Darwin
(ARCS-3)
Site Safety Plan
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ARM Tropical Western Pacific Office

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Darwin (ARCS-3) Site Safety Plan

Darwin Airport, Darwin, Northern Territory

Australia

I. Purpose:

This document contains procedures describing hazards and their mitigations associated with the operation of the Atmospheric Radiation Cloud Station (ARCS) located at Darwin Airport in Darwin, Northern Territory, Australia. The site is also adjacent to Bureau of Meteorology Office (MET Office).

II. Background:

The U.S. Department of Energy's (DOE) Atmospheric Radiation Measurement (ARM) Program relies on Atmospheric Radiation and Cloud Stations (ARCS) to measure surface components of solar and terrestrial radiation, surface meteorology, cloud properties, and other atmospheric quantities in the Tropical Western Pacific (TWP) locale. Pacific Northwest National Laboratory (PNNL) procured the TWP ARCS in conjunction with the Tropical Western Pacific Office (TWPO) at Los Alamos National Laboratory (LANL).

The ARM Program has established three ARCS facilities across the Pacific basin. The development, establishment, and operation of these ARCS facilities are the responsibility of the TWPO, while the ARM Program Office at PNNL is responsible for procurement of the ARCS and their components including all instruments.

The Darwin Site is operated and maintained in collaboration with the Australian Bureau of Meteorology (BOM). The site also serves as the maintenance center for the other two ARCS sites, Manus and Nauru. The ARM Program chose Darwin for its location near the western edge of the tropical warm pool during La Niña conditions. The ARCS instruments quantify many atmospheric properties including cloud height, cloud thickness, cloud type, percent cloud cover, cloud temperature, direct solar radiation, indirect solar radiation, atmospheric column water vapor and liquid water content, reflected solar radiation, terrestrial radiation, wind speed and direction, temperature, precipitation, and humidity.

III. ES&H Policy:

Individuals traveling outside the United State on official ARM/TWP business must notify TWPO of travel plans well in advance of departure and in sufficient time to comply with the following policies:

- All travelers are briefed by TWPO or their designates on medical, political, and social issues as determined by TWPO.

- Persons shall not travel alone unless TWPO makes an exception.
- Current certification in CPR/first-aid training is recommended for all travelers.
- Travelers are required to have an itinerary on file at TWPO and LANL.

IV. Rationale:

- In the event of civil disturbance, illness, or injury, travelers to the TWP locale must notify TWPO and other contacts (both personal and official) as soon as possible. An official travel companion who is fully briefed will be required for safety reasons. Short-term illness is a very common occurrence for travelers in the TWP locale. Since trips to the Pacific are expensive and time-consuming to set up, it is desirable that any official business be conducted on schedule. Consequently, personnel backups should be fully capable of conducting business for the ARM Program.
- First-aid/CPR certification is recommended for fieldwork of any nature at Los Alamos National Laboratory (LANL). Because of the unusual circumstances, remoteness of duty stations, and sparseness of medical services, this requirement also applies to official travelers to the TWP locale (no matter who their employer is), regardless of whether fieldwork takes place.
- TWP personnel must behave in polite and appropriate ways according to local norms.
- As conditions change, TWPO and LANL may require additional requirements and training.

V. Scope and Document Ownership:

- The procedures outlined here apply to LANL-controlled activities relating to ARCS-3 shelters and associated components.
- 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.
- These procedures are to be implemented as of the date of this document, and continue in effect until superseded by a revision of this document.
- The requirements of this document apply to all LANL employees, all US based subcontractors of LANL, and employees of collaborating US Organizations who visit any of the ARCS sites. Non US contractors, governments, and other organizations are directed to follow the requirements of this document (and in many cases trained accordingly), but as they answer to the regulations of their respective foreign employers and governments, the requirements are, in reality strong guidance and recommendations.

VI. Procedure:

A. Planning and Scoping Operation of ARCS-3

1. Plans:
   - Written plans will be developed and used for all phases of TWP work that involve predictable work tasks.
2. On-Site ES&H:
   - All visitors to the Darwin Site (ARCS-3) who plan to perform work there must read this document thoroughly and sign in to acknowledge that they have reviewed and understand its contents.
3. New work on the site shall comply not only with regulations outlined in this document but also with ones enforced by the Australian government regulations and the Australian Department of Defense regulations.
4. There will be no work performed on any ARCS site without approval of the site Officer-In-Charge (OIC), RESET visit lead, or TWPO management.
5. ES&H Incidents:
   - Any team member or visitor to the ARCS installation 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 ES&H guidelines will be asked to leave the site. If the team member does not or cannot agree to adhere to TWP ES&H requirements, that team member will be required to return to her/his home country.
   - DOE and PNNL ARM program officers are aware of and agree with the LANL TWP ES&H guidelines outlined in this document.

