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| Procedures for Small Commercial Energy & Water Assessments |
| **The process and scope developed in this guide is based on ASHRAE’s “Procedures for Commercial Building Energy Audits, Second Edition”. It is strongly recommended that all users read the ASHRAE guide prior to using this resource.** |
| **April 2016** |
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# Preface

The goal of this document is to provide a reference guide for conducting small commercial energy and water assessments for existing commercial buildings and the required deliverables as defined by Southface. It is not intended as a prescriptive approach or checklist, but rather an introductory guide for standardizing procedures specific to assessments for small commercial buildings. As a result, this document is targeted towards individuals with some assessment experience.

Generally, assessors must undertake the following process to complete an energy and water assessments:

* **Preassessment:** Collect and analyze historical energy and water use data and building drawings
* **Site Visit:** Interview the client and study the building to evaluate the facility’s existing system conditions and identify practical efficiency and/or conservation projects that will:
  + Reduce the energy and water use and cost of operating the facility
  + Improve the indoor environmental quality experience by the occupants
  + Meet the client’s goals, constraints, and economic criteria
* **Post-Assessment Data Download:** Record and integrate site visit notes, pictures, and project ideas immediately after the site visit. It is recommended that site visits are scheduled for the first half of the day/week, and the second half of the day/week is devoted to processing the data that was recorded. In order to avoid future confusion with other project sites and make the most of the time spent onsite:
  + Develop a preliminary project list
  + Record any unresolved questions to inform the need for additional site visits
* **Analysis:** Perform an engineering and economic analysis of the identified projects
* **Deliverables:** Prepare a report providing a pathway to implementing proposed projects and present assessment findings to the client, which may include the board of directors for a nonprofit organization
* **Closeout:** Provide technical assistance during the selection of contractors and implementation of proposed projects. Complete closeout project management tasks including budget evaluation, documentation and sharing of lessons learned, client evaluation, etc.

All process milestones are standard in this procedure, however the scope varies depending on various factors, including type and size of facility, the complexity of the systems within it, and owner requirements, needs and availability. The scope will be identified during the preassessment phase and should be established by the lead assessor after an initial site visit to meet the owner and define assessment goals within the staff time allotted and budget of the project. Items identified in ASHRAE’s guidelines which are specifically not in the scope of this small commercial procedure include:

* Creating an energy model
* Recommending a measurement and verification (M&V) method for post implementation monitoring
* Compiling detailed cost estimates (unless bids are made available)

The process and scope developed in this guideline are a modified version of ASHRAE’s “[Procedures for Commercial Building Energy Audits, Second Edition](file:///\\eco\server\Codes%20and%20Standards\_ASHRAE\Energy%20Audit%20Guide\Energy%20Audit%20Guide%20V2.pdf)”, and is specific to the Southface’s approach to small commercial buildings. The **process** milestones are identified in **bold blue text**, while the comprehensive scope of the process is identified as un-bold black text.

# Process & Scope

1. **Preassessment** 
   1. Discuss preassessment site visit/client discussion performed by lead assessor to draft scope of work, time allocation, and budget
   2. Send email to client regarding site visit preparation, and review client response and follow-up accordingly (See Appendix, section 1); ensure client has set up an ENERGY STAR Portfolio Account and entered at least 12 months of utility data
   3. Review collected client materials and the internet for the following:
      1. Facility history, occupancy, and use
      2. Drawings and/or online mapping images to verify floor area and complete satellite image checklist. <https://www.google.com/maps/d/>
      3. Client mission and goals for the assessment
   4. Review ENERGY STAR Portfolio Manager and complete utility bill review checklist. (See Appendix, section 2)
      1. Download account to excel. Copy worksheets to the Southface Small Commercial Energy and Water Assessment Workbook (Workbook).
      2. Identify building name, floor area, year of construction, schedules of use, and number of building occupants.
      3. Verify the following information with utility providers websites and flag anomalies or errors, as available (click “refresh” to update pivot tables):
         1. Monthly use and cost
         2. Utility rates and suppliers
         3. Location service areas of utility meters
      4. Conduct Preliminary Energy/Water-Use Analysis (PE/WA) and identify potential red flags
   5. Prepare for site visit by gathering the following equipment and information to take to site, at minimum (See Appendix, section 2):
      * Notebook/clipboard
      * Phone
      * Digital Camera
      * Flashlight
      * Ladder, if not available on site
      * Printed data collection forms from Workbook
   6. Summary of potential red flags identified during preassessment review
2. **Site Visit**
   1. Interview client staff, including decision makers to:
      1. Gain an understanding of building energy use, occupancy, operations, and occupant behavior, constraints, and economic criteria
      2. Discuss summary of potential red flags identified during preassessment review
      3. See Appendix, section 3, for a comprehensive list of interview discussion points
      4. Complete Overview form from Workbook during the interview
      5. Obtain fire escape plan if no other plans are available or if plans are dated
   2. Conduct walk-through survey (dividing up the facility if multiple auditors present) completing the data collection forms from the Workbook
   3. Review mechanical & electrical (M&E) design and condition and O&M practices, as necessary
   4. Measure key operating parameters, as necessary (See Appendix, section 5). Record HVAC schedules including thermostat set points and schedules for each system.
   5. Photograph key observations, including:
      * Thermostats
      * Hot water recirculation pumps without controls
      * Damaged refrigerant piping insulation
      * Combustion safety issues
      * Envelope infiltration paths
      * Insulation coverage

