Super Energy Efficient Containerized Living Unit (SuperCLU) Technology Design and Development

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Report Documentation Page

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Super Energy Efficient Containerized Living Unit (SuperCLU) Project

Two Phases:

- Modify Existing CLUs at Camp Lemonnier
- Design/Build SuperCLU Prototype

Camp Lemonnier, Djibouti

U.S. AFRICA COMMAND COMBINED JOINT TASK FORCE–HORN OF AFRICA

Mission: Conduct operations in the East Africa region to build partner nation capacity in order to promote regional security and stability, prevent conflict, and protect US and coalition interests.

Camp Lemonnier, Djibouti

- **Harsh Environment**
  - **Average Daytime Temperature (77 to 111 °F in 2010), can reach 125 °F during the day**
  - **High Humidity (Average Dew point was 72 °F in 2010)**
  - **Average wind flow 8 mph (gusts up to 34 mph)**
- **Personnel are Quartered in Containerized Living Units (CLUs)**
- **Increasing Population**
  - **Personnel at times Outnumbers available CLUs**

Camp Lemonnier, Djibouti

- **Energy Production comes from Diesel Power Generators**
  - **Generators run 24/7 (8 x 1.3 MW Caterpillars, 6 x 0.8 MW MUSE, 130-140 smaller generators)**
  - **Approximately 11,000 gallons of diesel fuel is required to run the generators daily (2010)**
  - **Estimated monthly cost for fuel is $600K-1000K ($3 per gallon)**

Camp Lemonnier, Djibouti

CLUs Current Condition uses 40% of Estimated Base Load

Camp Lemonnier, Djibouti

CLUs Current Condition

- **Poor Air Distribution**
- **Large Difference in Air Temperature down length of CLU**
- **Oversized ACUs Cycle On and Off every 3-4 Minutes**

SuperCLU Program Goals

- **Reduce Energy Load for CLU**
- **Easy Set Up and Tear Down (One Day/2 Person)**
- **Maintain Ability to be transported as a ISO container**
- **Create Private Resting Space**

