RA 3590 - Maintenance and Safeguarding

Rationale

An Aerodrome or Helicopter Landing Site (HLS) is intended to be a safe place for Aircraft to operate from. Inadequate Maintenance and safeguarding of Aerodrome facilities could increase Aviation Risk to Life and be instrumental in Aircraft Occurrences. Appropriate Maintenance and safeguarding of an Aerodrome or HLS will ensure that all Aerodromes and HLS continue to meet functional requirements and Regulations and ensure that whole life costs and disruption to Aircraft operations are minimized.

Contents

Regulation 3590(1)

Maintenance - General

3590(1) Heads of Establishments (HoEs) and Aviation Duty Holder-Facing organizations (ADH-Facing organizations) **shall** ensure that an appropriate Maintenance programme, including preventive and reactive / corrective Maintenance, is established at an Aerodrome and / or HLS to maintain facilities in a condition which does not impair the Safety, or efficiency of air navigation and operation on the ground.

Acceptable Means of Compliance 3590(1)

Maintenance - General

1. The design and application of the Maintenance programme **should** observe Human Factors principles in accordance with (iaw) the Human Factors Training Manual (International Civil Aviation Organization (ICAO) Doc 9683) and in the Airport Services Manual (ICAO Doc 9137), Part 8.

Guidance Material 3590(1)

Maintenance - General

2. Preventive Maintenance is programmed Maintenance work done in order to prevent a failure or degradation of facilities.

3. “Facilities” are intended to include such items as pavements, visual aids, fencing, drainage systems, electrical systems and buildings.

Civil Equivalence

4. This Regulation is in line with ICAO Annex 14 Vol I para 10.1.1 – 10.1.2.

Regulation 3590(2)

Maintenance - Pavements - Friction

3590(2) HoEs and ADH-Facing organizations **shall** ensure that the surfaces of all Runways have their friction conditions monitored regularly as part of an Aerodrome preventive and corrective Maintenance programme.

Acceptable Means of Compliance 3590(2)

Maintenance - Pavements - Friction

5. The surface of a Runway **should** be maintained in a condition such as to prevent formation of harmful irregularities and Foreign Object Debris (FOD).

6. A paved Runway **should** be maintained in a condition so as to provide surface friction characteristics at or above the minimum friction level specified by the MOD.

7. Runway surface friction characteristics for Maintenance purposes **should** be periodically measured with a MOD specialist approved continuous friction measuring device, and documented. The frequency of these measurements **should** be sufficient to determine the trend of the surface friction characteristics of the Runway.

8. Corrective Maintenance action **should** be taken to prevent the Runway surface friction characteristics for either the entire Runway or a portion thereof from falling below a minimum friction level specified in ICAO Annex 14 Vol I Attachment A, section 7.

9. Aerodromes **should** carry out 3 types of Runway friction testing:

   a. Runway Friction Classification Surveys (organized centrally by a MOD Specialist).

   b. Runway Friction Monitoring Surveys (organized and undertaken by Air Traffic Control (ATC) locally).

   c. Special Friction Surveys (organized centrally by an MOD Specialist).

10. As described in Annex A, procedures for special friction surveys **should** be detailed by the MOD specialists on a case-by-case basis.

11. The Maintenance Planning Level (MPL) and Minimum Friction Level (MFL)[1] **should** be as presented in Annex A.

12. Aerodromes **should** record friction survey reports using the templates presented in Annex A. All data and reports **should** be retained by the Aerodromes.

   a. Average friction reading of each track **should** be correctly identified, and highlights of significant features of the test detailed.

   b. Friction values **should** be marked on a plan of the Runway showing exact location and friction values as measured.

   c. The following photographs **should** be taken (each close-up photograph is to include a scale rule within the shot):

      (1) Location shot showing complete extent of rubber deposits at each Runway end (not required for night surveys);

      (2) Close-up of rubber deposits (not required for night surveys);

      (3) Close-up of Runway surface; and

      (4) Any significant features on the Runway surface (not required for night surveys).

13. Where the measured friction value of a portion of a Runway has deteriorated to the MFL value or less, the Runway **should** be notified as “liable to be slippery when wet”.

14. When a Runway is notified as “liable to be slippery when wet”, take-off and landing in wet conditions **should** only be considered when the distances available

[1] Refer to CAP 683: The Assessment of Runway Surface Friction Characteristics.

Acceptable Means of Compliance 3590(2)

equal or exceed those required for a very slippery or icy Runway as determined from the information in the Aircraft's Flight Manual.

Guidance Material 3590(2)

Maintenance - Pavements - Friction

15. The determination of Maintenance / restoration requirements to ensure that pavements remain safe for Aircraft operations is dependent on Airfield pavement evaluation procedures involving professional surveys, site testing and investigations. Procedures may also include Runway friction classification and monitoring surveys. Both the monthly and biennial pavement inspections are limited to surface condition assessments. However, if either unanticipated or abnormal distresses are noted, further and more detailed site investigations may be required.

16. The inherent friction characteristics of a paved surface deteriorate slowly over time. However, the friction of a Runway surface and the related braking action can vary significantly over a short period due to the presence of contaminants eg snow, ice, slush and water.

Civil Equivalence

17. This Regulation is in line with ICAO Annex 14 Vol I para 10.2.1 – 10.2.7.

Regulation 3590(3)

Maintenance - Pavements - Inspection

3590(3) HoEs and ADH-Facing organizations **shall** ensure that the surfaces of all movement areas including pavements (Runways, taxiways and Aprons) and adjacent areas (hardstandings, hangar floors, Hardened Aircraft Shelter floors, wash platforms etc) are inspected and their conditions monitored regularly as part of an Aerodrome and / or HLS preventive and corrective Maintenance programme.

Acceptable Means of Compliance 3590(3)

Maintenance - Pavements - Inspection

18. The surface of all movement areas **should** be maintained in a condition such as to prevent formation of harmful irregularities, harmful defects or FOD.

