

EmPower TN

Owner Project Requirements (OPR)

May
2015

The OPR is a management document provided by the EmPower TN Task Force to apply state energy standards and recommendations to all energy conservation and maintenance projects and programs funded through the EmPower TN Initiative. The requirements are only applicable to the specific scope of the projects being submitted for funding by the applicant and are not intended to require additional scope in areas not addressed by the project.

PROJECT NAME:	EmPower TN Projects
SBC #:	Pending Approval
LOCATION:	Statewide
AGENCY NAME:	Statewide
OPR AUTHOR:	Edward Wansing
DATE OPR CREATED:	4/21/2015
VERSION NO. and DATE:	Version #3 May 18, 2015

Table of Contents

Table of Contents 2

1. Owner Project Requirements Summary 3

2. Project Information..... 3

 2.1. General Operation Schedules 3

 2.2. Project Overview and Requirements 3

 2.2.1. General Space Requirements 3

 2.2.2. General Purchasing Requirements 4

 2.2.3. Lighting Requirements 4

 2.2.4. Lighting Control Requirements 4

 2.2.5. HVAC System Requirements 5

 2.2.6. Building Automation Systems Requirements 5

 2.2.7. Building Domestic Water Heating Requirements 7

 2.2.8. Solar Hot Water 7

 2.2.9. Building Water Conservation Requirements..... 7

 2.2.10. Metering Requirements 8

1. Owner Project Requirements Summary

The Owner Project Requirements (OPR) is a deliverable of the Governor's EmPower TN Task Force. The goal of this OPR template is to embed a greater economic value within the state building portfolio through reduced operating costs, higher system performance and increased sustainability.

The OPR identifies the intended functional requirements and the expectations of the building's design and operation. The OPR is to be used in conjunction with the EmPower Application Manual and correlating documents.

2. Project Information

2.1. General Operation Schedules

Lighting	<i>[Examples: 7 AM to 9 PM, Off, etc.]</i>	
	Weekday:	6am – 6pm
	Saturday:	8am – 12pm
	Sunday:	Off
	Holiday:	Off
HVAC	<i>[Examples: 7 AM to 9 PM, Off, etc.]</i>	
	Weekday:	6am – 6pm
	Saturday:	8am – 12pm
	Sunday:	Off
	Holiday:	Off
After-Hour Override(s)	<i>[Example: 2-hour occupant override of lighting on each floor.]</i>	

This schedule represents a general State office facility operating schedule. Some facilities will have special occupancy requirements which should be considered during project implementation.

2.2. Project Overview and Requirements

2.2.1. General Space Requirements

- Building envelope requirements need to meet or exceed ASHRAE 90.1-2010 including energy usage, minimum outside air requirements, and other requirements as applicable.
- Roof insulation shall provide a minimum rating of R30 and exterior wall insulation shall provide a minimum rating of R13 + R10 continuous insulation.
- Relative humidity (RH) is not to exceed 60%. Special space conditions may warrant lower RH levels.

2.2.2. General Purchasing Requirements

(Energy Star qualified equipment, systems and appliances per TCA 12.3.905(d))

- Energy Star products must be specified and purchased whenever available.
**12-3-905. Energy efficiency standards to be adopted --
Equipment, appliances, lighting and heating and cooling
products and systems to be Energy Star qualified**

(d) All future office equipment, appliances, lighting and heating and cooling products and systems purchased by and for state agencies shall be Energy Star qualified; provided, that such Energy Star qualified products and systems are commercially available.

(e) Existing purchasing contracts for all state agencies that do not provide as options Energy Star qualified office equipment, appliances, lighting and heating and cooling products and systems shall not be renewed upon expiration. All future contracts for state agencies shall provide as options Energy Star qualified office equipment, appliances, lighting and heating and cooling products and systems.