Camp Lemonnier, Djibouti

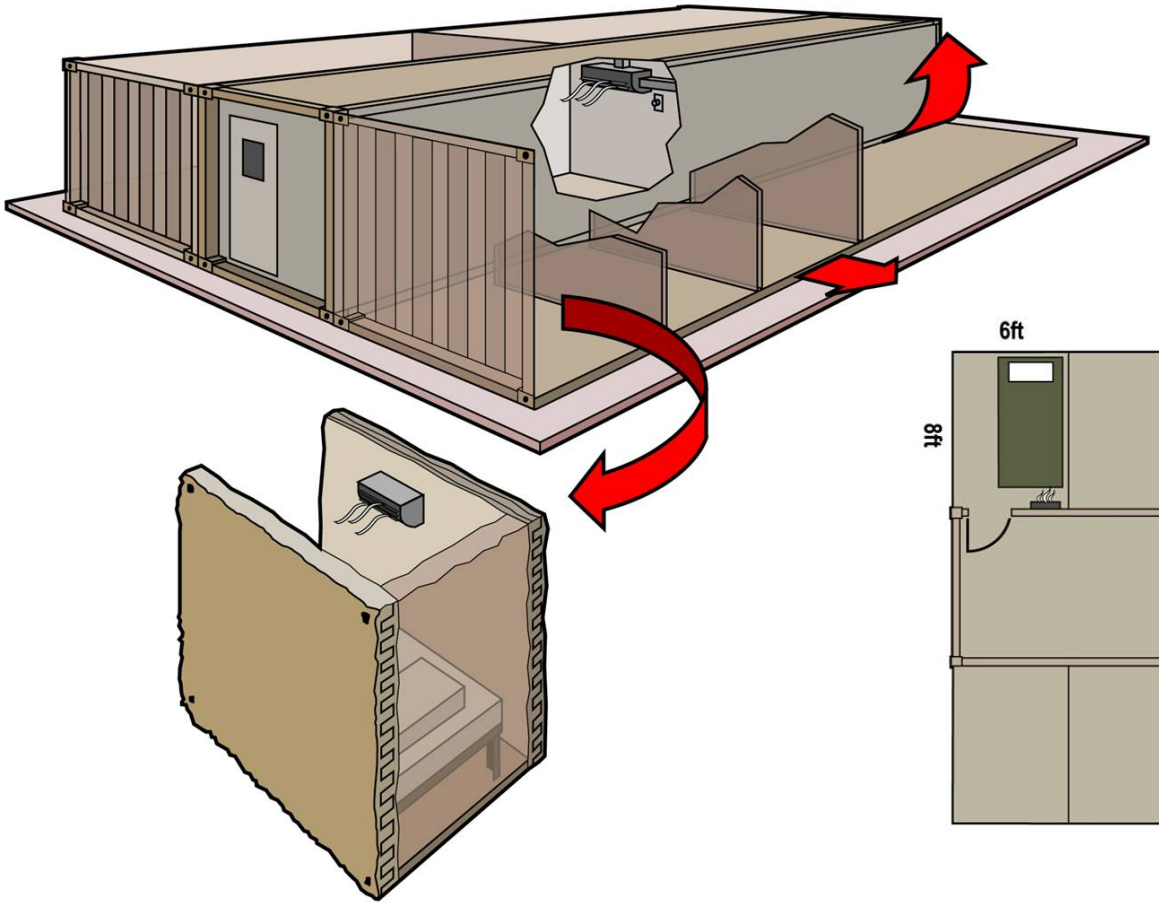
CLU Constraints

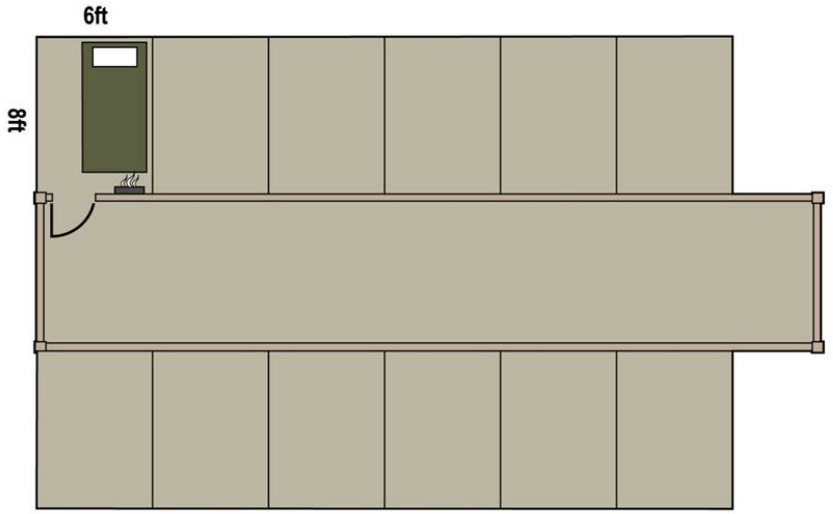
- **Limited downtime during repair**
- **No displacement of occupants**
  - **Work should only be done that can be completed during the day,**
  - **While occupants are away from CLUs,**
  - **Should not disrupt sleeping hours.**
- **Modifications should not limit CLU mobility in the camp**
  - **System installed needs to be able to be broken down fairly quickly**

SuperCLU Energy Reduction Innovation Areas

- **Layout**
  - **Increase People Housed per CLU**
  - **Reduce Cubic Feet of Conditioned Air**
  - **Enhance Individual Space (Individual Berthing Spaces)**
- **Air Conditioning**
  - **Type**
  - **Distribution**
- **Insulation Material (Walls, Floor, and Ceiling)**
- **Rigid Building Material**
- **Building Component Connections**
  - **No Heat Loss**
- **Coatings**
- **Interior Design Improvement**

