

Atmospheric Radiation Measurement Climate Research Facility

Safety Manual

– Eastern North Atlantic –

Santa Cruz, Graciosa Island
Azores, Portugal

PRO(ESH)017_ENA safety manual_160127

January 2016

Field Instrument Deployments and Operations (FIDO)

Los Alamos National Laboratory

U.S. Department of Energy

www.fido.lanl.gov

SAFETY MANUAL FOR ENA ARM Climate Research Facility

Table of Contents

1. Emergency Contacts
2. Introduction
3. Standard Operating Procedures (SOPs) – site wide
 - a. General work - all workers
 - b. Electrical Safety - all workers
 - c. Tool Safety - all workers
 - d. Ladder Safety – if using ladders
 - e. Van Roof Access Safety – if working on container roof
 - f. Compressed Gas Cylinder Handling – if handling gas cylinders
 - g. Hydrogen Gas Generation and Use Safety
 - h. Raman LIDAR
 - i. XSAPR Radar

Emergency Contacts

Police	295-730-200
Fire Department	295-712-215 or 295-732-222
Ambulance	295-712-215 or 295-732-222 (same as fire dept.)
Emergency Medical Clinic/hospital	Phone: 295-730-070
Centro de Saude de Santa Cruz da Graciosa Avenida Mouzinho Albuquerque, Santa Cruz da Graciosa	
Carlos Sousa (On-site Technician)	Phone: 918-444-029 E-mail: carlos@tbpl.com.au
Heath Powers (Technical Operations Manager)	E-mail: hpowers@lanl.gov
Kim Nitschke (Site Manager)	Phone: +1 505-667-1186
.....	Mobile: +1 505-231-2191
Field Instrument Deployments and Operations Office	Fax: +1 505-667-9122
Los Alamos National Laboratory	E-mail: nitschke@lanl.gov
	Phone: +1 505-667-9122

FIDO PROCEDURE Author: FIDO	ACRF SAFETY PLAN (ENA)	PRO(ESH)017 January 27, 2016 Page 3 of 15
--	-----------------------------------	--

Graciosa Airport Contact:
Manuela Santos (Airport Chief)

Phone: 917-949-075
E-mail: manuela.santos@sata.pt

U.S. Embassy, Lisbon
Avenida das Forcas Armandas
1600-081 Lisbon
Portugal

Phone: 217-273-300
Fax: 217-296-109
E-mail: lisbonweb@state.gov
Website: <http://portugal.usembassy.gov/>

U.S. Consulate, Ponta Delgada, Azores
Avenida Principe do Monaco No, 6-2F
9500-237 Ponta Delgada, Azores
Portugal

Phone: 296-282-216
Fax: 296-287-216
Website: <http://pontadelgada.usconsulate.gov/>

INTRODUCTION

Purpose:

This document describes the hazards, their mitigations, and work guidelines associated with the operation and use of the eastern North Atlantic ARM Climate Research Facility (ACRF) located on Graciosa Island, Azores, Portugal.

Policy:

Individuals working at or visiting Graciosa on ACRF official business, specific IOPs, or just for a casual visit (non-working casual visitors must be escorted by permanent on-site personnel), and shall:

- a. Act and work safely and not to jeopardize their own safety or that of others at the site.
- b. Perform work in such a manner that they do not jeopardize the operation of the site.
- c. Read all sections of the Safety Manual that apply to the work you will be doing and agree to comply with its recommendations and guidelines and sign the appropriate sheet acknowledging your personal commitment to follow the guidelines, work restrictions, and precautions associated with that section.
- d. All visitors to the ENA facilities from outside the host country must participate in a LANL led ES&H briefing well before departing for the host country.
- e. All visitors to the site must also follow all applicable local regulations and codes. In general, new construction shall follow EU regulations, unless local regulations are more stringent.

FIDO PROCEDURE Author: FIDO	ACRF SAFETY PLAN (ENA)	PRO(ESH)017 January 27, 2016 Page 4 of 15
------------------------------------	---------------------------	---

- f. All visitors must submit an official ACRF Site Access Request (SAR) online at <http://www.db.arm.gov/SARS2/> and cannot go to the facility until they receive approval from the TWP Site Manager.
- g. Follow all applicable local regulations and codes.
- h. LANL employees will follow LANL work safety requirements.

