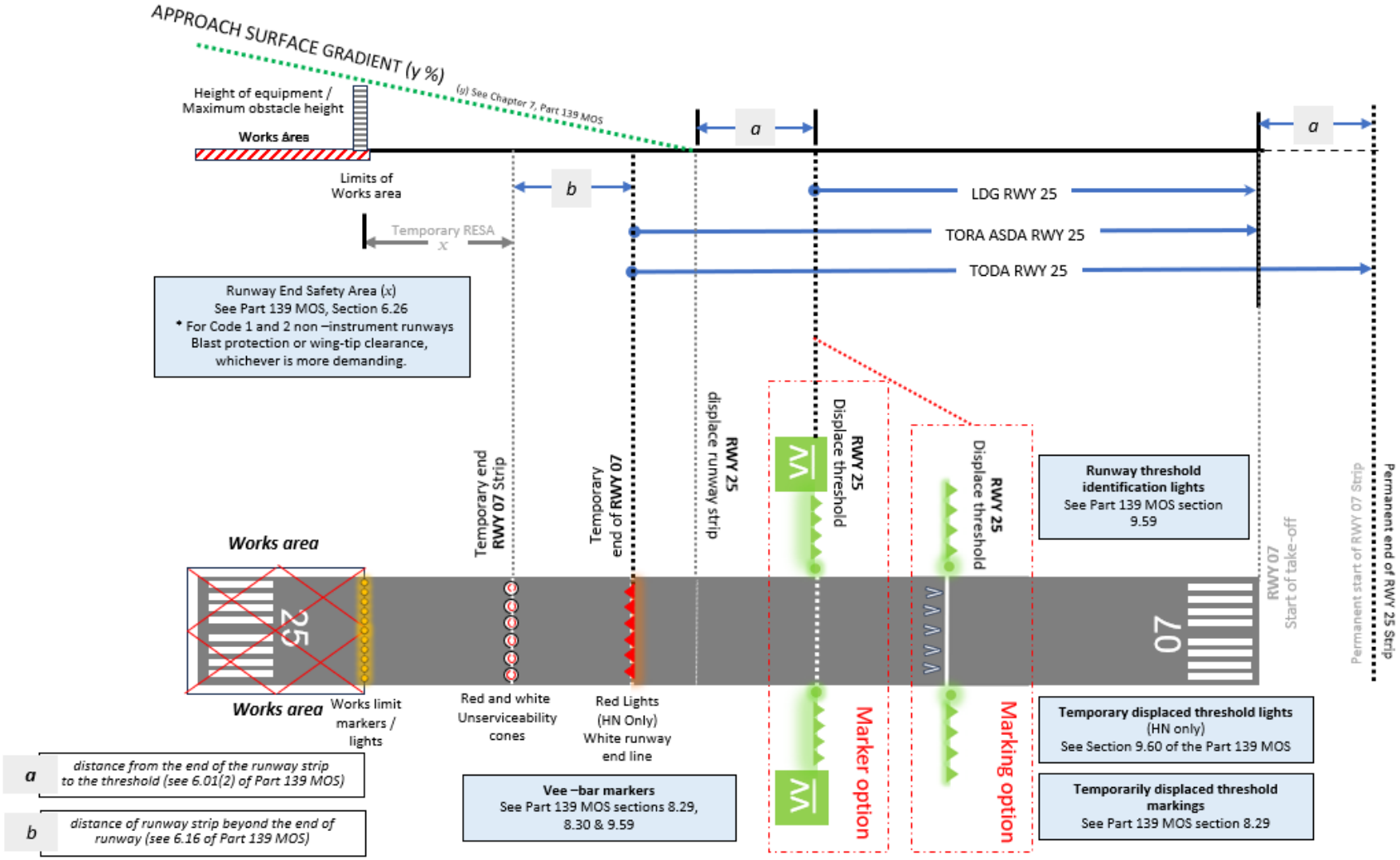


Figure 10: Determining declared distances from a temporary displaced threshold (temporary runway ends not aligned)