SuperCLU Concept



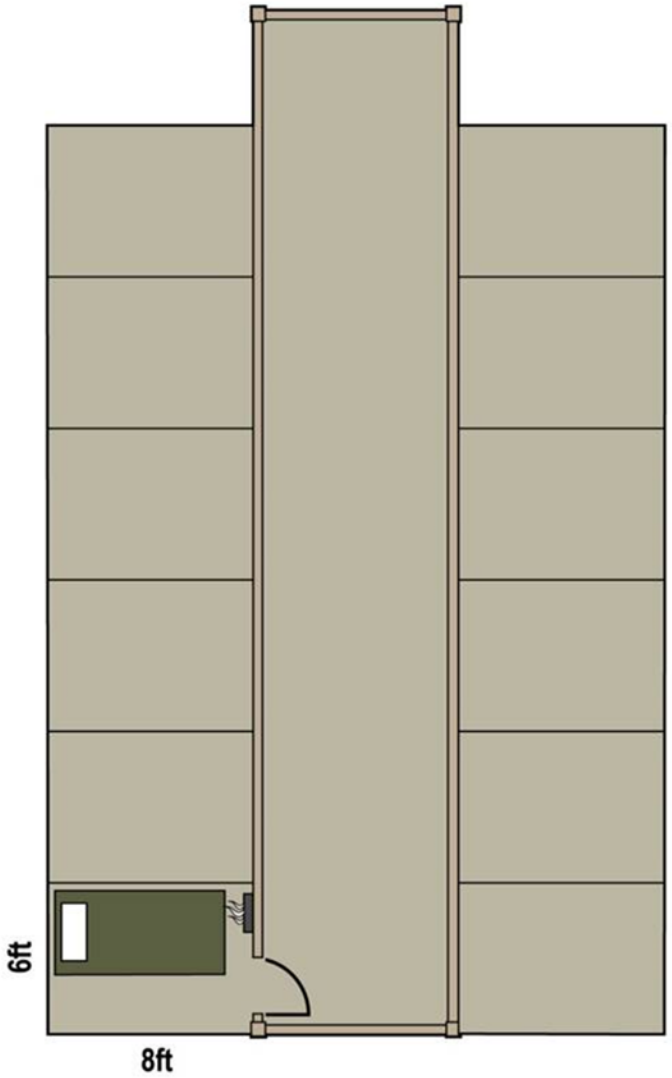


Testing/Prototype Schedule

Technical Test Event	*Location*	*Timeframe*
Insulation Component • Thermal performance, durability, flame resistance, physical properties	TBD, RFI	3-4Q12
Building Component Seal (Thermal)	TBD, RFI	3-4Q12
Building Layout Design	NFESC, Port Hueneme	3-4Q12
HVAC Computer Model	NFESC, Port Hueneme	3-4Q12
Build Prototypes	TBD, RFI	2-3Q13
Relevant Environment Test Event	*Location*	*Timeframe*
Various Trial SuperCLU Field Tests (Energy, Temperature, Human Factors)	WARTEC, 29 Palms CA	3-4Q13
SuperCLU Field Test OCONUS (Energy, Temperature, Human Factors)	Camp Lemonier, Djibouti	2Q14

