City of Columbia

701 East Broadway, Columbia, Missouri 65201

Agenda Item Number: R 2-15
Department Source: Convention and Visitors Bureau
To: City Council
From: City Manager & Staff
Council Meeting Date: January 5, 2015
Re: Public Hearing - Repairs to the Thomas G. Walton Building

Documents Included With This Agenda Item

Council memo, Resolution
Supporting documentation includes: Excerpts from Various Minutes along with Simon and Oswald Architects Proposal & Timeline, Images, Energy Conservation Assessment

Executive Summary

Setting a public hearing for January 20, 2015 for building repairs to the exterior of the Thomas G. Walton Building. The current cedar siding needs to be replaced to stop water infiltration at exterior walls and to replace damaged and ineffective insulation and windows. The total cost for repairs and upgrades is estimated at $375,000 and would be shared between the City and the Columbia Chamber of Commerce.

Discussion

The Thomas G. Walton Building, located at 300 S. Providence Road, was built in 1986 and is owned jointly by the City of Columbia and the Columbia Chamber of Commerce. For several years, there have been growing concerns about the current condition of the exterior of the building and the high cost of maintenance to the aging siding. After several incidents of leaking and flooding throughout the building an inspection was done by CIty of Columbia Public Works and Water and Light departments; the following was reported:

The cedar siding is 28 years old and has deteriorated to the extent that there are holes throughout various locations of the building allowing water penetration to the interior. The polyethylene weather barriers have completely deteriorated in some locations and there is insufficient insulation throughout. Although the roof is in good condition, the holes in the siding allows airflow from the HVAC to escape which creates a strain and inefficiency on the system. The windows have also reached the end of their life-span and several are inoperable. There are also design elements of the original building that need to be upgraded or replaced to improve building visibility and aesthetics, as well as for security of staff and the many customers served in the Walton Building.

The Chamber of Commerce contracted with Simon Oswald Architecture to present options and pricing for this project to the Walton Building Board of Managers, which includes CVB Director, OCA Director, Assistant City Manager, Director of Finance, Chamber of Commerce President, Chamber Chair of the Board and Chamber President. Due to the nature of the project, the Director of Public Works was also asked to sit in on the meetings. A design using concrete boards for siding was submitted by Simon Oswald Architecture and approved. The concrete siding should last for many

years with minimal upkeep. The cedar siding that is on the building now needs repairs and staining at least every 3-5 years. Because the building is located on Flat Branch creek, the staining process needs to be contained, so this expense can range from $18,000 - $20,000.

Columbia Public Works Department staff will oversee the project using building documents from Simon Oswald Architecture, contracted by the Chamber of Commerce. The total cost of the project is not to exceed $375,000 and will be split between the Columbia Chamber of Commerce and the Convention and Visitors Bureau.

Fiscal Impact

Short-Term Impact: The total cost of the project is estimated at $375,000, and will be split between the Convention and Visitors Bureau and the Columbia Chamber of Commerce.

Long-Term Impact: Minimal upkeep costs.

Vision, Strategic & Comprehensive Plan Impact

Vision Impact: Not Applicable
Strategic Plan Impact: Not Applicable
Comprehensive Plan Impact: Not Applicable

Suggested Council Action

Following public input and Council discussion at the public hearing, Council should make a motion directing staff to proceed with final plans, specifications and repair of the Thomas G. Walton Building.

Legislative History

In 2008, the Walton Building was renovated to allow for future needs and expansion of the Convention & Visitors Bureau and the Chamber of Commerce. The flooring, wall coverings, furniture, and fixtures were remodeled and the kitchen and lobby areas were reconfigured. Upgrades to the exterior were limited to repairing existing portions of the parking lot as well as repairs to roof flashing, drain pipes & downspouts and waterproofing a portion of the south end of the building. Total project costs was $536,000. The CVB and Chamber of Commerce shared the costs equally.

Department Approved

City Manager Approved

Introduced by _____ Council Bill No. _____R 2-15_____

A RESOLUTION

declaring the necessity for construction of renovations to the exterior of the Thomas G. Walton Building; stating the nature of and the estimate of the cost of the improvement; providing for payment for the improvement; providing for compliance with the prevailing wage law; and setting a public hearing.

BE IT RESOLVED BY THE COUNCIL OF THE CITY OF COLUMBIA, MISSOURI, AS FOLLOWS:

SECTION 1. The City Council deems the construction of renovations to the exterior of the Thomas G. Walton Building, necessary to the welfare and improvement of the City.

SECTION 2. The nature and scope of the improvement shall consist of furnishing all labor, materials, transportation, insurance and all other items, accessories and incidentals thereto necessary for the complete construction of the improvements.

SECTION 3. The estimated cost of this improvement is $375,000.00.

SECTION 4. Payment for this improvement shall be made from funds received from the Columbia Chamber of Commerce and such other funds as may be lawfully appropriated.

SECTION 5. Any work done in connection with the construction of the improvement specified above shall be in compliance with the provisions of the prevailing wage laws of the State of Missouri.

SECTION 6. A public hearing in respect to this improvement will be held in the Council Chamber of the City Hall Building, 701 E. Broadway, Columbia, Missouri, at 7:00 p.m. on January 20, 2015. The City Clerk shall cause notice of this hearing to be published in a newspaper published in the City.

ADOPTED this _____ day of _____, 2015.

ATTEST:

_____ _____

City Clerk Mayor and Presiding Officer

APPROVED AS TO FORM:

_____

City Counselor

City of Columbia
701 East Broadway, Columbia, Missouri 65201

SUPPORTING DOCUMENTS INCLUDED WITH THIS AGENDA ITEM ARE AS FOLLOWS:

Excerpts from Various Minutes along with Simon and Oswald Architects Proposal & Timeline, Images, Energy Conservation Assessment

Walton Building Board Meeting

October 1, 2014

In attendance - Chamber of Commerce: Matt McCormick, Heather Hargrove, Doug Callahan.

City of Columbia: Amy Schneider, Carol Rhodes, John Blattel, Billye Clemons.

Simon Oswald Architecture: Matt Pinkstaff, Jennifer Hedrick.

A brief overview of Walton building water damage and building maintenance history is given by Matt McCormick.

An overview of the decision making process is given. Chamber Board meets monthly, their next meeting is Oct 14th. They have the option to call a special meeting if necessary. Appropriation for funds on the City side needs to go through two City Council meetings.

Goals for the project include stopping water infiltration, creating a look that reflects the entities within the building and also sustainability/low maintenance.

Ideas for the building include updating the look, modernizing the signage, changing the color to brighter hues, having an open and welcoming feel.

It's noted that the roof is in good condition and this project should not include changes to the roof at this time.

Jennifer notes that the windows are reaching the end of their life. They would not change the window location or shapes, but changing out the windows will be an itemized option.

Matt Pinkstaff reviews some of the options being reviewed includes masonry, fiber cement, metal type panels. Because of the concrete base there are some limits to siding options. Exterior lighting also discussed, including day lighting under the eaves and possibility LED color lighting options.

This project may qualify for the 1% for Art, Amy will check with OCA to determine.

At least three drawings will be sent electronically by Matt Pinkstaff to Matt McCormick Oct 10th with meeting to review and narrow down options to one scheduled for Oct 13th at 1:00 pm.

Walton Building Exterior Renovation Kick-Off

Client:	Columbia Chamber of Commerce
Project Name:	Walton Building Exterior Renovation
SOA Project No:	14036
Meeting Subject:	Project Kick-Off
Meeting Location:	Walton Building
Meeting Date:	10/1/2014
Prepared by:	Matt Pinkstaff, pinkstaff@soa-inc.com 573.443.1407

Participants:		
	Matt Pinkstaff	SOA
	Jennifer Hedrick	SOA
	Matt McCormick	Chamber of Commerce
	Amy Schneider	Conference & Visitor's Bureau
	Heather Hargrove	Chamber of Commerce
	John Blattel	City of Columbia
	Carol Rhodes	City of Columbia
	Doug Callahan	Chamber of Commerce
	Billye Clemons	Conference & Visitor's Bureau

1. **Meeting Purpose:**
   - A. Identify project team members
   - B. Define decision making process
   - C. Identify the main goals and scope of work for this project
   - D. Review the project process and schedule
   - E. Discuss the project budget
   - F. Clarify lines of communication
   - G. Discuss project budget

2. **Project Team Introductions:**
   - A. Participants were introduced to one another prior to the start of the meeting.

3. **Decision making:**
   - A. The client team present in the meeting will direct the design decisions as a group, and then submit a design option and cost information to the city for approval to proceed.

4. **Main goals for the project:**
   - A. The goal of this current project is to develop one exterior design that the board can proceed forward with as a separate project. The objectives are:
     1. Stop water infiltration at the exterior walls.
     2. Give the building an updated look.
        1. The design should be such that it is won't look dated too quickly, timeless.
        2. Minimize short, squatty look of building.
        3. Make entries more inviting, brighter.
        4. Materials should be low maintenance.
        5. The materials need to be durable and provide a long-term solution.
        6. Provide better/additional exterior lighting around building.
        7. Use lighter colors on exterior.
        8. Update signage and improve signage visibility.

9. Remove trees from roof opening areas to increase natural light at small court area on east side and main entries.

5. **Scope of work:**
   A. Replace existing wood siding with new material.
   B. Replace windows. New windows to be operable.
   C. Potential modifications to eaves.
   D. Potential signage on building. Signage to be for Chamber and CVB only.
   E. Potential vertical element(s) to create visibility for building at entries on both east and west sides.
      1. There was discussion that this could include art funded by the City, but this would take additional coordination and time that the current schedule does not allow.
      2. It was noted that the District Gateway design has been approved by CID, and that these elements might have a visual connection with that design.
   F. Add exterior lighting.
   G. Consider removal of concrete base of all walls (SOA investigated this further after the meeting and determined it to be cost prohibitive).
   H. Removal of concrete wall at bike rack on east side.
   I. Add exterior electrical outlets.
   J. Components that are to remain as is:
      1. All interior elements
      2. Exterior doors
      3. Roof
      4. Parking area
   K. Components that are to be addressed by owner upon approval of design:
      1. Landscaping

6. **Process and Schedule:**
   A. An in-progress design and cost information are needed on 10/16 for a city council meeting on 10/20.
      1. SOA will send pdf images of the design options along with general cost information for each on 10/10 for the team to review prior to our next meeting
      2. The next meeting will be from 1:00-2:30 on 10/13, during which the options will be reviewed and discussed as a group. SOA will use the feedback obtained during this meeting to produce the final design and estimated cost information.
      3. We originally planned on a Final Exterior Design and Feasibility Meeting to wrap up this portion of work.
         1. 1.5 hrs – TBD, tentatively between 10/22 – 10/24.
         2. Review final exterior design.
         3. Review opinion of probable construction cost.
         4. Establish steps for transition to City-led construction project

7. **Project budget:**
   A. SOA understands the Chamber would like to receive estimated cost information on proposed work in order to evaluate what work is possible and the budget that will be required.

8. **Lines of communication:**
   A. Primary point of contact for SOA: Matt Pinkstaff (Project Manager)
      1. Secondary point of contact for SOA: Jen Hedrick (Principal-In-Charge)
   B. Primary point of contact for Chamber: Matt McCormick, President
      1. Secondary point of contact for Chamber: Amy Schneider (to be copied on all emails to Matt M.)

9. **Next steps:**
   A. Exterior Options Review Meeting, 1:00 – 2:30 on 10/13 at Walton Building. Matt McCormick to coordinate invitations to committee members.

Walton Building Board Meeting
October 13, 2014

In attendance - Chamber of Commerce: Matt McCormick, Heather Hargrove, Doug Callahan.
City of Columbia: Amy Schneider, Carol Rhodes, John Blattel, John Glascock, Billye Clemons.
Simon Oswald Architecture (SOA): Matt Pinkstaff, Jennifer Hedrick.

Design options from SOA e-mailed last week reviewed. Please see attached Design Options 10102014.