19. The surface condition of all Airfield Operating Surfaces in current use **should** be periodically visually inspected to ensure that dangerous surface and other defects are identified in sufficient time to enable them to be rectified to prevent damage to airframes using that surface.

20. The following types of visual inspection **should** be carried out:

a. Monthly inspections (undertaken by the site Maintenance organization iaw Defence Infrastructure Organisation (DIO) Practitioner Guide PG 06/11).

b. Biennial Inspections (organized and undertaken by the MOD specialist or their approved consultant).

21. Standard of Repairs: All Repairs undertaken on any operating surface **should** comply with the recommendations set out in Defence Works Functional Standard 06 Guide to Airfield Pavement Maintenance ("FS06").

Guidance Material 3590(3)

Maintenance - Pavements - Inspection

22. The determination of Maintenance / restoration requirements to ensure that pavements remain safe for Aircraft operations is dependent on Aerodrome and / or HLS pavement evaluation procedures involving professional surveys and site testing and investigations. Procedures may include monthly and biennial inspections of pavement surfaces and Runway friction classification and monitoring surveys. Monthly inspections are carried out by Aerodrome Maintenance staff as a regular check on pavement condition and also to aid determination of short-term Maintenance

Guidance Material 3590(3)

requirements and to check works undertaken / completed. Biennial inspections are carried out by specialist teams mainly for the purpose of providing long-term strategic Maintenance / restoration work forecasts but also to provide Assurance of the short-term Maintenance planning process.

23. The functional requirements and the evaluation / assessment of pavements in relation to the various distress types provide the basic technical inputs for producing optimum design / Maintenance solutions. Minor and / or preventative measures in many instances can provide a cost-effective means of complying with the functional requirements. However, the stringency of the functional requirements including future access constraints will have a considerable bearing on the latitude for ongoing Maintenance / small works programmes and also on options for restoration / major works.

24. For guidance on Maintenance measures including their application, reference can be made to Defence Works Functional Standards 06 - "Guide to Airfield Pavement Maintenance FS06". MOD specialists can provide design advice in relation to the distress mechanisms. Site Maintenance organizations are free to propose alternative techniques and / or materials to those set out in FS06 although these will be evaluated by the MOD specialist on a site by site basis.

Regulation 3590(4)

Maintenance - Pavements - Removal of Contaminants

3590(4) HoEs and ADH-Facing Organizations **shall** ensure that ►contaminants on the Movement Area are adequately managed to enable the safe operation of Aircraft at all times.◄

Acceptable Means of Compliance 3590(4)

Maintenance - Pavements - Removal of Contaminants

25. ►Contaminants, such as snow, slush and ice **should** be addressed iaw RA 3278[2].

26. Other temporary contaminants, such as mud or sand, **should** be removed as soon as practicable to minimize accumulation, which can be achieved through routine or ad hoc sweeping operations.

27. Contaminants from Aircraft and / or vehicles, such as fuel or oil, **should** be subject to environmental management iaw RA 1800[3] and removed as soon as possible to minimize environmental impact and damage to the affected surface.

28. The presence of cumulative contaminants, such as rubber deposits, **should** be monitored through routine inspections and friction testing to avoid accumulations. Such contaminants **should** be removed as soon as practicable, noting that specialist equipment is likely to be required and **should** be factored into the routine Maintenance of the Movement Area.

29. The use of chemicals for the removal of contaminants **should** be subject to environmental management iaw RA 1800.◄

30. The friction of the area treated **should** be measured periodically after the contaminants are removed, ►iaw RA 3272(1)[4].

31. The evaluation and reporting of Runway surface conditions **should** be carried out iaw RA 3272(2)[5].◄

[2] ►Refer to RA 3278 – Snow and Ice Operations.
[3] Refer to RA 1800 – Aerodrome and Air Weapon Range Aviation Activity - Management of Environmental Impacts and Risks.
[4] Refer to RA 3272(1): Continuous Friction Measuring Equipment.
[5] Refer to RA 3272(2): Reporting of Runway Surface Conditions.◄

Guidance Material 3590(4)

Maintenance - Pavements - Removal of Contaminants

32. ►Further guidance on the control and removal of contaminants is contained in ICAO Doc 9137 – Airport Services Manual, Part 2[6] and CAP 168 – Licensing of Aerodromes, Appendix 3G[7].◄

Civil Equivalence

33. This Regulation is in line with ICAO Annex 14 Vol I ►ninth edition,◄ para 10.3.1 – 10.3.6.

Regulation 3590(5)

Maintenance - Inspections - Measured Height Surveys

3590(5) HoEs and ADH-Facing organizations **shall** ensure that Measured Height Surveys are completed.

Acceptable Means of Compliance 3590(5)

Maintenance - Inspections - Measured Height Surveys

34. A Measured Height Survey **should** be completed annually, or at frequencies determined iaw Civil Aviation Publication (CAP) 232[8] or CAP 1732[9] as applicable.

35. Professional inspection of the pavement and visual aids services and associated infrastructure at an Aerodrome **should** be carried out at suitable frequency.

Guidance Material 3590(5)

Maintenance - Inspections - Measured Height Surveys

36. Nil.

Regulation 3590(6)

Maintenance - Inspections - Compass Calibration Bases Periodic Surveys and Annual Checks

3590(6) HoEs and ADH-Facing organizations **shall** ensure that all visual aids equipment, installation and facilities including supporting infrastructures and facilities **shall** be inspected and, as applicable, their conditions and performances be measured, tested and monitored regularly as part of an Aerodrome preventive and corrective Maintenance programme, with the objective of achieving the high levels of reliability of visual aids to properly support Aerodrome operation and to maintain Safety.

