**What is On-Going Commissioning?**

On-Going commissioning is the process of providing continuous improvement in the operating systems of a building for:

- Lower Energy Usage
- Lower Water Usage
- Improved Indoor Environmental Quality
ON-GOING COMMISSIONING

Why is NEBB creating a guideline?

NEBB members are uniquely qualified to provide OCx services to the industry

- RCx Certification
- Cx Certification
- TAB Certification
- S&V Certification
- Troubleshooting Skills

New Business Opportunity for NEBB Members
Not a new Certification, Resides under BSC
Who is the Target Customer?

Building Owners
- Government
- Municipalities
- Schools and Colleges
- Manufactures
- Owner Occupied Office Buildings
- Managed Office Buildings
- Just about every building who cares about energy, water and occupant productivity
ON-GOING COMMISSIONING

The On-Going Cx Overview

1. The OCx Contract
2. The CFR-OCx
3. The OCx Facility Inspection
4. OCx Plan
   - Define the OCx Team
   - Facility Operating Guide
   - Develop M&V Procedures
   - Define Baselines
   - Define OCx Procedures to be used
   - Define the OCx Schedule
ON-GOING COMMISSIONING

The On-Going Cx Overview

5. OCx Activities
   - Deploy Measurement Tools & Infrastructure
   - Train Operators
   - Measure Performance
   - Make Corrections
   - Re-Measure Performance

6. OCx Report
   - Deploy Measurement Tools & Infrastructure
   - Train Operators
ON-GOING COMMISSIONING

The OCx Contract

- Direct to Owner or Manager
- Consulting Services Agreement
- Lump Sum or Hourly
- Progressive Service
  - Program Development & Implementation
  - Training
  - Supervision and Management
The OCx CFR

- Developed with the Owner
  - Facility Performance Goals
  - Facility Uses and Operating Parameters
  - Anticipated Occupancy and Schedules
  - Special Facility Instructions
  - Scope of OCx
    - Energy
    - Water
    - IEQ
The OCx Facility Inspections

- Performed by Commissioner
  - Verify Performance Measurement Infrastructure
  - Verify no Major Performance Issues are present
  - Verify that Major Issues discovered through the RCx process have been resolved
The OCx Plan

- Define the OCx Team
  - Level of Involvement of Consultant
  - Level of Involvement of Management
  - Level of Involvement of Operators
  - Required Outside Expert Consultants or Contractors
The OCx Plan

- Facility Operating Guide
  - Operators Instructions for Optimal System Performance Procedures. What to do and What not to do
  - Systems Manual
  - M&V Procedures & Tools
  - Create Baselines
    - Design Energy Model
    - Prior Performance
    - National Database
ON-GOING COMMISSIONING

The OCx Plan

- Define Baselines
  - Energy & Water Usage Predicted Baselines
  - Energy & Water National Peer Building Baselines
  - IEQ Baselines
The OCx Plan

- Define OCx Schedules
- Standard OCx and M&V Procedures
  - Scripts for Operators
  - Standard Reporting Worksheets
ON-GOING COMMISSIONING

OCx Activities

- Kickoff Meeting
- Deploy Tools
  - Dashboards
  - Measurement Worksheets
- Set up Data Accumulation
  - Auto or Manual
  - Validate or Calibrate Data
ON-GOING COMMISSIONING

OCx Activities

 Validate Operator Skill Level
 Perform Operator Training
  o Systems Technical Training
  o OCx Process Training
 Schedule Activities
  o Supervise Activities
  o Manage Expectations
ON-GOING COMMISSIONING

OCx Activities

- Manage data accumulation
- Analyze and Normalize Data
  - Energy – Weather, Billing Days, # Occupants
  - Water – Billing Days, # Occupants
- Validate Performance
  - Compare Current Performance to Past Performance
  - Compare Current Performance to Baselines
  - Identify Areas of Unacceptable Performance
ON-GOING COMMISSIONING

IEQ Evaluations Involves

- **Occupant Comfort**
  - Temperature
  - Humidity
  - Draft Velocity

- **Acoustic Quality**
  - Sound & Vibration
  - Acoustic Reverberation

- **Lighting Quality**
  - Light Level
  - Glare, Color & other quality issues

- **Indoor Air Quality**
  - OSA & Pressurization
  - Contaminant Control
ON-GOING COMMISSIONING

OCx Activities

- Manage data accumulation (IEQ)
  - Automated BCE Survey
- Analyze Data (IEQ)
  - Survey Statistical Data
  - +20% Negative Input by Area
- Validate Performance (IEQ)
  - Compare Current Performance to Past Performance
  - Compare Current Performance to Baselines
  - Identify Areas of Unacceptable Performance
ON-GOING COMMISSIONING

OCx Activities

- Identify Method of Improving Performance
  - Systems Adjustment
  - Change Operating Methods
  - System Testing, Troubleshooting & Quick Fixes
  - Retro-Commissioning Process