In all options the wood siding would be removed and optional materials include manufactured stone, fiber cement lap siding, fiber cement vertical panels and metal siding. Manufactured stone needs to be painted for cosmetic purposes after approximately 10-15 years. Changes to eaves reviewed. Multiple colors are available in all the materials and do not effect price quote. Cost options range from $253,000 to $593,000.

All options include:
Replacement of existing wood siding
New operable aluminum windows
Soffit lighting
Exterior outlets
Removal of concrete wall at east entry
Foam insulation behind concrete wall base
Waterproofing on concrete wall base from grade level up
Weather barrier on walls above concrete
Signage on the building

Discussion includes public and Chamber member potential backlash if tower options chosen due to significantly higher cost. Likes and dislikes about each option reviewed. Topics include siding, coloring, signage and logos on the building. Group consensus is option A with some modifications.
Time line with City process is approximately 3-4 months. John Glascock will check with building maintenance to see what can be done, possibly caulking, to hold the moisture out during the winter months until project can be completed.

A new rendering will be sent by SOA in approximately one week. Next meeting to review final rendering set for Oct 22nd at 9 am.

Walton Building Exterior Renovation - Minutes

Client:	Columbia Chamber of Commerce
Project Name:	Walton Building Exterior Renovation
SOA Project No:	14036
Meeting Subject:	Design Options Review
Meeting Location:	Walton Building
Meeting Date:	10/13/2014
Prepared by:	Matt Pinkstaff, pinkstaff@soa-inc.com 573.443.1407

Participants:		
	Matt Pinkstaff	SOA
	Jennifer Hedrick	SOA
	Matt McCormick	Chamber of Commerce
	Amy Schneider	Conference & Visitor's Bureau
	Heather Hargrove	Chamber of Commerce
	John Blattel	City of Columbia
	Carol Rhodes	City of Columbia
	Doug Callahan	Chamber of Commerce
	Billye Clemons	Conference & Visitor's Bureau
	John Glascock	City of Columbia

1. **Meeting Purpose:**
   A. Review design options and costs
   B. Narrow options down to single design for the final meeting
   C. Set final meeting date

2. **Review Design Options:**
   A. Option A – Fiber cement lap siding / manufactured stone: $253,000 - $283,000.
   B. Option B – Metal siding / manufactured stone: $285,000 - $315,000.
   C. Option C – Fiber cement vertical panels / manufactured stone: $350,000 - $380,000.
   D. Options D1 & D2 – Fiber cement vertical panels / 1 tower: $470,000 - $490,000.
   E. Option E – Fiber cement vertical panels / 4 towers: $563,000 - $593,000.

3. **Comments & Feedback:**
   A. The following are comments that the group agreed SOA would continue forward with for the final exterior design rendering and opinion of probable cost.
      1. All roof trim (soffits, eaves, fascia) and window trim to be a lighter color than the siding.
      2. Edges of sloped portions of roof (outer portions only - rake edges) to be modified to be thinner.
      3. Upper wall siding to be fiber cement lap siding. The color is to be somewhere between the grey shown in Option A and the beige shown in Option C in terms of lightness. The color should have some warmth to it and read as different from the roof color. The group was not opposed to multiple colors, but the general consensus was to show just one color.
      4. The concrete base will have the stone veneer shown in the renderings applied to it as shown in Option A.
      5. The existing sign is to have stone veneer added to it.
      6. No signage is to be included on the west side of the building, but the logos are to be included in the courtyard area on the east side.

7. The tree in the courtyard is to be removed and the area is to be paved with concrete to create more space for outdoor gatherings.
8. The columns at the east and west entries will be built out wider and have stone veneer.
9. Soffit lighting is to be included, but there was discussion about spotlights mounted out in the landscaping as well.
10. No towers are to be included. The group felt that the budget did not allow for this nor that it would be interpreted by the public and Chamber members as a wise use of funds.
11. The concrete wall in front of the bike rack on the east side will be removed.

B. Spray insulation is to be included behind the concrete walls.
C. Waterproofing is to be included on the concrete walls.
D. A vapor barrier will be installed on the stud walls.
E. Exterior outlets will be added on the east side.
F. Attic insulation will be added to the building separate from this project.

4. Potential Cost Savings and Comparisons:

A. Comparison of siding costs (approximate costs):
1. Paint on concrete: $1.30/sf
2. Fiber cement lap siding: $6/sf
3. Metal siding: $9/sf
4. Manufactured stone: $17/sf
5. Fiber cement vertical panels: $17/sf

B. Potential cost savings items (approximate costs):
1. Don't include soffit lighting: $5,100
2. Don't replace windows: $30,200
3. Don't narrow the rake edges of roof: $3,100
4. No towers or less towers: $33,000 each

Schedule & Cost:

A. Concerns were expressed about the cost of the work, but the consensus is that the majority of the work has to be done to correct water infiltration into the building.
B. It was discussed that SOA can include items like replacing the windows and the stone as budget protecting alternates.
C. The renovation work will need to start in spring of 2015.
D. The team discussed that the expected timeline to get City approval is approximately 3-4 months.
E. The cost should not exceed $290,000 - $300,000 (*please note that the cost estimate amounts provided are only for construction and do not include professional fees to produce the construction documents*).

2. Next steps:

A. John Glascock will check with the City building maintenance department to see if something termporary can be done to the siding to stop water infiltration throughout the winter before work starts on the renovation.
B. Final Exterior Design and Feasibility Meeting to wrap up this portion of work schedule for 9am on 10/22. One hour will be sufficient for the meeting. The meeting purpose will be to review the final exterior design and opinion of probable cost.
C. SOA to send additional info on the durability and life expectancy of fiber cement siding to Matt and Amy.

COLUMBIA CHAMBER OF COMMERCE

COLUMBIA, MO
WHAT YOU UNEXPECT

WALTON BUILDING EXTERIOR RENOVATION DESIGN OPTIONS

10/13/2014

SOA

OPTION A: Fiber Cement Lap Siding / Manufactured Stone

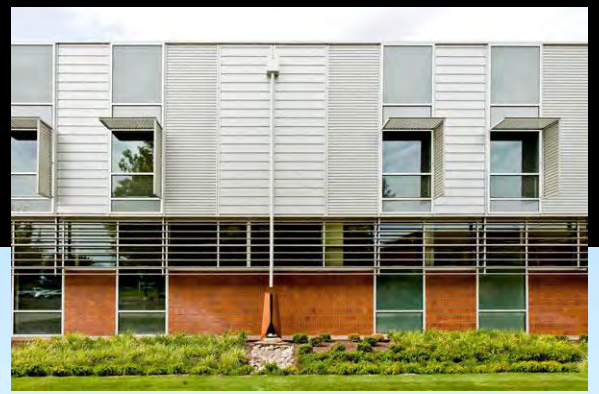
Estimated Construction Cost of $253,000 – $283,000

OPTION A: Fiber Cement Lap Siding / Manufactured Stone

OPTION B: Metal Siding / Manufactured Stone

Estimated Construction Cost of $285,000 - $315,000

OPTION B: Metal Siding / Manufactured Stone



OPTION C: Fiber Cement Vertical Panels / Manufactured Stone

Estimated Construction Cost of $350,000 - $380,000

OPTION D1: Fiber Cement Vertical Panels/ 1 Tower

Estimated Construction Cost of $470,000 - $490,000

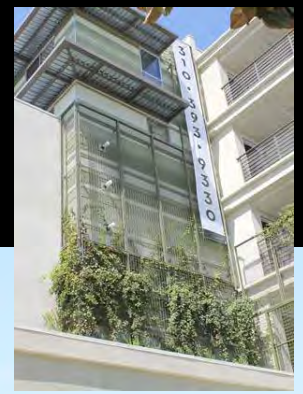
OPTION D2: Fiber Cement Vertical Panels/ 1 Tower

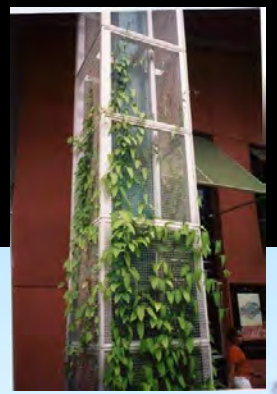
Estimated Construction Cost of $470,000 - $490,000

OPTION E: Fiber Cement Vertical Panels / 4 Towers

Estimated Construction Cost of $563,000 - $593,000

OPTION E: Fiber Cement Vertical Panels / 4 Towers





OPTION E: Fiber Cement Vertical Panels / 4 Towers

All options include:

- Replacement of existing wood siding
- New operable aluminum windows
- Soffit lighting
- Exterior outlets (4)
- Removal of concrete wall at east entry
- Foam insulation behind concrete wall base
- Waterproofing on concrete wall base from grade level up
- Weather barrier on walls above concrete
- Signage on the building

Walton Building Board Meeting
October 22, 2014

In attendance -
Chamber of Commerce: Matt McCormick, Heather Hargrove.
City of Columbia: Amy Schneider, Carol Rhodes, John Glascock, Billye Clemons.
Simon Oswald Architecture (SOA): Matt Pinkstaff, Jennifer Hedrick.

Final design renderings reviewed. Removal of trees located in the south east front pocket discussed regarding heat gain. SOA recommended wall insulation be evaluated when siding is removed. New renderings showed thinned eaves, stone and lighter siding. The site sign, after review, cannot have stone added to it and will need to be replaced. Probable construction cost range is $274,000 to 304,000. Potential for having current bus stop moved from Providence to Elm and a shelter placed discussed. John Glascock will research. As project moves forward, color samples would be utilized in person before final color decision is made.

City bid process is considered in timeline review. Time estimate for project included production of construction documents, review meetings, permitting by City, bid advertisement by City, pre-bid meeting, selection of general contractor, construction contract written and signed, pre-construction meeting, shop drawing and material acquisition, with 8-12 weeks for construction for a total of 26-32 weeks for project completion. Construction documents have additional estimated cost by SOA of $22,000-26,000. With a minimum 10% construction contingency, complete project estimate is $375,000.

Cost savings opportunity would be to have Parks & Red remove existing landscaping to make it easier for the contractors to access the building.

Walton Building Exterior Renovation - Minutes

simon oswald architecture

Client:	Columbia Chamber of Commerce
Project Name:	Walton Building Exterior Renovation
SOA Project No:	14036
Meeting Subject:	Final Review
Meeting Location:	Walton Building
Meeting Date:	10/22/2014
Prepared by:	Matt Pinkstaff, pinkstaff@soa-inc.com 573.443.1407

Participants:		
	Matt Pinkstaff	SOA
	Jennifer Hedrick	SOA
	Matt McCormick	Chamber of Commerce
	Amy Schneider	Convention & Visitor's Bureau
	Heather Hargrove	Chamber of Commerce
	Carol Rhodes	City of Columbia
	Billye Clemons	Convention & Visitor's Bureau
	John Glascock	City of Columbia
	JJ Musgrove	Office of Cultural Affairs

1. **Meeting Purpose:**
   - A. Review final design and opinion of probable cost.
   - B. Discuss next steps.

2. **Review Design Option & Cost:**
   - A. Changes include:
     1. Thinner eaves on the outer roofs.
     2. Trim color lighter than siding color (final colors to be selected if project proceeds).
     3. Columns to be built out and include stone.
     4. Stone on site sign. Sign will need to be replaced due to current construction.
   - B. Opinion of Probable Construction Cost in range of $274,000 - $304,000.
     1. It is recommended that a 10% minimum construction contingency be included.
     2. The total amount that will be budgeted for the project will $375,000.
   - C. The group likes the exterior design as shown in the new rendering.
   - D. The group likes the new monument sign as shown in the rendering. Reference was made to liking that it has a similar appearance to the University of MO sign.
   - E. Concern was voiced by John that the additional heat gain after removing the tree will be too much for the space inside. SOA recommended that the wall insulation be evaluated when the siding is removed.
   - F. SOA recommended that the landscaping adjacent to the building be removed by the Owner prior to construction.
   - G. John noted that the City is not required to go with the lowest bidder.
   - H. SOA recommended having bidder qualifications to ensure suitable bidders.
   - I. The group was not sure if this project would require public hearings or if it can be approved by consent.
   - J. The Chamber will discuss financing this project at the next board meeting. There was discussion about relocating the bus stop at the north end of the building on Providence, and replacing with a shelter.