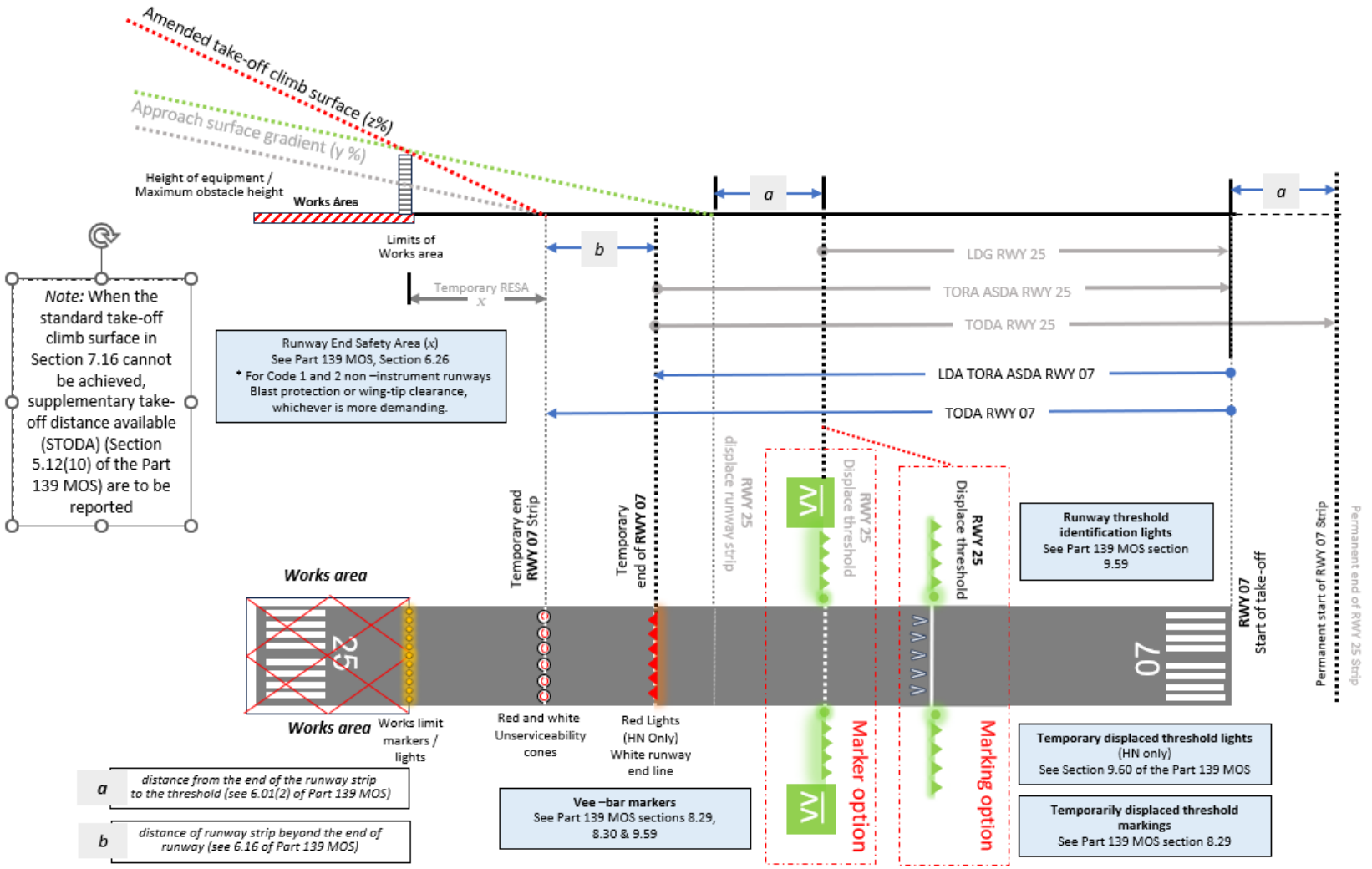


Figure 11: Determining declared distances for take-off towards a temporary displaced threshold (temporary runway ends not aligned)

7.14 Reduced runway length operations - Marking temporary displaced thresholds and runway ends

7.14.1 The marking of temporarily displaced thresholds is based on the type of aircraft operations intended at the aerodrome. Different markings may be used in different circumstances, and for different timeframes.

7.14.2 Table 11 - Markings, markers and lights for temporary displaced thresholds - day summarises matters to be considered when contemplating the implementation of reduced length runway operations through a temporarily displaced threshold.

7.14.3 The following is the minimum effort required to implement a temporarily displaced threshold. Intended aircraft operations, local traffic arrangements, seasonal change, and feedback from aircraft operator, airline, pilot and, where present, air traffic control may require additional risk controls on a case-by-case basis.

7.14.4 Nothing in this information removes the aerodrome operator's requirement to consider any other aspect of aviation safety and industrial safety requirements to ensure no harm is experienced because of planned aerodrome movement area unserviceability or operational restrictions required to facilitate maintenance or construction activities.

7.14.5 Temporary runway ends should be marked when the permanent end of the runway is temporarily relocated. The standard for the marking of temporarily relocated runway ends is the same as permanent runway ends. However, the marking of a temporary runway end for short period runway length reductions to facilitate activities such as aerodrome works may be difficult.

7.14.6 Temporary runway ends may be co-located with temporary displaced thresholds or not. The intent to allow aircraft to cross runway end lines to allow aircraft to turn will complicated the marking of runway end lines. If the turning of aircraft is intended, the ability to use markers becomes more problematic.

7.14.7 When determining whether to introduce temporary displaced thresholds, and runway ends, for short-term change, medium-term change or long-term change, hazards and risks specific to the aerodrome operator and the users of the runway may vary. The transition between normal runway operations and temporary runway operations also introduces hazards and risk.

7.14.8 In any circumstance, the operating runway configuration, markings, markers, lighting and published information must ensure that the potential for pilot confusion is fully considered.

Table 11 - Markings, markers and lights for temporary displaced thresholds - day

<table>
<tr><th>Aerodromes with scheduled international</th><th>Other aerodromes</th><th>Aerodrome lighting for day operations</th></tr>
<tr><td colspan="2">8.27 (1) Subject to subsection (2), if a permanent runway threshold is temporarily displaced, then temporarily displaced threshold markings must be provided.</td><td rowspan="3">9.59(3) RTIL must be used aerodromes with scheduled international aircraft operations with temporarily displaced threshold markings under sections 8.27 and 8.30, and subsection 8.29 (3).</td></tr>
<tr><td>8.27(3) For an aerodrome with scheduled international air transport operations, if a threshold is temporarily displaced then RTIL must be provided at the displaced location (except for an emergency).</td><td></td></tr>
<tr><td>8.29(3) RTIL must be provided.</td><td></td></tr>
<tr><td colspan="3">8.28 Temporarily displaced threshold markings — more than 30 days</td></tr>
</table>

<table>
<tr><th>Aerodromes with scheduled international</th><th>Other aerodromes</th><th>Aerodrome lighting for day operations</th></tr>
<tr><td colspan="3">If a permanent runway threshold is to be displaced for more than 30 days, the temporarily displaced threshold markings must comply with the following:
a. a white line, that is 1.2 m wide, must be marked across the full width of the runway at the line of the new threshold, together with adjacent 10 m long white arrowheads, whose lines are 1 m wide
b. existing centreline markings between the reciprocal runway end and the displaced threshold must be converted into arrows as shown in Figure 8.28 of the Part 139 MOS.
c. the permanent threshold marking and associated runway designation number must be obscured, and a temporary runway designation number provided 12 m beyond the new threshold.</td></tr>
<tr><td colspan="3">8.29 Temporarily displaced threshold markings — more than 5 days to 30 days or less</td></tr>
<tr><td>8.29(2) The existing threshold markings must be obscured.</td><td>8.29(4)(d) the temporarily displaced threshold markings must consist of “Vee-bar” markers.</td><td rowspan="3">9.59(3) RTIL must be used with temporarily displaced threshold markings under sections 8.27 and 8.30, and subsection 8.29 (3).</td></tr>
<tr><td>8.27 (1) temporarily displaced threshold markings must be provided.</td><td>9.59(4)(c) RTIL may be used in lieu of temporarily displaced threshold Vee-bar markings required by section 8.29.</td></tr>
<tr><td>8.29(2) The existing threshold markings must be obscured 8.27(3) RTIL must be provided.</td><td>8.29(2) The existing threshold markings must be obscured.</td></tr>
<tr><td colspan="3">8.30 Temporarily displaced threshold markings — 5 days or less</td></tr>
<tr><td>Permanent threshold markings may be retained.</td><td>8.30(1)(b) temporarily displaced threshold markings must consist of “Vee-bar” markers.</td><td rowspan="3">9.59(3) RTIL must be used with temporarily displaced threshold markings under sections 8.27 and 8.30, and subsection 8.29 (3).</td></tr>
<tr><td rowspan="2">8.27(3) RTIL must be provided.</td><td>8.30(1)(b) RTIL only.</td></tr>
<tr><td>Permanent threshold markings may be retained.</td></tr>
<tr><td colspan="3">8.31 Temporarily displaced threshold markings — large displacements for 30 days or less the displacement is by more than 450 m</td></tr>
<tr><td colspan="2">If RTIL is not provided:
a. a runway threshold is temporarily displaced for not more than 30 days
b. the displacement is by more than 450 m
c. RTIL are not provided.

then temporarily displaced threshold markings must be provided in accordance with section 8.28 of the Part 139 MOS.