FIDO PROCEDURE Author: FIDO	ACRF SAFETY PLAN (ENA)	PRO(ESH)017 January 27, 2016 Page 5 of 15
--	-----------------------------------	--

I. Work Control:

A. On-Site Safety:

- All visitors to ENA site who plan to perform work must read this document and sign in to acknowledge that they have reviewed and understood its contents. **Review the Hazard Control Matrix in section C that addresses types of site activities, hazards, and authorizations.**
- All visitors report to On-site Technician before beginning work each day.
- All visitors shall also comply with all applicable rules and regulations established by the host organization.

B. Work Authorization, Personnel Limitations, and Hazard Control

Personnel authorization categories (see Hazard Control Matrix):

- **Casual Visitors** – anyone who visits without working to include LANL managers
- **All Personnel** – including local on-site Observers and the categories listed below
- **Australian Bureau of Meteorology (BOM)** – technicians contracted by LANL
- **ARM System Expert** – contracted by LANL
- **Professional Service Provider** – specialists such as electricians, HVAC techs, etc. (contracted by ARM, LANL, BOM, or IAP)

Hazard Control Matrix (with work authorization CATEGORIES, work hazards, and controls):

CATEGORY: Casual visitor controls – NOT authorized to do any work:

Work	Work controls, tools – Casual Visitor
Casual visit to site	<ul style="list-style-type: none"> ▪ Escort by on-site personnel. ▪ Visitors may be asked to clear any area during the movement of equipment or other operations.

CATEGORY: All Personnel (except casual visitors) work authorizations and controls:

Work hazard or authorization	Work controls, tools – All Personnel
General Hazards	
Injury, fire emergency	<ul style="list-style-type: none"> ▪ Do not work alone at site – adhere to “Two-Person Rule.” ▪ During routine operations when only one ARM person is on site, that person must instruct a local “buddy” to notify emergency contacts in case of emergency. ▪ First-aid kit and AED in Operations building. ▪ Power shutoff in each van for electrical fires. ▪ ARM visitors to ENA site must participate in a FIDO-led Safety Briefing before departing their home countries for the site.

Work hazard or authorization	Work controls, tools – All Personnel
Lifting, dropping	<ul style="list-style-type: none"> ▪ Lifting of more than 23 kg per person prohibited. ▪ No open-toe shoes – slipover toe and metatarsal caps are available on site when a potential for a foot injury exists. ▪ Dollies are available for transporting heavy items. ▪ Work gloves are available.
Tripping, falling	<ul style="list-style-type: none"> ▪ Flagging for guy wires and other exposed projections is available onsite. ▪ Use of ladders above 2 m prohibited – without special training* ▪ Use stairs accessing areas above 2 m. ▪ Access allowed to instrument stand platforms and atop containers with railings only. ▪ Cable covers are used for most cables, but during installation, watch for cables running along ground.
Working at elevated locations on towers or containers	<ul style="list-style-type: none"> ▪ Climbing AOS tower not allowed. ▪ Climbing MET tower not allowed. ▪ Working atop containers without handrails not allowed.
Rain, wind, dust, lightning	<ul style="list-style-type: none"> ▪ Extreme temperatures may require special clothing. ▪ Go immediately inside a van or vehicle if a lightning storm threatens (i.e., strikes are within 5 km, or a 30-sec delay away).
Personal health – disease, respiration, sun, overheating	<ul style="list-style-type: none"> ▪ Obtain recommended vaccinations and medicines. ▪ Take precautions for sunburn. ▪ Drink bottled water and stay hydrated. ▪ Know your own personal limits for fatigue. Take a break or stop work when you need rest.
Plant and animal/insect life	<ul style="list-style-type: none"> ▪ Do not handle rodents, living or dead, found at the site.
Off-site activity, driving, recreation, tours, pedestrians on the road	<ul style="list-style-type: none"> ▪ Use common sense and take precautions when off site. ▪ If driving, be extremely careful, and absolutely do not drink and drive. ▪ Beware of pedestrian on roads.
Theft, vandalism, violence	<ul style="list-style-type: none"> ▪ Lock doors of containers when leaving site. ▪ Report unauthorized personnel on site to FIDO. ▪ Contact U.S. Embassy and other emergency contacts as appropriate.
Threat to ARM staff such as civil unrest (Action dependent on severity of threat)	<ul style="list-style-type: none"> ▪ Contact U.S. Embassy. ▪ Notify coworkers, local government, and FIDO. ▪ Lock site. ▪ Return to hotel/residence. ▪ Arrange for increased local security for site ▪ Fly home if advised by FIDO or U.S. Embassy. ▪ Follow up assessment with U.S. Embassy to plan next steps – resumption of operations or pack up and ship out.