- Implement Corrections

- Re-Measure Performance

- Record Results of Improvements
ON-GOING COMMISSIONING

OCx Activities

- **OCx Report**
  - Report is intended to be a show piece to encourage occupants and operators to support the OCx effort of improvement
  - Periodically published to Management, Occupants and Operators

- **Update OCx Plan for Next Cycle**
ON-GOING COMMISSIONING

OCx Process Cycle

- Measurement Plan
- Data Collection
- Normalize Data
- Analyze Data
- Usage Baseline
- Compare Results
- Publish Results
- Make Changes

Commissioning Concepts 21
**ON-GOING COMMISSIONING**

**OCx Tools**

- ASHRAE PMP Best Practices Guide
- CBE Automated IEQ Survey Services
- NEBB OCx Guideline
ON-GOING COMMISSIONING

The Value Proposition

- Establish/Improve Baseline Performance
- Sustain Performance/Energy Savings
- Realize 5% to 15% ‘Avoided Costs’
The Value Proposition

✓ Improve Preventive Maintenance
  ➢ Focused PM Activities
  ➢ Improved Operator Skills

✓ Sustain Optimized Energy Profile

✓ Avoid Capital Repair Spiral
ON-GOING COMMISSIONING

Business Model – On Going Cx

- Data Based Decision Making
- Preventive Maintenance Guidance
- Technical Support
- Facilitation – Repair/Replacement
ON-GOING COMMISSIONING

Business Model – On Going Cx

Defining Strategy

- Identify Issues
- Solve Problems
- Reinforce Training
ON-GOING COMMISSIONING

Business Model – Tools

- Automated Data Acquisition/Reporting
- Analytical Exception Reporting
- Dashboard Client Displays
ON-GOING COMMISSIONING

Business Model – Tools

Automated Data Acquisition/Reporting

M2M System Integrators – Dallas, Texas –
http://www.m2m.net/

Sky Foundry Inc., Glen Alan, VA,
http://skyfoundry.com/

American Energy Assets – Denver, CO -
http://www.americanenergyassets.com
ASHRAE PMP
BP Tool Kit
Electrical Cost Charts for:  Tester Products

Total Annual Electrical Costs

- 2009 Total Accumulated Electrical Energy Costs
- 2010 Total Accumulated Electrical Energy Costs

Electrical Cost Variance Trend

- Cost Variance Trend
- Linear Trend

Total Monthly Electrical Costs

- 2009 Monthly Electrical Costs
- 2010 Monthly Total Electrical Costs

Electrical Cost Variance by Month

- Higher Costs
- Lower Costs
Business Model – Tools


Johnson Controls Inc. – Milwaukee, WI (Panoptics System) - http://panoptix.johnsoncontrols.com/community/panoptix

Business Model – Approach

- Implement Data Acquisition
- Periodic Reporting
- Periodic Site Visits
- Facilitate Repairs
ON-GOING COMMISSIONING

Implement Data Acquisition

- Manual or Automatic Acquisition
  - Map System/Gather Trends/Import to DB
- Exception Reporting
  - Establish Rules/Appropriate Actions
  - Report Recommended Actions
ON-GOING COMMISSIONING

Periodic Reporting

- Report Issues/Recommended Actions
- Assign Responsibility
- Provide Technical Support

MATCH FREQUENCY OR REPORTING TO IMPLEMENTATION STRATEGY
### On-Going Commissioning

## Periodic Reporting

<table>
<thead>
<tr>
<th>Issue</th>
<th>Trend Data</th>
<th>Data Points</th>
<th>Guideline</th>
<th>Corrective Action</th>
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<tbody>
<tr>
<td>Energy Performance</td>
<td>Fan Total Energy</td>
<td>Fan Amperage (Load Side of Drive)</td>
<td>Based on Cx’d Value</td>
<td>1. Inspect Fan VFD</td>
</tr>
<tr>
<td>AHU</td>
<td>(Weekly Total)</td>
<td></td>
<td></td>
<td>2. Verify DP Calibration</td>
</tr>
</tbody>
</table>

**Match Frequency or Reporting to Implementation Strategy**

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Commissioning Concepts
ON-GOING COMMISSIONING

Periodic Site Visits/Facilitate Repairs

- Quarterly Site Visits
- Technical Support for Implementation
- Reinforce Training
ON-GOING COMMISSIONING

Business Model – Service Costs

- 688,000 GSF Hospital
- Acute Care/Psych/Outpatient Services
- Recent Retro Commissioning Program
- 11.5% Energy Savings/
- $1,900,000 Energy Spend
ON-GOING COMMISSIONING

Business Model – Service Costs

- DARS System Installation/Configuration
  - Base System: $35,000
  - Configuration: $50,000

- Bi Annual Site Visits: $85,000

- Repair Facilitation: $40,000
Business Model – Service Costs

- Total 1st Year Program Cost: $211,000
- Avoided Cost (10% Energy Spend): $168,000
- Subsequent Annual Costs: $120,000
- Program Pays @ 7% Avoided Cost
QUESTIONS ?