USPHS Commissioned Corps Engineers at the National Institutes of Health

Office of Research Facilities
Outline

• National Institutes of Health (NIH) Introduction
• Office Research Facilities Introduction
• Rocky Mountain Labs
• Research Triangle Park
• NIH Bethesda Campus
  – Division of Facilities Operations and Maintenance
  – Division of Design and Construction Management
  – Division of Technical Resources
    • Thermal Energy Storage System
    • NIH Bethesda Campus Central Utility Plant
National Institutes Health

- NIH mission is to seek fundamental knowledge about the nature and behavior of living systems and application of that knowledge to enhance health, lengthen life, and reduce illness and disability.
- Established in 1887 as a one room laboratory created within the Marine Hospital System
- 153 Nobel Prize Winners received support from the NIH
- NIH invests $37.3 billion annually in medical research for the American People
  - 80% goes to 50,000 grants to more than 300,000 researchers at more than 2,500 universities, medical schools, and other research institutions around the world
  - 10% goes to nearly 6,000 scientist in NIH’s intramural program
Office Research Facilities

- NIH Office Research Facilities (ORF) supports the NIH mission by providing, maintaining, and operating safe, healthy, and attractive facilities.
- ORF operates as a “Central Service” and reports directly to the Office of Management within the Office of the Director of the NIH.
- ORF services are supported by charge backs to NIH Institute or Centers using a census-based management fund, rent, membership fees, and fees for service direct charges.
- There are 13 USPHS Engineers working in ORF, and growing...
Rocky Mountain Laboratories (RML)

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Why Does NIH Have a Lab in Montana?

- Over a century of ongoing infectious disease research

Dr. Rickett’s Field Lab, 1906

RML Building 1, 1928
RML Today

- Nat. Institute of Allergy & Infectious Diseases (NIAID)
  - Division of Intramural Research
- Home to 5 Core Biomedical Research Laboratories
- Microscopy and Genomics Centers serve nationwide research needs
- Animal research facilities
- 36-acre campus
- Approx. 400,000 SF in floorspace
- 450 staff members
RML: High Containment Research Labs

- Includes BSL-2, 3, & 4 Labs
- Unique facility requirements and support systems:
  - Supply/Exhaust HEPA filtered Air systems
  - Breathing Air system
  - Chemical Decon. Showers
  - Air Pressure Resistant containment doors
  - Effluent Decon. wastewater system
  - BAS is facility’s nervous system
- Redundancy of systems is critical
- 24 / 7 / 365 Maintenance coverage
Research Triangle Park

- NIH is the nation’s medical research agency—making important discoveries that improve health and save lives. It is part of the Department of Health and Human Services (HHS)

- NIH is made up of 27 Institutes and Centers – each with a specific research agenda, often focusing on particular diseases or body systems

  - 26 headquartered on the main campus in Bethesda, MD.
  - One is in Research Triangle Park, NC—NIEHS.
National Institute of Environmental Health Science (NIEHS)

- The mission of the NIEHS is to discover how the environment affects people in order to promote healthier lives.
- Includes the HHS National Toxicology Program.
- About 1,400 people
Research Triangle Park Campus – NIEHS

- 511 acres
- Shared by NIH and EPA
- NIEHS—1 M square feet
RTP Campus Buildings

• **Building 101 (Main Building)** - 900,000 ft² wet lab, vivarium, and administration space.

• **Clinical Research Unit** – 14,000 ft²
  • Conduct human studies.

• **Building 105 (CUP)**
  • Five 3,500 Ton Chillers (Full Variable Flow)
    • Chilled Water Capacity = 17,500 tons
    • 3,000 Ton of Free Cooling Capacity
  • Four 40 MBRUH Generators/Boilers
    • High Temperature Hot Water Capacity = 160MM BTU’s

• **Building 108** – Waste Handling Facility

• **Building 107** – Powerhouse
  • Electrical distribution at 13.8 KV

• **Building 106** – Incineration
6 Vivarium AHU

• 60,000 square feet of fully functional and continuously occupied AAALAC facilities

• During HVAC outages, room temperature and humidity levels are continuously monitored so as not to increase above or decrease below a specified range.

