Audubon Aquarium of the Americas

Emergency Life Support Scheme
&
Hurricane Preparation

Presentation Overview

1. Process for development of Life Support Scheme
2. Back-up life support systems
3. Storm preparation
4. Storm staffing considerations

Development of Life Support Scheme

- Born out of our experience during Hurricane Katrina. Usable for any emergency.
- Identified facility's life support critical aspects.
- Tiered emergency back-up systems into levels based on ability to criss-cross weak points (Matrix).
- Scheme is designed for minimum two week facility isolation.

Facility Life Support Critical Aspects

- Critical Aspects:
    1. Power
    2. Water
    3. Exhibit chilling capacity
    4. Aeration
- Usage Level:
    - -Primary (Normal)
    - -Tier 1 emergency
    - -Tier 2 emergency
    - -Tier 3 emergency

Highlights of Matrix

- Emergency Generators (Tier 1 & 2)
- Exhibit water chilling (Tier 2)
- Extra aeration for largest exhibit (Tier 1+)
- Tier 3 equipment:

  "When it hits the fan"

Facility Emergency Generators

- Main generator- Tier 1

-1500kW, diesel w/ natural gas assist.

-Runs 80% of primary life support pumps

-400 gallon, day tank.

-4000 gallon, in-ground tank.

-7000 gallon on-site tanker for tropical events.

- Secondary generator- Tier 2

-400kW, diesel w/ natural gas assist.

-Can run most of emergency life support equipment.

-400 gallon day tank, with natural gas supplied to air intake.

(21gph vs. 8gph)

-7000 gallon on-site tanker for tropical events.

1500 kW emergency generator

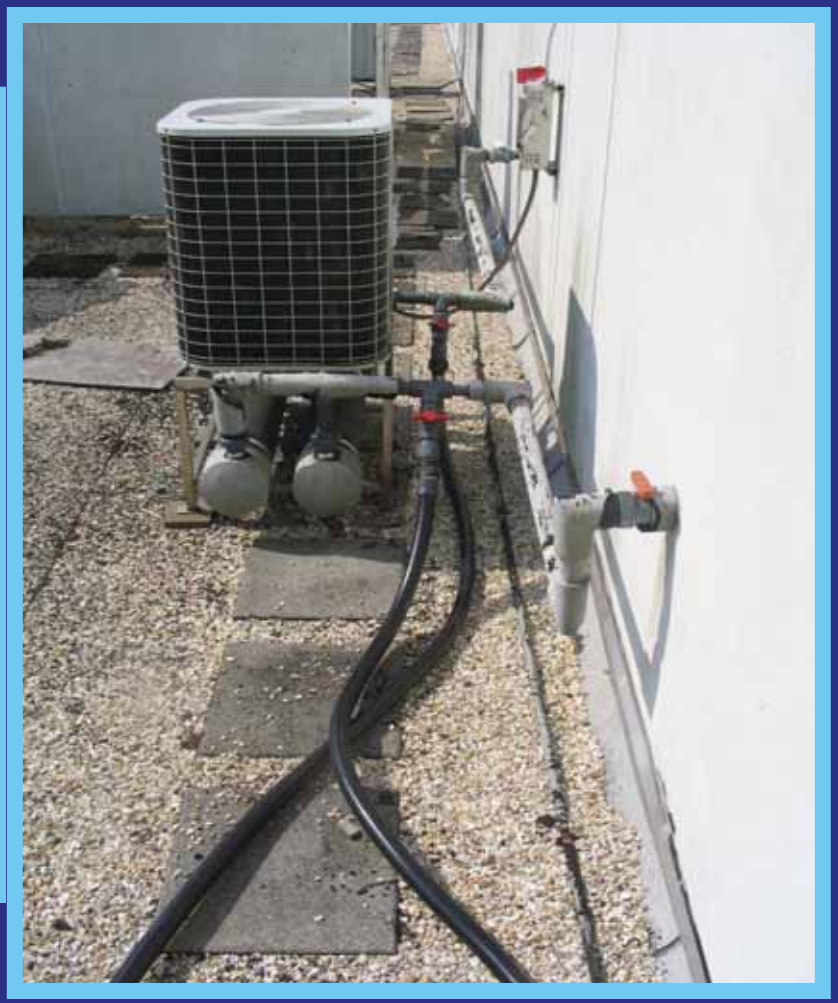
Tier 1

400kW secondary emergency generator (and reserve fuel)