Work hazard or authorization	Work controls, tools – All Personnel
Electrical Work Authorization	
Minor electrical work	<ul style="list-style-type: none"> ▪ Use Ground-Fault Interrupting (GFI) breakers for all extension cords, especially those placed outside enclosures. ▪ All electrical equipment should have a UL label, or another recognized testing laboratory to UL. ▪ Use UL-approved, three-wire electrical extension cords for short duration, temporary connections only. ▪ Extension cords may not be used in series.

FIDO PROCEDURE Author: FIDO	ACRF SAFETY PLAN (ENA)	PRO(ESH)017 January 27, 2016 Page 7 of 15
--	-----------------------------------	--

	<ul style="list-style-type: none"> ▪ Extension cord shall be protected to avoid damage from sharp edges and shall be routed so as not to create tripping hazards. ▪ Extension cords should be orange or yellow in color for high visibility.
Hazardous Materials	
Using lubricants, cleaning agents, adhesives, and other chemicals	<ul style="list-style-type: none"> ▪ Small amounts of lubricants, cleaning agents, adhesives, and other chemicals will be occasionally required at ENA site. In general they should be limited to less than 1 kg each. ▪ Read the Material Safety Data Sheet (MSDS) for any chemical that is to be used. ▪ Chemicals shall be used, stored and disposed of properly. ▪ Battery acid shall be stored in secondary containment pan.
Using fuel	<ul style="list-style-type: none"> ▪ Gasoline shall not be stored at the site unless in approved safety containers. ▪ Diesel fuel is handled by <u>local suppliers only</u> in most cases. Diesel fuel can be hand-pumped from tank to tank by on-site Observers if necessary.
Clean up of chemical and oil spills	<ul style="list-style-type: none"> ▪ Contact the local representatives (if listed herein) for major spills; this may include any chemicals, cleaner, solvent, or oil. ▪ Minor spills are to be cleaned using absorbent, disposable towels and then placed in a hazardous waste receptacle.
Hydrogen Generator	
Use of Hydrogen gas	Shall only be done by trained observers per site balloon launching procedure.
Repair and Maintenance	Shall only be performed by authorized personnel.
Raman Lidar	Only authorized personnel are allowed in the Raman Lidar container.
Work on Raman Lidar	Shall only be performed by authorized personnel designated by FIDO team and the instrument mentor.
XSAPR Radar	
Access	Authorized personnel only
Maintenance & repair	Performed by authorized personnel only. Authorized by the Site Manager and instrument mentors.
Tool Use Authorization	
Hand tools	<ul style="list-style-type: none"> ▪ Hand tools are to be used as per manufacture's recommendations. ▪ Inspect hand tools for defects before use. Any defective tool shall be removed from service. ▪ Use tools for their designed purpose only. ▪ Wear safety glasses and work gloves (available on site) when using tools. ▪ Always cut away from your body when using sharp tools.
Pressurized gasses Work Authorization	
Compressed helium (He), and nitrogen (N) gases	<ul style="list-style-type: none"> ▪ Follow the Compressed Gas Cylinder Procedure <i>PRO(OPS)-031</i>.