Record the observation with the note “Pic”, time the photograph was taken, and other identifying information.

* 1. Lighting
     1. Locate light switch for the room. Toggle the switch for each circuit.
     2. Record number of circuits, switch type, and emergency egress fixtures.
     3. Record fixture quantities for each fixture type in the room.
  2. Photograph equipment tags for major equipment, including:
     + Condensing units
     + Air handling units
     + Water heaters
     + Laundry equipment
     + Kitchen equipment
     + Large equipment
     + Typical lighting, based on lamps found in storage
     + Pumps, fans, heaters, and other HVAC

Record the type of equipment, quantity and operating state with the note “Pic”, time the photograph was taken, and other identifying information (e.g. RTU-1)

* 1. Conduct additional testing/monitoring, as necessary
  2. Identify low-cost/no cost projects and non-energy or water capital improvements
  3. Meet any additional requirements as required by programs that may apply to the assessment
  4. Discuss all potential projects with decision makers to gauge level of buy-in and prompt additional projects.

1. **Post-Assessment Data Download**
   1. As soon as possible proceeding the site visit, find a place where you can fully focus, ideally with the following characteristics:
      1. No distractions
      2. Internet connection
      3. Desk space for plans and notes
      4. Large screen for viewing multiple electronic files at once
   2. Transfer pictures to the hard drive of your laptop for rapid viewing
      1. Delete extraneous pictures
      2. Separate data and document pictures from general images
      3. Save a copy of each picture with an equipment nameplate as <system category abbreviation> - <system tag> - <system component (optional)>
      4. Assign designation number based on timestamp order, if unique designation is not available
      5. Record new and old name for the picture for future reference
      6. Save final photo set in appropriate location for back-up and sharing with other team members
   3. Transcribe notes that could not be recorded while simultaneously walking, talking, counting, writing, and taking pictures into survey spreadsheet
      1. Tally marks and poorly written gibberish should be translated into coherent notes
   4. Data Processing:
      1. Electronically complete the data collection forms in the Workbook
      2. Transcribe photographed data (e.g. model numbers) into the equipment worksheet and select correct equipment category
         1. Use serial numbers to avoid double-counting equipment
      3. Assemble vague statements and general observations to create equipment schedules
         1. State your assumptions
         2. Save product information after it is located online
      4. Define the building occupancy schedule
      5. Perform basic checks on the recorded data
         1. Is any major equipment missing from your inventory?
         2. Are key metrics within the expected range (e.g. Lighting Power Density, Sq-Ft/ton)?
   5. Develop a preliminary project list
   6. Send a follow-up email with requests for additional information and next steps, including a date for a potential follow-up site visit and final presentation to client.
   7. Finalize remaining scope of work, time allocation, and budget plan
2. **Analysis**
   1. Using the Workbook:
      1. Estimate savings from utility rate change, as necessary
      2. Verify ENERGY STAR Portfolio Manager in-puts based on site visit observations, survey, and on-site drawings/Google Maps Engine, including building name, floor area, year of construction, schedules of use, and number of building occupants.
      3. Compare EUI/WUI to EUI/WUI of similar sites (benchmark)
      4. Analyze utility history and recent annual statistics
      5. Estimate energy- and water-end use breakdown, as detailed as necessary
      6. Present typical breakout for the space type, if a breakout calculation is not performed
   2. Analyze the following environmental and economic impacts of individual projects:
      1. Estimated project energy and cost savings
      2. Budget project costs
      3. Simple payback period
      4. Potential EIU/WUI if projects were implemented
      5. Estimated utility rebate potential for each project
   3. Estimate project cost savings and EUI/WUI if project were implemented
3. **Deliverables**
   1. Draft report (using the Report template and Workbook)
      1. Executive Summary
         1. Summarize benchmarking results
         2. Summarize utility use and cost
         3. Summarize recommended projects