2.2.3. Lighting Requirements

- Energy-saving fixtures, lamps and lighting control systems will be used to the fullest extent possible. All spaces with Halogen, HID, incandescent or fluorescent lamps shall be replaced with dimmable LED fixtures that are 0-10 volt controllable unless the EmPower TN Task Force directs otherwise.
- Lighting levels must meet the minimum foot candles at the desk as set by current Illuminating Engineering Society of North America (IESNA). All occupied spaces will have lighting levels designed for optimal photometrics using manufacturer modeling data.
- All 2x2 and 2x4 LED troffers shall contain embedded Zigbee® Certified chip provided by the manufacturer, unless approved otherwise by the EmPower TN Task Force.
- All lighting systems shall contain controls according to Section 2.2.4 Lighting Control Requirements.

2.2.4. Lighting Control Requirements

- The Lighting Control System (LCS) shall use a large-scale wireless mesh network to communicate between all lighting control devices, plug load devices, and metering devices throughout the building. Coordinate with the DGS, UT or TBR Energy and or Sustainability Group on acceptable software systems.
- System shall be interoperable utilizing the open ZigBee® standard as adopted by ASHRAE Standard 135-2008 Addendum q for its wireless communications, or by other wireless system as approved by the DGS, UT or TBR Energy and or Sustainability Group as appropriate.
- The LCS shall have an interactive graphical display that allows full control of all systems operations.

- All LCS's shall be capable at a minimum of scheduling, dimming, task tuning, occupancy control, daylight harvesting and electrical sub metering. If not BAS system is available, the LCS shall also control unitary HVAC equipment.
- Control software shall enable integration with a Building Automation System (BAS) via BACnet/IP with no additional hardware required.
- Software interface shall be made available to networked computer devices via standard Web browser, without requiring additional software on computers and other access devices.
- All control software connections between managed systems shall be via the Owner's LAN (local area network) or WAN (wide area network), or the Internet in general. All IT drops shall be coordinated with the DGS, UT or TBR Energy and or Sustainability Group.
- Lighting Occupancy sensors shall have the ability to control plug loads and HVAC points.
- The LCS shall monitor the status of control devices, display alarm information, and notify select individuals, either through a web interface, or via emails or text messages, of important issues.
- The project shall include a baseline of existing equipment and run time schedule or monitor and record actual utility consumption via meters as outlined in section 2.2.9 Metering Requirements.
- All projects including lighting controls shall include metering of electricity at minimum as outlined in section 2.2.9. Metering Requirements.

2.2.5. HVAC System Requirements

- Equipment, systems and controls shall be designed for optimal energy efficiency and sustainability including, but not limited to, economizer, heat recovery (airside, chillers and central plant), geothermal and innovative sustainable design. Systems shall be designed to meet or exceed ASHRAE 90.1-2010.
- Projects should consider the use of geothermal heating and cooling systems. If geothermal is feasible for the project, an engineering analysis should be conducted to evaluate the life cycle cost analysis over a 20 year period. The analysis shall include test bores and conductivity of soils to determine bore field efficiency.
- Unitary cooling equipment shall have a minimum SEER rating of 16.
- Unitary heating equipment shall be ultra-high efficiency.
- Boilers shall be high efficiency condensing type with a minimum turn down ratio of 20:1.

2.2.6. Building Automation Systems Requirements

- New Building Automation Systems (BAS) shall be BACnet over IP compatible via Ethernet connection.
- The Sequence of Operation (SOO) must be designed to provide the general operations schedule designated in Section II of the OPR, economizer operation, occupancy considerations, system optimization and best industry practice for energy efficient building operation.

- All new control devices and sensors shall be integrated, including modification to any existing graphics. Consideration should be given to consolidation of sensors between LCS, BAS, Security and other integrated systems.
- For projects not including a BAS, install wireless Zigbee® Certified thermostats, connected to the State Network, located in the serviced zone, capable of control via LCS occupancy sensors. Integration with other LCS's will be considered as approved by the EmPower TN Task Force, provided that all requirements of section 2.2.4 Lighting Control Requiements are met.
- In addition to direct energy measurements, the BAS shall be capable of trending HVAC equipment status, temperatures, flow rates, and pressures which will assist in reconciling predicted and actual energy performance.
- Include an optimum BAS point schedule for typical systems to allow efficient control, trending and fault detection and diagnostics. Minimum HVAC trended points are noted in the table below. Some projects may have additional points that should be included.