If 24-hour ATC services are provided:
a. a threshold is temporarily displaced for not more than 5 days
b. the displacement is by more than 450 m
c. 24-hour ATC services are provided</td><td>9.60 temporarily displaced threshold lights must be provided at night to identify the new threshold location if the runway is to be used at night.</td></tr>
</table>

Aerodromes with scheduled international	Other aerodromes	Aerodrome lighting for day operations
then the permanent threshold markings may be retained if RTIL are provided.		

8 Control of works on the movement area

8.1 It is most important that all personnel engaged in works are made aware of, and be required to, observe the safety procedures under which the works are conducted. A good way is to include a safety highlight message in the briefing such as toolbox talks[12] at the commencement of each day's work.

8.2 Access routes to and from the worksite should be carefully planned and sign posted. Where vehicles are used to move excavated or backfill material, the loading and condition of the vehicles need to be checked to avoid any spillage. Where vehicles are allowed to travel on or cross taxiways or runways, dedicated clean up resources need to be made available to remove any spilled material from the pavement and adjacent areas.

8.3 If there are aircraft operations at night, the lights from vehicles engaged in night work should be sufficiently managed as to not affect the night vision of pilots. Vehicle light fittings and any auxiliary lights such as work lights and additional driving lights should be checked to ensure that the lights are not directed unduly upwards. Drivers should be instructed that high beam headlights should not be used unless required for the function they are performing (i.e., during movement area serviceability inspections).

8.4 The parking and storage areas of vehicles, equipment and building material should be carefully chosen and identified to avoid infringement of the runway or taxiway strip standard, aircraft parking positions or areas or penetrate OLS surfaces.

8.5 Excavation work along the runway or taxiway strips should be carefully planned as the area needs to be restored before the next aircraft operation. See Paragraph 15.06 of the Part 139 MOS, regarding restrictions when carrying out works on a runway strip. There should be a contingency plan to cover equipment breakdown, rain stoppage, other forms of inclement weather and other occurrences which may disrupt the work.

8.6 'Workers with hand tools' may carry out work on the runway strip of an active runway providing the work activity does not present a RTAO. There are certain restrictions governing the conduct of workers with hand tools carrying out works on the graded runway strip of an active runway. NOTAM action is required if the work area requires more than 10 minutes to be restored. At a controlled aerodrome, the ATC would normally only permit such works when the:

- cross wind component does not exceed 15 kts
- visibility is equal to or greater than 5000m
- ceiling is equal to or greater than 1000 ft
- runway surface is dry
- working party can be visually monitored by the ATC.

8.7 When activities with 'workers with hand tools operating to the edge of the runway[13]' are being performed, a WSO is to be present. The role of the WSO is to ensure the safe conduct of works, and where avoidable, not be part of the work activity. Although a dedicated works safety officer is not required if one of the persons carrying out the time-limited works has been trained to perform the function of the works safety officer, ensuring the person performing the task can ensure situational awareness of aircraft operations and the task they are performing.

[12] Refer Safe Work Australia – Consultation (https://www.safeworkaustralia.gov.au/safety-topic/managing-health-and-safety/consultation).

[13] Refer to Section 3.1.1.6 Runways, supplementary information of the Manual of Air Traffic Services.

Note: Aerodrome works are construction or maintenance work on or near the movement area of an aerodrome that may create an obstacle or hazard, or restrict the normal take-off and landing of aircraft, at the aerodrome.

8.8 At controlled aerodromes and when ATC is operating, the WSO is required to maintain a communication link with the ATC and always be at the site. Work can be carried out on one side of the runway only and may be suspended during period of heavy aircraft operations. ATC will advise pilots of the work under certain circumstances.

8.9 At aerodromes where ATC is not operating, or at non-controlled aerodromes, similar restrictions on works activities should be followed, except a WSO should monitor aircraft operations, and ensure the works do not result in a hazard to aircraft or cause confusion to pilots.

8.10 Jet aircraft are susceptible to foreign object damage (FOD). This means that loose material must not be left on or adjacent to runways and taxiways which can be blown away or sucked up by the aircraft engines. An important aspect of restoring the work site to an operational state is to remove any loose material at the end of each work period.

8.11 The WSO is responsible for assuring the movement area is serviceable at the completion of each work period, or the overall completion of the project. If the WSO is responsible for ensuring serviceability and the person is not the aerodrome reporting officer, necessary training and competence checks should be considered for each person, as necessary.

8.12 Where aerodrome markers, marking and lighting is impacted, taken out of service, replaced, or installed, a check of each facility should be considered prior to the completion of works. Depending on the complexity of work, a checklist may be considered that has been developed in context to the nature of works being undertaken. Sample checklists for the closing and reopening of the movement area are included in Appendix 3 of this AC.

8.13 Conditions to which works may be suspended or delayed, such as weather including inclement weather, reduced visibility or aerodrome emergencies should be considered during planning, with contingencies predetermined. Ad-hoc localised reactive response to address foreseeable aerodrome conditions may be avoided by risk analysis and contingency development based on local knowledge.

8.14 Necessary equipment should be available as required to ensure movement surface cleanliness, and aerodrome facility serviceability and reduce the potential of FOD in desired timeframes and windows of proposed works.

8.15 The painting of pavement surfaces, or the application of pavement surface conditioners should include the assessment of actual or forecast weather, and the time of year to avoid excessively cold weather. The time taken for paint or surface conditioners to cure may impact the serviceability of the aerodrome and any proposed return to service at the completion of works.

8.16 Lighting used to illuminate work areas at night should be shielded or directed away from the active portion of the movement area to ensure the night vision of pilots, air traffic controllers and airside drivers is not negatively affected.

8.17 Where the closed portion of the movement area is to be reopened at the completion of each work session or when the closed area is to be reopened after works is completed, a check of FOD and other hazards should be completed.

8.18 Prior to portions of the movement area being returned to service, an appropriate person should confirm that all markings, markers and lighting are present, in a serviceable condition, are appropriate for the nature of intended operations and meet applicable standards.

8.19 Assessing feedback to proposed aerodrome works

8.19.1 Informing organisations about aerodrome works is only one aspect of ensuring aerodrome safety.

8.19.2 As part of its safety management system, or risk management plan, aerodrome operators should also follow up with checks to ensure that the procedures of relevant organisations consider the aerodrome works and do not create new risk.

8.19.3 Examples of these include revised planning for, and table-top exercise of, Aerodrome Emergency Plan (AEP) and new routes or assembly points for emergency responding agencies and airside driver awareness of restrictions arising from works.

8.19.4 A safety assessment of all planned works, and contingency planning for unplanned works, should be completed beforehand to ensure hazards to the safe operation of aircraft have been identified by the aerodrome operator in coordination with interested or affected parties, and appropriate mitigation measures are introduced to keeps risks at an acceptable level.