Tier 2

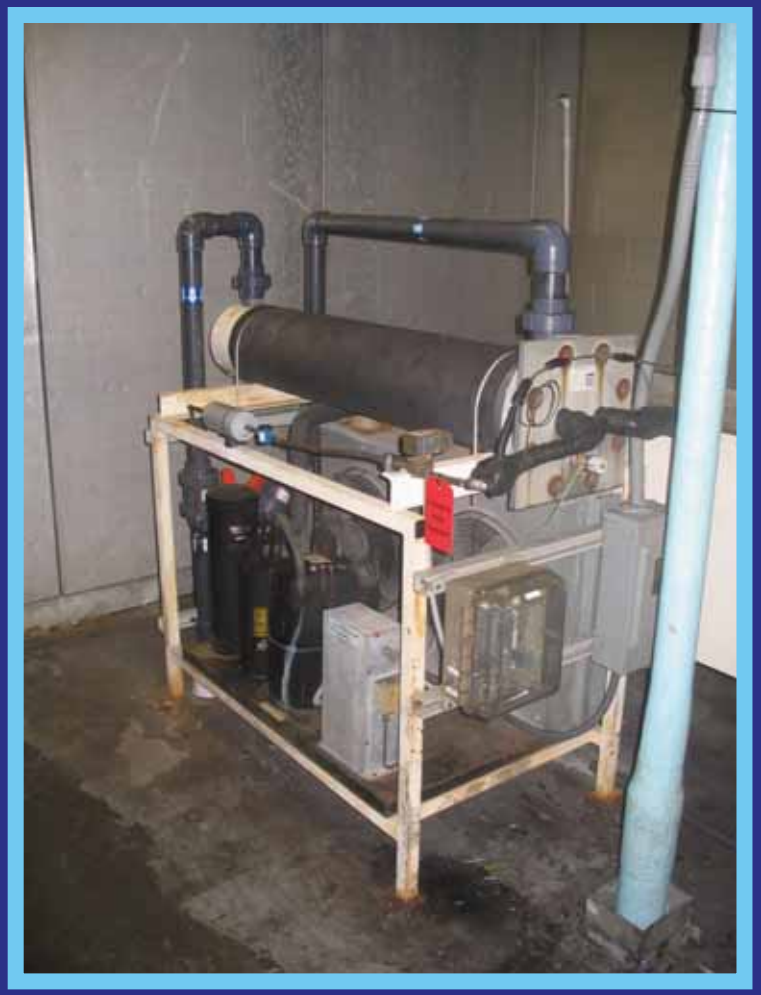
Sea Otter-10T chiller
Tier 2

Otter System umbilical supply and returns for chiller (Tier 2)



PENGUIN-5T CHILLER

TIER 2



Auxiliary air for Gulf Exhibit
Tier 1

- Air diffusers drop down to 10’, with aid of weights
- 1” control valves

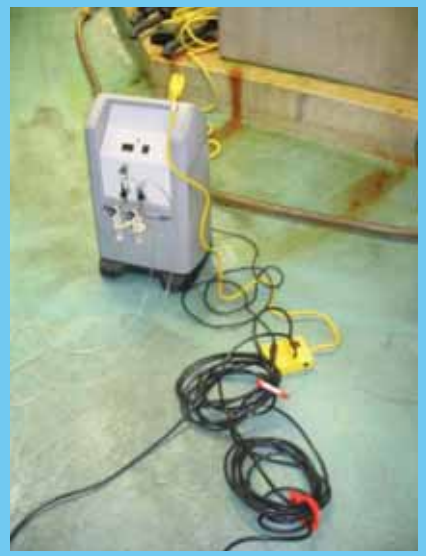
Tier 3 Equipment

- Building-wide emergency power failure.
- The equipment includes:

  (a) dedicated/portable power sources.

  (b) Aeration/oxygen source, for six largest systems.

Tier 3 life support for the Gulf Exhibit: (largest, deepest exhibit)



- Gasoline generators, submersible pumps, and oxygen concentrators

- Installation at the top of the Gulf Exhibit

- 2” PVC pipes are quick connected to the sump pumps.
- Concentrators are plugged in and turned on, the sump pumps are plugged in.
- Oxygenated water is carried down 10’.