Instrument	Unitary or Package AC	Air Handler Units	Air handler Units w/ Humidifier	Chillers	Cooling Towers	Boilers	Pumps	Fans
Supply Air Temp	X	X	X					
Supply Fan Airflow		X	X					
Return Air Temp	X	X	X					
Return Fan Airflow		X	X					
Mixed Air Temp		X	X					
Return Air Humidity			X					
Duct Static Pressure		X	X					
Damper Position		X	X					
Chilled Water Supply Temp				X				
Chilled Water Return Temp				X				
Condenser Water Supply Temp				X	X			
Condenser Water Return Temp				X	X			
Hot Water Supply Temp						X		
Hot Water Return Temp						X		
Differential Pressure				X		X		
Status On/Off	X	X	X	X	X	X	X	X

- At a minimum, all trended data points shall be recorded on the building server in an independent project file in CSV format. Trends will be created daily with a point name and time stamp for third party review as coordinated with the State Energy Group. All digital points will be trended by Change of Value (COV) for up to 1500 samples and all analog points will be trended every 5 minutes for up to 180 days. All trends will have a trend data report generated for each HVAC system daily. The Facility Manager shall have full administrative rights to the BAS to adjust set points, trending and data collection.
- The BAS system shall monitor and trend the status of control devices, display alarm information, and notify select individuals, either through a web interface, or via emails or text messages, of important issues.
- All capable equipment including Variable Frequency Drives (VFD), individual fan wall fans, multiple pumps, etc. shall have dedicated points with BACnet communication interface as individual trend-able points.
- The BAS shall provide BACnet/IP extension (server-side) as a software extension to its management software. No additional hardware shall be required.
- The BAS shall have 15% additional point capacity for future expansion for each type of I/O point type (AI, AO, DI, and DO) and with a minimum of 10% additional capacity at each controller.

2.2.7. Building Domestic Water Heating Requirements

- Control domestic hot water temperatures at 120° F unless medical, instructional, research or other special requirements necessitate the use of other temperatures.
- Utilize high efficiency condensing boilers or water heaters.
- Evaluate the use of tank-less or alternative water heater types, including solar thermal for lowest life cycle cost.

2.2.8. Solar Hot Water

- All projects will include a minimum of one meter for each circulation pump and controller to determine energy savings to the facility. The meter shall be capable of remote monitoring, trending and reporting via a Zigbee Alliance certified device.
- System must be certified by Solar Rating & Certification Corporation.

2.2.9. Building Water Conservation Requirements

- Install low flow toilets, showers, urinals and faucets.
 - Toilets – 1.28 gpf maximum
 - Urinals – 0.125 gpf maximum
 - Commercial Lavatory Faucets – 0.5 gpm maximum
 - Kitchen Faucets – 1.8 gpm maximum
 - Showers – 1.5 gpm maximum
- Irrigation systems shall utilize ground moisture sensors, or weather sensors to eliminate unnecessary watering.

2.2.10. Metering Requirements

- All projects will include a minimum of one meter for each utility per building.
- Lighting will be metered through the lighting control system or the BAS.
- Meter domestic water use in each building.
- Provide a dedicated meter for each irrigation system.
- Electric power monitoring will be through the BAS or through the ZigBee based wireless network (with BACnet interface) as appropriate. The BAS and ZigBee based wireless network shall include logic to initiate automatic demand reduction. The electric meter shall be an advanced meter capable of real time monitoring.
- Meter cooling tower make-up and overflow separately to allow for sewer cost reduction.
- All meters shall be connected to the State Enterprise Server for monitoring and control as coordinated by the DGS, UT or TBR Energy and or Sustainability Group.