8.19.5 When a safety concern, change or a deviation has an impact on several aerodrome stakeholders, consideration shall be given to the involvement of all stakeholders affected in the safety assessment process. In some cases, the stakeholders impacted by the change will need to conduct a separate safety assessment themselves to fulfil the requirements of their SMSs and coordinate with other relevant stakeholders.

8.19.6 When a change has an impact on multiple stakeholders, a collaborative safety assessment should be conducted to ensure compatibility of the final solutions. Feedback on any instance where a stakeholder has been impacted by the works activities should be provided to the aerodrome operator for a post event analysis.

8.19.7 At the completion of works programs and where the works included significant RTAO, a post event analysis should be completed and any lessons learned captured for consideration in future works programs.

Appendix A
Aerodrome works safety considerations

There are so many matters to consider in the planning and execution of aerodrome works that it is easy to overlook certain matters. The purpose of this list of considerations is to allow the works planners and works supervisors to systematically double check that safety matters or necessary procedures are not overlooked.

Note: This list of considerations is general in nature and may not address unique local situations.

A.1 SMS/RMP assessment considerations

The following information is compiled of information included in the aerodrome manual, and information published in the aeronautical information package and other documents such as the master plan (where appliable). This information is used to develop and understanding of the current state of the aerodrome:

a. aerodrome layout, including runway configurations; runway length; taxiway, taxilane and apron configurations:
    i. gates; jet bridges; visual aids; and the RFF services infrastructure and capabilities
b. types of aircraft, and their dimensions and performance characteristics, intended to operate at the aerodrome
c. traffic density and distribution
d. aerodrome ground services
e. air-ground communications and time parameters for voice and data link communications
f. type and capabilities of surveillance systems and the availability of systems providing controller support and alert functions
g. flight instrument procedures and related aerodrome equipment
h. complex operational procedures, such as collaborative decision-making (CDM)
i. aerodrome technical installations, such as advanced surface movement guidance and control systems (A-SMGCS) or other air navigation aids
j. obstacles or hazardous activities at or in the vicinity of the aerodrome
k. planned construction or maintenance works at or in the vicinity of the aerodrome.

The following information is used to determined existing aircraft operations, and services provided to industry and any impact change may have to routine operations:

a. Aerodrome layout, including runway configurations; runway length; taxiway, taxilane and apron configurations.
b. Aircraft parking positions; passenger boarding bridges; visual aids; and the RFF services infrastructure and capabilities.
c. Types of aircraft, and their dimensions and performance characteristics, intended to operate at the aerodrome.
d. Aircraft traffic density and distribution.
e. Aerodrome ground services.
f. Air-ground communications and time parameters for voice and data link communications.

g. Type and capabilities of surveillance systems and the availability of systems providing controller support and alert functions.

h. Flight instrument procedures and related aerodrome equipment.

i. Complex operational procedures, such as collaborative decision-making (CDM).

j. Aerodrome technical installations, such as advanced surface movement guidance and control systems (A-SMGCS) or other air navigation aids.

k. Obstacles or hazardous activities at or in the vicinity of the aerodrome.

l. Other planned construction or maintenance works at or in the vicinity of the aerodrome.

m. Any local or regional hazardous meteorological conditions (such as wind shear).

n. Airspace complexity, ATS route structure and classification of the airspace, which may change the pattern of operations or the capacity of the same airspace.

o. Feedback from persons with experience from previous projects.

A.2 Planning of aerodrome works

In preparing for works on an aerodrome, be it for Method of Working Plan works or time-limited works, have all of the following been considered and incorporated:

- Clear identification of the scope of works.
- Clear identification of all of the facilities affected.
- Clear identification of the different stages of works.
- Clear identification of the hours of work.
- Clear identification of what happens during inclement weather.
- Clear identification of the closure times of the affected areas.
- Clear identification of the operational restrictions.
- Clear identification of the access routes to the work site.
- Clear identification of the markings required at the work site.
- Clear identification of the arrangements for protecting electrical services and control cables.
- Clear provision for airside security.
- Clear identification of the arrangements for airport emergencies.
- Clear identification of what happens in poor visibility.
- Clear identification of the limit of the works area.
- Clear identification of conditions for the marking and lighting of vehicles.
- Clear identification of the arrangements for keeping pavements clean.
- Clear identification of the maximum height of vehicles allowed on site.
- Clear identification of the conditions for excavations on site.
- Clear identification of conditions for filling of trenches.
- Clear identification of conditions for hot cutting and welding.
- Clear identification of conditions for the use of explosives on site.
- Clear identification of conditions for smoking on site
- Clear identification of conditions for parking of vehicles on site.

- Clear identification of conditions for waste control.
- Clear identification of conditions for the control of works personnel.
- Clear identification of conditions that apply at the end of the works.
- Clear identification of any obstacles created by the works.
- Clear identification of the markings to be used for marking the unserviceable areas.
- Clear identification of the Contractor carrying out the work.
- Clear identification of the Project Manager.
- Clear identification of the Work Safety Officers.
- Clear identification of the responsibilities of the Work Safety Officers.
- Clear identification of the Works Organiser.
- Clear identification of the Safety Co-ordinator.
- Clear identification of the conditions under which the MOWP can be varied.
- Clear identification of the person who has approved the MOWP.
- Clear identification of potential sources of wildlife attractants.
- A set of clear and easy to read drawings setting out the impact of the works.
- Do the drawings clearly show the limit of works?
- Do the drawings show the planned set out of temporary markers and markings?
- Do the drawings show the access routes to and from the works?

A.3 Conduct of works

In the conduct of the works, have the following been considered:

- Is there a system to audit the works to ensure MOS compliance?
- Does the system include a process for investigating incidents and accidents?
- Are the works being conducted so that there is minimal disruption to the normal operations at the aerodrome?
- Are the access routes being followed to and from the work site?
- Are the access routes adequately supervised?
- Are the markings for the work site obvious?
- Are the markings for electrical services and control cables adequate?
- Are the provisions for airside security enough?
- Are staff aware of what happens in reduced visibility?
- Are the markings and lighting of vehicles adequate?
- Are pavements used or crossed during the work being kept clean?
- Are the controls on the maximum height of vehicles on site adequate?
- Are there adequate controls over excavations on site?
- Are trenches being filled correctly?
- Are the controls on hot cutting and welding adequate?
- Are the controls over smoking on site working?

- Are the controls of parking of vehicles on site enough?
- Do the waste control methods prevent FOD?
- Are the controls over works personnel adequate?

