

LEED®
Green and
Sustainability
In
Central Plant
Design and
Operation



What makes a project:

■ Sustainable “*Green*”

- The goal of sustainable design is to produce places, products and services in a way that reduces use of non-renewable resources, minimizing environmental impact, and relating people with the natural environment.
- The practice of managing resources to meet the long-term needs of a facility
- The practice of operating a facility to not adversely affect it’s surroundings

Key Principles:

- Energy Efficiency
 - Simply requires less energy
- Quality and Durability
 - Long lasting so as not to require replacement
- Renewability
 - Materials should come from nearby

Being “Green”:

- Efficient use of natural resources
- Reuse of resources
- Protects the health of building occupants
- Protects the health of the surrounding community

Typical Central Plant Objectives:

- Energy Efficiency
- Operational Efficiency
- Redundancies
- Infrastructure flexibility & adaptability
- Sustainability
- Within means of the project



We Need to Start with
Understanding

Understanding of:



- Issues affecting Design
- Governing Codes and Standards
- Model Energy Codes
- Sustainable and Green options

Issues that Affect Design:

- Facility master plans
- Program Requirements
- FTE availability & responsibilities
- Plant location
- Desire to be “Green”
- Project means

Governing Codes and Standards :

- Building Codes
- AIA Guidelines
- NFPA
- ASHRAE
- Energy Conservation Code

Model Energy Codes:

- Generally not reflective of Healthcare
- Adoption of codes varies by State
- May require energy modeling

Sustainable and Green Options:

- LEED® Certification
- Green Guide for Healthcare
- Energy Modeling

LEED® Certification

- “Need to consider a building’s energy efficiency as a whole and to integrate synergistic energy-efficiency measures in order to maximize savings”.
- “Energy consumption can be dramatically reduced through practices that are economical and readily available”.

LEED® Certification

- Energy and Atmosphere Prerequisites
 - Commissioning
 - Minimum energy performance (ASHRAE 90.1)
 - CFC Reduction

LEED® Certification

■ Energy and Atmosphere Credits

- Optimize energy performance
- Renewable energy
- Added Commissioning
- Ozone Depletion
- Measurement and Verification
- Green Power

Green Guide for Healthcare

- Pilot programs
- Similar to LEED® Certification
- Measures how “green” a facility is

“Many codes applicable to healthcare have requirements that preclude the building from meeting ASHRAE 90.1 requirements”

GGHC v2.0

Green Guide for Healthcare

■ Energy and Atmosphere Prerequisites

- Commissioning
- Minimum energy performance (model)
- CFC Reduction

Green Guide for Healthcare

■ Energy and Atmosphere Credits

- Optimize energy performance
- Renewable energy
- Added commissioning
- Refrigerant selection
- Measurement & Verification
- Energy supply efficiency
- Medical equipment efficiency

Back to our Objectives:

Priorities

- Energy vs. Operational efficiency
- Redundancy vs. Project means
- Program vs. Flexibility
- “Green” vs. cost



The Central Plant:

- Chilled water production and distribution
- Heating – Steam production and distribution
- Domestic hot water
- Water treatment
- Central Sterile Steam

Chilled Water:

- Chiller efficiency (Full vs. Part load)
- Pumping configurations (CV vs. VF)
- Cooling towers (Design conditions)
- Winter operation



Chilled Water:

Chiller Efficiency

- Compare block loads to seasonal
- Determine best configuration
 - Redundancy – Same size
 - Energy – Differing sizes or series flow
- Select energy efficiency based on configuration

Chilled Water:

Pumping Configurations

- Chilled Water –
 - Variable Primary Flow
 - Match pump selection to loads
- Cooling Towers –
 - Constant Volume
 - Winter operation
- Interconnecting
 - Any pump, any tower, any chiller at any time



Chilled Water:

