



Airfield Ground Lighting

Solent Airport, Runway 05/23

Works Information and Specification





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1 ABOUT THIS DOCUMENT

This document forms the basis of the requirements for the works at Solent Airport, Daedalus for the installation of Airfield Ground Lighting and associated electrical works. This document is intended as the scope of works and works information for tenderers.

2 GENERAL REQUIREMENTS

2.1 Overview

Runway 05-23 is not currently equipped with Airfield Ground Lighting and as such suitable for day VFR Ops only. Historically, lighting systems have been installed across the airfield, but none of the retained equipment is considered useful for a modern system. Runway 05-23 is 1178m in length.

Currently no navigational aids are in place, although potentially the airport may procure GPS approaches in future. Airfield Ground Lighting will be installed to support poor weather operations and night flying, including for coastguard search and rescue operators.

2.2 CDM 2017

The Client is Fareham Borough Council. The Principal Designer is RPS. The contractor shall act as Principal Contractor.

2.3 Access to Site

Works outwith the runway strip (28m from the edge of the runway), including within the building, can take place at any time by prior approval.

Work within the runway strip shall take place during the periods of closure, from 6:00pm to 9:00am.

During all works time, the contractor's supervisor shall be contactable by MCA via a provided airband radio.

The contractor may provide an ISO container or similar for airside storage at an agreed location.

The Contractor's supervisor must be available at 8:30am to attend a FOD walk with the airport team where works have taken place within the runway strip.



2.4 Programme Constraints

The contractor is requested to submit a proposed programme of works with the tender submission. This should include the proposed end date. The Employer's priorities are for early access to the system, and a minimised total installation time. The project shall ideally be completed by the End of May 2018.

For the avoidance of doubt, all weather risk remains with the contractor.

2.5 INSURANCES

The contractor shall provide evidence of:

- Airside liability (£25m)
- Public liability (£10m)
- Employer's liability



3 SITE INFORMATION

3.1 Existing Safeguarding

During previous overlay works, safeguarding for AGL installation was considered by the following works:

- 50mm ducts for runway edge lights installed at 60m spacings covering from the 30m runway strip to 2m into the grass clear and graded area. To include the starter extension.
- Single ducts running perpendicular to the runway centreline at Threshold and End locations.
- Ducting for simple approach inset positions on 05.

These works are detailed in Parson Brinckerhoff drawing 500-001 attached at *6.3 Appendix 3 – Parsons Brinckerhoff Drawing 500-001 – AGL Duct Installations* for information only.

3.2 Existing Power Supply

The ATC tower is equipped with a modern mains distribution board which has recently been inspected. The board includes a 160A auto-changeover panel fed from the mains and an external generator. Spare breakers are available in the panel to feed the new AGL distribution board.

The changeover panel does not support a 'no break' changeover, but this is not required.

3.3 Space for Constant Current Regulators

The CCRs will be installed, along with the new distribution board, in the garage in the ATC tower building. All containment required for this installation shall be provided by the contractor.

3.3.1 Asbestos

The latest asbestos register for the building is included at *6.1 Appendix 1 – Asbestos Survey Report* for information. No asbestos removal works are required under this contract.



3.4 Project Considerations

Based on the scope of works containing a minimal amount of civils works, it is considered that it would be in Solent Airport's best interests to appoint a specialist AGL installation contractor directly to act as main contractor. The costings in this document are based on this assumption.

It is presumed that installation of the AGL would take place around airfield operations – i.e. no closure of the airfield would be required. This may require installation of cables and fixtures within the runway strip to take place at night.

3.4.1 IFA2

The site of the 23 approach will be intersected by the forthcoming Interconnexion France-Angleterre cables. Construction of the ducting for these cables (by others) is due to take place from April to September 2019. Tenderers shall identify the proposed access dates for trenching at the 23 approach to allow coordination with the IFA2 project team.

3.4.2 Open Space Project

The land to the North of Threshold 23 is undergoing landscaping works to be designated as an area of public open space. The contractor shall be responsible for the reinstatement of all surfaces within the public open space which are affected by the project, including reinstatement of grass and pavements.

3.5 PROTECTION OF EXISTING SERVICES

The Contractor shall be responsible for protecting all existing services within the works area. It is essential that sufficient CAT scans are performed prior to all excavation works to prevent accidental damage to infrastructure.