         4. Discuss potential for Georgia Power rebates
      2. Property Overview
         1. Describe assessment process
         2. Describe analysis methodology
         3. Describe report structure
         4. Assessor staff contact information
      3. Facility Background
         1. Describe nonprofit mission
         2. Describe building use and occupancy type
         3. Insert pictures, as necessary
      4. Building Envelope, Systems and Operations
         1. Summary of systems, as detailed as necessary but avoid a repeat of Energy and Water Efficiency Projects
         2. Equipment inventory, as detailed as necessary
      5. Energy & Water Use Profile
      6. Energy and Water Consumption End Use
      7. Energy & Water Efficiency Projects
         1. Describe recommended projects, as detailed as necessary but avoid a repeat of Building Envelope, Systems and Operations descriptions
         2. Organize projects based on descending order of simple payback period
         3. Provide schematic layouts for projects, as necessary
         4. Qualitatively identify synergies between projects
         5. Discuss future project recommendations
         6. Discuss current waste management practices and identify opportunities and resources
         7. Discuss maintenance opportunities
      8. Other Sustainability Recommendations
      9. Next Steps
      10. Appendix
          1. Include lengthy inventories here.
   2. Final presentation
      1. Create 15 minute presentation using the Presentation template as reference.
      2. Create a final presentation handout, such as the energy and water project table and/or executive summary section of the report.
      3. Prepare for final presentation by bringing the following:
         1. Business cards
         2. Notebook to note comments
         3. Projector and screen, as necessary
         4. Printed handouts, as necessary
         5. Back up presentation on flash drive
         6. Laptop, as necessary
4. **Closeout**
   1. Follow-up
      1. Incorporate comments from final presentation into report
      2. Email final report to client (CC other team members as appropriate)
      3. Provide technical support during contractor selection and implementation project
         1. Review and edit Implementation Verification Checklist with client and relevant contractors in preparation for project implementation
   2. Project evaluation/Budget analysis with internal manager
      1. Invoice client as needed
      2. Did this project stay within the allotted hours and time span?
   3. Share lessons learned with peers
   4. Implementation Verification
      1. Conduct site visit to verify installation of implementation projects in accordance with the Implementation Verification Checklist

# Appendix

1. **Preassessment: Sample Site Visit Preparation Email to Client**

Good Afternoon <*Client Name*>,

I’d like to touch base in preparation for the assessment site visit coming up on ***<Weekday, Month, Day>.*** I will be the lead assessor and main point of contact during this process.

**Site Visit Attendees:**

* **<*Client Name*> Team:** Yourself and anyone who understands the building operations and occupant behavior, often the person with the most keys (only need to be available first half of the day)
* **Southface Assessment Team:** <*Name of Southface team attending site visit*> (will likely be there the entire day)

**Site Visit Agenda**: (*edit as necessary)*

* <*9:30AM*>: Arrive
* <*9:30 – 10:30AM*>: Interview with *<Client Name>* staff to discuss the facility’s history, current operations, wish list etc.
* <*10:30 – 11:30AM* >: Guided general walk-through of the facility to get the lay of the land and identify areas of concern.
* <*11:30 – 5PM*>: Southface will continue the assessment site visit by surveying the property in detail on our own, unless you or a *<Client Name>* representative is interested or required to escort us, or we cannot access locked areas on our own.

**Special Requests:**

* Please provide electronic drawings, if available
* Please provide a copy of the most recent bill for each utility serving the property
* If possible, please reserve a space for the first hour where we can begin with an interview
* Have all locked areas, such as mechanical rooms, accessible.
* Please confirm if you have a 10 foot ladder available on site, otherwise we can bring our own
* We will be taking a lunch break, whenever it is convenient for you

Feel free to call me with any questions/concerns. On the day of the site visit, you can reach me on my cell at <*Insert Lead Assessor Cell Phone Number*>. Thanks!