Acceptable Means of Compliance 3590(6)

Maintenance - Inspections - Compass Calibration Bases Periodic Surveys and Annual Checks

37. The officer responsible for Aircraft compass swinging, normally the Station Navigation Officer, is also responsible for the periodic, resurvey and annual check of the compass calibration base. In addition, they are to ensure that the station services are aware that paving Repairs **should** be carried out using materials approved by QinetiQ, MOD Portland Bill. They **should** also notify QinetiQ, Land Magnetic Facilities at the earliest opportunity of any planned work within 200 m of the centre of the compass base.

38. Periodic surveys of all compass bases **should** be undertaken by staff from QinetiQ, Land Magnetic Facilities. Class 1 bases **should** be re-surveyed every 5 years. However, Class 2 bases are normally subject to magnetic anomalies, the effects of which are liable to change with time; these bases **should** therefore be re-surveyed every 2 years.

[6] ►Refer to ICAO Doc 9137 – Airport Services Manual, Part 2.
[7] Refer to CAP 168 – Licensing of Aerodromes.◄
[8] Refer to CAP 232 – Aerodrome Survey Information.
[9] Refer to CAP 1732 – Aerodrome Survey Guidance.

Acceptable Means of Compliance 3590(6)

39. At least once a year, the officer responsible for the compass calibration base **should** visit the base to check:

a. That the datum compass circle is clearly and adequately marked.

b. That no work has been carried out on or around the compass base which might alter its magnetic properties. Any suspect areas **should** be subjected to a detailed magnetic survey.

c. That no magnetic objects such as metal chocks, fire extinguishers, reinforced concrete or cables have been placed within the site.

40. If any doubts about the magnetic integrity of the compass base arise during the annual check or at any time, the officer responsible for the base **should** contact QinetiQ, Land Magnetic Facilities for advice.

Guidance Material 3590(6)

Maintenance - Inspections - Compass Calibration Bases Periodic Surveys and Annual Checks

41. Nil.

Regulation 3590(7)

Maintenance - Visual Aids

3590(7) HoEs and ADH-Facing organizations **shall** ensure that a system of preventive Maintenance of visual aids is employed to ensure lighting and marking system reliability.

Acceptable Means of Compliance 3590(7)

Maintenance - Visual Aids

42. When in use, the operational status of the Aeronautical Ground Lighting (AGL) system **should** be continuously monitored. An appropriate means of detecting an AGL system failure or Fault and other serviceability information **should** be provided. The AGL system serviceability information **should** be provided to the AGL operator in a simple but accurate and concise way, so that if necessary the user can pass a report to Aircrew. The report will enable Aircrew to determine whether the AGL meets their current operational flight requirements or not.

43. A light **should** be deemed to be unserviceable when the main beam average intensity is less than 50% of the value specified. For light units where the designed main beam average intensity is above the design value, the 50% value **should** be related to that design value. Where more than one light is used in a unit, the unit is considered to be unserviceable if its light output is similarly reduced.

44. The system of preventive Maintenance employed for a Runway **should** include at least the following checks:

a. Visual inspection and in-field measurement of the intensity, beam spread and orientation of lights included in the approach and Runway lighting systems;

b. Control and measurement of the electrical characteristics of each circuitry included in the approach and Runway lighting systems; and

c. Control of the correct functioning of light intensity settings used by ATC.

45. In-field measurement of intensity, beam spread and orientation of lights included in approach and Runway lighting systems for a Runway **should** be undertaken by measuring all lights, as far as practicable, to ensure conformance with the applicable specification.

46. Measurement of intensity, beam spread and orientation of lights included in approach and Runway lighting systems for a Runway **should** be undertaken using a mobile measuring unit of sufficient accuracy to analyse the characteristics of the individual lights.

47. The frequency of measurement of lights for a Runway **should** be based on traffic density, the local pollution level, the reliability of the installed lighting equipment and the continuous assessment of the results of the in-field measurements but, in any

Acceptable Means of Compliance 3590(7)

event, for CAT II and III and LV Operations, the measurement **should not** be less than twice a year for in-pavement lights and not less than once a year for other lights.

48. The system of preventive Maintenance employed for a precision approach Runway Category II or III **should** have as its objective that, during any period of Category II or III operations, all approach and Runway lights are serviceable and that, in any event, at least:

a. 95% of the lights are serviceable in each of the following particular significant elements:

(1) Precision approach category II and III lighting system, the inner 450 m;

(2) Runway centre-line lights;

(3) Runway threshold lights; and

(4) Runway edge lights;

b. 90% of the lights are serviceable in the touchdown zone lights;

c. 85% of the lights are serviceable in the approach lighting system beyond 450 m; and

d. 75% of the lights are serviceable in the Runway end lights.

49. In order to provide continuity of guidance, the allowable percentage of unserviceable lights **should not** be permitted in such a way as to alter the basic pattern of the lighting system. Additionally, an unserviceable light **should not** be permitted adjacent to another unserviceable light, except in a barrette or a crossbar where two adjacent unserviceable lights may be permitted.

50. The system of preventive Maintenance employed for a stop bar provided at a Runway-holding position used in conjunction with a Runway intended for operations in Runway Visual Range (RVR) conditions less than a value of 350 m **should** have the following objectives:

a. No more than two lights will remain unserviceable; and

b. Two adjacent lights will not remain unserviceable unless the light spacing is significantly less than that specified.

51. The system of preventive Maintenance employed for a taxiway intended for use in RVR conditions less than a value of 350 m **should** have as its objective that no two adjacent taxiway centre-line lights be unserviceable.

52. The system of preventive Maintenance employed for a precision approach Runway Category I **should** have as its objective that, during any period of Category I operations, all approach and Runway lights are serviceable and that, in any event, at least 85% of the lights are serviceable in each of the following:

a. Precision approach Category I lighting system;

b. Runway threshold lights;

c. Runway edge lights; and

d. Runway end lights.

53. In order to provide continuity of guidance an unserviceable light **should not** be permitted adjacent to another unserviceable light unless the light spacing is significantly less than that specified.