4 SCOPE OF WORKS

4.1 Overview

The contractor shall be required to supply and install, as per the contract drawings and this document:

- Simple approach lighting for 05 and 23 runways, with 05 being inset into the starter extension.
- High intensity runway edge lighting at 60m spacing using safeguarded ducts.
- Runway end and threshold lighting, with both thresholds being inset and displaced.
- PAPI for both approaches.
- Taxiway edge lighting to highlight route from runway exit at 05 Threshold to MCA (Maritime and Coastguard Agency) hangar.
- One windsock, powered by a taxiway edge circuit.
- One aerodrome beacon, controlled by AGL control system via contactor, mounted on ATC tower.
- Constant current regulators for AGL circuits.
- LV distribution board, isolators, cables and containment for constant current regulators, fed by existing automatic changeover panel.
- New Threshold markings – addition of ‘Piano Keys’ at 23, relocation of 05.
- AGL control system with a touch-screen interface in the Visual Control Room and PLC located in the CCR room, including some capacity for expansion to future circuits.
- Air to ground radio interface to allow pilot control of lighting for coastguard use
- Primary cable and transformers to be installed in trenches adjacent to the runway. New ducted crossing over taxiways as indicated on the drawings.
- The development of a Safety Case.
- Specialist tools and spares to allow maintenance of the system.
- Optional: supply, installation and commissioning of a replacement standby generator.

4.2 Exclusions

The contractor is not required to provide the following services:

- Planning and land acquisition costs, including any consents or wayleaves required.
- Design services (although the design of the AGL control system remains with the Contractor).
- Services on runway 17-23.
- Illuminated signs.
- Obstruction lights.
- Extension to the runway.
- Replacement changeover panel.
- Liaison with CAA SRG.
- Liaison/costs associated with coordination of the installation of IFA2.



4.3 DOCUMENTATION

The contractor is required to produce the following documentation. The list is non-exhaustive.

4.3.1 At tender:

- Datasheets for all light fixtures, transformers, cables and LV electrical components.
- Outline programme for the works.
- Outline Construction Phase Health and Safety Plan.
- Outline Quality Plan.
- Details of the tenderers experience of airfield lighting installation.
- CV for proposed supervisor/project manager.

4.3.2 Prior to Works on Site:

- Agreed programme for the works.
- Agreed Construction Phase Health and Safety Plan.
- Agreed Quality Plan and associated Inspection and Test Plans.

4.3.3 Prior to Handover

Health and Safety file containing:

- All operation manuals for equipment supplied.
- Mark-ups to design drawings for as-built.
- Results of all electrical and photometric tests.
- Commissioning reports for all CCRs.
- Electrical Installation Certificate including test results.
- Signed SAT document.



4.4 INSPECTION AND TESTING

4.4.1 Inspection of Shallow Base and Fixture Insulation

The installation quality and workmanship for shallow base installation is of utmost importance to the success of the project. To this end, Contractors are required to:

- Submit a detailed method statement for shallow base installation for review and acceptance by the Employer in advance of the works.
- Ensure that all personnel employed for this activity are trained and competent to carry it out. The Contractor shall demonstrate in the tender submission the measures taken to ensure that AGL staff are trained and competent for the works.
- Store and prepare all bedding and grouting materials in accordance with manufacturers' instructions.
- Submit a detailed inspection and test plan for AGL shallow base installation, during which the Employer shall be invited to witness inspection of at least the following points:
 - At initial chase and centre core installation:
 - Verify core depth
 - Verify that angle drill has sufficient distance from the core to prevent cable damage during shallow base coring.
 - Ensure cable and backer rod are pushed fully to the base of the chase prior to pouring sealant.
 - Ensure that sufficient cable length is available at the base and the pit for termination and future repair.
 - Ensure that coiled cable is sufficiently protected from damage during surfacing operations.
 - At shallow base and fixture installation:
 - Ensure cleaning of cables within centre core such that all excess bedding mortar is removed.
 - Ensure that spillage of bedding mortar into the centre core is minimal and does not restrict the cable.
 - Verify that sufficient pourable resin is installed within 3mm of the shallow base upper surface.
 - Clean any excess pourable resin from the pavement surface or the shallow base inner surface.
 - Check that secondary termination is correctly assembled and tape applied.
 - Ensure that the fixture is well seated and that fixing bolts are torqued to the manufacturers' recommended torque setting using a calibrated torque wrench.