Cooling Towers

■ Selection

- Design conditions
- Winter Operation

■ Configuration

- Can work with any chiller
- Segmented for service

■ Water temperatures

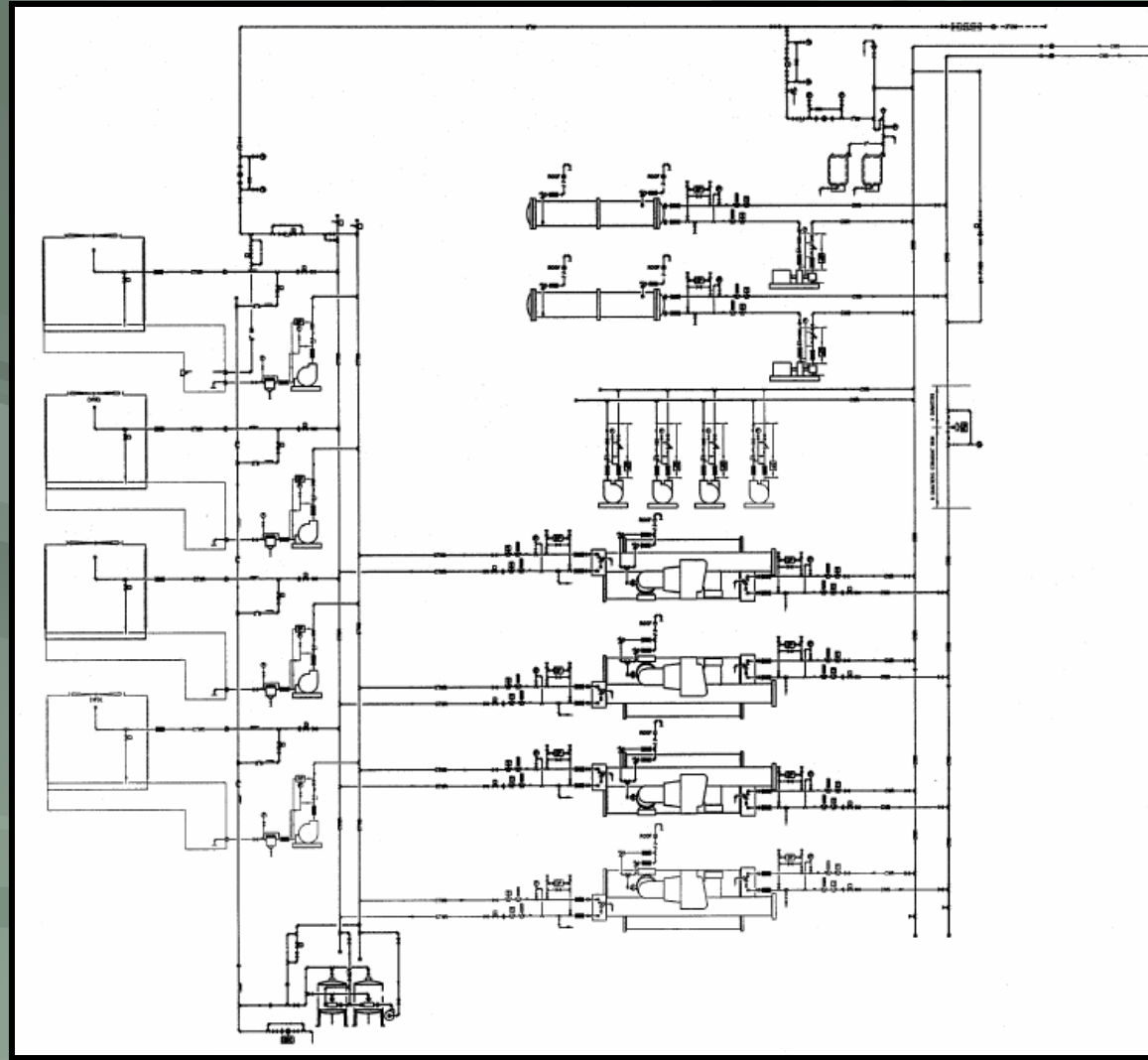
- Chiller head pressure vs. temperature
- Economizers

Chilled Water:

Winter Operation

- Water-side economizers
 - Energy efficiency
 - Reset chilled water temperatures
 - Operational dead-bands
- Air-cooled chillers
 - Operational efficiency
 - Simple on/off
 - Lower available temperatures

Chilled Water:



Boiler Plant:

- Boiler Efficiency
 - Number of passes
 - Low Nox
- Distribution pressure
- Building appliances
- Redundancy



Boiler Plant:

- Boiler Configuration
 - N + 1 By code (of largest boiler)
 - Select sizes based on seasonal loads
- Distributed infrastructure
 - High pressure distribution (100 psi)
 - Low pressure usage at satellite mechanical rooms for reheat, humidification (15 psi)
 - Instantaneous hot water production
- Central sterile
 - Medium pressure steam (65-75 psi)

Domestic Hot Water:

■ Production

- Generally uses steam
- Storage no longer preferred
- Instantaneous to match loads

■ Distribution

- Locate as close to end user as possible
- Reduce length of recirculation lines
- Match equipment to Program spaces

Distributed Infrastructure:

- **Satellite Mechanical Rooms**
 - Pressure reducing stations
 - Heat exchangers for space reheat
 - Air handling unit humidification and reheat
 - Domestic hot water production and recirculation

- **Distributed infrastructure**
 - Reduces long return mains and recirculation lines
 - Allow for changes in spaces w/out affecting entire facility
 - Make adjustments by program space
 - Patient towers are not served/controlled like D&T areas

Other Options:

■ Geothermal

- Lake coupled works
- Projects generally too large for wells

■ Photovoltaic

- Generally limited to site lighting

■ Wind

- Always seems to interfere with the helipad

Questions?

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