The Cost of Airtight Homes

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Description

As Pennsylvania transitions to the 2018 ICC codes for building enclosure airtightness requirements there may be a concern on what it will require to adapt to these new changes. One of the biggest concerns is what the cost will be to implement these new requirements. The cost of air sealing a home varies depending on the size, location of the home being sealed. Air sealing cost are also determined by the scope of the project, such as whether you intend to do the basement/foundation, attic space, or a whole house sealing. The final cost of air sealing may be also determined by current rebates and assistance programs from government and utility companies.

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Learning Objectives

1. Review the 2018 Codes within Pennsylvania's UCC pertaining to enclosure air tightness.
2. How to maximize efficiencies within the building process for achieving airtightness with minimal additional cost.
3. Selecting and communicating desired outcomes with subcontractors for airtightness for their specific trades, and how best economically to achieve those outcomes.
4. Determine the new benefits within the 2022 IRA (Inflation Reduction Act)

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What are your Short-Term Goals?

Short-Term Goals:

- Meeting 3 ACH50 with as little impact to the budget as possible
- Develop an air sealing plan
- Develop a budget
- Train employees

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What are your Long-Term Goals?

Long-Term Goals:

- Have the budget be as close to pre-2018 UCC code change as possible
- Exceeding code
  - To be certified under the DOE Zero Energy Ready Homes (ZERH) program

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Where do Costs Come From to Reach 3 ACH50?

1. Short-term operational costs
2. Long-term operational costs
3. Material Costs
4. Labor Costs

We will place material and labor costs as part of production costs.

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Short-Term Operational Costs

1. Training staff
2. Educating subcontractors
3. Creating mockups

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Long-Term Operational Costs

1. Training field staff
   - Maintaining certifications (as appropriate)
2. Adding administrative staff

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Production Costs

- **Material Costs:** Many components already being used in construction can also be used as an air barrier, such as drywall, sheathing, and house wrap. With a little additional expense in both materials and labor these can be an effective air barrier.
- **Labor Costs:** There is always an increase with labor cost when implementing new processes and materials but as with anything the labor costs will lower with time and experience.

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What is your budget?

- Determining a budget in the beginning is going to be difficult just as it is when introducing any new procedures or materials to your projects.
- Starting the process of determining a budget is deciding on what your air barrier is going to be.
  - Do you know what you air barrier material/system is?

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Where will you find the money?

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How Will Achieving 3 ACH50 Impact the Construction Process?

How it impacts the process will be determined by how you prepare.

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#1 Plan

- First establish *what is your air barrier method?*
- Then *Establish a Pre-Construction Air Tightness Strategy*:
  - Developing a plan prior to building construction can help to ensure that all aspects of air tightness are taken into account and that a budget is established.
    - Use installation guides from manufacturers
- Surprises can be costly

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Plan some more

- Establishing a *quality assurance system* that can be used prior to and during the construction process can help to ensure that all components of the building envelope are properly installed and that all air sealing measures are adequately implemented.
- Getting things right the first time and finding mistakes early saves time and money

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How to develop a QA checklist

1. Determine the objectives:
2. Identify the critical areas: Identify the critical areas that are most important to achieving the objectives of 3ACH. For example, sealing the connection between the foundation and sill plate.
   a) Define the criteria for each critical area. This should include specific installation guidelines that must be met to ensure that the quality standards are achieved. For example, sealing the connection between the foundation and sill plate.
3. Organize the criteria into a checklist: Organize the criteria into a checklist format, grouping them under the critical areas they relate to. This will make it easier to follow and use during the QA process.
   a) Review the checklist with other stakeholders to ensure that it is complete and accurate.
4. Use the checklist during the QA process

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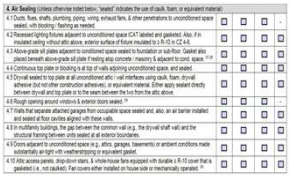
QA Checklist

- IRC and above-code programs make it easy to develop a checklist of common areas to seal.



Energy Star Rater Checklist Source:
https://www.energystar.gov/sites/default/files/asset/document/National%20Rater%20Files%20Checklist%20ENERGY%20STAR%20Certified%20Home_s_Rev10.pdf

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Better Design

- What are some ways to improve the overall design?
  - Avoid unnecessary corners, intersections, and junctions
  - Bring ductwork into conditioned space
  - Use strategies such as the “pen test” to identify challenging details

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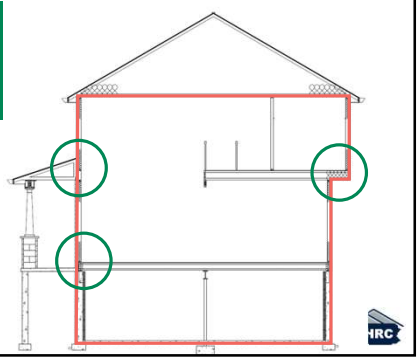
Pen Test