CATEGORY: BOM technicians and ARM system experts work authorizations and controls:

Work & associated hazards	Work controls, tools – BOM technicians and ARM instrument experts
Electrical work authorization	
Equipment installation using outlets	<ul style="list-style-type: none"> ▪ Reset breakers.
Electrical work on DC systems	<ul style="list-style-type: none"> ▪ None.
Power tools, shop equipment, hatches, doors, ports	<ul style="list-style-type: none"> ▪ Inspect portable electric tools prior to use. With the exception of double-insulated tools, all portable electrical tools requiring 60-Hz power shall be equipped with three conductor cables and grounded plugs. ▪ Any tool with frayed cords, exposed wiring, missing ground plugs, etc., shall be removed from service. ▪ Keep body parts away from cutting parts of power tools. ▪ Electrical equipment and tools used at ENA site shall have UL approval ratings where possible. ▪ Electric-powered heaters and fans shall have UL approval ratings. ▪ Equipment owned and furnished by other organizations (non-LANL/PNNL) and agencies shall be provided with appropriate safe operating procedures. These procedures must be observed by all personnel working at or visiting ENA site. ▪ Operate all equipment as per site procedures and manufacturer's recommendations. ▪ Lockout/Tagout: Any equipment tagged with a "Lockout/Tagout" indicator may not be operated.
Large or heavy equipment, air conditioning units	<ul style="list-style-type: none"> ▪ Follow all electrical controls listed.

FIDO PROCEDURE Author: FIDO	ACRF SAFETY PLAN (ENA)	PRO(ESH)017 January 27, 2016 Page 9 of 15
--	-----------------------------------	--

Work & associated hazards	Work controls, tools – BMO techs and ARM instrument experts
Hazardous Materials	
Butanol (AOS van only)	<ul style="list-style-type: none"> ▪ Butanol containers must be stored sealed in a chemical cabinet. ▪ All equipment using butanol shall be vented to outdoors. ▪ Notify FIDO immediately of any odors inside AOS van.
Soldering operations	<ul style="list-style-type: none"> ▪ Soldering must be performed in designated work areas only. ▪ Soldering equipment shall be turned off at the end of work shifts or when personnel leave the site for times exceeding one hour. ▪ Solder and related equipment shall be stored in labeled drawers or lockers.
Radiant energy work authorizations	
Raman LIDAR	<ul style="list-style-type: none"> ▪ Beam exiting the top of the container is eye safe. ▪ No unauthorized personnel are allowed in the container. ▪ Laser is a class 4 when protective covers are removed.
MPL and Ceilometer lasers, and Ka/W-band scanning radar (SACR)	<ul style="list-style-type: none"> ▪ Ceilometer's laser light is eye safe as installed in a sealed container. ▪ MPL laser is eye safe in normal operating conditions; however, <u>when opened for maintenance, pump diode is Class-4 laser, therefore it is an eye hazard.</u> Opening MPL for repair is prohibited. ▪ Ka/W SACR (35 GHz and 95 GHz operating frequencies) is low energy and not a hazard.
Power tools, shop equipment, hatches, doors, ports work authorizations.	<ul style="list-style-type: none"> ▪ Inspect portable electric tools prior to use. With the exception of double-insulated tools, all portable electrical tools requiring 60-Hz power shall be equipped with three conductor cables and grounded plugs. ▪ Any tool with frayed cords, exposed wiring, missing ground plugs, etc., shall be removed from service. ▪ Keep body parts away from cutting parts of power tools. ▪ Electrical equipment and tools used at the AMF site shall have UL approval ratings where possible. ▪ Electric-powered heaters and fans shall have UL approval ratings. ▪ Equipment owned and furnished by other organizations (non-LANL/PNNL) and agencies shall be provided with appropriate safe operating procedures. These procedures must be observed by all personnel working at or visiting ENA site. ▪ Operate all equipment as per site procedures and manufacturer's recommendations. ▪ Lockout/Tagout: Any equipment tagged with a "Lockout/Tagout" indicator may not be operated.
Large or heavy equipment, air conditioning units	<ul style="list-style-type: none"> ▪ Follow all electrical controls listed.
Pressurized gasses work authorization	
Pressurized gasses such as AMF low-pressure compressor for shutter operations, portable air compressor for tools, dry air compressor	<ul style="list-style-type: none"> ▪ Use compressed gases as per mfr recommendations.