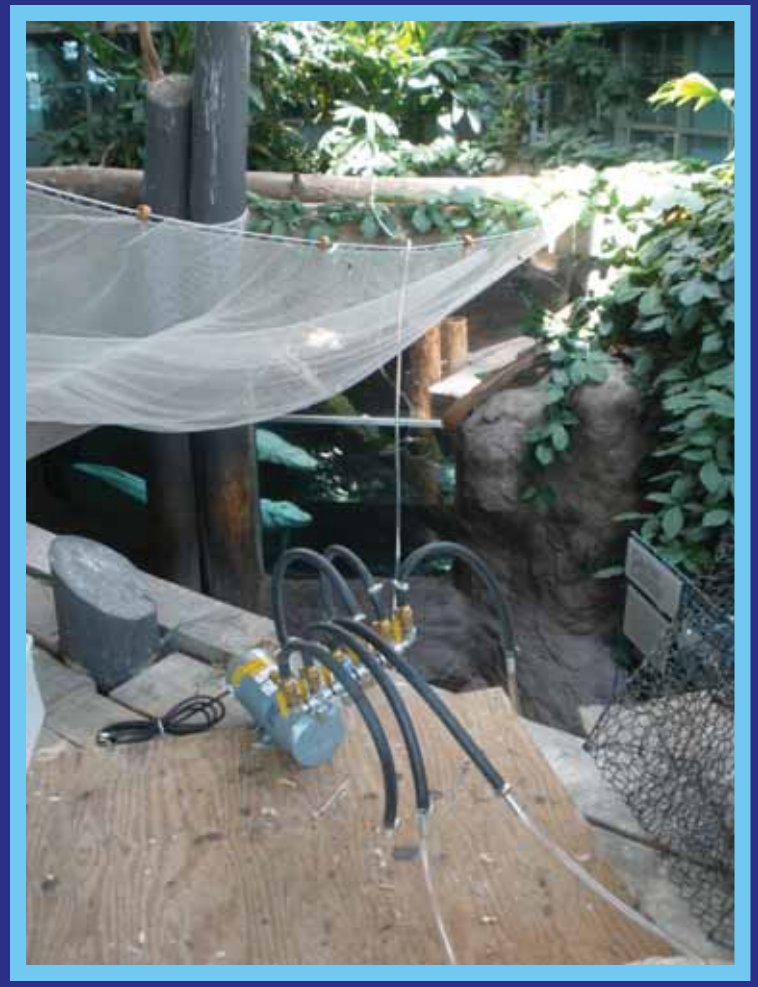
Tier 3 life support for the Caribbean Exhibit :

Auxiliary Air for Amazon Gallery
Tier 3

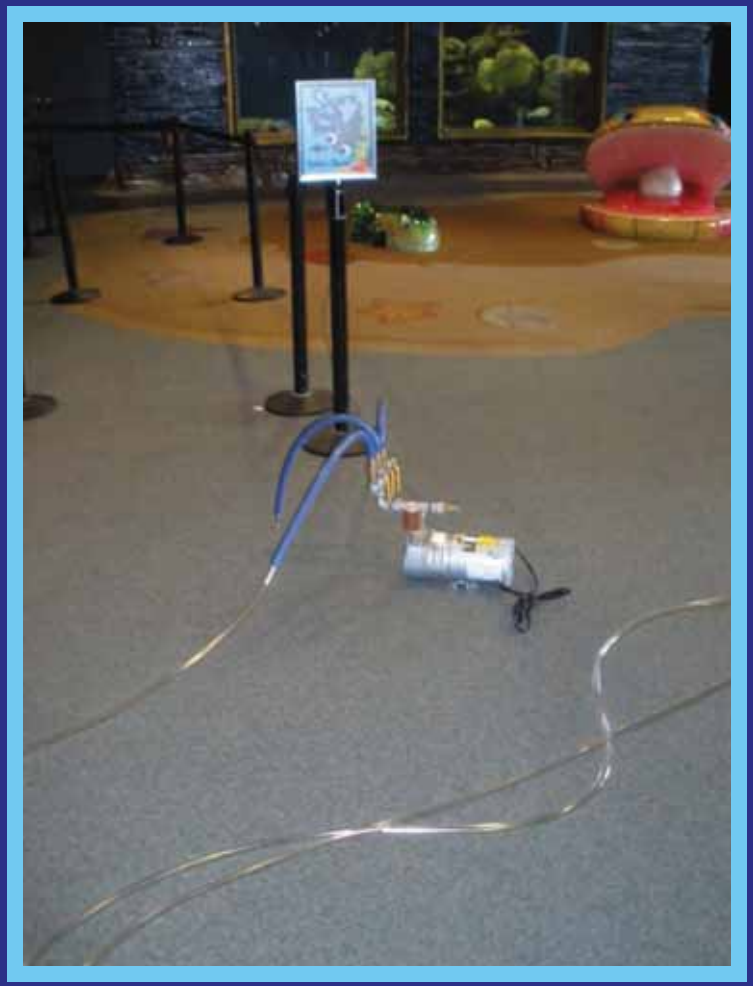
- ¼ HP rotary vane compressor
- Power portable junction box
  (house and emergency).