Walton Building Exterior Renovation - Minutes

simon oswald architecture

3. **Schedule:**

A. It was stated at last project meeting that the City needs to go through two readings to obtain approval to proceed.

B. Once approved to proceed, the following are the remaining steps, and approximate amounts of time for completion of each:

1. **1 Week** - SOA to submit to the City a proposal for professional services including production of Construction Documents, assistance with Bidding and Negotiation, and Construction Administration. Receipt of the signed City issued contract will act as SOA's notification to proceed.
2. **4 Weeks** - Production of Construction Documents, including one progress review meeting with Owner.
3. **4 Weeks** – Permitting by City, Bid Advertisement, Pre-Bid Meeting.
4. **4 Weeks** – Selection of General Contractor, Construction contract written and signed.
5. **5 – 7 Weeks** – Preconstruction meeting, shop drawing / submittal review, material acquisition.
6. **8 – 12 Weeks** – Construction.
7. **Total duration = 26 to 32 weeks.**

C. No concerns were expressed by the group about the above estimated durations.

4. **Next steps:**

A. SOA to wait for further direction from Chamber.

COLUMBIA CHAMBER OF COMMERCE

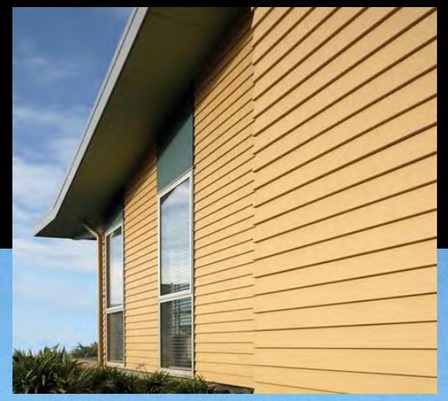
COLUMBIA, MO
WHAT YOU UNEXPECT

WALTON BUILDING EXTERIOR RENOVATION

10/22/2014

SOA


Hardee's




Hardees

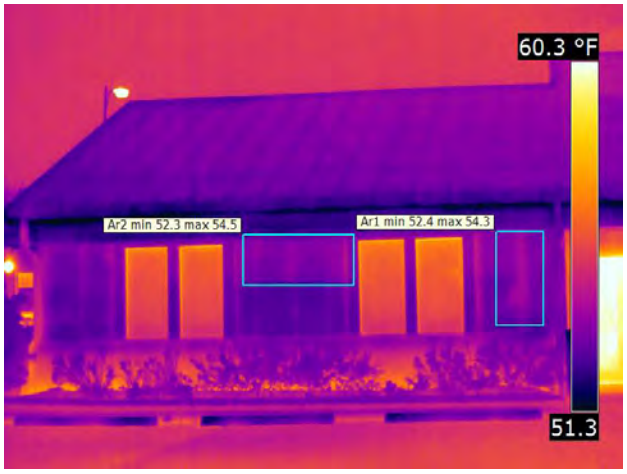

Hardee's
Hardee's
CHAMBER
OF
COMMERCE
CONVENTION
AND
VISITORS BUREAU


Hardees
Hardees
THOMAS G. WALTON BUILDING

Inspection Report

Report Date	10/27/2014

Company	Columbia Water & Light/Utility Services Division	Customer	Convention and Visitors Berau
Address	701 East Broadway, Columbia, MO	Site Address	300 South Providence Road, Columbia, MO 65205
Thermographer	Davidson Le'Tang/John Wulff	Contact Person	Kent Branson/Billye Clemons



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Emissivity	0.94
Reflected apparent temperature	4.1 °F
Object Distance	60.0 ft

Text Comments

Description

Location: east side of building. Image showing wet insulation inside walls.

Inspection Report

Report Date	10/27/2014

Company	Columbia Water & Light/Utility Services Division	Customer	Convention and Visitors Berau
Address	701 East Broadway, Columbia, MO	Site Address	300 South Providence Road, Columbia, MO 65205
Thermographer	Davidson Le'Tang/John Wulff	Contact Person	Kent Branson/Billye Clemons

Image and Object Parameters

Camera Model	FLIR P660
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Image Name	IR_2014-10-27_0017.jpg
Emissivity	0.94
Reflected apparent temperature	4.1 °F
Object Distance	44.2 ft

Text Comments

Description

Location: east side of building. Image showing moisure where indicated. See page 2.

Inspection Report

Report Date	10/27/2014

Company	Columbia Water & Light/Utility Services Division	Customer	Convention and Visitors Berau
Address	701 East Broadway, Columbia, MO	Site Address	300 South Providence Road, Columbia, MO 65205
Thermographer	Davidson Le'Tang/John Wulff	Contact Person	Kent Branson/Billye Clemons

Image and Object Parameters

Camera Model	FLIR P660
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Emissivity	0.94
Reflected apparent temperature	4.1 °F
Object Distance	55.0 ft

Text Comments

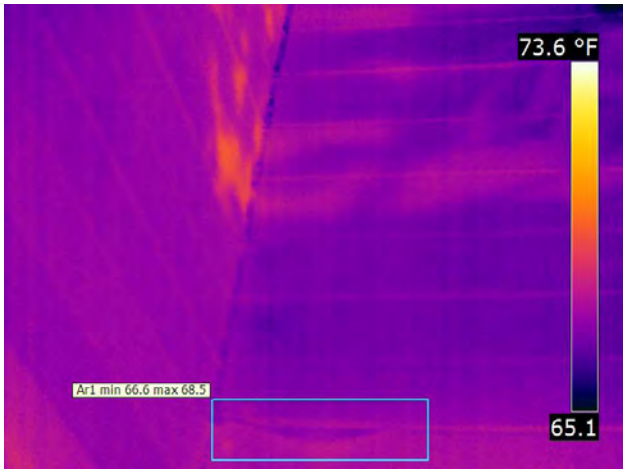
Description

Location: east side of building. Image showing presence of moisture where indicated. See page 3.

Inspection Report

Report Date	10/27/2014

Company	Columbia Water & Light/Utility Services Division	Customer	Convention and Visitors Berau
Address	701 East Broadway, Columbia, MO	Site Address	300 South Providence Road, Columbia, MO 65205
Thermographer	Davidson Le'Tang/John Wulff	Contact Person	Kent Branson/Billye Clemons



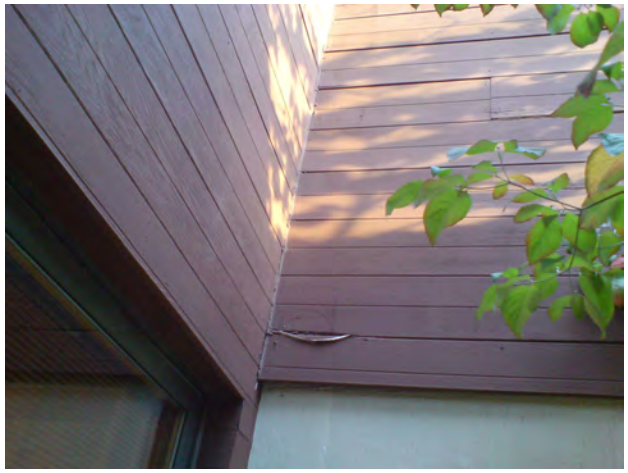


Image and Object Parameters

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Image Name	IR_2014-10-27_0073.jpg
Emissivity	0.94
Reflected apparent temperature	4.1 °F
Object Distance	15.0 ft

Text Comments

Description

Location: east side of building. Caulking has deteriorated and allowing moisture to enter.

Inspection Report

Report Date	10/27/2014

Company	Columbia Water & Light/Utility Services Division	Customer	Convention and Visitors Berau
Address	701 East Broadway, Columbia, MO	Site Address	300 South Providence Road, Columbia, MO 65205
Thermographer	Davidson Le'Tang/John Wulff	Contact Person	Kent Branson/Billye Clemons

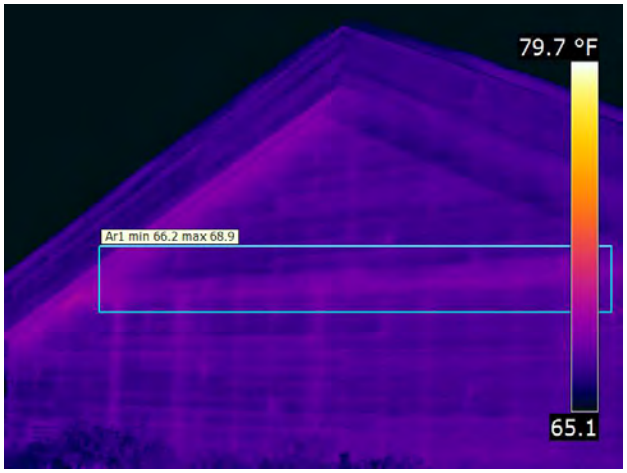

Image and Object Parameters

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Image Name	IR_2014-10-27_0021.jpg
Emissivity	0.94
Reflected apparent temperature	4.1 °F
Object Distance	60.0 ft

Text Comments

Description

Location: south side of building. Image idicating moisture infiltration.

Inspection Report

Report Date	10/27/2014

Company	Columbia Water & Light/Utility Services Division	Customer	Convention and Visitors Berau
Address	701 East Broadway, Columbia, MO	Site Address	300 South Providence Road, Columbia, MO 65205
Thermographer	Davidson Le'Tang/John Wulff	Contact Person	Kent Branson/Billye Clemons

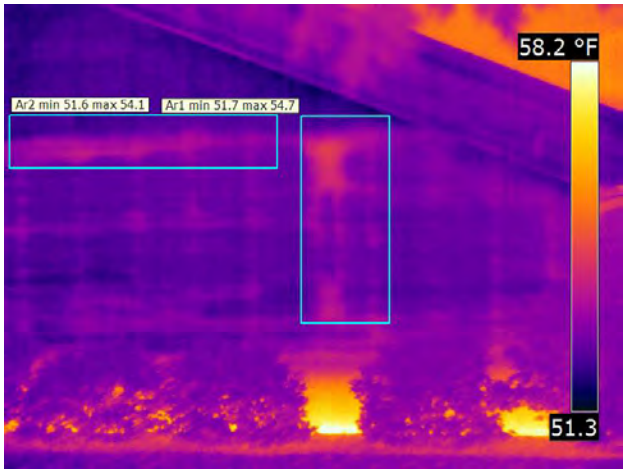

Image and Object Parameters

Camera Model	FLIR P660
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Image Name	IR_2014-10-24_0019.jpg
Emissivity	0.94
Reflected apparent temperature	4.1 °F
Object Distance	48.0 ft

Text Comments

Description

Location: south side of building. Image indicating areas of wet insulation.

Inspection Report

Report Date	10/27/2014

Company	Columbia Water & Light/Utility Services Division	Customer	Convention and Visitors Berau
Address	701 East Broadway, Columbia, MO	Site Address	300 South Providence Road, Columbia, MO 65205
Thermographer	Davidson Le'Tang/John Wulff	Contact Person	Kent Branson/Billye Clemons

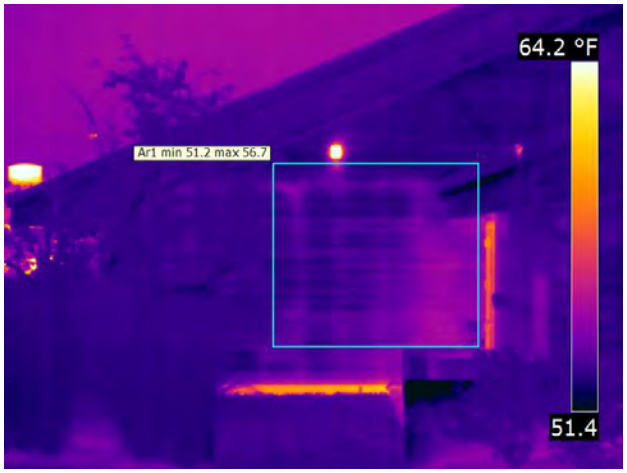

Image and Object Parameters

Text Comments

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Image Date	10/24/2014 6:42:14 AM
Image Name	IR_2014-10-24_0025.jpg
Emissivity	0.94
Reflected apparent temperature	4.1 °F
Object Distance	60.0 ft

Description

Location: west side of building. Image indicating areas of moisture inside walls. See page 2.