54. The system of preventive Maintenance employed for a Runway meant for take-off in RVR conditions less than a value of 550 m **should** have as its objective that, during any period of operations, all Runway lights are serviceable and that in any event:

a. At least 95% of the lights are serviceable in the Runway centre-line lights (where provided) and in the Runway edge lights; and

Acceptable Means of Compliance 3590(7)

b. At least 75% of the lights are serviceable in the Runway end lights.

55. The system of preventive Maintenance employed for a Runway meant for take-off in RVR conditions of a value of 550 m or greater **should** have as its objective that, during any period of operations, all Runway lights are serviceable and that, in any event at least 85% of the lights are serviceable in the Runway edge lights and Runway end lights.

56. In order to provide continuity of guidance, an unserviceable light **should not** be permitted adjacent to another unserviceable light.

57. During low visibility procedures the appropriate authority **should** restrict construction or Maintenance activities in the proximity of Aerodrome and / or HLS electrical systems.

58. General inspection and Maintenance **should** include cleaning, checks on electro-mechanical, Structural Integrity of installation and normal function, Repair and replacement of all visual aids facilities and their supporting infrastructures. Precision Approach Path Indicator (PAPI) serviceability gives rise to additional considerations as moisture and / or dirt on the lenses will diffuse the beam and can result in a white signal being emitted at all angles of elevation. To prevent this potentially hazardous situation from occurring additional measures **should** be adopted as follows:

a. Daily inspection to ensure:

(1) All lamps are operational and evenly illuminated.

(2) There is no damage to units.

(3) All lenses are clean.

(4) The change from red to white is coincident for all elements of a unit.

(5) The heating facilities are functioning correctly.

b. Bi-monthly inspection to ensure:

(1) Vertical alignment of each PAPI unit to a tolerance of ± 1 minute of arc.

(2) Azimuth alignment of each PAPI to a tolerance of ± 1 minute of arc.

c. Yearly inspection:

(1) Internal inspection of unit.

(2) Correct setting of black heat current (approx. 1.5 A RMS).

59. A PAPI wing bar installation **should** be withdrawn from service if one unit within the wing bar is found to be unserviceable.

60. Setting angles **should** be checked with a manufacturer's clinometer or platforms. A theodolite or equivalent device may be used for increased accuracy. Errors in excess of 1 minute of arc **should** be corrected.

61. After installation, the angles **should** initially be checked on a daily basis using a clinometer or equivalent device and, if necessary, adjusted using a theodolite or equivalent device. The interval between checks may be extended progressively to once a week, as greater stability becomes evident. However, special checks **should** be made in the event of heavy frost or rain or a significant change of weather such as the end of a drought, since angular variations are possible at such times.

62. Aerodrome Operators (AOs) **should** ensure that PAPI checks are completed:

a. On commissioning.

b. Following temporary removal of a system.

c. Following the completion of a Runway refurbishment where flying has ceased and construction traffic may have caused the misalignment of the PAPI units.

Acceptable Means of Compliance 3590(7)

63. The checks at Table 9 (Annex A) **should** be completed by an accredited flight checking unit.

64. The results of the PAPI Check **should** be recorded on the form at Table 10 (Annex A). The form **should** be retained by the Unit as part of its Defence Aerodrome Assurance Framework iaw RA 1026[10].

65. The insulation resistance value of a primary series circuit may decrease by a significant amount before any operational effect on the AGL is noticed; however in this case there would be a much greater Risk of harm to Maintenance or installation persons and Risk of loss to operational capability. Maintenance Management Organizations **should** comply with the procedures and recommendations dealing with AGL circuit installation, commissioning, Maintenance and Fault finding detailed in DIO Publication: Installation, Testing, Commissioning and Maintenance of AGL Circuits; the Practitioners Guide PG 01/2008: Management of Visual Aids at Military Aerodromes; and BS EN 61821- Electrical installations for lighting and beaconing of Aerodromes: Maintenance of aeronautical ground lighting constant current series circuits.

66. A check of an alternative input supply to the AGL system (where provided) operating under full load **should** be made at least once a month. Where the alternative input power supply is provided by independent generators, they **should** be run for at least 15 minutes under full load when carrying out this check. When automatic switchover is provided a check of the switching system **should** also be made. A log **should** be maintained detailing each check undertaken with the maximum switchover times and generator running times recorded along with any action taken.

67. All visual aids equipment, installation and facilities including supporting infrastructures and facilities **should** be inspected and, where required, tested. Their conditions and performance **should** be monitored regularly as part of an Aerodrome and / or HLS preventive and corrective Maintenance programme, with the objective of achieving the high levels of reliability of visual aids to properly support Aerodrome and / or HLS operations and to maintain safety.

Guidance Material 3590(7)

Maintenance - Visual Aids

68. This RA is intended to define the Maintenance performance level objectives. They are not intended to define whether the lighting system is operationally out of service.

69. The energy savings of Light Emitting Diodes (LEDs) are due in large part to the fact that they do not produce the infra-red heat signature of incandescent lamps. AOs who have come to expect the melting of ice and snow by this heat signature may wish to evaluate whether a modified Maintenance schedule is required during such conditions, or evaluate the possible operational value of installing LED fixtures with heating elements.

70. Enhanced vision systems (EVS) technology relies on the infra-red heat signature provided by incandescent lighting. An appropriate means of notifying Aerodrome and / or HLS users of EVS when lighting systems are converted to LED needs to be used.

71. With respect to barrettes, crossbars and Runway edge lights, lights are considered to be adjacent if located consecutively and:

a. Laterally: in the same barrette or crossbar; or

b. Longitudinally: in the same row of edge lights or barrettes.

72. In barrettes and crossbars, guidance is not lost by having two adjacent unserviceable lights.

73. The Maintenance of AGL equipment needs to consider the objectives of Aerodrome and / or HLS operations and address the impact on such operations whilst Maintenance activities are being performed. In addition, during periods of

[10] Refer to RA 1026 – Aerodrome Operator and Aerodrome Supervisor (Recreational Flying) Roles and Responsibilities .