Auxiliary Air for Mississippi Gallery
Tier 3

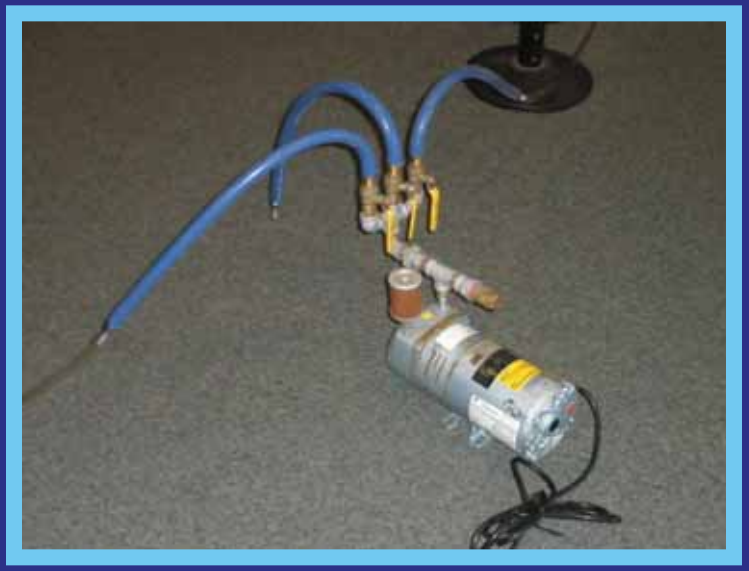
- ¼ HP rotary vane compressor
- Power: portable 5kw.