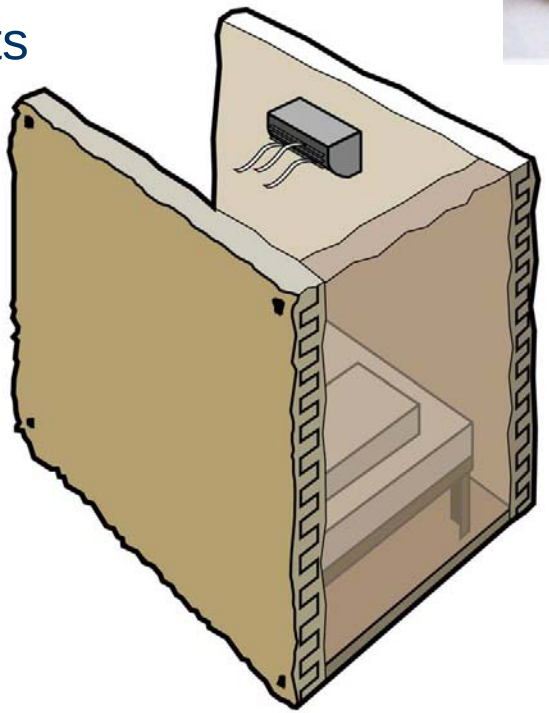
SuperCLU Innovation Areas

- **Layout**
  - **– Increase People Housed per CLU**
  - **– Reduce Cubic Feet of Conditioned Air**
  - **– Enhance Individual Space (Individual Berthing Spaces)**
  - **– Flexible Design**
    - Different Size Space Options



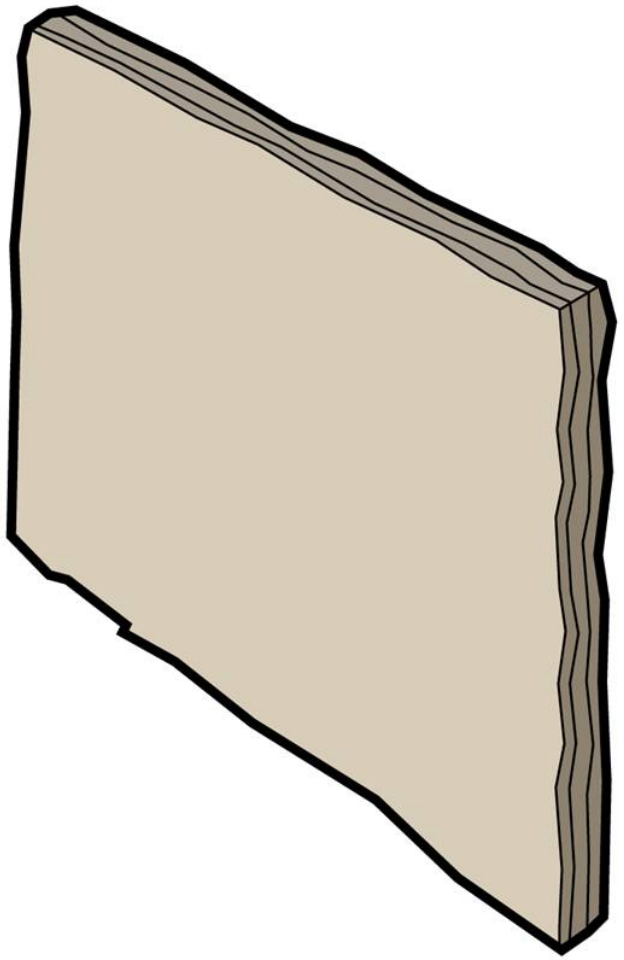
SuperCLU Innovation Areas

- **Air Conditioning**
  - **Type is Dependant on Layout**
    - Split System
    - Individual AC Units
  - **Distribution**
    - Ducted
    - Dustless