B. Emergency Services

1. Emergency Phone Numbers in Darwin:

Ambulance 000
Police 000
Fire 000
Director of Public Health 8951-6920
Power and Water 1-800-24-5090
Communications/Phone 1-800-80-8821
Roads 1-800-24-6199
LANL ES&H Hotline ..... 505-665-5010 (LANL, U.S.A.)
Jeff Hansen (EES Div. Safety Officer, LANL) .... 505-667-5043 (LANL, U.S.A.)

2. ES&H Notification of ARCS Project Personnel:
   - Immediately notify TWPO of any ES&H occurrence: 00-1-505-667-1186
3. Urgent Care Facilities:
   - The Royal Darwin Hospital:
     8922-8888
     This facility is approved for emergency medical care. Ambulance service is also available. Service is free or requires low fees.

C. Safety Equipment

1. Safety Equipment/Items Available at Nauru Site:
   - Fire extinguishers in each van
   - First aid kit in the E-Van
   - Safety shoes – no sandals or flip flops
   - Safety glasses
   - Hearing protection
   - Gloves
   - Sunscreen
   - Hard hats
   - Signs/Barriers
   - Communication system
   - Emergency shower outside
   - Dollies and rolling platforms for lifting

D. General Requirements

1. Before starting any activity, be aware of the consequences of the operations:
   - 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 manufacturers' safety recommendations as a minimum.
   - Personnel shall:

     a) Plan the work.

b) Analyze the hazards.

c) Develop and implement controls to mitigate the hazards.

d) Perform the work safely after you have confirmed your readiness to do so.

e) Identify improvements to further enhance the safety of the operation.

f) Read the Material Safety Data Sheet (MSDS) for any chemical that may be used.

g) Know the appropriate team member who supervises the job based on ES&H training required for the task.

2. Adhere to the "Two Man Rule" – Visitors are not allowed to work at the Site alone.

3. Visitors are responsible for cleaning up areas they use and bagging their trash.

E. Potential Project-Related Hazards

1. Electrical Hazards:

a) Transformers (240:120 step-down, 5 kVA)

b) UPS batteries, solar panel-batteries, other backup batteries

c) Wiring and service outlets

d) Power and signal cable runs

e) Standard operating voltages (< 120 volts)

f) Common operating voltages (120 - 600 volts)

g) Diesel-powered generators (internal and external)

h) Grounding

i) Portable generator

2. Gravity, Tripping, and Obstruction Hazards:

a) Cranes, hoist, slings, rigging, forklift operations for moving ARCS and components.

b) Davit crane

c) Ladders and stairs

d) Tripping hazards from cables and equipment

e) ISO container jack operation

f) Working on top of enclosures (vans)

g) Working on top of instrument stands

h) Raising and lowering SMET tower

i) Obstruction hazards from equipment

3. Hazardous Materials, Substances, and Waste:

a) Fuel and lubricants for generator

b) Cleaners and cleaning solvents (less than one pound each)

c) Adhesives, epoxies

d) Soldering operations

e) Battery acid

f) Disinfectants

g) Hydrogen generator caustic chemicals

4. Mechanical Hazards:

a) Power tools, common shop equipment, test equipment

b) Operation of doors, hatches, and ports

c) Installation of large or heavy equipment, such as electronic cabinets, ISO containers, instrument stands, and air conditioning units

5. Pressure Hazards:

a) ARCS low-pressure compressor for shutter operations

b) Portable air compressor for tools

c) Compressed helium (He), hydrogen (H), and nitrogen (N) gases

d) Dry air compressor

6. Diesel Generator Hazards:

a) Noise

b) Battery chemicals

c) Mechanical parts

d) Fuel

7. Radiant Energy Hazards:

a) Eye-safe laser in LIDAR

b) Eye-safe Ceilometer

c) 35-GHz radar

d) Generator fuel and lubricants

e) Combustible materials

8. Natural Hazards:
    a) Heat
    b) Rain and lightning
    c) Pathogens
    d) Untreated water
    e) Unprocessed foods
    f) Plants, animals and insect life (although no known poisonous animals are present at the site)
9. Visitor Hazards:
    a) Recreational hazards (associated with swimming, snorkeling, and boating) such as drowning, crocodiles, jellyfish, etc.
    b) Sunburn
    c) Heat stress
    d) Personal health
    e) Driving
10. Other:
    a) Local driving rules and laws

F. Safety Methods

1. Electricity/Electrical Equipment Procedures:
    - Electrical Safety:
        a) Only local utility power company personnel are allowed to work on 416 VAC, 3-phase site power supply.
        b) Work on 220 VAC, 3 phase or 110 VAC, 1 phase exposed connectors is prohibited for Observers. Only trained personnel or certified electricians are authorized to work on 220 VAC or 110 VAC systems.
        c) AC Distribution or control cabinets or enclosures may not be opened when power is applied.
        d) All electrical loads must be disconnected before connecting or disconnecting the main AC power cables to any enclosure or van.
        e) Visitors may not reset breakers.

f) Ground-fault interrupting (GFI) breakers are required for all extension cords. All extension cords placed outside enclosures must be on GFI breakers.

g) A red emergency shutdown button in each ARCS enclosure may be used at any time to remove main AC power in case of fire, electrical malfunction, or other emergency requiring removal of main power.