FIDO PROCEDURE Author: FIDO	ACRF SAFETY PLAN (ENA)	PRO(ESH)017 January 27, 2016 Page 10 of 15
--	-----------------------------------	---

CATEGORY: Professional service provider specialists work authorizations and controls:

Work & associated hazards	Work controls, tools – Professional service provider (Electrician, HVAC tech, etc.)
Electrical work authorization	
Equipment installation using outlets	<ul style="list-style-type: none"> ▪ Reset breakers.
Electrical work on DC systems	<ul style="list-style-type: none"> ▪ None.
Electrical work on AC systems, wiring, transformers, UPS systems, power panels	<ul style="list-style-type: none"> ▪ Only certified electricians are authorized to work on 220 VAC or 110 VAC systems. ▪ Only qualified electricians are allowed to open AC distribution, control cabinets, or enclosures when power is applied. ▪ All electrical loads must be disconnected and locked out before connecting or disconnecting the main AC power cables to any enclosure or van. ▪ All energized electrical work, other than diagnostics and testing, shall be performed de-energized whenever possible. FIDO may approve procedures for energized electrical R&D work when the items below have been addressed: <ol style="list-style-type: none"> 1) Potential hazards associated with the task 2) Minimum work clearances required 3) What barricades are required and their placement 4) What personal protective equipment is required 5) Test instruments to be used 6) Proper instructions for safety using test instruments 7) Minimum number of workers required to do the task 8) Description of the duties of each worker 9) Sequence of steps which affect safety 10) Lockout/Tagout required for all work on energized systems ▪ All electrical maintenance or repair of electrically powered equipment or electrical supply systems shall be done as follows: <ol style="list-style-type: none"> 1) Maintenance procedures shall not be performed by a lone person where a dangerous or lethal hazard exists. Two knowledgeable persons shall be present, one of whom is clear of the hazard. Whenever possible, troubleshooting of energized equipment should be avoided. 2) Before starting work, de-energize all voltage sources and provide a positive method of ensuring that voltage will stay off. Lockout/tag out procedures must be used. 3) When working on energized equipment, personnel shall work with one hand whenever possible. <u>Note: Use rubber mats or other insulating material that will keep the operator isolated from ground.</u> 4) When using an oscilloscope or other test equipment, probes shall be connected to oscilloscope or other test equipment before being connected to the equipment under test and shall remain connected to the oscilloscope or other test equipment throughout the test.
Electrical work on grid power systems	<ul style="list-style-type: none"> ▪ Only local utility power company technicians are allowed to work on 416 VAC, 3-phase site power supply.
Large or heavy equipment, air conditioning units	<ul style="list-style-type: none"> ▪ Follow all electrical controls listed.
Cranes, hoist, slings, rigging, and forklift operations for moving the AMF vans and their components	<ul style="list-style-type: none"> ▪ Any work requiring a forklift or crane will be performed by owner/operators of the equipment. <u>No ENA team member is authorized to operate equipment owned by local service providers.</u> ▪ If any crane or forklift work is to be performed on the site, all team members, visitors and colleagues must be warned of the work and asked to clear a suitable wide area around the work.
Diesel Generator noise, battery chemicals, mechanical parts, fuel	<ul style="list-style-type: none"> ▪ Use headset ear protection. ▪ Work on generator is as per maintenance schedule. ▪ Refer to <i>PRO(GEN)-004, PRO(GEN)-012.</i>

CATEGORY: Professional service provider specialists work authorizations and controls:

Work & associated hazards	Work controls, tools – Site technician, Balloon Launchers
Hydrogen Gas work authorization	
Balloon Launching	<ul style="list-style-type: none"> • Performed by site technician or trained balloon launcher only. • Refer to ENA PRO(RBL)-001.001
Calibration	<ul style="list-style-type: none"> • Performed by site technician or BOM technician only
System repair	<ul style="list-style-type: none"> • Only done by authorized technicians
	<ul style="list-style-type: none"> ▪
	<ul style="list-style-type: none"> ▪
	<ul style="list-style-type: none"> ▪
	<ul style="list-style-type: none"> ▪

FIDO PROCEDURE Author: FIDO	ACRF SAFETY PLAN (ENA)	PRO(ESH)017 January 27, 2016 Page 12 of 15
--	-----------------------------------	---