4.4.2 Pre-handover Testing

Prior to final acceptance of the works, the Contractor shall carry out a series of tests. The Employer shall be invited, with a minimum of two weeks' notice, to witness the following tests. Witnessing of the test by the Employer shall not be a substitute for supplying a full written report of test results.

- Photometric testing of all newly installed AGL fittings using a MALMS, FB Technology PAC System or approved equivalent. The Contractor shall be responsible for rectifying any defects in intensity or alignment identified by the photometric test. The Employer shall be invited to witness the testing.
- Electrical testing in accordance with BS7671 for all new distribution equipment.
- Testing of insulation resistance at 5kV for two minutes on each primary series circuit. This test should only be performed once to minimise cable degradation. All intermediate Insulation Resistance Tests shall be carried out at no more than 2.5kV. No circuit shall be accepted with an Insulation Resistance of less than 1GΩ.
- Measurement of the continuity of each primary series circuit, to show a maximum of 12Ω.
- Site Acceptance Testing of AGL control system, to include at least:
 - Demonstration of all brilliance and service control selections.
 - Correct reporting of errors and faults such as CCR offline, generator offline etc.
 - Shut down and reset of the ALCS without user intervention (to simulate a power outage)
 - Correct selection of pre-sets and landing directions.
 - Full functionality of the air to ground radio controller at ground level
- Attendance at testing of the air to ground radio controlled by MCA from an aircraft.

4.4.3 One-year Testing

The Contractor is required to repeat the Insulation Resistance (2.5kV) and Continuity testing on a mutually agreed date between 50 and 54 weeks after practical completion. The Insulation Resistance is expected to remain above 1GΩ, and the Contractor shall take any remedial action required to return the circuits to this condition. Any circuits which have been modified or disturbed by the Employer or any third party during the period between practical completion and the test shall be excluded from this requirement.

4.5 TRAINING

The contractor shall include for all costs of product familiarisation training by the ALCS manufacturer and AGL fitting manufacturers to cover all products supplied under the contract. Separate sessions shall be provided for ATC and maintenance staff. This training shall be on site in Daedalus for up to five attendees on each session, and is expected to cover two or three days.



5 SPECIFICATION

5.1 AIRFIELD LIGHTING CONTROL SYSTEM

5.1.1 General

The AGL services shall be controlled by a touch screen user interface installed in the VCR. The contractor shall be responsible for the detailed design of the control system to achieve the following performance specification:

- Within the VCR, the contractor shall provide power and data connections to the touchscreen. Should a PC or KVM interface be required, these shall be installed under the control desk.
- Within the AGL substation, the contractor shall install a PLC cabinet and connect to all CCRs. The interface between CCRs and the ALCS may be by serial bus communication or multiwire DC control relays. If serial bus communication is used, the bus must be redundant.
- There is no need for PLCs to be redundant.
- Within the cabinet, a UPS shall be provided for the PLC and associated control equipment.
- The contractor shall be responsible for cabling from the tower to the new panel in the CCR room. This may be copper or fibre-optic according to manufacturer's specifications.

5.1.2 ATC Functionality

The ATC operators shall have the following functionality:

- Brilliancy control for individual services
- On/off control for Airport Beacon
- Inputs from standby generator:
 - Running, fault, on-load
- Start control for standby generator
- Display of faults and current status of all services
- User-configurable pre-sets for brilliancies according to meteorological conditions
- Selection of landing direction to interlock PAPI and Approach services
- 'Remote' setting for enabling of air to ground radio controller, including user configurable settings for services which are not available remotely. When not in remote, radio signals received from the controller shall have no function.
- Automatic shutdown of the airfield lighting after a configurable time period when under radio control.



5.1.3 Remote Air-to-Ground Radio Controller

The contractor shall supply and install a radio-controlled interface device to allow pilot control of the lighting services by the MCA when the tower is unattended. The controller shall satisfy the requirements of FAA AC 150/5345-49.

Control outputs of the radio controller shall be low, medium, or high using 3, 5 and 7 clicks of the pilot's microphone respectively.

The contractor shall be responsible for all power and communications cable to the radio controller, including an external aerial if required.