Inspection Report

Report Date	10/27/2014

Company	Columbia Water & Light/Utility Services Division	Customer	Convention and Visitors Berau
Address	701 East Broadway, Columbia, MO	Site Address	300 South Providence Road, Columbia, MO 65205
Thermographer	Davidson Le'Tang/John Wulff	Contact Person	Kent Branson/Billye Clemons

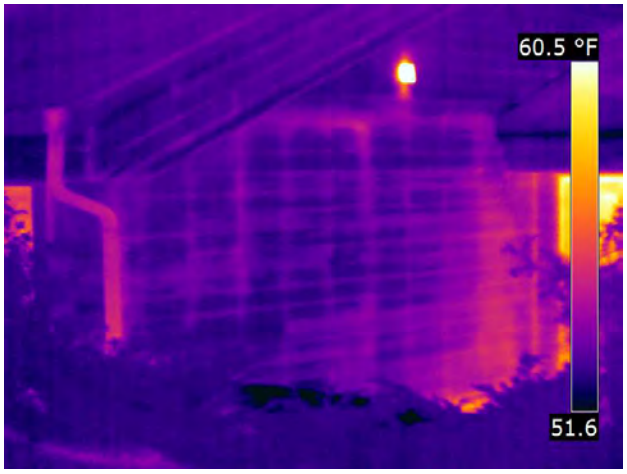


Image and Object Parameters

Text Comments

Camera Model	FLIR P660
Image Date	10/24/2014 6:44:23 AM
Image Name	IR_2014-10-24_0029.jpg
Emissivity	0.94
Reflected apparent temperature	4.1 °F
Object Distance	60.0 ft

Description

Location: west side of building. Image showing areas with wet insulation.

Energy Conservation Assessment for Chamber Of Commerce/ Convention and Visitors Bureau/ Office of Cultural Affairs Thomas Walton Building 300 South Providence Road Columbia Mo

Revised September 29, 2014

Lawrence Lile, P.E.
Chief Engineer
Lile Engineering, LLC
573.657.0231

Provided through Columbia Water and Light

Summary

Scope

Lile Engineering was contracted through Water and Light to analyze energy conservation opportunities at the Walton Building. This report provides recommended energy conservation measures based upon direct inspection of the facility.

Findings Summary

There is a particularly important opportunity to upgrade the exterior siding and insulation, as the facility is scheduled to have the existing cedar siding replaced this fall.

Inspection revealed the existing walls have a number of air and water leaks which have damaged the building. These leaks, along with the existing polyethylene vapor barrier on the interior of the walls, create a high potential for mold. We make specific recommendations about exterior cladding, air and water barriers to mitigate the safety hazard from potential mold growth. We believe this will also have benefits for energy conservation, but recommend it primarily as a safety measure.

We strongly recommend against installing continuous foam insulation on the outside of the walls under cladding. There is an existing polyethylene barrier or the inside of the walls. This prevents the wall from drying to the interior. An exterior layer with a low permeability will trap moisture between the inner and outer layers. Continuous foam will prevent the wall from drying to the exterior, and increase the likelihood of mold growth within the walls, creating a safety hazard. See ECM #9, below.

Recommendations

The following Energy Conservation Measures (ECMs) are recommended:

ECM #1: Repair all furnace enclosures to prevent air leakage. Cost $50. Energy Savings not calculated. Payback should be rapid.

ECM #2: Replace incandescent and CFL lamps in cal lighting with LED. Cost: $515. Lighting Incentive Rebate: $252.5. Net cost: $252.5. Total Annual KW Savings: 1.87KW. Annual Energy Savings: $743. Payback: 0.3 Years.

ECM #3: Install programmable thermostats. Cost: $595. Annual Energy Savings: $1214. Payback: 0.5 years.

ECM #4: Repair damaged refrigeration insulation and install a weather- and sunlight-proof covering. Cost: $70. Annual Energy Savings: $87. Payback: 0.8 years.

ECM #5: Repair and upgrade attic insulation. Cost: $3900. Annual Energy Savings: $1209. Payback: 3.23 years.

ECM #6: Replace exit and emergency lights with LED models. Cost: $816. Annual Energy Savings: $75. Bulb Replacement Savings: $108. Payback: 4.5 years.

ECM #7: Install switching and motion sensors in the Storage Room. Cost: $150. Annual Energy Savings: $19.66. Payback: 7.6 years.

ECM #8: Install Energy Recovery Ventilator (ERV) Cost: $10,000. Annual Energy Savings: $1136. Payback: 8.8 years.

ECM #9 – Upgrade continuous water-and-air barrier and cladding. Do not use continuous foam insulation. Cost: $6400. Annual Energy Savings: $679. Payback: 9.43 years.

Building Inspection

Building Description

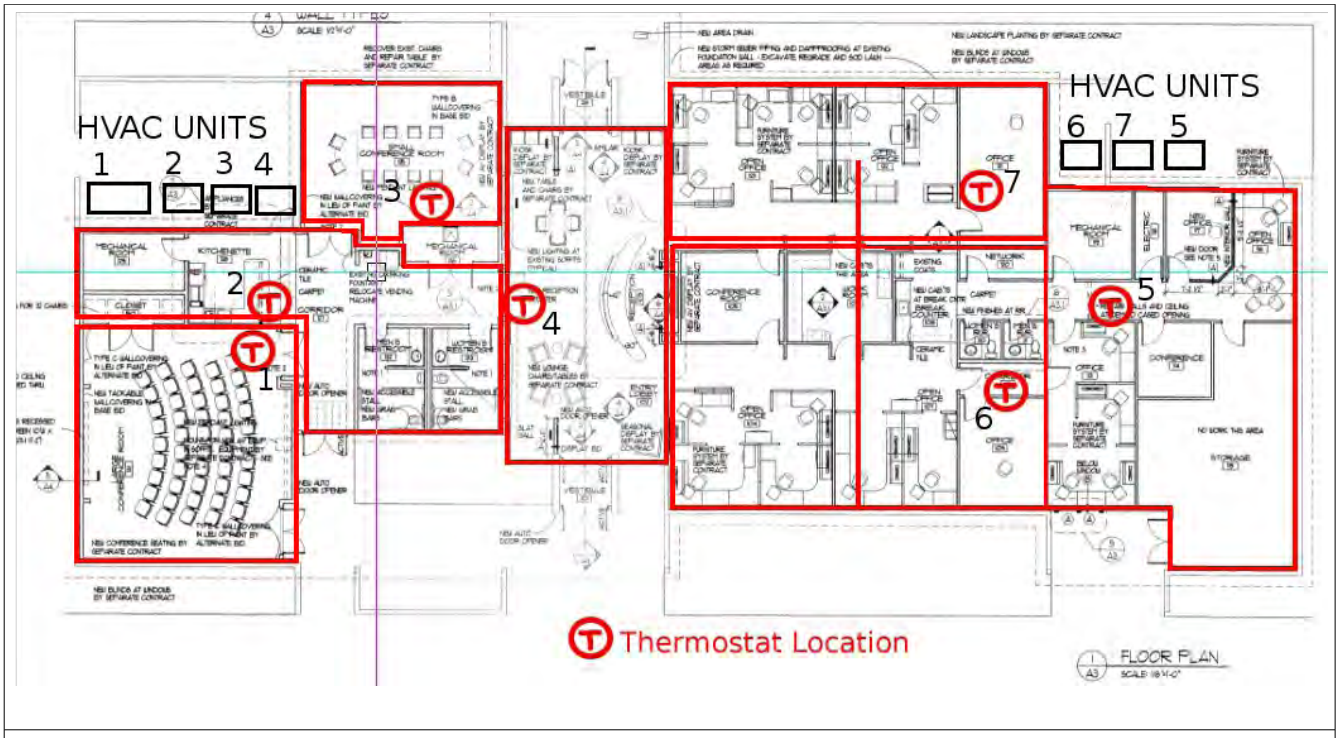
The Walton Building, located at 300 S Providence Road, is a one-story slab on grade office building, approximately 8200 sq ft in size, constructed in 1986. The Walton Building has a north-south orientation with a main entrance on the east side of the building, facing a parking lot, and an entrance on the west side of the building, facing Providence Road. The building is co-owned by the City of Columbia (50%) and the Columbia Chamber of Commerce (50%) and houses offices for the City of Columbia Office of Cultural Affairs (OCA), the City of Columbia Convention and Visitors Bureau (CVB), and the Columbia Chamber of Commerce (COC). All HVAC appears to have been replaced in 2008, and consists of Lennox SEER 11-12 split systems with high efficiency natural gas furnaces. Outside air is brought to each furnace, and relief air is exhausted to the attic above each mechanical room.

Provided Details

Lawrence Lile and Jessica Scott of Lile Engineering met with Julie Ausmus and Amy Schneider prior to investigating the building. Ms. Ausmus and Ms. Schneider indicated that the building was last renovated about five years ago and that one air conditioning unit had been replaced and some foundation leak issues had been addressed at that time. They indicated that currently the building was experiencing some water leakage from above into conditioned spaces. They also indicated that there were known issues with the cedar siding present on the building; however, it was likely that the siding was scheduled to be replaced in October or November of this year. Plans from a 2008 renovation were provided however original plans for the building are not available.

Comfort Complaints

Ms. Ausmus and Ms. Schneider indicated that some parts of the building could feel muggy and that the entry/lobby area could be overheated in summer and cold in winter. It was observed during inspection that significant amounts of insulation are missing from high walls in the attic, which may contribute to the lack of comfort in this room. The height of the room and skylights also contribute to lack of comfort, as skylights can let in excess heat, and height can allow warm air to stagnate in winter.



HVAC condensing unit and thermostat locations, with approximate zones served.

Safety and Maintenance Issues

Much evidence of leaking building envelopes were observed during inspection. Rot was observed in the plywood sheathing where a piece of siding was removed on the southwest wall. There were many areas in the attic that showed evidence of past water damage, and there is currently new water damage in the ceiling of the board room near the west wall, as well as on the south wall near the floor. Outside the boardroom south wall is a concrete pad which does not slope properly away from the building. An attempt to fix this problem with spray foam was observed, an ineffective measure. This pad should be demolished and a pad properly installed at a level lower than the building floor, properly sloped away from the building.

Polyethylene sheets were originally used behind wood siding in the attic for a weather barrier. This poly sheeting is deteriorated, only shreds remain because it does not stand freezing, thawing, heat and movement. The exposed wood siding is an ineffective water barrier, leaving the attic open to windblown rain entry.

Ground was observed to slope toward the building near both the north and south HVAC units on the west side of the building. Water pooling against the building may exacerbate moisture issues; because these areas are nearly surrounded by a concrete wall, stormwater has nowhere else to flow. The HVAC fenced areas on the north and south west sides of the building should be positively drained. We suspect that the wall could become flooded in these areas which could compromise insulation as well as promote rot.

Concern about mold potential in this building leads us to recommend dealing with the walls, attic, new siding in a comprehensive way that allows drying but excludes moisture.

Maintenance Issue: Install Properly Sized Filters

Many air handlers had improperly sized filters installed. These ill-fitting filters allow dust to bypass the filter, fouling coils. Cooling coils fouled with dust reduce efficiency and could cause freeze-up, resulting in expensive service calls. All air handlers should have coils professionally cleaned, and correct filters should be installed. The correct filter size for all units is 25X20X1. Many 22X20X1 filters were observed.