Auxiliary Air for Changing Exhibits Gallery
Tier 3



- ¼ HP rotary vane compressor
- Power: 5kw generator

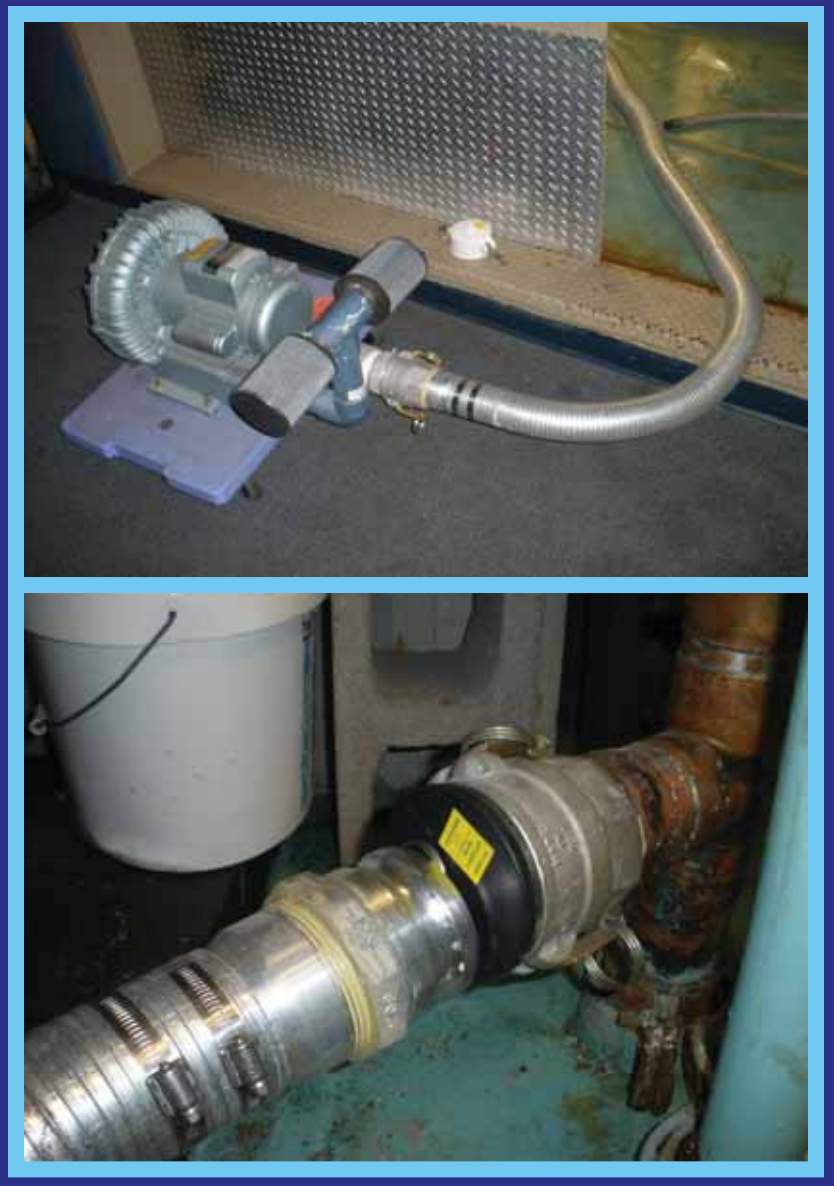


3.5 HP Blower

Tier 3

-Ties into building air network.

-Power: 17.5kW generator.



Facility Critical Aspects Matrix

Critical Aspect / Tier	1. Power	2. Water	3. Exhibit chilling	4. Aeration
Primary	City grid **(two live feeds)**	Municipal water	Existing building chillers	20 Hp Blower (#1)
1st back-up (Tier 1)	1500 kw diesel generator	-Fill fresh water Vault -Adequate salt water	60T life support chiller (I) 200T existing Chiller (II)	-20 Hp Blower (#1) -Auxiliary air for Gulf
2nd back-up (Tier 2)	400 kw diesel generator	Fill reserve fresh water vault	-5T air cooled (Penguins) -10T air cooled (Otters)	20 Hp Blower (#2)
3rd back-up (Tier 3)	**Portable Gasoline generators (4)**	River pump	Air control: Ice, fans	**-Sump pumps/O2 Concentrators** **-vane compressors** **-3.5 HP blower**

Life Support Preparation

1. **Pre-Season**

   -Run generators, test all emergency equipment, and backup chillers.

   -Acquire ammonia neutralizing agents and bicarbonate.

2. **Storm in the Gulf (*We are in the cone of probable landfall*)**

   -Fill two reserve vaults with municipal water (92,000).

   -Verify at least 48,000 gal. reserve salt water.

   -Begin backwashing filters associated with emergency powered pumps.

3. **72-48 hours Pre-landfall**

   -Stage portable emergency equipment (Tier 2 and 3).

   -Continue backwashing filters associated with emergency powered pumps.

4. **Landfall looming**

   -Set Tier 2 and 3 equipment in place, finalize life support preparations, and assist others.

Staffing considerations for tropical events

- Remote HQ (Administrative staff)
- Team divisions (Operational staff)
- Department responsibilities.

Remote Head Quarters

- Audubon Nature Institute administrators set up remote command center.
- Present: CEO, CFO, COO, Facility Directors, External communicators, purchasing agent.
- Functions: communications, supplies, and recovery. Plus normal business functions (payroll, finance, etc.)

Team Divisions

- **<u>Team 1-Storm Riders: 13 Aquarium staff members.</u>**
  - -1 internal communicator.
  - -2 engineering.
  - -2 security.
  - -3 electrical.
  - -5 husbandry.

Responsible for the care of the building in the event of a lock down.

- **Team 2-Relief : 14 Aquarium staff members**
  - -1 internal communicator.
  - -1 engineering.
  - -1 maintenance.
  - -2 security.
  - -2 electrical.
  - -5 husbandry.
  - -2 horticulture/grounds.

Responsible for taking over the care of the building from storm riders 7 days after landfall.

- **Team 3-Reserve: 18 Aquarium staff members**
  - -1 internal communicator.
  - -1 engineering.
  - -2 maintenance.
  - -3 security.
  - -2 electrical.
  - -6 husbandry.
  - -2 horticulture/grounds.
  - -1 facility services.

Responsible for taking over the care of the building from relief Team 2, 7 days on/14 days off.

Department responsibilities during landfall of tropical system

Husbandry:

- -Animal care
- -Normal life support function
- -Life support function on emergency power (all tiers)

Engineering/Electrical:

- -Normal building function
- -Building function on emergency power
- -Function of 1500kW and 400kW generators

Operations:

- -Security
- -Audubon communication
- -Rations and basic supplies
- -FEMA paperwork
- -Cash handling

THE END