A.4 Works safety officer

In terms of the aviation safety management of the work site, are the following requirements for works supervision being met:

- Has a works aviation safety officer been trained to the requirements of the Part 139 MOS?
- Have the aviation works safety officer/s been formally appointed?
- Are there adequate numbers of aviation works safety officers to cover all aspects of the works: i.e. access gates, access routes, escorts, site supervision?
- Do the aviation works safety officers have a radio to communicate with ATC and/or aircraft?
- Does the works organiser understand the role of the work safety officer?
- Do the aviation work safety officers have communication facilities between each other (where there is more than one WSO)?
- Where there is two or more aviation works safety officers on duty, has a person been allocated as a responsible person?
- Does the works safety officer have a formal reporting process?
  - A reporting system may include:
    - » safety incident on the worksite
    - » safety incident outside the worksite
    - » emergency activations on the worksite
    - » non-compliance to procedures
    - » activation, cancellation or deviation of agents engaged in the works
    - » aviation incident that elevated risk or hazard to the work activities or those engaged in the works
    - » any incident of damage to facilities and anything that may affect the safety of aircraft operations.

Note: To avoid confusion between various forms of safety requirements, the function of the aviation works safety officer relates to their function under Part 139 of the CASR, and the Part 139 MOS, unless otherwise appointed by the aerodrome operator for those other functions.

Appendix B
Revised declared distances

B.1 Example 1: Calculation of declared distances – STODA example - Landing for works in progress on a runway

Figure 12: Calculation of declared distances – Supplementary take-off climb surface for works in progress on a runway demonstrates the threshold of Runway 25 displaced to ensure a standards 2% take-off climb surface gradient and 2% landing surface gradient, with collocated origins, is achieved. This is typically required for a Code 3 or Code 4 instrument runway.

The user should determine where the 2% gradient intersects the runway and check whether the position satisfies the RESA requirement. If the unobstructed slope over the obstacle 2%, a standard take-off climb surface is achieved. If not, relocate the temporary runway strip end if possible.

The distance from the take-off runway end to the temporary Runway 07 strip end is the difference between the TORA and TODA. For a Code 3 or Code 4 instrument runway, reduce 60 m from the temporary strip end to establish the temporary runway end. In the example provided, TORA, ASDA and LDA are the same and terminate at this chainage. If the Runway 07 threshold is permanently displaced, the LDA would be different.

Note: For a TODA having an obstacle clear gradient of more than 1.6%, the STODA must be reported for obstacle clear take-off gradients of 1.6%, 1.9%, 2.2%, 2.5%, 3.3% and 5%, up to the gradient associated with the TODA, unless the corresponding STODA for a particular gradient is less than 800 m. In calculating the STODA, care must be taken to ensure that a shielded object does not become critical for the lesser take-off distances, and that the slope of the runway is considered.

B.2 Example 2: Calculation of declared distances – STODA examples - works in progress on a runway

As demonstrated in Figure 13: Calculation of declared distances – STODA examples – due to works in progress on a runway, supplementary take-off distances should be established for the gradients of 1.6%, 1.9%, 2.2%, 2.5% and 3.3%, nothing that if the length of the runway is 800 m or less, that gradient should be excluded. In this example, a gradient of 1.6% would result in a runway length of less than 800 m.

Any changes to permanently published TODA and STODA for each runway will require a NOTAM to be current for the period of runway displacement and changes to runway declared distances.

Note: In the following images, the end of runway strip is marked with unserviceability markers. The start of take-off runway available (TORA) commences 60 m from the temporary runway strip end. The start of TORA is co-located with the temporary displaced threshold.

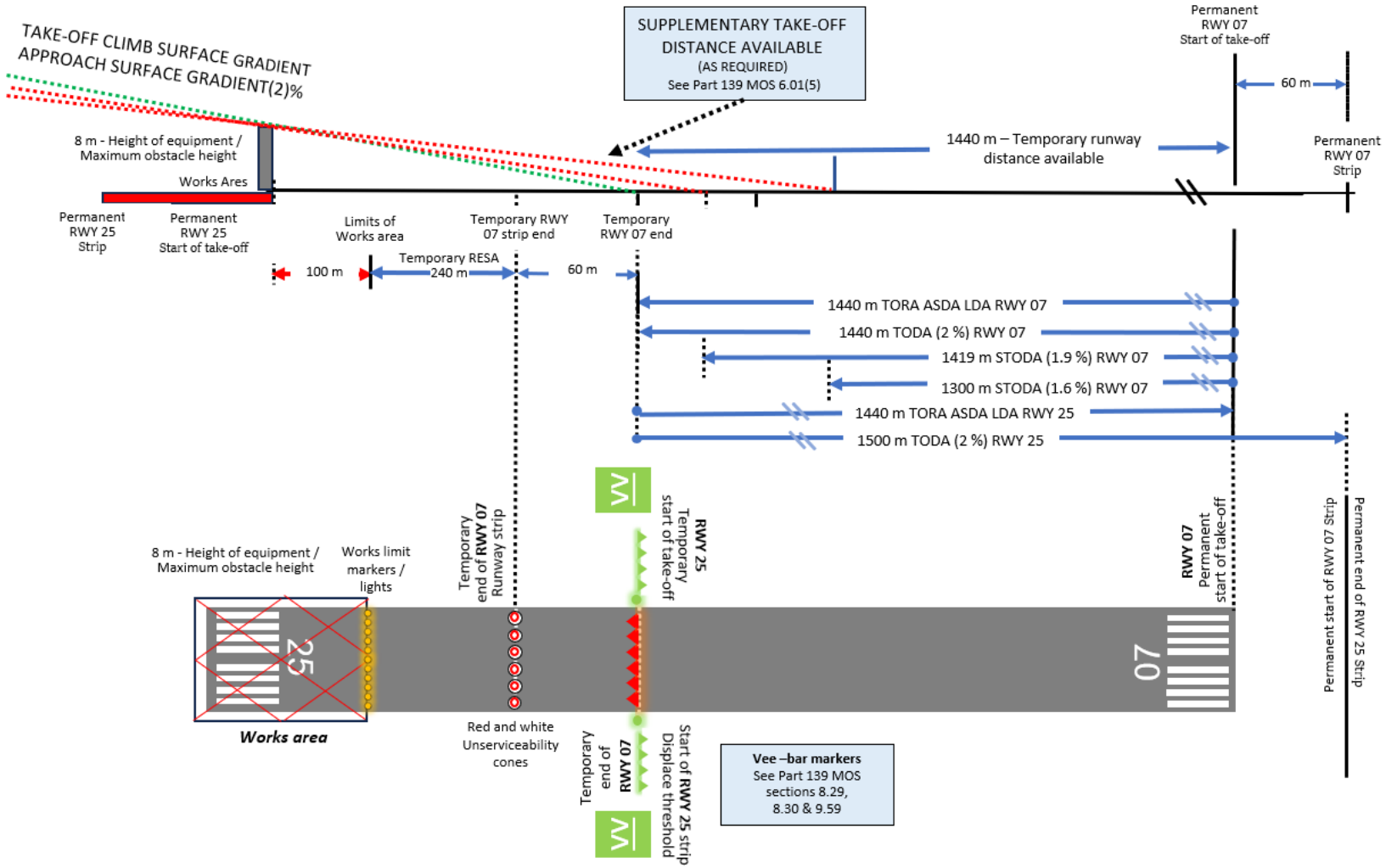


Figure 12: Calculation of declared distances – Supplementary take-off climb surface for works in progress on a runway

