City of Seattle (OSE Director's Rule – Tune-up Specialist) Field Walk-Down Training Outline

1. Heating, Ventilation and Air Conditioning

- a. Review HVAC equipment schedules (set schedules to optimize operations for actual) Mandatory
 - i. Programmable thermostats (if provided)
 - 1. Ensure occupancy time is no earlier than 30-60 minutes prior to actual occupancy
 - a. assumes optimal start, smart start or similar feature is embedded in the thermostat to automatically learn/start earlier when required
 - 2. Ensure vacancy time is no later than 30-60 minutes past actual vacancy
 - Other (Exhaust Fans may have time clocks or similar scheduling devices)

 if noted, ensure schedules are configured to start as late as possible to not impact morning warmup and are configured to shut down as early as possible
 - 4. Temperature-driven exhaust systems should be covered in the next section (b)
- **b.** Review HVAC set points where applicable (set or adjust to optimize function and energy efficiency of operations as appropriate to support the building use and occupant needs
 - Mandatory
 - i. Zone Set Points
 - ii. Discharge Temperature Set Points
 - iii. Discharge Static Pressure Set Points
 - iv. Minimum OA Set Points
 - v. HW & CHW Supply Set Points
 - vi. Domestic HW Set Points
 - vii. Economizer Change-Over Set Points
 - viii. OA Lockouts (heating, cooling, other)
 - ix. Miscellaneous Set Points for exhaust and process-driven systems (elevator machine rooms, LAN/Electrical Closets, Mechanical Rooms, Garages, etc.)
- c. Review reset schedules (if applicable establish or adjust as appropriate) Mandatory
 - i. HW Loop Temperature
 - ii. CHW Loop Temperature
 - iii. HW Loop Differential Pressure
 - iv. CHW Loop Differential Pressure
- Review optimal start/stop capabilities (implement optimal start/stop capabilities as appropriate to support the building use and occupant needs should be reviewed with (a) above) Mandatory
 - i. Is optimal start feature available at the equipment?
 - ii. Is optimal start feature correctly configured (OA temperature input, zone temperature input, building design parameters, etc.)?
 - iii. Is optimal start feature configured to work (earlier start) from a normal occupancy time (say 6 AM) or did the normal occupancy time get pushed back to 3-4 AM with optimal start activating equipment as early as midnight-2 AM (to bring temperatures to some desired value by 3-4 AM instead of 6 AM)?

- e. Verify that HVAC sensors are functioning, calibrated and in appropriate locations. Identify where sensors should be repaired, adjusted, calibrated and/or moved (adjust or recommend repairs as appropriate) – Mandatory
 - i. Use calibrated IR temperature gun and/or IR camera to take readings of space sensors and validate that the sensor reading is within acceptable range for accuracy (1°F-2°F above/below, but no greater)
 - ii. If sensor reading is beyond acceptable tolerance, ensure discrepancy is not due to location or external impact from other sources of heat or cool (sun, solar gain, convection, radiation, drafts moving down wall cavities, etc.)
 - iii. Outdoor temperature sensors are notorious for location issues due to radiation from walls, roofs, metal panels, etc.
 - iv. CO2 sensors (if provided) should never read lower than ambient background (400-500 ppm).
 - 1. CO2 sensors that read over 1500 ppm should be suspect as well unless the space is always over-crowded and poorly ventilated.
 - 2. If building is extremely negative, it is possible for CO2 sensors to read close to ambient (due to significant infiltration levels)
 - 3. Perimeter spaces should be reviewed for occupant comfort issues if CO2 readings are near ambient (either due to infiltration or over-ventilation)
 - v. HW loop (supply and return temperature) and CHW loop (supply and return temperature) sensors should read close to the boiler or chiller source temperature
 - Unless the site has multiple boilers/chillers and the non-running boilers/chillers do not have isolation valves or they have failed isolation valves that allows water to circulate through non-running boilers/chillers – resulting in a "mixing" effect of tempered and nontempered water such that the loop delivery temperature sensor is reading more than 4°F-5°F different from the source
- f. Verify HVAC controls are functioning as intended (adjust control sequences as appropriate for current facility requirements) Mandatory
 - i. Use calibrated IR temperature gun and/or IR camera to take readings of space sensors and validate that the sensor reading is within acceptable range for accuracy (1°F-2°F above/below, but no greater)
- g. Review HVAC controls for unintended or inappropriate instances of simultaneous heating and cooling (adjust HVAC controls to reduce or eliminate any unintended or inappropriate simultaneous heating and cooling) – Mandatory
 - i. IR images should heating or cooling coil(s) active at the same time unless the controls are configured for cooling/de-humidification with reheat
 - ii. Economizers that are actively more than 50%-100% open during optimum outdoor conditions for air-side economizers, yet are also heating may indicate problems with the control sequences, or excess minimum OA set points that may be driven by CO2 control set points or air balance configuration that is trying to keep the building from going into a negative pressurization condition
 - iii. If coils are hydronic (hot water and chilled water) and boilers and chillers are both active with pumps running, it may be possible to over-pressurize the hydronic loop with VFD-pumps that are improperly controlled, resulting in control valves opening up in response to excess differential pressure (resulting in simultaneous heating and cooling as one coil or the other is active when not