	*Maintenance Issue: Many air handlers had incorrectly sized filters, allowing coils to collect dirt.*

Energy Conservation Measures (ECMs)

The following ECMs were studied. Cost estimates were based on industry averages and rough estimates of the scope of the work, not on quotations from contractors. These cost estimates are approximate, for budgetary purposes only, and allow us to screen ECMs for basic economics. Actual installed costs will vary based on many factors. Quotations from contractors should be obtained to determine costs more precisely.

Energy savings were determined by constructing an energy model of the building using EnergyPro Software version 5.1.9.8. A base model was constructed to reflect historic energy bills. Each ECM

was applied separately to the base model and considered alone. Actual energy savings will result from an interaction between the ECMs that are implemented, weather, maintenance and user operation of the system. Energy models are useful for comparing alternatives but not for predicting actual performance. **We recommend implementing any of the following ECMs with paybacks less than 10 years:**

ECM #1: Repair all furnace enclosures to prevent air leakage. Cost $50. Energy Savings not calculated. Payback should be rapid.

ECM #2: Replace incandescent and CFL lamps in cal lighting with LED. Cost: $515. Lighting Incentive Rebate: $252.5. Net cost: $252.5. Total Annual KW Savings: 1.87KW. Annual Energy Savings: $743. Payback: 0.3 Years.

ECM #3: Install programmable thermostats. Cost: $595. Annual Energy Savings: $1214. Payback: 0.5 years.

ECM #4: Repair damaged refrigeration insulation and install a weather- and sunlight-proof covering. Cost: $70. Annual Energy Savings: $87. Payback: 0.8 years.

ECM #5: Repair and upgrade attic insulation. Cost: $3900. Annual Energy Savings: $1209. Payback: 3.23 years.

ECM #6: Replace exit and emergency lights with LED models. Cost: $816. Annual Energy Savings: $75. Bulb Replacement Savings: $108. Payback: 4.5 years.

ECM #7: Install switching and motion sensors in the Storage Room. Cost: $150. Annual Energy Savings: $19.66. Payback: 7.6 years.

ECM #8: Install Energy Recovery Ventilator (ERV). Cost: $10,000. Annual Energy Savings: $1136. Payback: 8.8 years.

ECM #9: Upgrade continuous water-and-air barrier and cladding. Do not use continuous foam insulation. Cost: $6400. Annual Energy Savings: $679. Payback: 9.43 years.

We do not recommend implementing the following ECMs with paybacks greater than 10 years:

ECM #10: Install Interior Storms on Skylights. Cost: $400. Annual Energy Savings: $40. Payback: 10 years.

ECM #11: Install SEER 16 efficiency HVAC equipment once the currently installed systems fail. Cost and Payback not calculated. Annual Energy Savings $428.

Details of these ECMs are discussed in the following section.

Energy Conservation Measures (ECMs)

Details of ECMs for the Walton Building are presented in this section in order of payback time, from shortest to longest.

ECM #1: Repair all furnace enclosures to prevent air leakage. Cost $50. Energy Savings Not Calculated. Because the cost of repair is low and because air leakage is difficult to measure, payback was not calculated. We expect the payback to be very short, measured in weeks or months.

Almost every air handling unit we inspected had air leakage at the evaporating (cooling) coil. This is due to missing screws and gaskets at covers to these units. Air leakage at this point wastes cooled air, causes condensation and could grow mold. We do not calculate a payback for this ECM, but it should be relatively inexpensive to repair and should increase comfort and efficiency of the HVAC system.

Photo shows evaporator coil cabinet at HVAC unit serving the boardroom leaking 60 degree air. Gaps around much of the edge of this access panel were leaking on almost every unit.

Condensation on air handler cabinet results from leaking cold air. Nearly every air handler showed air leaks in the area indicated. These should be sealed using the same techniques as are used on ductwork, including extra screws, gaskets, duct mastic and good quality tape.	

ECM #2: Replace incandescent and CFL lamps in can lighting with LED. Cost: $515. Lighting Incentive: $252.5. Net cost: $252.5. Total Annual Energy Savings: 1.87kW; $743. Payback: 0.3 Years

There are several areas where inefficient incandescent lamps can be replaced with LED lamps.

The first area is the Lobby Desk, where 5 MR16 lamps illuminate the desktop. Caution should be used in obtaining replacement lamps – some LED MR16 lamps are not compatible with low voltage wiring or may overheat in these kinds of fixtures. One lamp should be changed out, and if that is successful after a few weeks, then the rest should be replaced.

The Large Assembly Room and Boardroom have a number of can lights with 65W or 120W incandescent lamps. These should be replaced with 9.5 watt dimmable LED lamps, BR30 lamp size. Make sure they are dimmable and test one for compatibility with the dimmer first. If there are flickering issues after replacement, the dimmer module may need to be replaced with a more modern, LED compatible dimmer switch.

The three mechanical rooms and the Large Assembly closets all have 100W incandescent bulbs. Although these rooms are not used frequently, we believe replacement with 12W LEDs will still have a cost-effective payback.

	LED fixtures are now available to replace inefficient 50W MR16 lamps. One lamp should be tested for compatibility before replacing all. Image from Home Depot http://www.homedepot.com/p/Philips-50W-Equivalent-Bright-White-3000K-MR16-GU10-Base-LED-Flood-Light-Bulb-E-423418/203321687

Lighting Incentive Program data:	
Total Kilowatt Reduction: 1.87	
Lighting To Be Removed:	**Replacement Lighting:**
(10) 65 Watt Incandescent Lamps	(10) BR30 Dimmable LED Lamps 9.5 Watts
(2) 16W Compact Fluorescent Lamps	(2) BR30 Dimmable LED Lamps 9.5 Watts
(5) 120 Watt Incandescent Lamps	(5) BR30 Dimmable LED Lamps 9.5 Watts
(5) 50W MR16 Incandescent Lamps	(5) LED MR16 Lamps 7 Watts
(5) 100 W Incandescent Lamps	(5) 19 Watt LED Lamps

ECM #3: Install programmable thermostats. Cost $595. Annual Energy Savings: $1214. Payback: 0.5 years.

Building users have been erroneously told that thermostats should be set at a constant temperature and forgotten. Our energy model shows that programmable thermostats, set to 65F in the winter and 80F in the summer unoccupied hours, would dramatically reduce heating and cooling costs. The building should be set so that a comfortable temperature is achieved during occupied hours and expected early morning and late evening use for the conference room. Override buttons should allow unscheduled meetings to have comfortable temperatures. As the staff was quite concerned about comfortable

temperatures, programmable thermostats should be set to come on early enough to achieve comfort before people arrive in the morning.

	Programmable thermostats such as this model from Honeywell allow users to adjust settings temporarily, but will default back to the original programming on a set schedule. Many styles are available at local hardware stores.

ECM #4: Repair damaged refrigeration insulation and install a weather- and sunlight-proof covering. Cost: $70. Annual Energy Savings: $87. Payback: 0.8 years.

Much of the insulation on exterior refrigeration piping is damaged, which means that the efficiency of the HVAC is reduced. Sunlight deteriorates this kind of plastic. Have this damaged insulation replaced, and then have the insulation covered with a barrier that resists deterioration by sunlight. We estimate there is about 70 feet total of missing insulation.

Much of the insulation is damaged or missing from refrigeration lines.

It is estimated that about 800 KWHr per cooling season is being wasted by these uninsulated pipes, and they also rob the HVAC of capacity. This means the HVAC cannot deliver full cooling where it is needed. An estimate of the annual energy cost of the uninsulated pipes is about $87. Repairing the pipes when the serviceman is already on the job doing a seasonal check would cost about $70, making the payback on this measure 0.8 years or one cooling season. The technician should install a cover on the insulation that will resist sunlight.

	*Adding a sunlight resistant cover to HVAC refrigeration pipe insulation will increase its life. Product shown is Aerocel Saniguard http://www.aeroflexusa.com/products/saniguard/*

ECM#5: Repair and upgrade attic insulation. Cost: $3900. Annual Energy Savings: $1209. Payback: 3.23 years.

Attic insulation is damaged , disturbed, and missing. Installers have pulled down insulation in order to install IT wiring, and not replaced it. Because of disturbed insulation, many walls and ceilings in the tall Lobby area have effectively zero attic insulation. This may explain the comfort complaints. Infiltration into these attic walls is not controlled, which can add to energy loss and comfort complaints.

Walkways have been worn through the blown-in insulation where technicians have repeatedly stepped on ceiling joists. The original insulation was blown to an R-30 level which is below current recommendations, but has now been walked down to about R 18 in many areas. The original polyethylene vapor barrier, where was left exposed in the attic, has decomposed leaving air leakage gaps and allowing water infiltration. Wet insulation is ineffective, and damages the building. Blown-in fiberglass was used in the attic originally, which is ineffective at blocking air movement within the

insulation. Several steps are included in this ECM:

1. IT changes are inevitable. Install permanent walkboards in the central areas of the attic that have been repeatedly accessed to change IT wiring. Install these walkboards in a way that they are above the insulation level, so that technicians do not have to walk on rafters and disturb insulation repeatedly. If the attic is accessed, insist that technicians replace disturbed insulation, and have building maintenance personnel inspect the attic periodically and repair any disturbances.

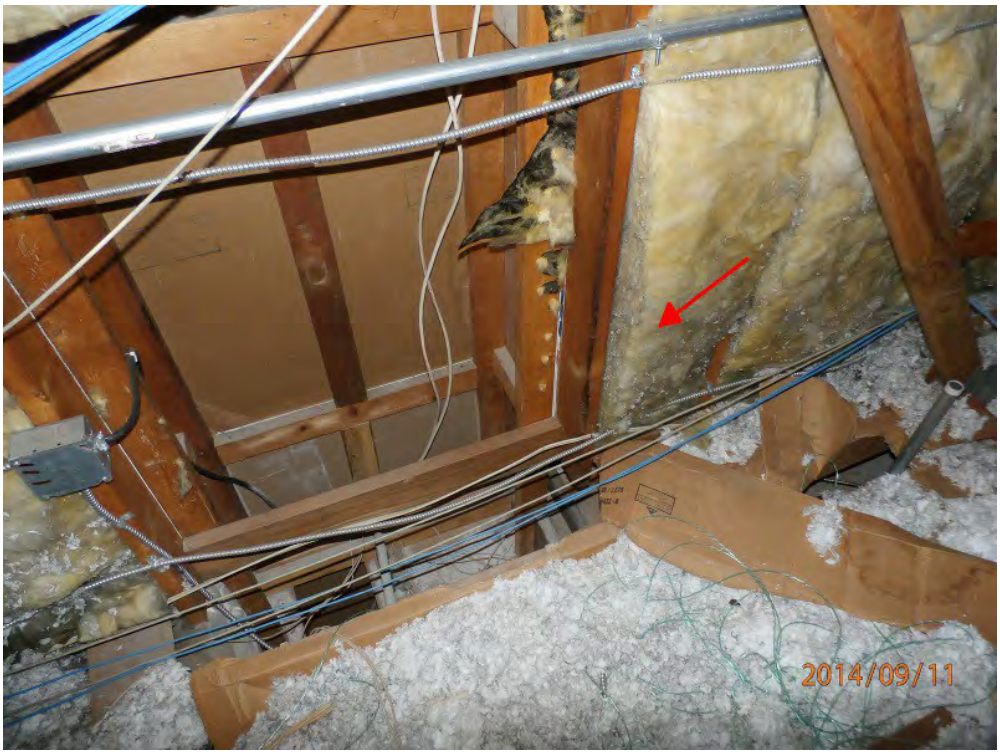
2. Add blown-in cellulose insulation to restore attic insulation to original levels, upgrading to R38 to meet current energy codes. Blown-in cellulose will also help reduce air movement within the attic insulation itself, unlike the existing fiberglass. Do not use blown-in fiberglass. Do not remove existing fiberglass either – the existing insulation will be more effective with a cap of cellulose on top of it.