C. General Guidelines

1. All work performed at ENA site must be approved by FIDO.
2. If you feel uncomfortable with the safety of any work you are asked to perform, **do not do it**; instead, contact the FIDO at +1 505-667-1186.
3. ES&H Incidents:
 - Any team member or visitor to ENA site can recommend or order a work stoppage for ES&H concerns without reprisal. Work will not recommence until the incident is resolved.
 - Any team member who does not adhere to the ES&H guidelines outlined in this document will be asked to leave the site.
4. Awareness of Consequences:
 - Know hazards involved and safety equipment required to mitigate those hazards.
 - Identify potential waste and disposal methods to be followed.
 - Read operating manuals for test equipment or tools before using these devices. Observe manufacturer's safety recommendations.
 - Read the Material Safety Data Sheet (MSDS) for any chemical that may be used.
 - Personnel shall:
 - ⇒ Plan the work.
 - ⇒ Analyze the hazards.
 - ⇒ Develop and implement controls to mitigate the hazards.
 - ⇒ Perform the work safely after you have confirmed your readiness to do so.
 - ⇒ Identify improvements to further enhance the safety of the operation.
5. Follow the "Two-Person Rule" – Visitors are not allowed to work alone at the site.
6. Visitors are responsible for cleaning up areas they use.

FIDO PROCEDURE Author: FIDO	ACRF SAFETY PLAN (ENA)	PRO(ESH)017 January 27, 2016 Page 13 of 15
--	-----------------------------------	---

II. Background:

The U.S. Department of Energy's (DOE) Atmospheric Radiation Measurement (ARM) Program relies on climate research facilities to measure surface components of solar and terrestrial radiation, surface meteorology, cloud properties, and other atmospheric quantities in various locations throughout the world, which include the U.S. Southern Great Plains (SGP), the Tropical Western Pacific (TWP), and the North Slope of Alaska (NSA).

FIDO operates the ENA site in collaboration with a host organization or government. The ARM Climate Research Facility (ACRF) Science Board selects the deployment locations based on formal proposals.

III. ES&H Policy:

Individuals working at or visiting ENA site on official DOE business, a specific Intensive Operational Period (IOP), or just for a casual visit, must notify FIDO of travel plans well in advance of departure and in sufficient time to comply with the following policies:

- All personnel who are at ENA site are required to act and work safely and not to jeopardize their own safety or that of others at the site.
- All personnel who are at ENA site must perform work in such a manner that they do not jeopardize the operation of the site.
- All visitors must read the Safety Plan and agree to comply with its recommendations and guidelines as per their specific authorization, and sign the visitor sheet acknowledging their personnel authorization and the work restrictions and precautions associated with that authorization.
- All visitors to ENA site from outside the host country must participate in a FIDO-led ES&H briefing before departing for the host country.
- All visitors to ENA site must also follow all applicable local regulations and codes. In general, new construction shall follow U.S. regulations, unless local regulations are more stringent.
- All ENA visitors must submit an official ACRF Site Access Request (SAR) online at <http://www.db.arm.gov/SARS2/> and cannot go to the site until they receive an approval.

IV. Scope and Document Ownership:

- This plan applies to activities relating to ENA shelters and associated components within the AMF site only. It does not cover work performed off site that is the responsibility of others. No work is authorized by LANL off the AMF site unless specified in writing. If off-site work is proposed and funded by DOE, it should follow the ARM Safety Policy online at http://www.arm.gov/acrf/safety_policy.stm and the DOE Integrated Safety Management online at <http://www.eh.doe.gov/ism/diagram.html>.
- This document covers activities that normally occur in light electro-mechanical laboratories and activities common to mobile electro-optic laboratories with no chemical or wet-lab facilities.
- This plan is to be implemented as of the date of publication, and continue in effect until superseded by a revision.
- The requirements of this document apply to all LANL employees, all U.S. subcontractors of LANL, and employees of collaborating U.S. organizations who visit ENA site. In addition, non-U.S. contractors, governments, and other organizations must follow the requirements outlined in this document.

FIDO PROCEDURE Author: FIDO	ACRF SAFETY PLAN (ENA)	PRO(ESH)017 January 27, 2016 Page 14 of 15
---	-----------------------------------	---

V. References:

FIDO Operations procedures – see FIDO web site at www.twppo.lanl.gov.

VI. Attachments:

1. ENA Visitor Sign-in Sheet