- All energized electrical work, other than diagnostics and testing, shall be done de-energized if possible. TWPO may approve procedures for energized electrical R&D work when the following nine items have been addressed:

  a) Potential hazards associated with the task

  b) Minimum work clearances required

  c) What barricades are required and where to place them

  d) What personal protective equipment is required

  e) Test instruments to be used

  f) Proper instructions for safety using test instruments

  g) Minimum number of workers required to do the task

  h) Description of the duties of each worker

  i) Sequence of steps which affect safety

  j) Lock out / tag out required for all work on energized systems

- General Electrical Safety Requirements:

  a) It is recommended that all electrical utilization equipment have a UL (Underwriter Laboratories) label, or other mark indicating that it has been tested by UL or another approved Nationally Recognized Testing Laboratory to UL. Work in compliance with OSHA and NFPA.

  b) UL- approved, three-wire electrical extension cords are acceptable for short duration, temporary connections only. They shall not be used as a substitute for permanent wiring. A permanent electrical outlet shall be installed to provide power for equipment that is used for other than temporary use.

  c) Extension cords may be used in series, but shall be disconnected from the power source at the end of the work shift. This practice should not take the place of hardwire connections as appropriate. All power strips and power centers shall be turned off at the end of the day.

d) Extension cord shall be protected to avoid damage from sharp edges and shall be routed so as not to create tripping hazards.

e) Extension cords should be orange or yellow in color for high visibility.

- Maintenance for Electrical Equipment:

a) 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 who is clear of the hazard. Whenever possible, troubleshooting of energized equipment should be avoided.

a) Before starting work, de-energize all voltage sources and provide a positive method of ensuring that voltage will stay off. LANL- approved lockout/tag out Red Lock Procedure will be observed.

b) When working on energized equipment, personnel shall work with one hand whenever possible.

Note: Use rubber mats or other insulating material that will keep the operator isolated from ground.

c) 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.

2. Gravity, Tripping, and Obstruction Hazards:

- Forklifts and Cranes:

a) Any work requiring a forklift or crane will be performed by owner/operators of the equipment on Darwin. **No TWP team member is trained or authorized to operate equipment owned by Darwin residents.**

b) If any crane or forklift work is to be performed on the site, all team members, visitors and colleagues will be warned of the work and asked to clear a suitable wide area around the work.

- Tripping Hazards:

a) Tripping hazards shall be mitigated to the degree possible by judicious routing of cables and wires. Where such hazards exist, warning signs shall be placed.

b) Many cables run along surfaces at the site during installation and these create tripping hazards. Watch for cables when you walk, especially in low-light conditions.

c) Some equipment protrudes into work areas or near walkways. Take caution to avoid injury when walking or working in these areas.

d) Visitors may be asked to clear any area during the movement of heavy equipment.

- SMET Tower:

a) SMET Tower to be raised and lowered carefully and with at least two people, minimum.

3. Handling of Lubricants, Cleaning Agents, Adhesives, Fuels and Other Chemicals:

- Small amounts (generally, less than one kilogram each) of lubricants, cleaning agents, adhesives, and other chemicals will be occasionally required at the ARCS-3 site.
- Gasoline (petrol) shall not be stored at the site unless in approved safety containers.
- Diesel fuel is handled by the local supplier only in most cases. Fuel can be hand pumped from tank to tank by the Observers.
- Storage, use, and disposal of these chemicals shall be performed in accordance with the documents cited in this procedure.
- Soldering:

a) Soldering will be performed in areas designated for chemical use by the appropriate ES&H placards.

b) Soldering equipment shall be turned off at the end of work shifts or when personnel leave the site for times exceeding one hour.

c) Solder and related equipment shall be stored in labeled drawers or lockers.

d) Soldering shall be performed in accordance with LANL's ES&H requirements.

- Chemical or Oil Spills:

a) Contact the fire department for any spills greater than 10 gallons; this includes any chemical, cleaner, or oil spilled. A spill kit is located in the U-Van near the generator.

