Condenser Water Supply Temperature Reset Controls

California Statewide Utility Codes and Standards Program

CWST Reset
Background

- Reset CWST downward during times of low load to allow chiller to operate more efficiently
- Based on Acceptance Testing CASE proposal
  - PECI RCx program in CA in 2005-2008: savings of 0.19 kWh/sf
  - Water-cooled chiller(s) w/cooling tower(s)
  - Prohibit fixed CWST, allow CWST reset according to any relevant parameter or sequence
  - Accompanying acceptance test proposal

CWST Reset
Background

- Initial Concerns & Complications
  - Controls can be set improperly during/after installation
  - Possible energy penalty from cooling tower fan
  - Potential centrifugal chiller surge at low CWST
  - Optimal controls sequences are very site specific and can not yet be specified by code
  - WB sensors (one strategy to reset CWST) may be unreliable
  - Need to integrate with water-side economizers if provided
  - Need to provide for head pressure control of chillers
  - May not be common practice
- CASE team still looking into feasibility concerns, open to feedback from designers/manufacturers

CWST Reset
Estimating Energy Savings

EnergyPro modeling parameters

- 2 building types
- 3 chiller types
  - DOE-2 standard chiller coefficients
  - Centrifugal, Screw, Scroll
  - Prescriptive COP
- 5 CZs
- CWST reset downward following Outside Air Wet Bulb
- Fixed CW pump speed
- Cooling Tower Control
  - 80 F Design WB with 66 F minimum CWST (Standard reference)

Office Schedule	Hotel Schedule
117,000 sf	67,500 sf
6 stories	3 stories
VAV w/HW reheat	4-Pipe FC
220-280 ton chiller	120 ton chiller
280-330 ton CT w/VSD	150 ton CT w/VSD
10 F approach	6 F approach

CWST Reset

Modeled Energy Savings – CWST Reset

Energy Savings				
	kWh / Bldg	kWh / Ton	kWh / SF	Standard Deviation
Wt Avg Centrifugal	8,216	34.0	0.07	4%
Wt Avg Screw	13,513	55.9	0.12	5%
Wt Avg Scroll	3,213	27.0	0.05	14%

- Higher savings in warm, dry climates (10, 12)
- Lower savings in mild, wet climates (3, 6, 16)

CWST Reset
Estimated Costs

Material	Install & Program (4 hrs x2)	Test & Review (4 hrs x2)	PV Yearly Maintenance	PV Total Cost (Per Plant)
$200	$700	$700	$500	$2,100

Material:

- Sensors (rH): $200 (RSMeans)
- VSD on Chiller (Path B) effectively required by Chiller CASE

Installation, Programming, Testing and Review

- $85/hr (Plumber, Controls Contractor RSMeans Standard Union)
- Includes time estimated for acceptance testing (See AT CASE)
- Include periodic maintenance/reprogramming (See AT CASE)

CWST Reset

Average Measure Cost-Effectiveness

Net TDV Savings		
	$/ton	**$/SF**
Wt Avg Centrifugal	$53.13	$0.11
Wt Avg Screw	$93.68	$0.20
Wt Avg Scroll	$70.40	$0.13

CWST Reset
Draft Code Language

SECTION 144 – PRESCRIPTIVE REQUIREMENTS FOR SPACE CONDITIONING SYSTEMS A building complies with this section by being designed with and having constructed and installed a space-conditioning system that meets the requirements of Subsections (a) through (l).

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(j) Hydronic System Measures

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8. Condenser Water Supply Temperature (CWST) Reset Controls

Water-cooled chilled water plants that are served by (a) cooling tower(s) shall have controls capable of automatically resetting condenser water supply temperature.

EXCEPTION to Section 144(j)8: Chillers serving constant loads, including facilities operating 24/7.

CWST Reset

Draft Code Language

Acceptance Test

NA7.5.17 Condenser Water Supply Temperature Reset Controls

- http://www.h-m-g.com/T24/AcceptanceTestingCommissioning/acceptance.htm

NA7 Drafts in the Draft Report, available online

Compliance Manual: Later update schedule

- Forms (Certificates of Acceptance)
- At-A-Glance Guides

QUESTIONS & COMMENTS

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