Guidance Material 3590(7)

Maintenance, or equipment failure, it may be necessary to operate AGL circuits on local control at the 'A' and / or 'B' Centres, thus removing control from ATC whilst the work is being performed. A procedure for local operation needs to be agreed with ATC before local switching of AGL circuits commences. A record of all Maintenance operations needs to be kept including periods when local operation of a circuit or 'A' and 'B' Centre is under the control of Maintenance staff. A log book needs to be provided at each 'A' and 'B' Centre for this purpose. As an aid to Maintenance each AGL location needs to be marked with an identification number legible, where practicable, from a passing vehicle (eg 27/A/14 refers to light position No 14 of circuit A on Runway 27) as follows:

a. Short term measures for no more than 12 months may utilize:

(1) Lights in paved areas – Numbers painted with white road paint adjacent to the light fitting;

(2) Lights in grassed areas – Numbers painted on a suitable tag, plate or plinth;

(3) Pole or mast mounted lights – Numbers painted on plates attached to the poles or masts;

b. The number of each position needs to be permanent, reusable and may be repositioned when required without the necessity for refurbishment. Identification of fittings, particularly inset type, needs to be considered as part of an overall Maintenance strategy and potential asset Audit system. The use of electronic tagging needs to be viewed as an innovative solution.

Regulation 3590(8)

Safeguarding - MOD Property

3590(8) HoEs and ADH-Facing organizations **shall** ensure that Siting Boards are held for any new installation to be built on the establishment they are responsible for.

Acceptable Means of Compliance 3590(8)

Safeguarding - MOD Property

74. At an Aerodrome and / or HLS, the AO or a nominated deputy **should** attend Siting Boards to give specialist advice and comments in relation to safeguarding criteria. The safeguarding criteria **should not** be violated except when the proposed obstacle is operationally essential and a waiver or exemption has been granted by the MAA.

75. The AO **should** ensure that the safeguarding criteria are strictly adhered to and, where appropriate, comprehensive specialist remarks are recorded in the Findings and Recommendations of Siting Boards (Form 2). Annex B of this RA contains the AO's Certificate, which **should** be completed and attached to the Form 2 following each Siting Board. Amplification of the remarks by an accurate plan of the proposed siting area, together with all relevant dimensions, **should** be included as an Annex to the Findings of the Siting Board.

76. Any paperwork associated with Aerodrome and / or HLS Siting Boards for obstacles / buildings, which could affect Aerodrome and / or HLS design and safeguarding standards, **should** be retained indefinitely or until the obstacle / building is removed.

Guidance Material 3590(8)

Safeguarding - MOD Property

77. Safeguarding criteria includes considering the potential to increase the wildlife strike Risk.

Regulation 3590(9)

Safeguarding - Outside MOD Property

3590(9) DIO Assistant Head - Estates-Safeguarding **shall** publish an official safeguarding map (Official Safeguarding Plan) which is issued to County and Local Planning Authorities and to certain other bodies.

Acceptable Means of Compliance 3590(9)

Safeguarding - Outside MOD Property

78. For statutory safeguarding map production purposes:

a. Aerodrome codes **should** be determined from the length of the Runway only. Width and Runway letters **should not** be used. Where more than one Runway exists the most stringent code **should** be used for all Runways.

b. Threshold, Runway end and clearway locations and heights **should** be taken from the latest Measured Heights Survey available.

Guidance Material 3590(9)

Safeguarding - Outside MOD Property

79. The requirement to identify the standard / criteria needed to safeguard an Aerodrome, and when a safeguarding plan needs to be produced / replaced, resides with the Top Level Budget (TLB) / operating authority.

80. The planning and other relevant development control processes in place in England, Scotland and Wales make provision for the Secretary of State to issue official Aerodrome safeguarding plans upon which planning (and other relevant consenting authorities) are obliged to consult the MOD on relevant development proposals which might prejudice their actual or potential use for aviation purposes. The MOD publishes an official safeguarding map which is issued to County and Local Planning Authorities and to certain other bodies. MOD Aerodromes are also issued with copies of the map, through the DIO.

81. The Statutory safeguarding map is colour coded into sections for which different reference heights are given. These are the heights above which new construction, on and near an Aerodrome, may interfere with flying activity. Planning Authorities are required to consult the DIO (Safeguarding) about any application they receive for any development exceeding the appropriate reference level. The area covered by the map depends upon the length of the longest safeguarded Runway, either existing or planned. Other factors are incorporated iaw the obstruction limitation criteria given in RA 3512[11] and RA 3532[12]. Account is also taken of the need to protect instrument approach procedures and radio and radar aids, some of which cannot be utilized satisfactorily unless stringent rules are observed to protect the operating environment.

82. Instrument approach and departure criteria, as laid down in ICAO Procedures for Air Navigation - Operations (PANS-Ops) are unlikely to be infringed by obstacles that do not violate safeguarding criteria. If, when considering the implication of obstacles, doubt exists about their effect on instrument approach and departure criteria advice may be sought from SO3 AIM No 1 AIDU, RAF Northolt.

Regulation 3590(10)

Safeguarding - Surface Obstructions

3590(10) HoEs and ADH-Facing organizations **shall** ensure that any obstacle which projects above the surface of an Aircraft movement area and its associated shoulder and Runway / taxiway strip, and therefore constitutes an obstacle hazardous to Aircraft, **shall** be removed.

[11] Refer to RA 3512 – Permanent Fixed Wing Aerodrome - Obstacle Environment.
[12] Refer to RA 3532 – Helicopter Landing Site - Obstacle Environment.

Acceptable Means of Compliance 3590(10)

Safeguarding - Surface Obstructions

83. Obstacles **should not** be permitted on Runways, taxiways or Aprons. Frangible elevated light fittings and Airfield reflective markers **should** be sufficiently low to preserve clearance for propellers and for the engine pods of jet Aircraft.