3. Replace batts on vertical walls against conditioned spaces throughout the attic where they have been removed. Cover all attic wall batts with a continuous air barrier such as Tyvek. Seal edges and seams to prevent air movement. Do not use polyethylene as it traps moisture and does not last. (vertical exterior surfaces in the attic should be properly weatherproofed when the siding is replaced, which is not in the scope of this ECM)

4. There is an attic area between the North and South attics that has been repeatedly used as a walkway, but had insulated walls blocking access to it. This area is on the east and west sides of the main Lobby. Many batts have been removed from this wall in order to walk through this part of the attic to run IT wires. Both the north and south attics of the building can be accessed through this area (See figure below). These attics were improperly insulated in the first place. The warm wall of the space should be insulated, and the space should have blown-in insulation on the floor of the attic. Currently there are large areas of exposed walls and ceilings against occupied spaces in the lobby.

5. Install weatherstripped and insulated attic doors to prevent air leakage. Cover attic doors with 9" of foam insulation (R-38 or better).

Photos of attic insulation follow:

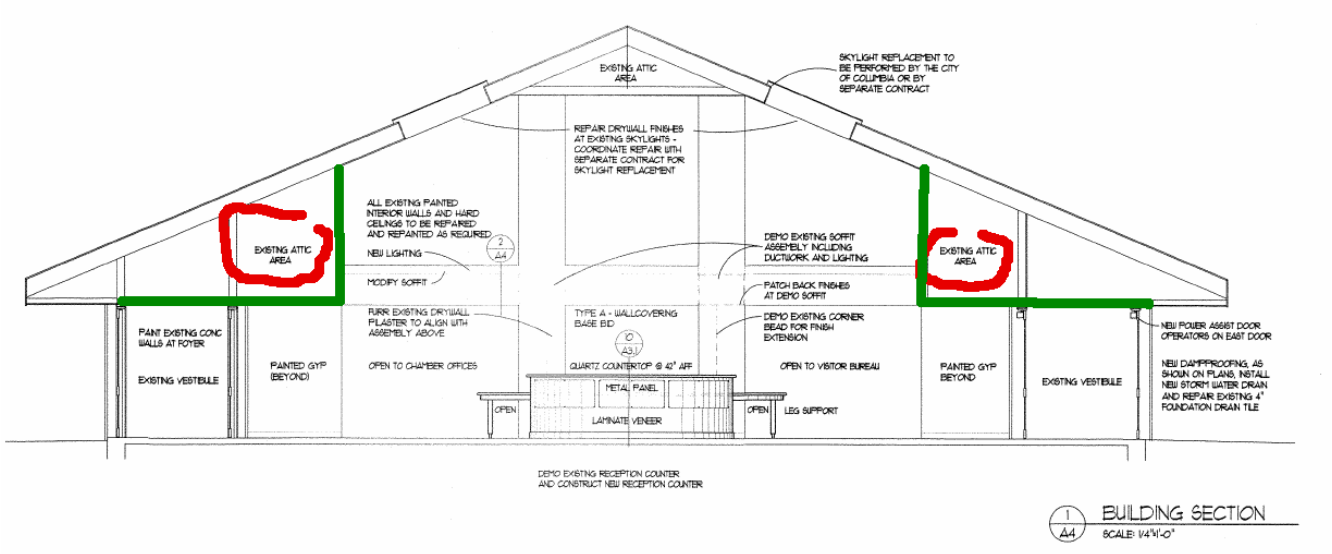
	*Attic insulation has been removed from walls around the central lobby causing energy loss and uncomfortable temperatures. Note black areas in fiberglass(arrow) which could be signs of excessive air movement (dirt accumulation) or possible mold growth. There is no air barrier in this area resulting in excessive infiltration. This area can function as a chimney, pumping out conditioned air.*

	*Insulation has been walked down in many areas of the attic by repeated foot traffic. Permanent walk boards should be installed above the insulation level to allow IT wiring changes.*

	*Evidence of water damage in the attic area behind the North wall. There was evidence of water damage inside the attic essentially everywhere we looked along all vertical outside walls. When exterior siding is replaced, weatherproof layers should extend to the eaves.*

	*Polyethylene was used as a weather barrier in the attic, and has completely deteriorated. Cedar siding is visible, an ineffective weather barrier. Water stains show evidence of water penetration.*

Attic above east vestibule entry has completely compromised insulation. Instead of insulating the ceiling below, vertical walls were insulated, but this insulation has now been taken down. Lobby ceiling is directly exposed to outdoor air. This space has served as a pathway from the north to south attics for IT wiring. Insulation at arrows A and B, plus the spot we are looking from, has been taken down. Bare gypsum on the Lobby ceiling can be seen at the bottom of the photo. This area should be insulated using blown-in insulation on the bottom, and walkboards should allow access for IT wiring changes.



Attic area in previous photo is shown on this building section in red. Areas shown in green should be insulated, and walkboards should allow maintenance access. Current insulation for this area is ineffective and does not allow access.

ECM #6: Replace Exit and Emergency Lights with LED models. Cost: $816. Annual Energy Savings: $183.14. 19.66. Payback 4.5 years.

Replacing these fixtures will result in a reduction in energy use and a reduction in maintenance costs incurred from having to replace light bulbs.

ECM #7: Install switching and motion sensors in the Storage Room. Cost: $150. Annual Energy Savings: $19.66. Payback: 7.6 years.

The unfinished storage room on the North East corner has no switching that can turn it off separately from the hallway nearby. Employees use this as an entrance. These lights stay on continuously as long as the hallway lights are on in the north office area. Three-way switching should be installed at both ends of the storage room to allow the lights to be turned off when not in use, and a motion sensor should be installed that can "see" employees at either door to operate the lights.

ECM #8: Install Energy Recovery Ventilator (ERV). Cost:$10,000. Annual Energy Savings: $1136. Payback: 8.8 years.

Currently each air handler received fresh air through intakes. This excess air is then relieved through vents in the ceiling of each mechanical room, into the attic space.

There are several issues with this existing approach. First, it wastes energy that could be recovered. Second, it puts warm, moist air into the attic space in the winter, where it may condense and exacerbate moisture problems.

An energy recovery ventilator is recommended for the building. One unit, or two smaller units, might be able to be sized to serve the building. Engineering study would be required in order to detail the ductwork and configuration, and to obtain quotes on costs. We estimate the cost of this ECM to be $10,000 based on no design. Energy savings is estimated at $1136 per year. Payback is estimated at 8.8 Years.

Energy recovery ventilators can be used to capture waste heat from relief air.	

	Relief vents flow directly into the attic, instead of being directed outdoors. Air continuously blows out these relief vents while the fans are running. This air is wasted, and risks creating condensation in the attic, which could promote mold. This is an opportunity to use energy recovery ventilators to capture this energy and use it to temper incoming fresh air.

ECM #9: Upgrade continuous water-and-air barrier and cladding. Do not use continuous foam insulation. Cost: $6400. Annual Energy Savings: $679. Payback: 9.43 years.

We strongly recommend against any additional foam insulation on the outside of the wall. This building has an interior layer of polyethylene – a nearly absolute barrier against water vapor. Currently, the wall system can (at least) dry toward the exterior in good weather. Adding an exterior foam insulation creates a perfect formula for mold. Two layers of vapor-impermeable material will trap moisture that inevitably gets between these layers, but will not allow drying to the interior or the exterior.

All walls eventually get wet. Well designed walls dry out. A comprehensive approach to exclude water and limit air movement, but allow drying is critical to the success of siding repair.

A vapor-open exterior insulation system of at least R-3.75 is recommended to move the dew point toward the outside of the wall. This should be a material which allows moisture movement such as Mineral wool board (Roxul Comfortboard® or equivalent), unfaced rigid fiberglass boards, or similar material. [1] Follow recommendations in the 2012 International Building Code, but be sure to use a continuous insulation with high vapor permeability. This recommendation is not meant to conserve energy, but to help manage moisture and dew point.

Why is polyethylene bad?

Building scientists no longer recommend using polyethylene as an air barrier. Well-intentioned builders in the 70's and 80's began adding plastic Class I Vapor Retarders to the interior of the framing before installing gypsum board. These materials do not allow water vapor movement. It was thought this would stop moisture and air from moving through the wall. These builders then proceeded to punch the plastic barrier full of holes for electrical outlets, pipes, etc, as well as leaving seam gaps. Each of these penetrations was a pathway for warm, humid air (from the interior in the winter, from the exterior in the summer) to move through the wall, finding its way to a colder surface and condensing moisture.

Lile Engineering has inspected several buildings with plastic sheeting on the inside, and found evidence of mold in nearly every one, behind the interior gypsum board or in the insulation cavity. Water condenses on plastic surfaces, then promotes mold growth. National building science experts agree, strongly recommending against using polyethylene in walls. [2] Given the wall already has this layer, the best we can do is to not make the situation worse by trapping moisture.

Moisture always moves into a wall. No wall can seal out all moisture, either from bulk moisture, or humidity transport through air leakage. But well-designed walls also allow moisture to dry through the wall materials.

Isn't commercial air barrier and vapor retarder (Tyvek ® or similar) a vapor barrier? Wont' that trap moisture?

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1 BSI-049 Confusion about Diffusion - Joseph Lstiburek Accessed 2014-09-06
http://www.buildingscience.com/documents/insights/bsi-049-confusion-about-diffusion/view

2 BSI-071: Joni Mitchell, Water and Walls By Joseph Lstiburek Accessed 2014-09-06
http://www.buildingscience.com/documents/insights/bsi-071-joni-mitchell-water-and-walls

Tyvek ® and similar materials are engineered products that block bulk moisture, but allow vapor transmission. These are called *smart vapor retarders* because they slow moisture transmission, but do not block moisture movement like polyethylene. These engineered materials allow the wall to dry. We recommend using a commercial product instead of a residential-grade product.

Does this exterior insulation you recommend save energy?

The exterior insulation is not recommended in order to add insulation value. Although it will have a minor effect on energy use, the important consideration is to control moisture. Exterior vapor-open continuous sheathing under a furred-out cladding is recommended to move dew points toward the outside of the wall and allow drying to the exterior. The major energy savings of this ECM is from reducing infiltration by air sealing.

Wall Insulation and Cladding Recommendations:

1. Use the opportunity when replacing siding to inspect existing wall cavities. Remove sections of exterior plywood, push insulation aside and inspect the wall cavities for evidence of mold from past water entry, evidence of air leakage paths or rotted materials. Mitigate any mold that is observed.

2. Do not replace rotted plywood sheathing with OSB. OSB is made with glue that blocks moisture transmission and will trap moisture. Use real plywood to replace rotted sections of existing plywood sheathing. Use the opportunity to remove existing damaged siding and inspect the insulation cavity for evidence of mold and opportunity to spray foam insulation to reduce air infiltration. The principle here is to avoid introducing materials with a lower vapor transmittance than the existing materials. Such materials will increase the potential for mold formation.

3. Use spray foam to seal up holes and gaps in the existing walls from the outside. Electrical outlets, switches, and other penetrations through the polyethylene vapor barrier allow warm, moist air to contact cold surfaces. The resulting condensation produces mold-growth conditions. These existing gaps can be mapped on the exterior, and accessed through the plywood sheathing, by removing it or making holes in it. Spray foam can be used to seal around electrical boxes and other gaps, by pushing the existing unfaced fibergalss aside. Fiberglass insulation should then be replaced to fill the wall cavity. The purpose of this step is to reduce potential for moist air movement and mold.

4. Install a continuous vapor-open insulation such as mineral wool boards or unfaced fiberglass boards to help control condensation and dew point within the walls. It is important to use a vapor-open material, not foam sheets.

5. Install an engineered air-barrier and vapor retarder (such as Tyvek ® and similar materials). Barrier should be continuous to the roofline. This material should be thoroughly air-sealed at all edges and seams using manufacturer's seam tape or self-adhesive butyl rubber flashing

properly lapped to drain. Use a commercial grade air-and-water barrier material, not residential grade.