4. Mechanical Hazards:

- Tools:

a) Hand tools are to be used by RESET members only and as per manufactures' recommendations.

b) Inspect hand tools for defects before use. Any defective tool shall be removed from service.

c) Use tools for their designed purpose only (e.g., do not use a screwdriver as a chisel, or a scribe as a pry tool, etc.).

d) Safety glasses or goggles shall be worn when performing operations with hand tools that could result in uncontrolled material movement or if there is a possibility of tool breakage, such as hammering or chiseling, drilling, sawing with portable electric tools.

e) Use of leather gloves is recommended when working with hand tools.

f) Always cut away from your body when using sharp tools.

- Portable electric tools and equipment safety requirements:

a) Inspect portable electric tools prior to use. With the exception of double-insulated tools, all portable electrical tools that require 60 Hz power shall be equipped with three conductor cables and grounded plugs.

b) Any tool with frayed cords, exposed wiring, missing ground plugs, etc, shall be removed from service.

c) Keep all body parts away from cutting parts of power tools.

d) Electrical equipment and tools used at the ARCS-3 site shall have UL Approval ratings where possible.

e) Electric-powered heaters and fans will have UL Approval ratings.

- Equipment Provided and Owned by Agencies:

a) Equipment owned and furnished by other (non-LANL) laboratories and agencies shall be provided with appropriate safe operating procedures. These procedures shall be observed by all personnel working or visiting at the ARCS-3 site.

- Operate all equipment as per site procedures and manufactures recommendations.

- Lockout/Tagout:

a) Any equipment tagged with a “Lockout/Tagout” indicator may not be operated.

5. Pressure Gases:

- Use compressed gases as per procedures.

6. Diesel Generator Hazards:
   - Do not enter the U-Van generator compartment when the generator is running without ear protection.
   - Wear ear protection during any operations that have a significant noise level.
   - **ONLY** trained and authorized personnel are to connect, start, or stop the diesel generator sets used to power the ARCS.
   - Battery maintenance shall be performed by qualified personnel only.
7. Radiant Energy Hazards:
   - The MPL (laser light) is eye safe. Operations must conform to the procedures provided.
   - Access to the MMCR radar antenna is restricted.
8. Natural Hazards at Site:
   - No known poisonous animals are present at the site.
   - Use common sense is grassy areas for snakes in Darwin.
   - Watch for insects and spiders when moving items, especially wooden ones; none are poisonous.
   - Do not handle rodents, living or dead, found at the site.
   - Use common sense when near the water and beware of crocodiles and jellyfish in Darwin
   - Weather conditions may create certain hazards at the Darwin Site.
     a) Rain may reduce traction on surfaces.
     b) Extreme temperatures may necessitate the use of special clothing.
     c) Take cover during thunder storms. When thunderstorms develop, avoid being near high, open places (hills, fields, etc.) or near isolated high points (trees, light poles, etc.). Large enclosed buildings provide the greatest safety from a lightning strike. In general, vehicles (with windows rolled up), provide significant safety if you do not touch the metal surfaces of the vehicle.
9. Visitor Hazards:
   - The “buddy system” is recommended in Darwin for all recreational activities that involve snorkeling, swimming and boating.

     Note: Visitors are required to wear life jackets while boating.

- Be careful of sunburn. You should try to wear hats and sun-protective clothing (pants & long sleeved shirts).
- Know your own personal limits for fatigue. Take a break or stop work when you need rest. Come inside to cool down.
- Be careful of dehydration and Heat Stroke. Drink plenty of fluids:
    a) Heat rash/heat cramps in stomach and muscles (drink liquids and get in cool place.)
    b) Heat exhaustion – excessive sweating, rapid pulse, pale skin, dizziness, nausea, tiredness (drink liquids, rest in cool place, contact doctor.)
    c) Heat stroke – hot and dry skin, chills, irritability, disorientation, collapse (call contact doctor and evacuate to hospital).
- Skin abrasions may become infected in the hot, humid environment. Be careful when working and use gloves if possible.
- Avoid drinking untreated water. Drink bottled, boiled or treated water, or rainwater.
- Use common sense and take safety precautions when off site. Travel in pairs, use life preservers, drive safely, and take health precautions as per the pre-trip oral ES&H briefings.
- Locking doors of trailers and containers:
    a) Personnel entering a trailer, enclosure, or container will take action to ensure the entry door will not be locked from the outside.
- See your doctor well before leaving and go over SDS recommendations.

10. Other:
    - Drinking and driving is prohibited

I. ES&H Site Briefings and Training

1. ES&H Briefings:
    - Most visitors to the ARCS-3 site will be given an oral ES&H briefing. The TWPO will maintain records of all project personnel who completed this briefing.

VII. References:

None.

VIII. Attachments:

None.