84. Shoulders **should** be obstacle free, except when impossible for operational reasons.

85. Runway and Taxiway Strips **should** be free of obstacles.

86. Runway End Safety Areas **should** be free of obstacles.

87. Stop ways. The only obstacles permitted in stopways **should** be approach lights, of a lightweight construction, frangibly mounted and not exceeding 0.46 m in height.

88. Clearways. Any obstacle that has to be located in the clearway **should not** penetrate the prescribed clearway gradient. Any obstacle which does penetrate this gradient will define the end of the clearway.

89. Overlapping Areas. Where 2 or more areas overlap, eg clearway overlapping stopway, the more stringent obstacle limitation **should** apply.

90. ATC Tower Visibility. The Visual Control Room (VCR) **should** be suitably positioned, elevated and safeguarded to provide the maximum visibility of the Aircraft manoeuvring area, with an absolute minimum visibility requirement considered as a clear and uninterrupted view of all Runways, thresholds, approach paths and circuit patterns.

91. Objects **should not** penetrate the Obstacle Limitation Surfaces iaw RA 3512[11].

Guidance Material 3590(10)

Safeguarding - Surface Obstructions

92. The VCR will ideally be provided with the maximum possible uninterrupted view of all taxiways, Aprons and dispersal areas.

93. Guidance on the frangible design of visual and non-visual aids for navigation is given in the ICAO Aerodrome Design Manual (Doc 9157), Part 6.

Regulation 3590(11)

Safeguarding - Sub-Surface Obstructions

3590(11) HoEs and ADH-Facing organizations **shall** ensure that where sub-surface structures cannot be dispensed with, they are constructed so that they present the minimum practical vertical face to undercarriage wheels, if necessary, by the provision of sub-surface ramps.

Acceptable Means of Compliance 3590(11)

Safeguarding - Sub-Surface Obstructions

94. Any structure which lies within 300 mm of the surface or is flush with the surface of the unpaved parts of the movement areas, shoulders or Runway strips may be hazardous to an Aircraft which runs off the paved surface. Such potential Hazards **should** be kept to a minimum by critically examining each stated need in the first instance and by ensuring that any existing obstructions continue to meet an essential function.

Guidance Material 3590(11)

Safeguarding - Sub-Surface Obstructions

95. Sub-surface obstructions may include holes, trenches etc.

Regulation 3590(12)

Safeguarding - Operationally Essential Obstructions

3590(12) HoEs and ADH-Facing organizations **shall** ensure that Operationally Essential Obstructions are sited iaw correct procedures and are treated as Hazards where appropriate.

Acceptable Means of Compliance 3590(12)

Safeguarding - Operationally Essential Obstructions

96. Each Aerodrome and / or HLS **should** have the appropriate Siting Board paperwork in place for operationally essential obstructions, and each item **should** be recorded within the appropriate Risk Register / Hazard Log.

97. The distance of operationally essential obstructions from the Runway or taxiway centre-line **should** be the maximum, and their height the minimum, commensurate with their function and provision of safe passage to Aircraft taxiing whilst keeping all wheels on the paved surface.

Guidance Material 3590(12)

Safeguarding - Operationally Essential Obstructions

98. Operationally Essential Obstructions are defined as objects which:

a. Are essential for the safe operation of the Aerodrome and / or HLS.

b. Need to be sited in a specific location in order to carry out their function.

c. Penetrate one or more protected surfaces.

99. The following items may be considered examples of operationally essential equipment:

a. Runway Caravan.

b. Arrestor Equipment including Barrier and Rotary Hydraulic Arrestor Gear (RHAG) installations.

c. RVR Towers.

d. Illuminated Runway Distance Marking Signs.

e. Precision Approach Radar (PAR) and Instrument Landing System (ILS) installations.

f. Instrumented RVR (IRVR) equipment.

100. The MAA may offer guidance on any additional items considered to be operationally essential.

Annex A

Maintenance and Safeguarding

Table 1. Friction Survey Requirements

Item	Friction Survey Type		
	Monitoring [a]	**Special**	**Classification**
Programme			MOD Specialists
Frequency	6 monthly or ►more frequently◄ at SATCO discretion.	As required by MOD specialists, Relevant Military Authority or Station.	≤ 4 yearly [c]
Survey notification			Calling notice by MOD specialists.
Survey timing		By arrangement by an MOD Specialist.	
Survey duration		1-2 days depending on survey scope, weather and availability of water.	
Conducted by	Station	MOD specialists Term Contractor.	
Measuring speed	65 km / h [b]		65/80/95 km / h [b]
Survey validity	If the maximum absolute difference between the average friction values for any two check runs is greater than 0.06 the entire survey is invalid.		
Results reporting format	As per Table 4	As per Table 3	
Results Reporting / Evaluation	To Relevant Military Authority.	MOD specialists Term Contractor to MOD specialists and onward to Relevant Military Authority and Station.	
Equipment calibration / usage	Iaw relevant Service Operator's Manual.		
Results retention	Until next classification Survey.		
Survey funding	Station [de]		

[a] There is no correlation between monitoring and classification survey results.
[b] For straight runs only. MOD specialists can advise on test methods for curved or restricted areas.
[c] See Table 5 for variations.
[d] Except for survey prior to handover of new / reconstructed pavements – paid for by Project.
[e] Additional costs caused by Station imposed restricted access to pavements during survey fall to Station.