6. Carefully detail the vapor retarder around windows, penetrations and the bottom edge, using self-adhesive butyl rubber flashing and metal edge flashings. Include a termite shield at the bottom of the wall. Tape seams and all edges to create a continuous barrier.

7. Grade the soil away from the building and install a yard drain system. There are several areas where soil slopes toward the building, allowing bulk moisture to move into the building. There is a concrete step at the West door which does not slope away from the building. This step should be demolished and replaced with a step that is lower than the slab and sloping away. The air conditioner enclosures on the Northwest and Southwest corners both have ground slopes toward the building. Wet walls produce compromised insulation.

8. Furr out an air gap before applying the new siding. This is crucial to control air pressure that can drive warm, moist air into the building. This air gap allows water that inevitably gets behind the cladding to drain. Many siding installers skip this important step, and apply siding directly to the substrate. Using an air gap behind new siding will improve its energy and moisture performance.

9. Install a new layer of furred-out cladding that is rot resistant but allows moisture movement. Cement board siding is acceptable. Do not use excessive caulk at seams, especially horizontal seams. The purpose of the cladding is to resist bulk moisture. Horizontal seams actually help drying. Vapor must be able to move through it. The air-and-moisture retarder underneath is the real waterproof layer of the building.

See details below.

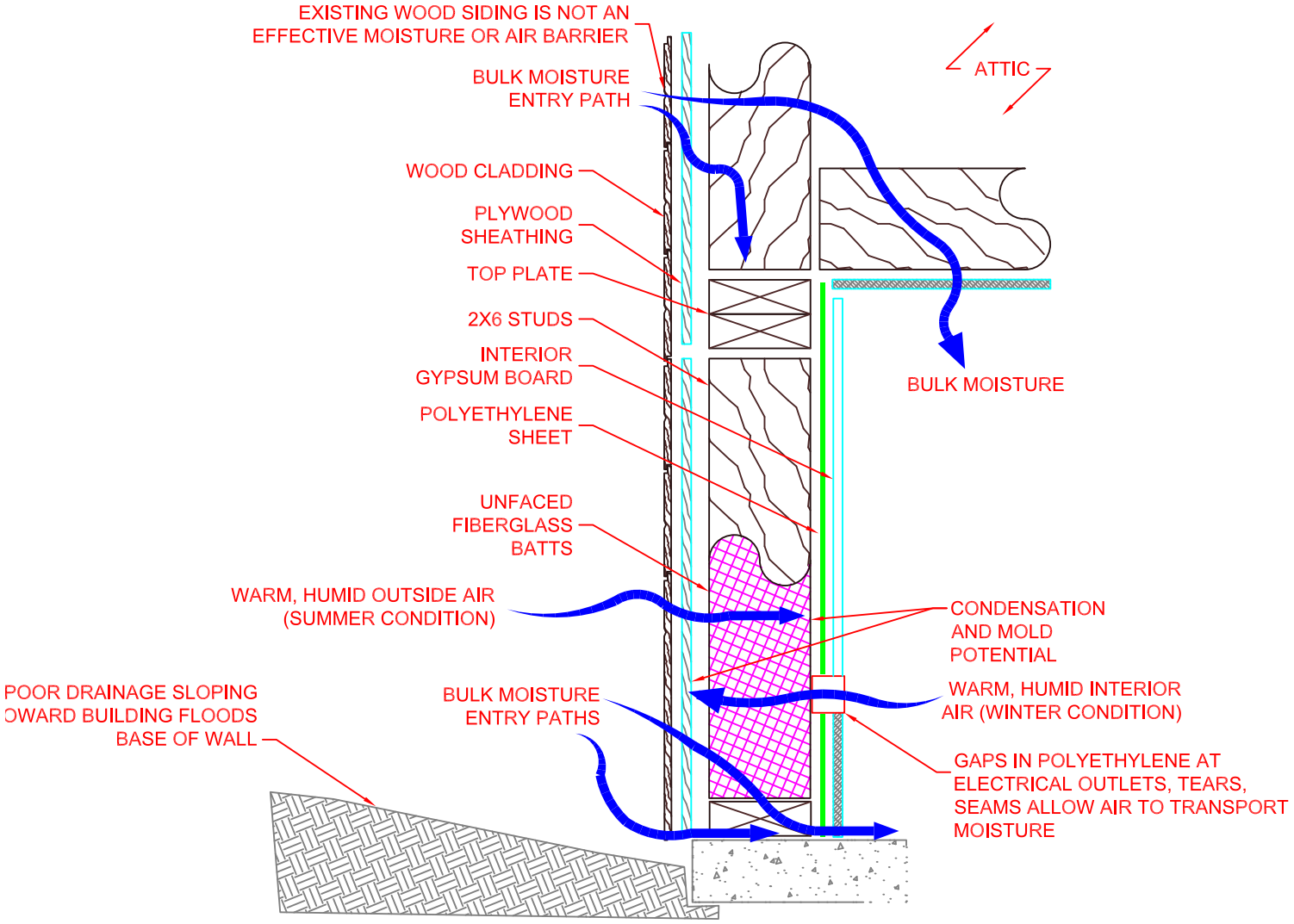
A piece of siding was removed on the South West corner of the building. The plywood sheathing below shows evidence of rot. There is no continuous water-and-air barrier in the existing wall. However, the plywood sheathing and wood siding do allow the wall to dry to the exterior.	

Rotted plywood sheathing was removed for inspection. A view inside shows fiberglass batts and a polyethylene barrier behind the gypsum wallboard inside. Moisture can be seen condensing on the poly sheeting, which increases the potential for mold. Poly sheeting is no longer recommended as an air barrier by building scientists because of its potential to trap moisture.

A note about costs:

We are assuming that the existing siding will be replaced whether this ECM is implemented or not. We also assume that the existing plywood sheathing will be kept where it is sound, and replaced where damaged by moisture. We are assuming that a new weather barrier will be installed as part of any renovation. Any needed grading to drain water away from the building, flashing, and other weatherproofing and waterproofing details would be part of a renovation. We assume that existing fiberglass batt and poly vapor retarder will remain in place. These costs are not included in the cost for this ECM. Savings are based mainly on increasing the airtightness of the wall system.

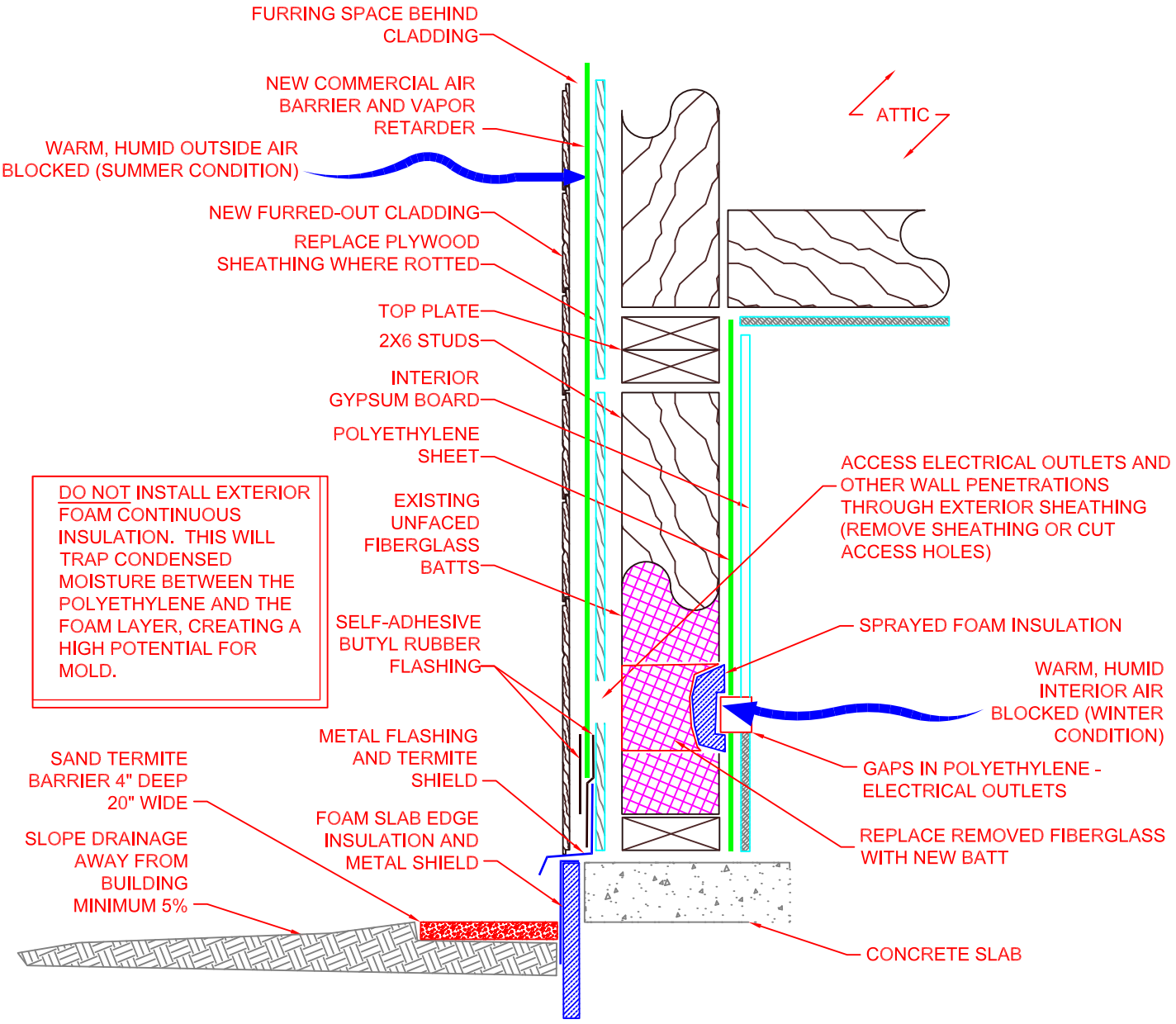
Cost that were included are: New vapor-open continuous insulated sheathing, labor and materials to spray foam behind existing gaps in the poly sheet (such as electrical outlets).



EXISTING EXTERIOR WALL

NOT TO SCALE

SEPARATION BETWEEN MATERIAL LAYERS EXAGGERATED FOR CLARITY



RECOMMENDED EXTERIOR WALL DETAIL

NOT TO SCALE

SEPARATION BETWEEN MATERIAL LAYERS EXAGGERATED FOR CLARITY
THIS DETAIL IS NOT TO BE USED FOR CONSTRUCTION. LILE ENGINEERING DOES NOT EMPLOY LICENSED ARCHITECTS. CONSULT AN ARCHITECTURAL PROFESSIONAL BEFORE PROCEEDING WITH CONSTRUCTION.

ECM #10: Install Interior Storms on Skylights. Cost: $400. Annual Energy Savings: $40. Payback: 10 years. Not recommended.

Additional layers of glazing would improve the efficiency of skylights in the lobby area. Interior storms may also improve comfort. We estimate that an interior storm would cost about $400, save approximately $40 per year, and have a payback of 10 Years. We do not recommend ECMs with 10 or greater year payback.

ECM #11: Install high-efficiency HVAC equipment once the currently installed systems fail. Cost and Payback not calculated. Annual Energy Savings $423. Not Recommended.

Tan opportunity to replace HVAC may not occur for many years as the current units are about 6 years old, and will likely last 20 years. As the life of this equipment is likely to be long, predicting costs for upgrading to higher SEER (efficiency) ratings is unpredictable.

The existing units are rated at 11-12 SEER. Minimum SEER ratings are currently at 13, with 14 to 16 or higher SEER rated units available. We recommend that when these units fail, they be replaced with units of at least 16 SEER rating.

One complication that may make upgrading difficult is that higher SEER ratings require variable speed or two-speed furnace fan motors. As the existing furnaces do not have variable speeds, the furnaces would have to be upgraded to realize the savings with high-efficiency AC. It is likely that the outdoor unit (Air Conditioner) and the furnace (Heat and cooling distribution) will not fail simultaneously. It may be quite expensive to upgrade the furnaces to variable speed, negating any payback from high efficiency air conditioning.