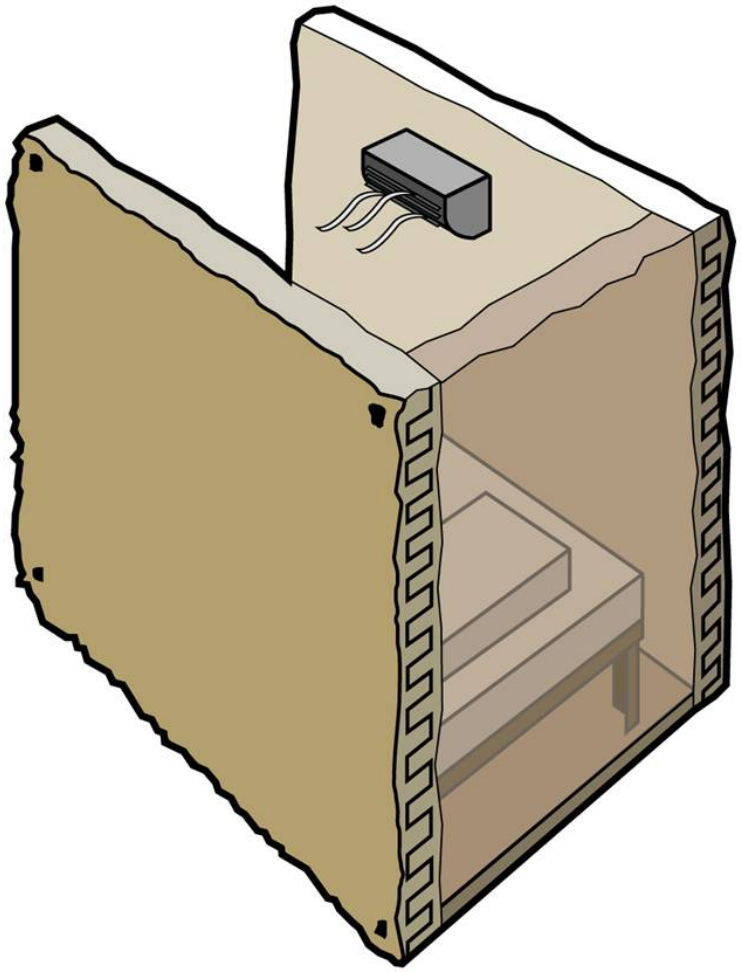
SuperCLU Innovation Areas

- **Insulation Material**
  - **Walls**
  - **Floor**
  - **Ceiling**
  - **High “R” Value**