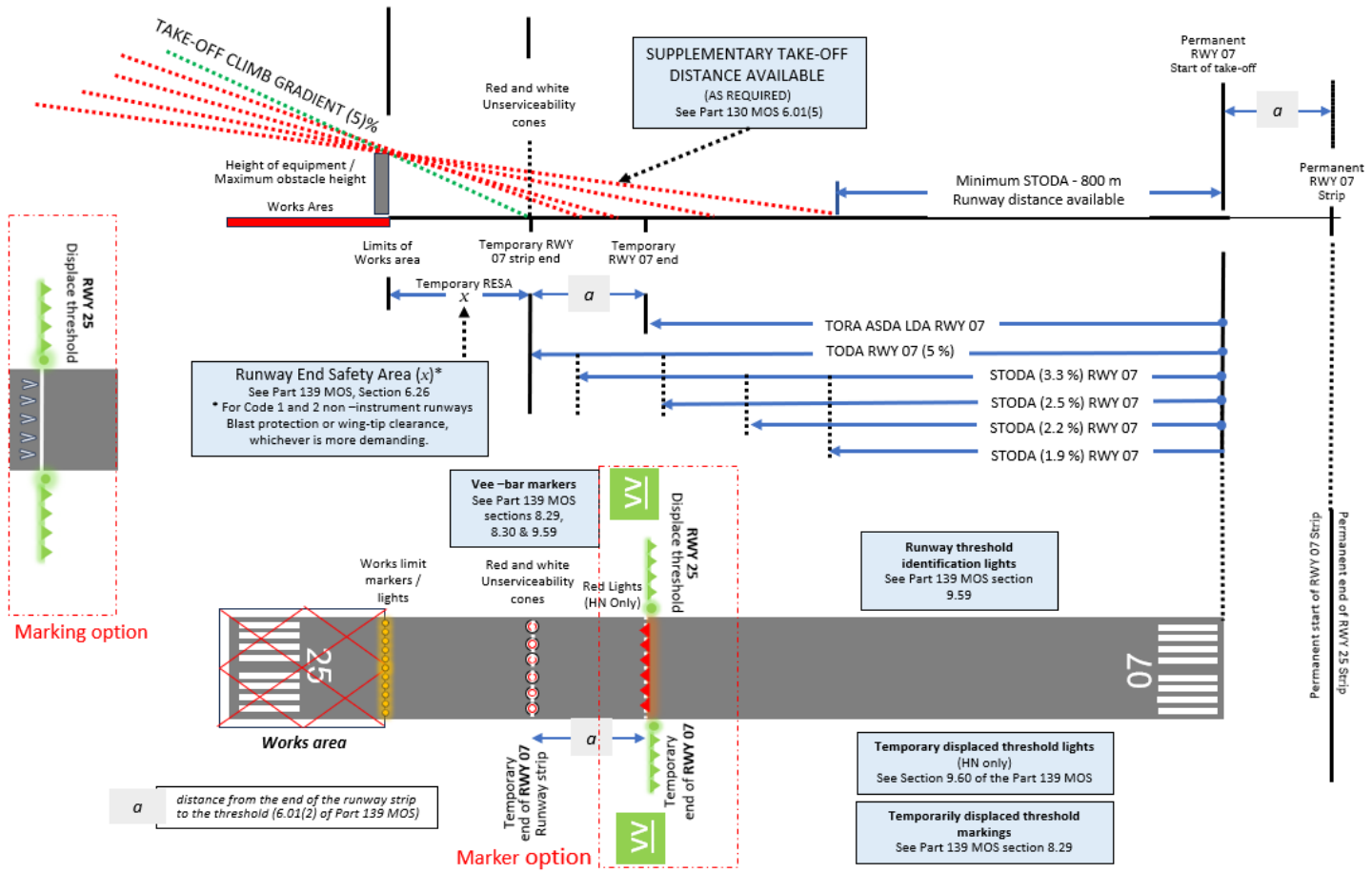


Figure 13: Calculation of declared distances – STODA examples – due to works in progress on a runway

Note: Drawings are not to scale – these drawings are indicative examples.

Appendix C
Sample worksite checklist

C.1 Worksite checklist: Worksite setup / Movement area closure

MOWP No: (or other works identifier)	
NOTAM No:	
WSO name:	
Date:	
Time:	
Location:	
Work activities:	

Table 12: Sample worksite checklist

Task	Sample only	Task completed
1	Participate in pre works toolbox talks or briefing sessions.	
2	Ensure work clearance with ATC (if applicable), and apron users advised of parking positions(s) affected.	
3	Close area with ATS ATC (if applicable) – either ground or tower frequency.	
4	Inform fire service (if applicable) and aerodrome users affected by movement areas impact.	
5	Isolate the works area with markers / barriers / lights.	
6	Mask movement area guidance signs (as necessary and if applicable).	
7	Ensure runway/taxiway centre lines lights or edge lights are blacked out (for night work).	
8	Check clearances from runway, taxiway or taxilane centrelines to worksite fencing and height of fence or hoarding.	
9	Verify worksite lighting is not a hazard to aircraft operations (for night work).	
10	Ensure or verify safe route for works party / contractor to and from site.	

C.2 Worksite checklist: Worksite setup / Movement area reopening

MOWP No: (or other works identifier)	
NOTAM No:	
WSO name:	
Date:	
Time:	
Location:	
Work activities:	

Table 13: Sample worksite checklist

Task	Sample only	Task completed
1	Verify that pavement surface is sound and clean and clear of FOD.	
2	Verify that light fittings are secure and clean.	
3	Ensure all pit lids are closed.	
4	Verify grass areas are clear of FOD.	
5	Verify that grass areas are reinstated and secure from aircraft blast.	
6	Inspect reinstated runway/taxiway lighting routes.	
7	Ensure runway/taxiway centre lines are reinstated.	
8	Final sweep of area.	
9	Remove barriers and reopen area with ATC (if applicable).	
10	Inform operators of the reopening of the movement area.	
11	Confirm status of NOTAM.	

Appendix D
Safety assessment methodologies for aerodromes

Where an aerodrome certificate includes the requirement for a Safety Management System (SMS) or Risk Management Plan (RMP), the SMS or RMS will include a safety assessment methodology. Where the aerodrome certificate does not require an SMS or RMS, the aerodrome operator should ensure an appropriate safety assessment methodology is considered.