5.2 CCRS OR ALTERNATIVE POWER SUPPLIES

The basic scope of works includes for supply and installation of CCRs on all services as indicated on the contract drawings. Contractors are invited in the tender to suggest alternative power supplies which reduce the space and electrical requirements for the project. The Employer will consider these options, if feasible, in the value engineering phase. For the avoidance of doubt, evaluation of the tender will be based on the designed CCR based system.

All new CCRs or alternative power supplies shall be served by new LV distribution fed from the existing automatic changeover switch.

Constant current regulators shall be 450mm wide, 6.6a output, 415v input with thyristor-based current control.

New CCRs shall use multiwire or serial remote control, according to the manufacturer of the proposed control system.

CCRs shall include an integrated series circuit cutout, allowing for in-service, short and earth connections.

CCRs shall be powered by XPLE LV feed cables, terminating in suitable wall-mounted rotary isolators, with SY braided cables feeding the CCR from the isolator.



5.3 LV DISTRIBUTION AND CONTAINMENT

New LV distribution shall be by TP MCB board by Eaton, Schneider or approved equivalent. LV distribution shall be installed by a suitably approved contractor, and the installation certified at the moment of bringing into service.

Cables routed within the substation shall be secured to appropriately sized medium duty perforated cable tray. Trays shall be installed to a high level of finish, including:

- Factory made connectors and accessories where required.
- Straight and level throughout.
- End caps and exit plates used at ends and where cables join.
- All cuts deburred, and no sharp edges left in place.

Communications and power cables shall use separate cable trays. All cable trays shall be bonded to the main substation earth.

5.4 PRIMARY CABLE

Primary cable shall be unscreened, 5Kv rated AGL cable, 6mm² copper cores, XPLE insulated, PVC sheathed, Nexans, Eupen or approved equivalent. Cable shall be resistant to oil, abrasion, UV. Cable must be suitable for direct-buried application.

Primary cable sheath shall be coloured per circuit. The contractor shall submit a table of circuit colours prior to commencement of cable installation. Joints between colours shall not be allowed under any circumstances.

The primary cable shall run continuously from the substation to the first transformer, with discontinuities permitted only at the transformers. Any joints in the cable at other locations shall be accepted only with the written consent of the project manager.



5.5 SECONDARY WIRES

Secondary wires shall be black, single core, 4mm² high temperature resistant copper cored XLPE insulated, suitable for direct burial and installation in cable chases and ducts.

Secondary wires shall be terminated with connector kits, providing a plug at the manhole for connection to the isolating transformer and a socket at the shallow base for connection to the lighting fixture. Secondary connector kits shall be in full compliance with the latest edition of FAA AC 150/5345-26 specification for L-823 Type II, class B, style 4, 5, 11 and/or 12 connectors. The compliance is essential to ensure a perfect fit with the connectors of the light units and series transformers. The selected connector kit must be designed for single wire of 4mm².

Assembled secondary connections at both light and manhole shall be sealed with at least three layers of self-amalgamating tape, type 3M Scotch 130C or approved equivalent.

Where required, secondary cables shall be installed in the surface course. The shallow base shall be removed. A 100mm centre core shall be opened in the centre of the shallow base core. A sawcut shall be opened from the centre core to the pavement edge as indicated on the drawings.

The sawcut shall be connected to the duct within the soft at the pavement edge by means of an open fillet. The sawcut shall be connected to the centre core by means of an angle drill. The drill must be of sufficient length and distance from the core to prevent damage to the cable during installation of the shallow base.

Secondary wires, earth wires and backer rod shall be placed in the chase, and backfilled with hot-pour sealant.

The installation method is designed to allow replacement of the shallow base without damage to the secondary cable. The works shall be planned in such a way that no open core nor sawcuts are remaining at the handover of a shift to operations.

5.6 AGL TRANSFORMERS

Transformers shall be 1:1 ratio, encapsulated, 6.6a rated as shown on the tender drawings.

The transformers shall be in full compliance with FAA AC150/5345-47 and IEC 61823.

The transformer and connection leads shall be pressure encapsulated with thermo-plastic elastomer, which resists UV light, chemical agents, and rough handling. The encapsulation must not absorb water.

Primary connectors shall be L-823 plug and sockets, wrapped in suitable 3M Self-Amalgamating tape (Scotch 130C or approved equivalent).