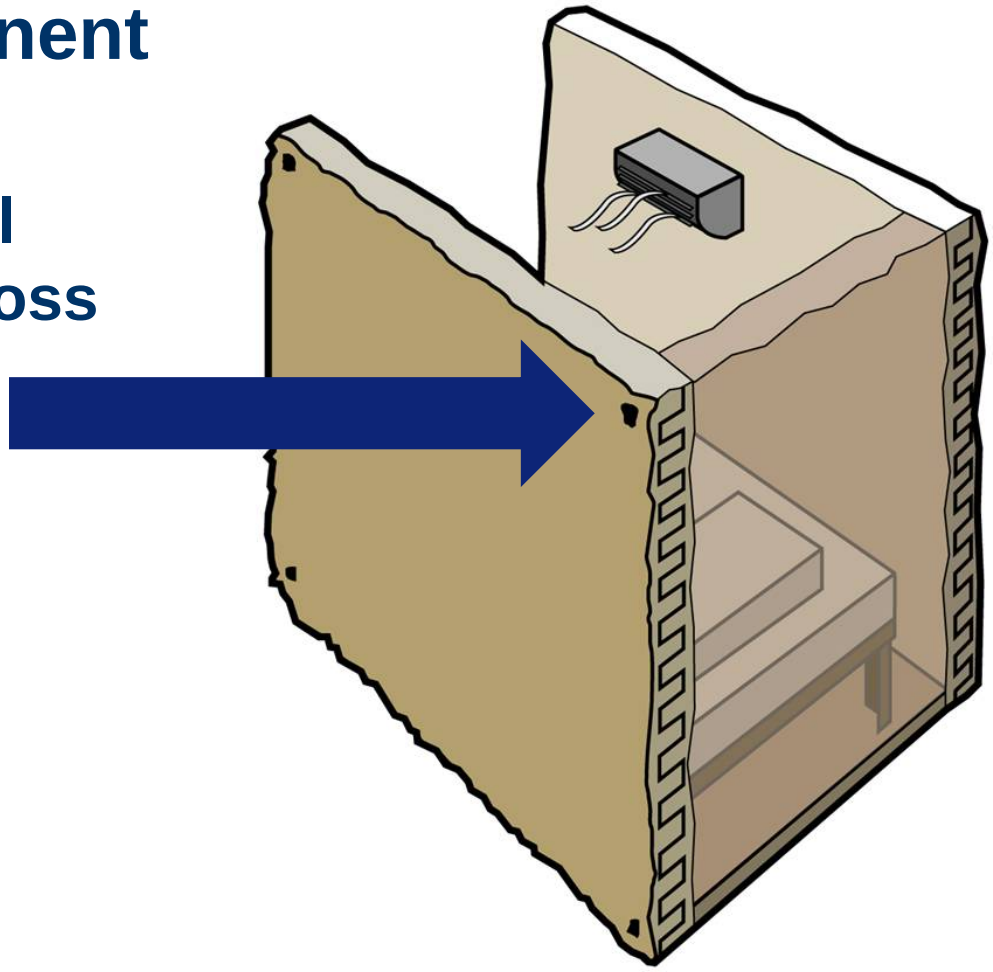
SuperCLU Innovation Areas

- **Rigid Building Material**
- **Incorporate Insulation**



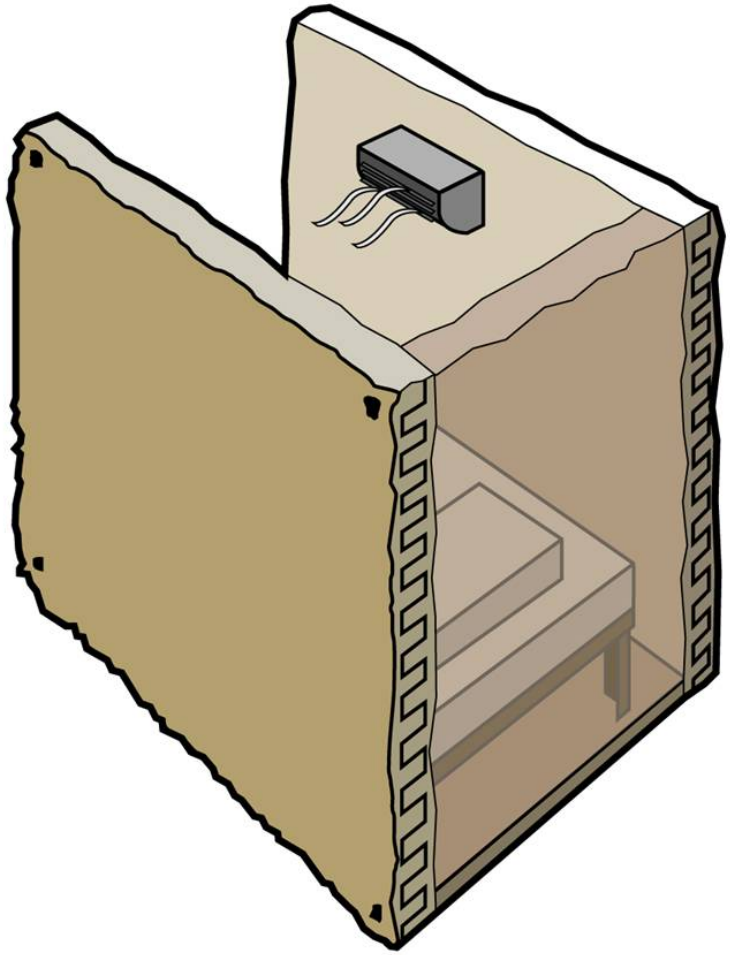
SuperCLU Innovation Areas

- **Building Component Connections**
  - **Reduce Thermal Infiltration and Loss**