The method for risk evaluation is strongly dependent on the nature of the hazards. The risk itself is evaluated by combining the 2 values for severity of its consequences and probability of occurrence.

Once each hazard has been identified and analysed in terms of causes, and assessed for severity and probability of its occurrence, it must be ascertained that all associated risks are appropriately managed. An initial identification of existing mitigation measures must be conducted prior to the development of any additional measures.

All risk mitigation measures, whether currently being applied or still under development, are evaluated for the effectiveness of their risk management capabilities.

Note: Further guidance on safety risk probability, severity, tolerability and assessment matrix can be found in Doc 9859 — Safety Management Manual (SMM) or CASA AC 139.C-26 Safety management systems for aerodromes.

Depending on the nature of the risk, three methodologies can be used to evaluate whether it is being appropriately managed:

1. **Method type 'A':**

For certain hazards, the risk assessment strongly depends on specific aeroplane operations and/or system performance. The risk level is dependent upon aeroplane operations/system performance (e.g. more accurate navigation capabilities), handling qualities and infrastructure characteristics. Risk assessment, then, can be based on aeroplane operation/ aerodrome certification requirements, feedback from users or those that could be affected or accident/incident analysis.

2. **Method type 'B':**

For other hazards, risk assessment is not really linked with specific aeroplane operations and/or system performance but can be derived from existing performance measurements. Risk assessment, then, can be based on statistics (e.g. deviations) from existing operations or on accident analysis; development of generic quantitative risk models can be well adapted.

3. **Method type 'C':**

In this case, a “risk assessment study” is not needed. A simple logical argument may be sufficient to specify the infrastructure, system or procedure requirements, without waiting for additional material. This may be appropriate at an aerodrome with low aircraft traffic, air transport operations are not undertaken, and the aerodrome facility is not complex.

Appendix E
NOTAM coding

The NOTAM Code is a comprehensive description of information contained in NOTAM. It serves as an important criterion for storage and retrieval of information, for deciding whether an item is of operational significance or not and establishes the relevance of the NOTAM to flight operations and determines whether it must be part of a pre-flight information bulletin.

The second and third letters identify the subject reported upon. Table 14 is a list of the second and third letter codes of the five letter NOTAM code.

> **Note:** Where more than one subject could be identified by the same self-evident code, the most important subject is chosen.

Table 14: NOTAM coding - Second and third letters

Code	AGA Lighting facilities	Code	AGA Movement and landing area
LB	Aerodrome beacon .	MK	Parking area.
LR	All landing area lighting facilities.	MY	Rapid exit taxiway (specify).
LA	Approach lighting system (specify runway and type).	MR	Runway (specify runway).
LK	Category II components of approach lighting system (specify runway).	MH	Runway arresting gear (specify runway).
LU	Helicopter approach path indicator.	MU	Runway turning bay (specify runway).
LW	Heliport lighting heliport.	MO	Stopbar (specify taxiway).
LH	High intensity runway lights (specify runway).	MS	Stopway (specify runway).
LD	Landing direction indicator lights.	MW	Strip/shoulder (specify runway).
LL	Low intensity runway lights (specify runway).	MG	Taxiing guidance system.
LM	Medium intensity runway lights (specify runway).	MX	Taxiway(s) (specify).
LG	Pilot-controlled lighting.	MT	Threshold (specify runway).
LP	Precision approach path indicator (specify runway).		
LJ	Runway alignment indicator lights (specify runway).		**AGA** **Facilities and services**

Code	AGA Lighting facilities	Code	AGA Movement and landing area
LC	Runway centre line lights (specify runway).		
LE	Runway edge lights (specify runway).	FA	Aerodrome.
LI	Runway end identifier lights (specify runway).	FI	Aircraft de-icing (specify).
LZ	Runway touchdown zone lights (specify runway).	FC	Ceiling measurement equipment.
LF	Sequenced flashing lights (specify runway).	FZ	Customs/immigration.
LS	Stopway lights (specify runway).	FD	Docking system (specify AGNIS, BOLDS, etc.) .
LX	Taxiway centre line lights (specify taxiway).	FF	Firefighting and rescue fire and rescue.
LY	Taxiway edge lights (specify taxiway).	FO	Fog dispersal system.
LT	Threshold lights (specify runway).	FB	Friction measuring device (specify type).
LV	Visual approach slope indicator system (specify type and runway).	FU	Fuel availability.
		FG	Ground movement control.
AGA Movement and landing area		FH	Helicopter alighting area/platform.
		FP	Heliport.
MP	Aircraft stands (specify).	FL	Landing direction indicator.
MN	Apron.	FM	Meteorological service (specify type).
MB	Bearing strength (specify part of landing area or movement area).	FJ	Oils (specify type).
MC	Clearway (specify runway).	FE	Oxygen (specify type).
MM	Daylight markings (specify threshold, centre line, etc.).	FS	Snow removal equipment .
MD	Declared distances (specify runway).	FT	Transmissometer (specify runway and, where applicable, designator(s) of transmissometer(s)).
MA	Movement area.	FW	Wind direction indicator.

The NOTAM Code is a comprehensive description of information contained in NOTAM. It serves as an important criterion for storage and retrieval of information, for deciding whether an item is of operational

significance or not and establishes the relevance of the NOTAM to flight operations and determines whether it must be part of a pre-flight information bulletin.

The fourth and fifth letters denote its status of operation. Table 15 is a list of the fourth and fifth letter codes of the five letter NOTAM code.

> **Note:** Where more than one subject could be identified by the same self-evident code, the most important subject is chosen.

Table 15: NOTAM coding - Fourth and fifth letters

Code	Availability	Code	Hazard Conditions
AD	Available for daylight operation.	HH	Hazard due to (specify).
AN	Available for night operation.	HU	Launch in progress . . . (specify balloon flight identification or project code name, launch site, date/time of launch(es), estimated time passing 18,000 m (60,000 ft), or reaching cruising level if at or below 18,000 m (60, 000 ft), together with estimated location, estimated date/time of termination of the flight and planned location of ground contact, when applicable)
AR	Available on request.		
AP	Available, prior permission required.		
AW	Completely withdrawn.		
AF	Flight checked and found reliable.		
AH	Hours of service are now . . . (specify).		
AM	Military operations only.		
AU	Not available (specify reason if appropriate).		
AG	Operating but ground checked only, awaiting flight check.	HJ	Launch planned . . . (specify balloon flight identification or project code name, launch site, planned period of launch(es) — date/time, expected climb direction, estimated time to pass 18,000 m (60, 000 ft), or reaching cruising level if at or below 18,000 m (60,000 ft), together with estimated location)
AO	Operational .		
AL	Operative (or reoperative) subject to previously published limitations/conditions.		
AX	Previously promulgated shutdown has been cancelled.		
AK	Resumed normal operation.		
AS	Unserviceable.		
AC	Withdrawn for maintenance.		
Changes		HM	Marked by.
CA	Activated.	HO	Obscured by snow.
CN	Cancelled.	HQ	Operation cancelled . . . (specify balloon flight identification or project code name).