5.7 EARTHING AND BONDING

5.7.1 Substation

A new Earth bar shall be install behind each row of CCRs, with a 6mm² green/yellow PVC insulated earth cable connecting each CCR to the earth bar. All containment shall also be earthed to the same point.

5.7.2 Airfield

A 6mm² bare copper earth cable shall be installed alongside all primary cables within the trench. The earth cable shall end at the closest manhole to the AGL substation, which shall contain an earth rod. No other earth rods are required. Discontinuity of the earth cable shall be minimised, and any joints shall use Cembre C Crimp connectors or approved equivalent.

A 2.5mm² green/yellow PVC sleeved earth cable shall run from each inset shallow base or elevated light base plate to the bare copper earth conductor. Termination shall be via Cembre C Tap Connectors or approved equivalent. Transformer earthing studs or wires shall be terminated to the bare copper earth conductor in a similar manner.



5.8 AGL FITTINGS

5.8.1 General

To reduce spares holding and simplify maintenance, all AGL fittings shall be from the same manufacturer. All fittings should be of a type which has been trialled and proven within a UK airport, and contractors are requested to demonstrate this via a reference list.

All Approach, Runway Edge, End, Threshold, Wingbar and Taxiway Edge lights shall be LED.

All inset lights shall be installed on an 8" or 12" shallow base to match the fitting. The base and light must be supplied by the same manufacturer. Bases shall have smooth sides, webbed sides are not permitted.

All elevated lights shall be installed on an appropriate socket to be cut in to the pavement. No or other fixings which may require inspection shall be used in securing lights.

All lights shall be installed in compliance with the relevant sections of EASA CS ADR-DSN.M.

Photometric performance of the installed fixtures shall be in accordance with CS ADR-DSN.U.

Fixtures shall be LED type, capable of operating from a CCR using existing current transformers

Fixtures shall operate from 2.8 to 6.6a, replicating the dimming curve of a halogen light.

Fixtures shall connect using a moulded FAA L-823 style 6 plug.

5.8.2 PAPI

PAPI units shall be LED type. The PAPI shall contain a closed-loop system to shut down a complete wingbar of four units in the event of an electrical or alignment failure of any unit within the wingbar.

PAPIs shall be mounted on concrete base with secondary cables fed via a 100mm duct. A separate duct shall be provided for the interface cable to adjacent units.

5.8.3 Runway Guard Lights

The runway guard lights shall be mounted on L867 deep cans, containing the associated transformer.

The runway guard lights shall comply with FAA: L-804(L) AC 150/5345-46 (Current Edition) and ICAO Annex 14, Vol. I, Para 5.3.22 & Appendix 2 Fig. A2-25.



5.9 AGL BASES

Shallow bases shall be designed and tested in compliance with requirements of AC 150/5345-46 and 42 for direct mounting of inset lights (class 1).

8" shallow bases shall have smooth sides. The use of shallow bases with webbed side walls is not permitted.

Installed shallow bases shall be clear of all spoil, debris and excess adhesive.

Shallow bases shall be installed on weber bedding mortar or approved equivalent. The base shall then be sealed to the pavement using weber pourable grout or approved equivalent. All resin and grout shall be mixed as per manufacturer's instructions. The bedding mortar must be placed neatly and free of voids to ensure structural integrity and prevent leakage of the pourable grout.

5.10 APPROACH MASTS

Approach masts shall be GRP and must be:

- Frangible in accordance with the requirements of Part 6 of the ICAO Aerodrome Design Manual.
- UV resistant
- Finished in Aviation Yellow
- Corrosion free on all metallic components

The siting and height of the masts shall be in accordance with the project drawings. Masts shall be orientated in such a way as to avoid obstacles such as shrubbery when in the folded position.

5.11 AIRFIELD BEACON

The beacon shall comply with ICAO Annex 14, paragraph 5.3.3. and FAA AC 150/5345-12.

Supply to the beacon shall be 415v, 50Hz nominal mains, fed via an SWA cable from the new LV distribution board, which shall include a contractor for control.

The beacon shall have an expected lamp life of at least three years.



5.12 WIND SOCK

The windsock and tower shall comply with the requirements of ICAO Annex 14, Volume 1, para 5.1.1.