1. **Preassessment:**

Utility Bill Review

* Electricity
  + 12 months of bills
  + No gaps
  + Is winter higher than summer? (heat pump or electric resistance heating)
  + Is the rate plausible?
  + Is the cost intensity reasonable?
* Gas
  + 12 months of bills
  + No gaps (zero usage with cost is okay in summer)
  + Is gas used for space heating?
  + Is gas used for water heating or other functions?
  + Is the rate plausible?
  + Is the cost intensity reasonable?
* Water
  + 12 months of bills
  + No gaps
  + Is there a season variation in water usage?
  + Is the rate plausible?
  + Is the cost intensity reasonable?
* Benchmarking
  + ENERGY STAR Score
  + % difference from median property
  + Identify spikes in usage and discuss with client

**Measuring & Monitoring Tools to Take to Site**

* + Measuring tape
  + Digital thermometer and humidity meter
  + CO2 meter
  + Personal protection equipment (PPE)
    1. Face mask
    2. Hearing protection (for mechanical rooms)
    3. Goggles
    4. Clothing protection
  + Light meter
  + Infrared temperature spot meter
  + Power meter and/or power loggers
  + Temperature and relative humidity loggers
  + Light loggers
  + Infrared camera
  + Anemometer
  + Pressure gauges

1. **Site Visit: Interview Discussion Points**
   * Reintroduce assessment scope and goals
   * The history and mission of the client
   * How the property is operated (schedules, occupancy type, etc.)
   * Existing equipment condition
   * General maintenance procedures
   * Persistent comfort issues
   * Indoor air quality (IAQ) problems
   * Malfunctioning equipment (including excessive O&M expenses, excessive noise, etc.)
   * Waste management practices
   * General sustainability practices
   * Previous and/or planned upgrades
   * Previous energy and water assessments
   * Wish list items that meet nonprofit and program goals
   * Funding capability and plans to implement proposed projects
   * Site access procedures
   * The use of photography during the assessment
   * Additional information necessary for assessment to be provided by the client
   * Next steps for assessment process, including:
     1. Future site visits
     2. Expected draft report submittal
     3. Available final presentation dates
2. **Assessment Checklists**

Satellite Image Review

* Footprint length
* Footprint width
* Footprint area
* Number of stories
* Window to wall ratio (rough)
* Roof type/condition
* Roof top HVAC equipment
* Wall type
* HVAC equipment on the ground
* Exterior lighting
* Irrigated turf or landscaping
* Building shading
* Save screenshot

Roof Checklist

* Number of flue ducts for gas-fired equipment
  + Does the number of flue ducts equal the number of gas-fired equipment?
* Really big flue duct (boiler)
* Exhaust and outside air ventilation outlets and inlets
* Roof membrane type, condition, and age
* Depth of roof (insulation is usually not visible)
* Air leakage pathways
* Parapet wall condition

HVAC Equipment Checklist

* Split system
  + Condensing unit
    - System number/designation
    - Heat pump?
    - Visual inspection of condition
    - Take pictures of damaged refrigerant piping and model information
  + Air handling unit
    - Heating type
    - Combustion safety concerns
    - Outside air system
    - Evidence of condensate overflow
    - Maintenance log, if available
    - Is the air handler in conditioned space?
    - Is the ductwork in conditioned space?
    - Ducted returns?
    - Is there a return path for each supply diffuser?
    - Visual inspection of ductwork
    - Take picture of model information
* Packaged unit
  + System number/designation
  + Visual inspection of condition
  + Heating system type
  + Constant volume or VAV
  + Outside air intake
  + Economizer
  + Ceiling used as a return air plenum?
  + Take picture of model information
* Roof mounted fans
  + Is it running?
  + Supply or exhaust
  + Used for kitchen exhaust?
* Remote refrigeration condensing unit
  + Picture of model number for refrigerator and for compressor
  + Condition
  + Refrigerant line insulation quality

Domestic Hot Water

* Is there a recirculation pump?
* Timer?
* Heat type
  + Combustion safety issues
* Heat trap present
* Hot water piping insulation
* Is the water heater functioning?
* Temperature set-point