needed and the other coil will have to respond to offset the unintended consequence.

- iv. OA lockouts for heating and cooling (at the AHU/RTU or at the HW and CHW plant) should be reviewed/employed to help minimize unintended simultaneous heating and cooling (where appropriate)
- h. Note any indications of significant air-balancing issues Voluntary
 - i. entry doors that are difficult to open
 - ii. entry doors that are difficult to close
 - iii. use a flow meter or tissue to indicate airflow imbalances at the main entry doors
- i. Identify any indications of excessive ventilation rates that may be greater than ASHRAE 62.1 standards and are not appropriate for the current facility requirements Voluntary
 - i. no outside air being supplied to help make up for exhaust
 - ii. 100% outside air being supplied when not required
- j. Identify any zones that are dominating the HVAC system Voluntary
 - i. Corner offices
 - ii. Spaces converted to process-loads (server/data rooms, etc.) that do not have dedicated cooling
 - iii. South-facing or west-facing zones with large windows that are solar-load dominated

2. Lighting

- a. Identify any areas where lighting levels appear to be significantly higher than necessary for the current building function Voluntary
 - i. Use light meter to spot check light level readings in offices, hallways, lobby and other spaces look for opportunities to either dim, daylight control, or de-lamp
 - ii. Stairways = 1 Foot Candle per City of Seattle 2015 Code (Page 367)
 - iii. Offices = 10 Foot Candle per City of Seattle 2015 Code (Page 367)
- b. Verify lighting sensors are working and are correctly located as necessary for the current functioning of the building (Identify areas which could benefit from occupancy or daylight sensors) Mandatory
 - i. Occupancy sensors
 - ii. Photocell switch/sensor for exterior lights
 - iii. Daylight harvesting sensor
 - iv. Identify areas that would benefit from newer technology (where missing)
- c. Review lighting control schedules and sequences (Set or adjust as appropriate to match actual building use patterns) Mandatory
 - i. Exterior light time/astrological clock (if provided)
 - ii. Ensure turn-on time is no earlier than 30 minutes prior to actual sunset if the technology is a time clock (the clock should be adjusted monthly on a preventive maintenance task)
 - iii. Ensure turn-off time no later than 30 minutes after actual sunrise if the technology is a time clock (the clock should be adjusted monthly on a preventive maintenance task)
 - iv. Ensure the turn-on and turn-off times are auto-adjusted to account for geographical location, time zone and date to automatically adjust the turn-on time to match the astrological changes

3. Domestic Hot Water

- a. Review domestic hot water temperature set points (Adjust set points to improve efficiency, as appropriate for building use and occupant needs) Mandatory
 - i. 120°F vs 140°F
 - ii. Concerns over legionella disease (drives higher hot water delivery with mixing valves at the point of use)
- b. Review circulation pump controls (set or adjust, as appropriate, according to ANSI/ASHRAE/ACCA Standard 180-2012 Table 5-21) Mandatory
 - i. Pump currently runs 24/7?
 - ii. Time clock or automatic control configured for occupancy schedule
 - iii. http://resilientenergymanagement.com/ASHRAE_180_0010.pdf