No cost or payback is calculated, as the costs are likely far in the future and depend on equipment failure to make replacement a viable option. We do calculate that if SEER 16 equipment were available, the annual energy savings would be $423 per year, which is not expected to be cost effective.

This client would qualify for City energy efficiency rebates for high efficiency equipment, which may make the option less expensive.

ECM #12: Solar PV Installation. Cost: $112,500. Water and Light Rebate: $11,250. Annual Energy Savings: $3278. Payback: 31 years. Not Recommended.

The solar electric potential of the building was analyzed. The best location for a PV array on the building would be on the west side of the north end of the building. This site was chosen because it has the most direct sunlight and has the least potential of being shaded by growing trees. The unshaded 30' by 50' area would accommodate 90 PV panels, a 22.5 kW array. An array of this size would generate more than 27,000 kW of energy and would save $3278 in energy costs annually. The cost of materials

and installation of PV systems remains around $5000 per kW; therefore, an array of this size will cost $112,500. A rebate of $500 per kW is available, reducing the cost to $101,250. The payback of the cost after rebates is calculated to take 31 years. We do not recommend this ECM.

Other ECMs

The following items were not studied, for the reasons cited:

Solar Water Heating – there is not a large hot water usage, minimizing the effectiveness of this potential ECM.

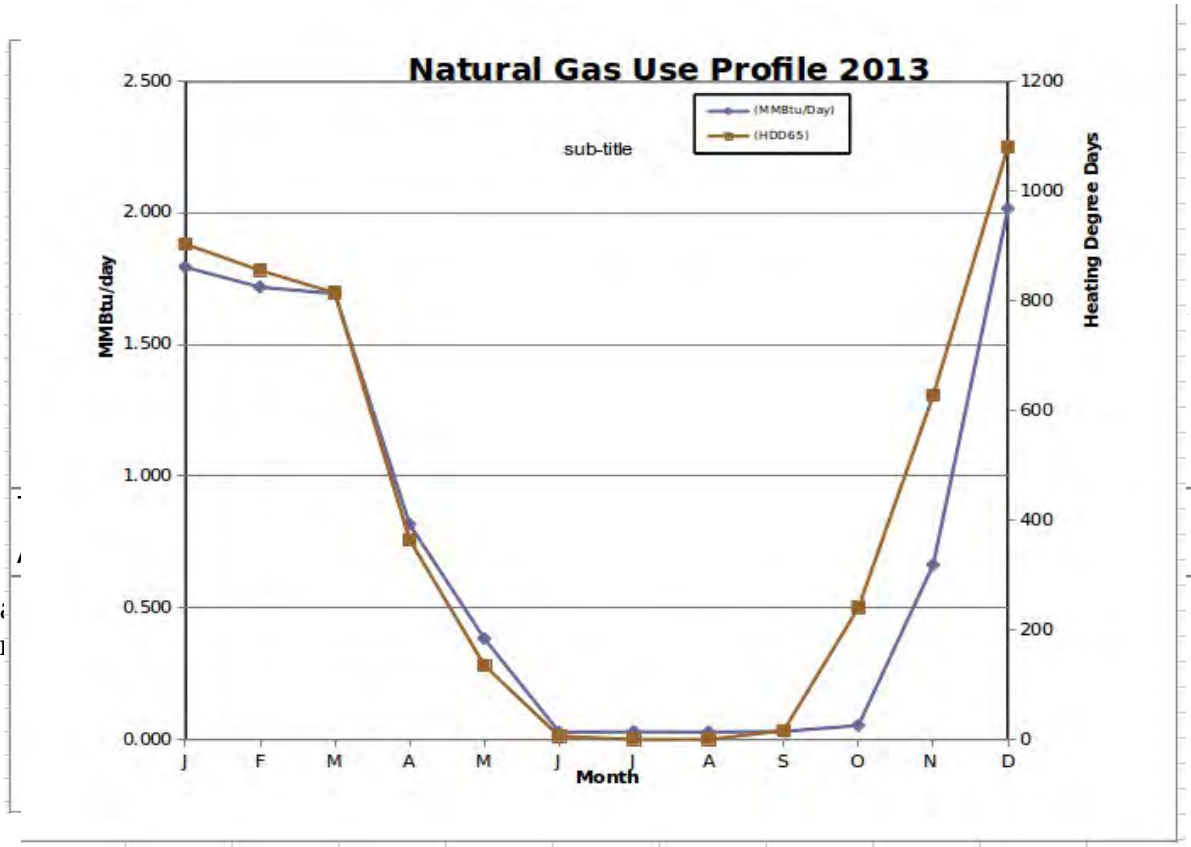
Utility Record:

2014 Natural Gas Bills (data after August 2014 is estimated from previous year)

Billing Period		Billing	Days in the	Usage	Energy	Daily Use	Deg. Days
From	To	Month	Bill. Period	(MMBtu)	Cost	(MMBtu/Day)	(HDD65)
12/12/2012	1/15/2013	J	34	61	640	1.794	903
1/15/2013	2/13/2013	F	29	50	533	1.718	855
2/13/2013	3/14/2013	M	29	49	527	1.693	814
3/14/2013	4/15/2013	A	32	26	307	0.817	364
4/15/2013	5/15/2013	M	30	11	167	0.383	135
5/15/2013	6/17/2013	J	33	1	66	0.028	6
6/17/2013	7/15/2013	J	28	1	65	0.029	0
7/15/2013	8/13/2013	A	29	1	65	0.028	0
8/13/2013	9/12/2013	S	30	1	66	0.031	16
9/12/2013	10/13/2013	O	31	2	73	0.053	240
10/13/2013	11/12/2013	N	30	20	248	0.663	627
11/12/2013	12/12/2013	D	30	60	626	2.016	1080
Total			365	283	$3,386		5,040
Average				24	$282	0.7710	

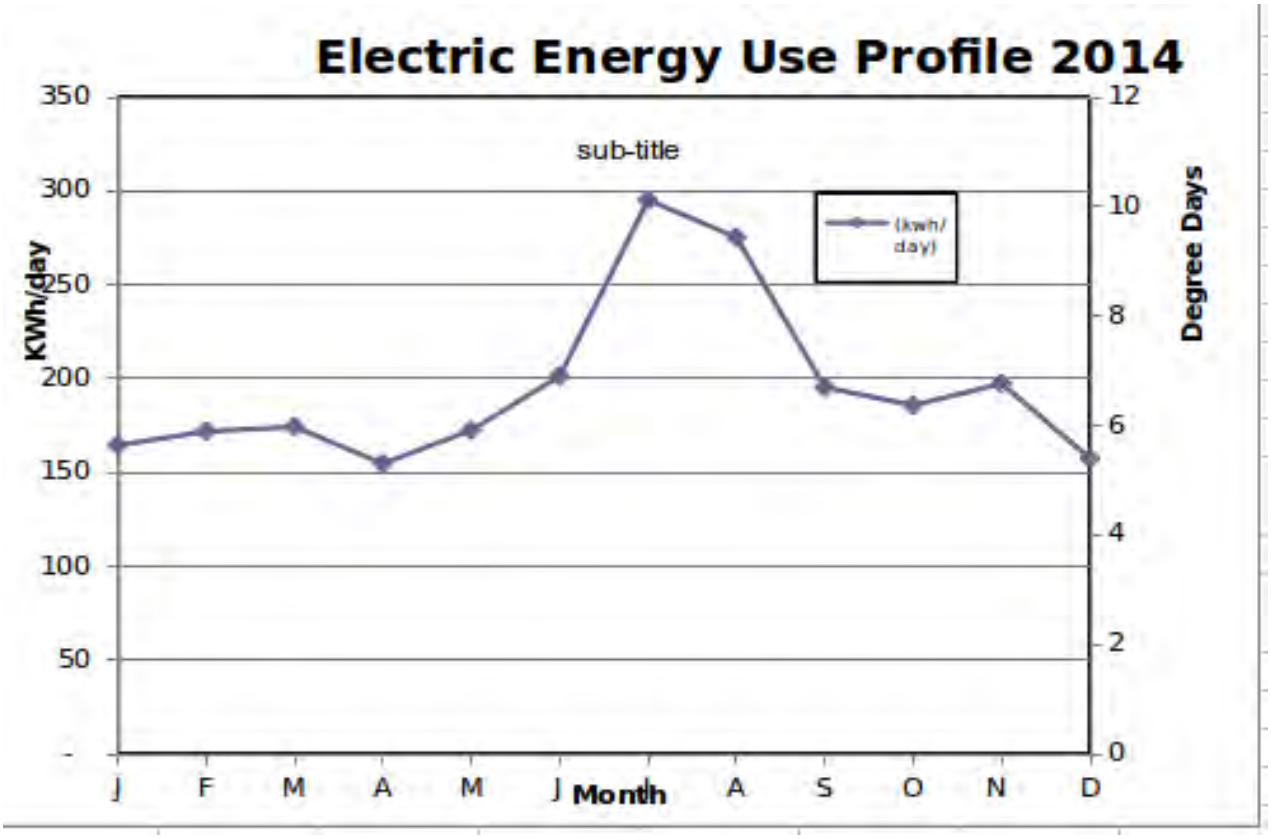
2013 Natural Gas Bills

Billing Period		Billing	Days in the	Usage	Energy	Daily Use
From	To	Month	Bill. Period	(MMBtu)	Cost	(MMBtu/Day)
12/12/2012	1/15/2013	J	34	61	640	1.794



2014 Electric Bills (Data after August 2014 is estimated from previous year)

Billing Period		Billing	Days in the	Usage	Demand	Energy	Daily Use
From	To	Month	Bill. period	(kwh/mo)	(kw)	Cost	(kwh/day)
12/16/2013	1/21/2014	J	36	5,920	17.0	$662	164
1/21/2014	2/17/2014	F	27	4,640	16.0	$596	172
2/17/2014	3/17/2014	M	28	4,880	16.0	$608	174
3/17/2014	4/16/2014	A	30	4,640	16.0	$596	155
4/16/2014	5/18/2014	M	32	5,520	32.0	$707	173
5/18/2014	6/16/2014	J	29	5,840	25.0	$732	201
6/16/2014	7/15/2014	J	29	8,560	33.0	$1,064	295
7/15/2014	8/18/2014	A	34	9,360	34.0	$1,125	275
8/18/2014	9/30/2014	S	43	8,400	36.0	$1,094	195
9/30/2014	10/31/2014	O	31	5,760	28.0	$742	186
10/31/2014	11/30/2014	N	30	5,920	16.0	$662	197
11/30/2014	12/31/2014	D	31	4,880	16.0	$608	157
Total			380	49360.00		$6,089	
Average				6,170	23.63	$761.16	134



Billing Period		Billing	Days	Usage	Demand	Energy	Daily Use
From	To	Month		(kwh/mo)	(kw)	Cost	(kwh/day)
12/17/2012	1/16/2013	J	30	5,520	17	$649	184
1/16/2013	2/18/2013	F	33	6,400	18	$695	194
2/18/2013	3/18/2013	M	28	5,200	16	$633	186
3/18/2013	4/15/2013	A	28	5,680	19	$658	203
4/15/2013	5/15/2013	M	30	6,640	28	$713	221
5/15/2013	6/17/2013	J	33	7,920	30	$894	240
6/17/2013	7/16/2013	J	29	8,400	32	$1,028	290
7/16/2013	8/19/2013	A	34	8,720	29	$1,008	256
8/19/2013	9/17/2013	S	29	8,400	36	$1,094	290
9/17/2013	10/15/2013	O	28	5,760	28	$742	206
10/15/2013	11/17/2013	N	33	5,920	16	$662	179
11/17/2013	12/16/2013	D	29	4,880	16	$608	168
Total	N/A	N/A	364	79,440		$9,383	N/A
Average	N/A	N/A	N/A	6,620	23.75	$782	218