Code	Availability	Code	Hazard Conditions
CH	Changed.	HS	Sanding in progress.
CC	Completed.	HY	Snow banks exist (specify height).
CD	Deactivated.	HL	Snow clearance completed.
CM	Displaced.	HP	Snow clearance in progress.
CG	Downgraded to.	HR	Standing water.
CE	Erected.	HF	Totally free of snow and ice.
CI	Identification or radio call sign changed to.	HV	Work completed.
CS	Installed.	HW	Work in progress.
CT	On test, do not use.	**Limitations**	
CO	Operating.		
CF	Operating frequency(ies) changed to.	LR	Aircraft restricted to runways and taxiways.
CP	Operating on reduced power .	LC	Closed.
CL	Realigned.	LN	Closed to all night operations.
CR	Temporarily replaced by.	LI	Closed to IFR operations.
Hazard Conditions		LV	Closed to VFR operations.
		LF	Interference from.
HT	Approach according to signal area only.	LT	Limited to.
HK	Bird migration in progress (specify direction).	LK	Operating as a fixed light.
HA	Braking action is . . .	LX	Operating but caution advised due to.
1)	Poor.	LA	Operating on auxiliary power supply.
2)	Medium/Poor.	LE	Operating without auxiliary power supply.
3)	Medium.	LG	Operating without identification.
4)	Medium/Good.	LP	Prohibited to.
5)	Good.	LB	Reserved for aircraft based therein.
HX	Concentration of birds.	LS	Subject to interruption.
HC	Covered by compacted snow to a depth of.	LD	Unsafe.

Code	Availability	Code	Hazard Conditions
HD	Covered by dry snow to a depth of.	LH	Unserviceable for aircraft heavier than.
HZ	Covered by frozen ruts and ridges.	LL	Usable for length of . . . and width of . . .
HI	Covered by ice.	LW	Will take place.
HE	Covered by water to a depth of.	**Other**	
HN	Covered by wet snow or slush to a depth of.		
HB	Friction coefficient is . . . (specify friction measuring device used).	XX	Plain language.
HG	Grass cutting in progress.		

Appendix F
Sample NOTAM request form for temporarily reduced length runway distances

This example demonstrates a NOTAM for reduced length runway operations, in this instance due to a displaced threshold. The information requested in this example is the only information that should submitted to the Notam Office.

The NOTAM request may include a recommended Q Code.

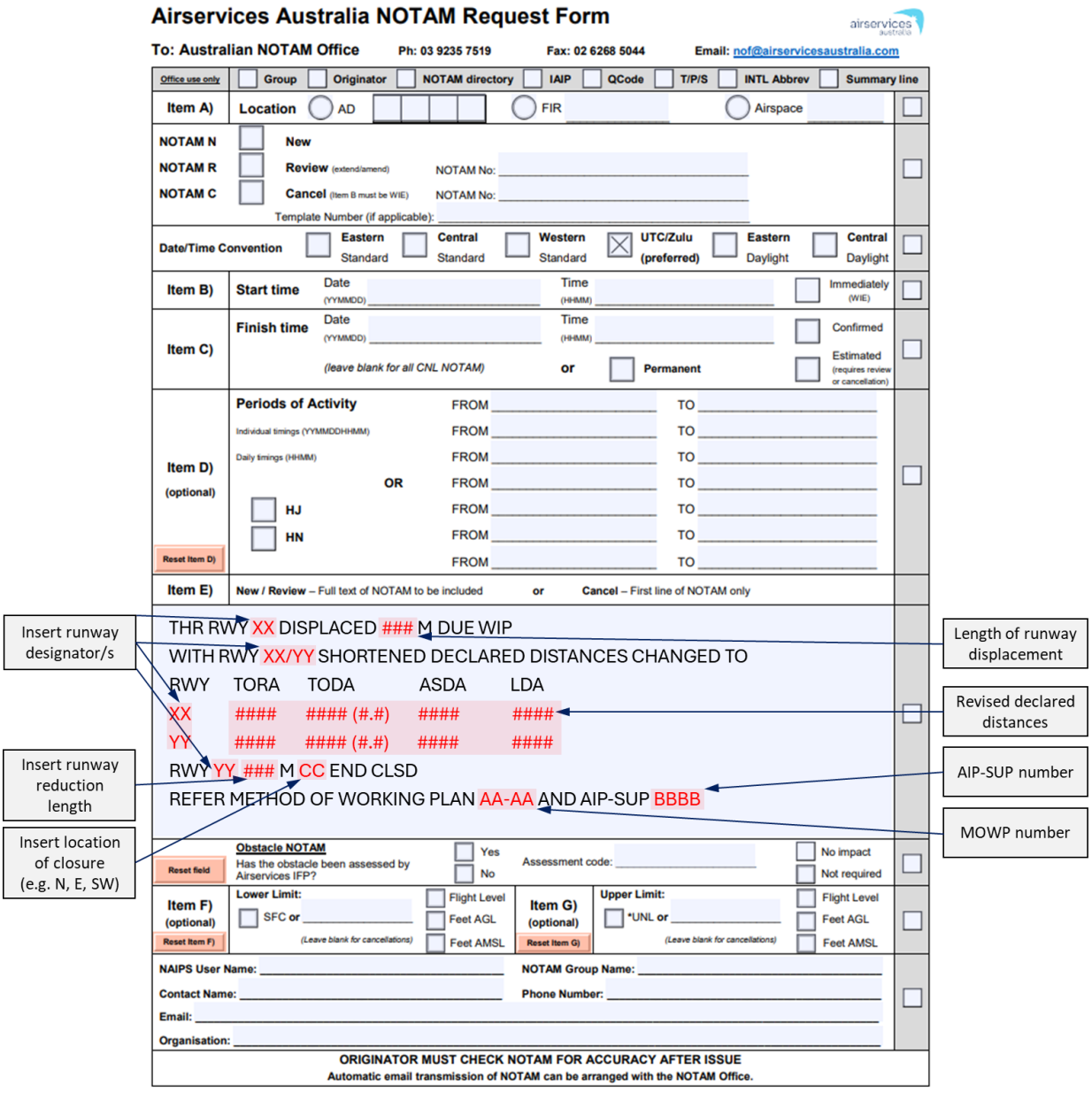


Figure 14: Sample NOTAM request form for temporarily reduced length runway distances