Table 2. Runway Friction Classification / Monitoring Survey Procedures

Item	**Criteria**	
	Classification Survey	**Monitoring Survey**
Equipment	Mk 6 Mu-Meter, or other MOD specialists approved equipment	
Equipment calibration interval	a. Before every survey.	a. ≤12 months. b. iaw manufacturer's instructions. c. Results to be retained.
Operator	DIO Term Contractor approved person	Authorized ATC Personnel
Team Size	≥ 2 people (Driver and recorder)	
Recording medium	Purpose designed software with instant Visual Display Unit (VDU) and hard-copy read out together with database recording capability	
Pavement surface conditions	a. Dry before and during survey. b. Conditions and changes in condition to be recorded.	a. Natural rain or in detrimental to Aircraft movement conditions. b. Conditions and changes in condition to be recorded.
Met conditions	Ambient air temperature ≥ 2°C	
Aircraft arrestor systems	De-rigged	
Procedure	**Method / Criteria**	
Establish run and start position	a. See Figure 1 which shows the stationary vehicle start position. b. Enables location of data relative to Runway threshold lights to be determined[a]. c. Mark on pavement and record position.	
Conduct runs	a. iaw Table 3 for Classification Surveys and Table 4 for Monitoring Surveys. b. 1st run starts from Runway end with the higher QDM.	
Water Depth	1 mm	Natural wet conditions
Speed	As given in Table 3 ± 5 km / h	65km / h ± 5 km / h
Run track separation	a. 3 m. b. Start 1.5 m from Runway centre-line.	
Track tolerance	±1m	
Check runs	a. Runs 1, 11 and 17. b. Run 1 taken @ 3 m from Runway edge. c. Runs to be consistently wet or dry throughout. d. All runs in the same direction.	a. Runs 7 and 8. b. All runs in the same direction.
Check run 10	a. Self-wetted. b. 1.5 m from Runway centre-line.	
Speed runs 2,3,8 and 9	a. To establish speed friction curve. b. Self-wetted. c. Each run to traverse the same track in the same direction. d. Located outside area of rubber deposits but ≤ 15 m either side of Runway centre-line.	
Standard Runs[b]	a. Self-wetted. b. Start run 4 @ 1.5 m from Runway centre-line. c. Subsequent runs @ 3 m spacing out to 19.5 m.	a. Runs 1-6. b. Surface soaked but no standing water.
Reports	In accordance with RA 3590(2) AMC Para 12 and Annex A Tables 3, 4, 6 and 7 as applicable.	

[a] Distances before the threshold in the landing direction will be negative see Figure 1.
[b] Known as wet runs for monitoring survey.

Figure 1 Runs Start With Stationary Friction Machine Measuring Wheel/s 10 m from Pavement End

Table 3. Runway Friction Classification Survey Run Sequence and Results

Aerodrome		Runway		Date	

Run No		Run Type	Run Direction (Start QDM)	Distance from Runway Centre-line (m)	Side of Centre-line [b]	Speed (km / h)	Self-Wetting ON / OFF	Water Depth	Surface Condition[g]	Surface Temperature (°C)	Results	Remarks
1[f]		Check	Hi	3.0 [a]	L / R [d]	65	On / Off [cd]	Dry or Wet				
2		Speed	Lo	13.5	R	80	On	1 mm				
3		Speed	Hi	10.5	R	95	On	1 mm				
4		Standard	Lo	1.5	R	65	On	1 mm				
5		Standard	Hi	4.5	L	65	On	1 mm				
6		Standard	Lo	1.5	L	65	On	1 mm				
7		Standard	Hi	4.5	R	65	On	1 mm				
8		Speed	Lo	13.5	R	95	On	1 mm				
9		Speed	Hi	10.5	R	80	On	1 mm				
10		Check	Lo	1.5	R	65	On	1 mm				
11		Check	Hi	3.0 [a]	L / R [d]	65	On / Off [cd]	Dry or Wet				
12		Standard	Lo	7.5	R	65	On	1 mm				
13		Standard	Hi	10.5	L	65	On	1 mm				
14		Standard	Lo	7.5	L	65	On	1 mm				
15		Standard	Hi	10.5	R	65	On	1 mm				
16		Standard	Lo	13.5	R	65	On	1 mm				
17		Check	Hi	3.0 [a]	L / R [d]	65	On / Off [cd]	Dry or Wet				
18		Standard	Lo	13.5	L	65	On	1 mm				
19[e]		Standard	Hi	16.5	R	65	On	1 mm				
20[e]		Standard	Lo	19.5	L	65	On	1 mm				

21[e]		Standard	Hi	16.5	L	65	On	1 mm				
22[e]		Standard	Lo	19.5	R	65	On	1 mm				
23		Standard	Hi	10.5	L	65	On	0.5 mm				
24		Standard	Lo	13.5	L	65	On	0.5 mm				

[a] From Runway edge.
[b] Side is taken relative to the Centre-line in the direction of travel, run specific.
[c] To be consistent throughout runs 1, 11 and 17.
[d] Delete as required.
[e] For narrow Runways ignore runs 19-22.
[f] Run 1 must start from the higher QDM.
[g] In accordance with Table 8 Classification of Surface Conditions.

Table 4. Runway Friction Monitoring Survey Run Sequence and Results

Aerodrome			Runway			Date	

Run No	Time	Run Type	Run Direction (Start QDM)	Distance from Runway Centre-line (m)	Side of Centre-line [b]	Speed (km / h)	Surface Condition[d]	Surface Temperature (°C)	Average Friction Value (relative to Hi QDM / Centre/ Lo QDM 1/3 portions of Runway)			Remarks
									Lo 'A'	Ctr 'B'	Hi 'C'	
1		Wet	Hi	10.5	R	65						
2		Wet	Lo	1.5	L	65						
3		Wet	Hi	10.5	L	65						
4		Wet	Lo	1.5	R	65						
5		Wet	Hi	3.0 [a]	R	65						
6		Wet	Lo	3.0 [a]	R	65						
7		Check	Lo	1.5	L [c]	65						
8		Check	Lo	1.5	R [c]	65						

[a] From Runway edge.
[b] Relative to the Centre-line in the direction of travel, run specific.
[c] **Should** be from the lower to the higher QDM.
[d] In accordance with Table 8 Classification of Surface Conditions.