The windsock tower shall be 4 to 5m in height, either made from frangible material, or secured using frangible bolts.

Lowering shall be possible by one person.

The lighting shall be powered by a 6.6a transformer from the adjacent primary circuit. The light output shall be constant, regardless of the input power (2.8 to 6.6a).

5.13 GENERATOR

Tenderers are requested to provide pricing for a replacement generator to be included as an option.

The specification shall be as follows:

- Minimum 40kVa output, 415v Three Phase.
- Three phase, diesel
- Supplied in silenced weather-proof canopy suitable for prolonged outdoor use.
- Maximum rated noise 64dBA at 7 meters (lower noise outputs will be viewed favourably)
- On-board bunded fuel storage for minimum 30 hours runtime at 75% load.
- Generator to be supplied with a full tank of fuel at handover.
- Automatic voltage regulator.
- On board control interface to receive start command from existing 160A changeover panel. Provision of 'available' feedback to auto changeover panel.
- Feed and control cables to existing generator may be reused, contractor shall be responsible for junction boxes and extensions where required.
- Commissioning certificate to be issued on completion of commissioning, including simulated mains failure demonstrating successful changeover.

Installation works for the generator shall consist of:

- Existing generator to be decommissioned and fully removed from site, including associated fuel tank.
- Existing lean-to to be demolished, including making safe all electrical items within and clearing all material from site.
- New generator to be sited on concrete pad in location of existing generator.
- All cable connections to new generator to be suitably glanded, with cables routed via new cable tray.



5.14 SURVEY

Due to the poor quality of existing background information, the contractor is required to provide survey services for the setting out of the AGL. The survey scope shall consist of:

On appointment, take a detailed survey of the runway and affected taxiway, capturing:

- All markings
- Levels of centre of Thresholds
- Topographical survey of approach areas
- Topographical survey of four lines parallel to runway centreline for PAPI locations, starting at 150m from Threshold to 350m from Threshold
- Pavement edge line for the runway and affected taxiway.
- Verification of the height of the house in the 23 Approach Light Plane.
- CBR test at each approach mast location.

Setting out locations for levels and tests shall be determined after the true runway centreline and threshold points are identified on site by the contractor's surveyor.

The survey shall be provided to the Project Manager who shall, within three weeks of receipt, respond with construction drawings showing the absolute setting-out coordinates of the lighting, adjusted to the survey. The concrete base volumes may also be adjusted to suit the provided CBR values.

This process shall be detailed in the Contractors' Programme, including proposed date for the receipt of survey information.

The contractor shall capture the as-built location of all transformers, fittings and sawcuts, to be provided to the Client in AutoCAD format. These shall use GPS to an accuracy of +/- 10mm.

5.15 SAFETY CASE

The contractor shall include for the production of a safety case by an experienced consultant familiar with the requirements. The safety case must be produced in accordance with Solent Airport's Safety Management System, which is available on request.

Through the safety case, the contractor must demonstrate compliance of the AGL control system to CAP670 in addition to all other requirements of the SMS.



5.16 DUCTING AND TRENCHING

Taxiway crossings shall consist 2No 150mm ducts as indicated in the drawing. Asphalt shall be fully reinstated to existing levels. Tenderers may submit trenchless Horizontal Directional Drilling, and should make this clear within the tender submission.

Cables shall be laid in trenches prepared by the contractor, 600mm deep, 400 to 1800mm wide. The trench width shall be at least 100mm per cable to be laid within. Cables should be laid as straight as practicable, at 100mm between centres.

Cables shall lay on a bed of sand 100mm deep, and be covered with a further 100mm of sand coverage. Electrical warning tape reading 'Warning Electrical Cable Below' shall be laid above all cables, at 150mm from the surface.

5.17 PAINT MARKINGS

The contractor is required to replace the paint marking at the 05 Threshold and add additional marking at the 23 Threshold as detailed on the drawings. The paint specification shall match the existing, included in 6.2 Appendix 2 – Paint Marking Specification.



6 APPENDICES

6.1 APPENDIX 1 – ASBESTOS SURVEY REPORT

6.2 APPENDIX 2 – PAINT MARKING SPECIFICATION

6.3 APPENDIX 3 – PARSONS BRINCKERHOFF DRAWING 500-001 – AGL DUCT INSTALLATIONS

