



Applied Water Source Heat Pump System Integration

Geothermal applications in military

Current applications are focused on base housing providing space conditioning and supplemental hot water

Single family structures

Multi-family structures

Primary challenges encountered in military applications

Facilities must be capable of peak operations despite unpredictable schedules and impact on energy efficiency

Reliability and system integrity are basic requirements

Advantages of WSHP systems integration

Ability to significantly improve overall system efficiencies of existing equipment utilizing water loops

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Advantages of WSHP systems integration

Ability to significantly improve overall system efficiencies of existing equipment utilizing water loops

Enhanced reliability and security using WSHP systems

Applied WSHP Integration Strategies

Space Conditioning
Offices

Military support and equipment maintenance facilities
Recreation facilities

Condenser Water Loop

Waste heat recovery for hot water pre-heating

Chiller economizer and cooling tower optimization

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strategies

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Ventilation Systems

- Earth coupled water-side economizer

- Waste heat recovery from ventilation air streams

Process Applications

- Swimming pool water

- Waste heat recovery for any process water

- loop

- Intake air economizer for compressed air

- systems

On-site Power Generation

- Waste heat recovery from engines

- Intake air pre-cooler

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- Waste water heat recovery



What is LEED™?

- ❖ Leadership in Energy and Environmental Design
- ❖ Buildings are Certified Green if criteria are met
 - Potential for 69 "points" for design criteria
 - Levels of Certification, "Certified" (26), "Silver" (33)...Platinum (52)
- ❖ Developed by US Green Building Council
- ❖ Five Categories of Points:
 - Sustainable Sites
 - Water Efficiency
 - Energy and Atmosphere
 - Materials and Resources
 - Indoor Environmental Quality





Credits for Energy

- ❖ 17 of 69 points in “Energy and Atmosphere”
- ❖ 3 points for onsite renewable
 - 5%, 10%, 20% of total energy
 - Geothermal not included as renewable (must generate electricity)
- ❖ Points for Green Power, non-CFCs, Commissioning
- ❖ Points for being more than 20% more efficient than ASHRAE 90.1
 - Determined by modeling actual design, and design based on ASHRAE minimum efficiency requirements
 - 2 points for 20% up to 10 points for 60%

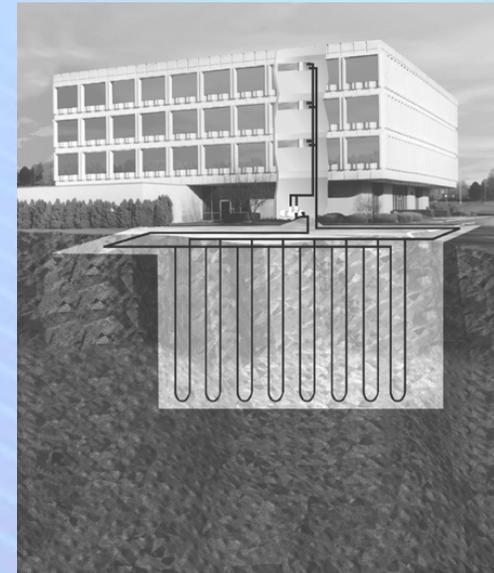
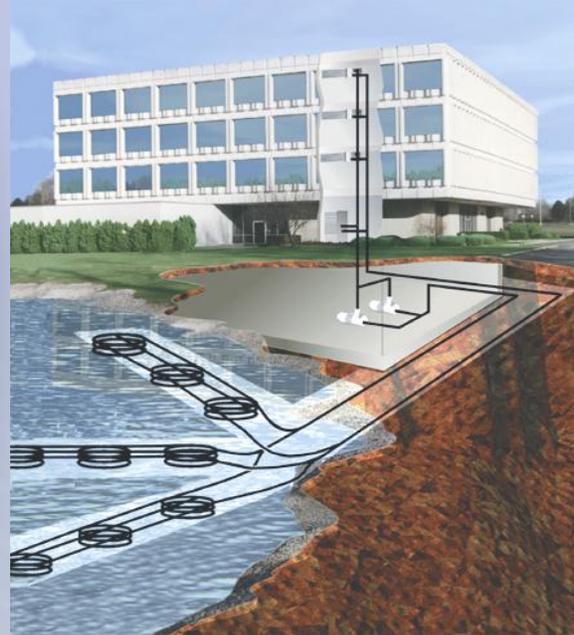