Table 5. Pavement[a] Classification Friction Table for the 65 km / h Self Wetting Test

Device	MPL[b]	MFL	Water Depth (mm)	Speed (km / h)	Tyre Pressure (kPa)	Tyre
Mu-Meter Mk6	0.55[c]	0.50[c]	1.0 ±0.025	65 ± 5	70 ± 3.5	ASTM E-1551

[a] Primarily for Runways. Seek MOD specialist advice for friction concerns with other operating surfaces.
[b]When calculated pavement friction levels are at or below the MPL, the periodicity of classification surveys may increase in frequency to ≤ annually.
[c] Levels are for Runway markings as well as pavements. Seek MOD specialist advice for friction concerns.

Table 6. Runway Friction Survey Report

Survey Type	
Friction Machine Type	
Friction Machine Serial No.	
Distance Per Reading	
Station	
Runway	
Date Of Survey	
Contractor	
Operators	
Tyre Serial No(s).	
Calculated Water Depth	
Air Temperature (°C)	
Weather	
Rubber Deposits	
Remarks	
Offset distance from threshold end 1 (m)	
Offset distance from threshold end 2 (m)	
Mu-Meter friction board Ser No	
No of passes over Mu-Meter friction board to date	
Confirm correct Mu-Meter calibration before survey	
Confirm correct Mu-Meter tyre pressures before survey	
a Classification Survey only	

Table 7. Classification of Rubber Deposits

Description of Rubber Covering Pavement Texture in Touchdown Zone - Central 18m	**Classification of Rubber Deposit**
No tyre tracks.	None
Intermittent individual tyre tracks.	Very light
Individual tyre tracks begin to overlap.	Light
Up to 60% surface texture exposed.	Medium
Rubber bonded to pavement surface: less than 40% of surface, texture exposed.	Heavy

Table 8. Classification of Surface Conditions

Descriptor	Observation
Damp	The surface shows a change of colour due to moisture.
Wet	The surface is soaked but there is no standing water.
Water patches	Significant patches of standing water are visible.
Flooded	Extensive standing water is visible.
Dry	No visible moisture.

Note: These descriptions **should not** be read or used in conjunction with RA 3272(2)▶5◀ and Global Reporting Format.

Table 9. PAPI Flight Check Procedure

Effective Range	Check 1	At a range of approximately 7.5–9 km and height about 1500 ft QFE check the effective range. In daylight the difference between the red and white lights **should** be clearly discernible at a minimum of 7.5 km in good visibility.
Colour Change	Check 2	Commence an approach from 7.5 km flying level at 1000 ft QFE and check that the units are evenly illuminated and that signal changes from red to white are sharp. Check also that the colour change sequence is even. Where PAPI is on both sides of the Runway check that the colour change of corresponding opposite units is coincident. ***Note:*** *In reduced visibility it may be necessary to carry out this check at closer range in which case the height will have to be reduced. The minimum practicable height is 500 ft.*
	Check 3	Commence an approach from about 5 km and acquire an on-slope signal. Continue the approach, descend until 4 reds (or 2 reds in the case of APAPI are just visible. Then climb until 4 whites (or 2 whites) are visible. Return to on-slope and continue to a point close to the threshold. The colour changes **should** be consistent with change in height and permit easy correction of approach height and angle.
Luminous Intensity Settings	Check 4	Make a normal approach from approximately 7.5 km starting at about 1000 ft QFE. Maintain an 'on-slope' indication and during the approach call for progressive reductions in intensity of the units.
Compatibility with non-visual aids	Check 5	Where an instrument glidepath is available carry out an instrument approach maintaining the glidepath, or in the case of a radar approach, following ATC instructions. Check that the PAPI indicates 'on-slope' from a range of 7.5 km to close in to the threshold. The ILS glidepath **should** be near the lower limit of the PAPI 'on-slope' signal if an aeroplane with a small eye-to-aerial height is used. The person inspecting the system **should** carry a diagram of the installation to facilitate recording any observed deficiencies.
Obstacle check	Check 6	Fly sufficiently low from 7.5 km so as to be just within the all-red indication and check that there is clearance from obstacles throughout the horizontal coverage of the beam.

Table 10. PAPI Flight Check Form

PAPI Flight Check		**Aerodrome:**	
Runway Designation			
Effective Range (KM)			
Colour Change : Red-to-White (Level run 1000 ft QFE from 7.5 km)			
Intensity Balance of individual Units (and of Left and Right sides if applicable)			
Intensity Check	100%		
	80%		
	30%		
	10%		
	3%		
	1%		
	<1%		
Integration with non-visual aids			
Synchronisation Left – Right (If applicable)			
Obstacle Clearance			
Fitting Type			
Date: Time: Aircraft Registration: Captain:			Day / Dusk / Night: Weather: Visibility: Cloud: Turbulence:

Notes:

L				R			
1	2	3	4	1	2	3	4
0	0	0	0	0	0	0	0

1	1
2	2
3	3
4	4

Additional Notes:

Inspected by:

Annex B

Aerodrome Operator's Certificate

1. The following Aerodrome Operator's Certificate is given iaw the requirements of the RA 3500 Series.

   a. Proposed facility:

   b. Reference:

Certificate by Unit

2. I certify that:

   a. *The proposed facility will not infringe any Runway, taxiway or Aircraft Servicing Platform (ASP) / Operational Readiness Platform (ORP) strips.

   b. *The proposed facility will not infringe any Obstacle Limitation Surface

   c. *The proposed facility will infringe the safeguarding criteria for the movement area or Aerodrome / HLS environment and I have the following comments:

*(delete as appropriate)

Date……..Signature……..Name……

Appointment…….....Rank……..

Comments by HQ AIR / NCHQ / HQ Land / MOD DE&S

3. We have seen the plans for the proposed facility and have the following comments:

Date……..Signature……..Name……

Appointment…….....Rank……..

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