- Units are completely redundant.
- Utilized UV light to minimize microbial growth on coils and drain pans
NIEHS –RTP Campus PV Arrays

PV Arrays: Building 101, Building 102, and Building 110

Pictured: Building 101 PV Arrays
NIEHS Bldg. 110 - Net Zero Energy (NZE) Secure Warehouse
Completed: 7/21/2017
First Net-Zero Energy Building in HHS
Pending LEED Platinum Certification

Conference Room

NZE Warehouse – 26,613 ft^2
## NIEHS Bldg. 110 - NZE Warehouse Features

### Water Efficiency (WE)

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<th>Water Use Reduction</th>
<th>Low-flow technology on toilets, sinks &amp; urinals in the restrooms &amp; shower</th>
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- Hands-free operation
- Low flow fixtures
- Waterless urinal
- 26.6% water savings on Campus using these type fixtures!
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Water Heater

- Instantaneous gas hot water heaters respond to building demand.
- No hot water storage tank.
- Hot water is recirculated to all fixtures reducing water usage waiting for the water to warm up.
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- **New Variable Flow Refrigerant (VFR) cooling and heating system**

- **Skylights, solar tubes and daylight harvesting systems**
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### Roof Mounted PV Array
Bethesda Campus

- 310 acres
- ~90 buildings
- Bethesda Campus: 11M Square Feet
Facilities Operations & Maintenance

Facility Space Types
- Clinical Research
- Biomedical Laboratory Research
- Administrative
- Utility/Industrial
- Animal Holding
- Amenities/Lodging
- Public Safety/Security
- Childcare

Accreditation Programs Supported
- CGMP – Good Manufacturing Practices
- AAALAC – Laboratory Animal Care
- The Joint Commission - Patient Care
- BSL – High Containment
- Environmental Compliance
Facilities Operations & Maintenance
What’s it do?

- Chilled Water is vital to lab environments, ULT freezers, and human comfort.
- TESS is a $35M+ system of pumps, plumbing, and 8M gallon insulated tank
- Chilled Water from CUP pumps into TESS when power is cheapest
- Chilled Water from TESS pumps to campus when power is expensive
- Energy costs savings, thermal efficiency, and system resilience

What’d we do?

- Technical/Design Reviews
- Address Requests for Information
- Review Performance & Scope
- Independent Government Cost Estimates
- Change Orders
- Oversee General Contractor progress daily
Bethesda Campus CUP

• One of the largest utility plants in the country
• Collects 34M data points daily
• 11.8M square feet of occupied space
  **Boiler Plant**
  • 5 boilers produce 1M PPH steam
  • 450°F steam @ 165 psi
  • Burns 3B SCF of natural gas annually
  • Generate 1.8B pounds of steam annually
  • Boilers can burn diesel fuel when necessary
  **Chiller Plant**
  • 12 (twelve) 5K-ton chillers
  • 240K GPM @ 110 psi
  **Distribution**
  • 300 manholes
  • 2 miles of walkable tunnels
  • 2 miles of concrete trench
  • 3.6 miles of natural gas lines
  • 7 miles of steam lines
  • 12 miles of domestic water lines
  • 7 miles of chilled water lines
Cogeneration Plant

- Operated since July 2004
- Cogeneration is the process whereby a single fuel source produces both electrical and thermal energy
  - 23MW natural gas-powered turbine
  - heat-recovery steam generator (HRSG) produces up to 180K PPH
  - ~30% is converted to electricity & ~55% is converted to steam
  - ~40% of average campus load
- One of lowest emission cogeneration plants in the world
  - Reduces ~60K tons of CO₂ emissions per year
  - Equivalent to emission from 10K cars
- Saves NIH ~$7M per year in steam and electricity costs