Geothermal Role

- ❖ Cannot achieve maximum energy points without GSHP
- ❖ EE WC Chiller: 15% to 30% below ASHRAE
- ❖ EE AC Chiller: 20% to 35% below ASHRAE
- ❖ EE Boiler: up to 18% below ASHRAE
- ❖ GSHP: 40% - 60% below ASHRAE (cooling and heating)
 - If system under 150 tons, LEED allows ACC basecase
 - If system over 150 tons, WSHP basecase, 80% boiler



Water Source Heat Pump System

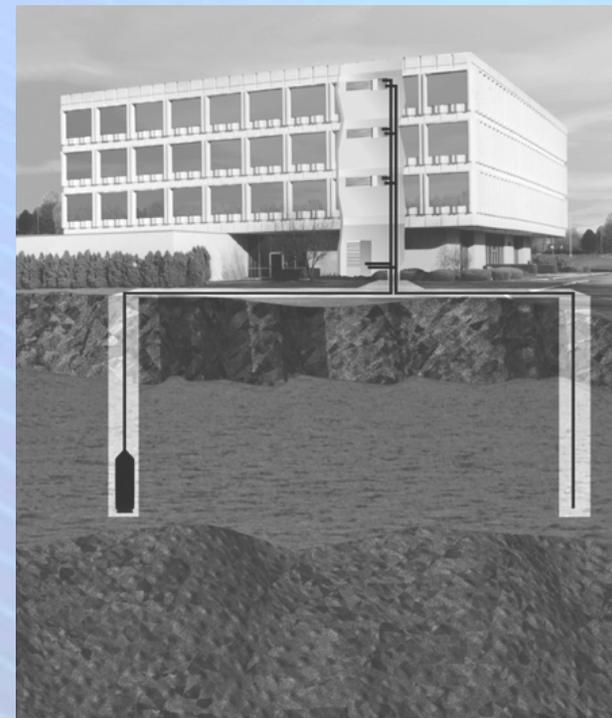
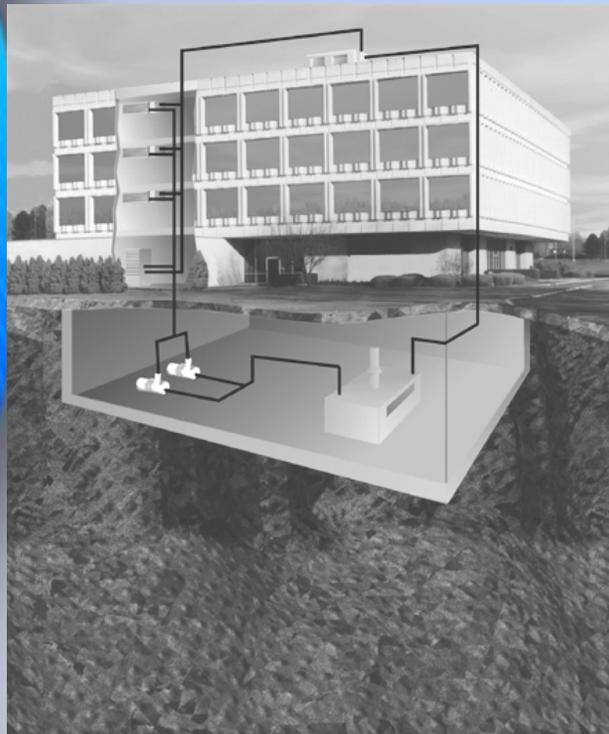


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