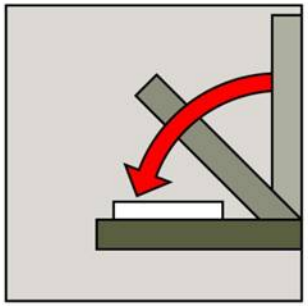
SuperCLU Innovation Areas

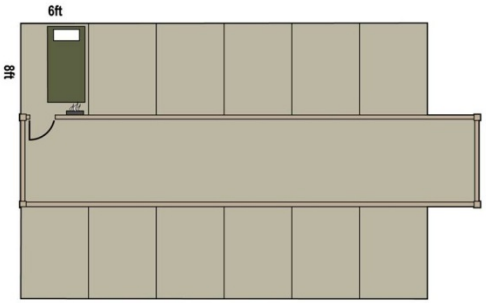
- **Coatings**
  - **External**
  - **Internal**

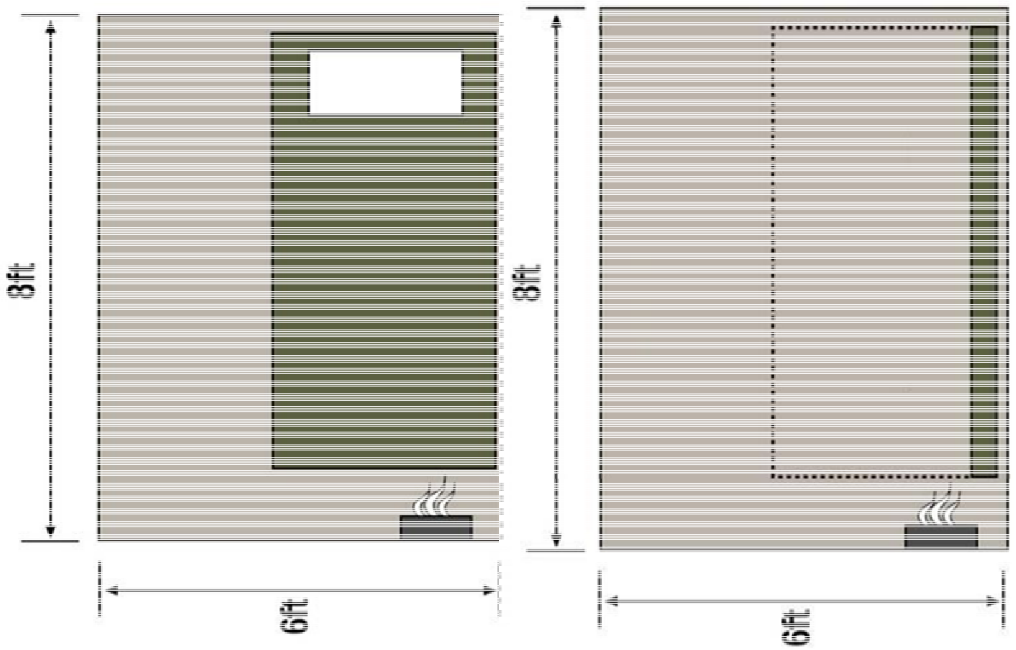


SuperCLU Innovation Areas

- **Interior Design Improvement**
  - **Individual Sleeping Space**
  - **Storage**
  - **Work Space**







Team Members

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  - **Lisa Rotty**
  - **Chris Leksono**
- **Camp Lemonnier Public Works**
  - **CEC USN LT. Michelle Caponigro**
  - **CEC (SCW/SW) Rajon Martin**

Contact Information

The BAA page on the NAVFAC portal (see below link) has been updated to reflect the FY12 Solicitation (#N62583-12-R-0716).

https://portal.navfac.navy.mil/portal/page/portal/NAVFAC/NAVFAC_WW_PP/NAVFAC_NFESC_PP/ENVIRONMENTAL/EQC/BAA

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Camp Lemonnier, Djibouti

QUESTIONS?