- Identify air barriers and intersections



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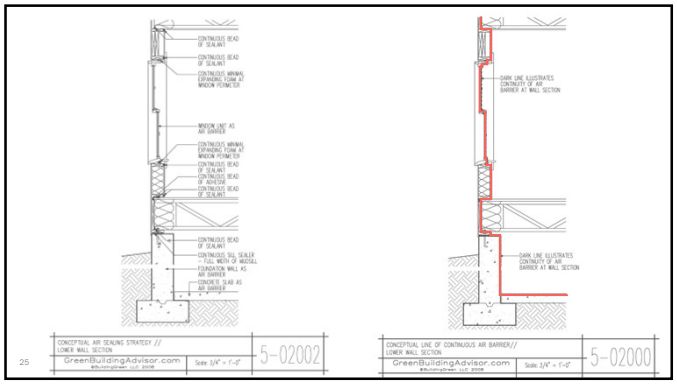

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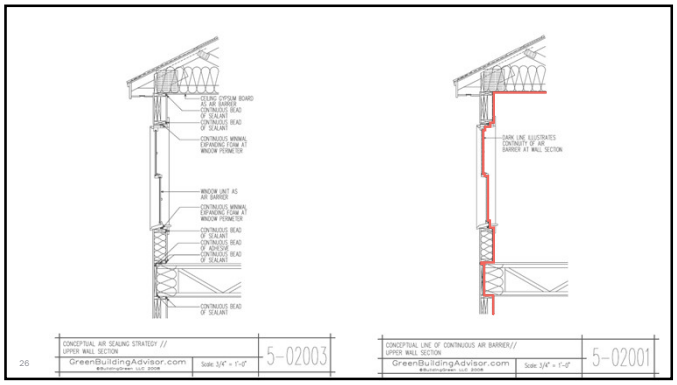

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#2 Prepare

- **Education**
  1. Additional training for managers and site supervisors
     a) This can be as simple as a learning lunch
     b) Allowing time and space for online training through outside agencies such as the PHRC
     c) If budget allows attending conferences and trade shows
  2. Training sub contractors
     a) Buy some donuts and coffee, this can be as simple as a casual conversation about expectations.
  3. Creating Mockups

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#2 Prepare

- Material sourcing.

Many of the materials you may need for air sealing may not be readily available at your local building supply center. This can be especially true with specialty tapes and sealants, having these products preordered can help eliminated unwanted and costly delays

Cost for some of these materials may vary dramatically if you order them online, but doing so may have a longer lead time to receiving them.

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Benefits of Mockups

- The details in methods and materials in construction are becoming more complex and mockups can be an invaluable tool to learn how you sequence that work. Mockups not only allow the contractor to test new methods but they can be a training tool when communicating with subcontractors.
- Mockups do cost money…

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Example: Stone/Rainscreen Mockup

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#3 Perform

- All the hard work has been done; the majority of success comes from preparation.
- Remember your already established QA system.

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Invest in Outside Professional

- Employ a building envelope professional: Employing an expert in the field of building envelope design can help to identify any potential issues in the design and construction process.

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Air Sealing is not its Own Process, it is a Goal

- Air sealing should be integrated into any trade which has an effect on the building envelope.
- The codes are really set up at this point to achieve the required results if each individual involved in the construction processes follows them and cares about quality installation.
- From a management perspective there are processes and strategies that can be put into place to help.

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Who is doing what?

NAHB Study

- Average New Home Uses 24 Different Subcontractors
  - *"The top-line results show that subcontracting remains as common as ever, with builders on average employing two dozen different subcontractors and subcontracting out 84 percent of their construction costs in the typical home they build."*

Source: https://www.nahb.org/-/media/NAHB/news-and-economics/docs/housing-economics-plus/special-studies/2020/special-study-average-new-home-uses-24-different-subcontractors.pdf

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Don't Forget Who is Involved

- Which contractors impact overall air sealing (aside from the primary air sealing sub)?
  - Framing crew
  - MEP contractors
  - Exterior cladding/siding crew
- If a contractor is contributing to the overall airtightness of the building, do they have the materials and techniques to do this well?

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Communication with Subcontractors

- Educate Subcontractors: Educating subcontractors on the importance of airtightness and the proper installation of building materials can help to ensure that all components are properly installed and sealed.
- Sometimes your subs are able to help you. Subcontractors generally work with many different contractors and have seen things done which may be a help to you with deciding on best course of action on specific projects.

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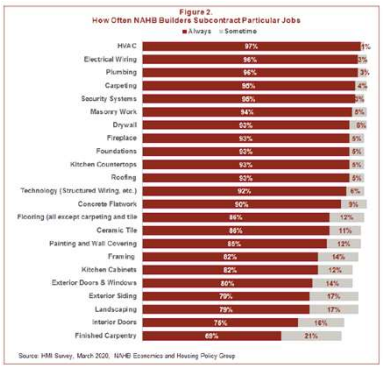

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Methods for Air Sealing?

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General Air Barrier *Methods*

- Drywall Method
- Spray Foam Method
- Sheathing/Framing Method
- Housewrap Method

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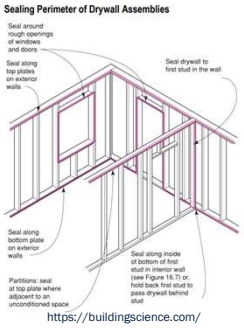
Drywall Method

- with little additional material cost drywall can be an affective air barrier when installed with a few extra steps.



https://buildingscience.com/

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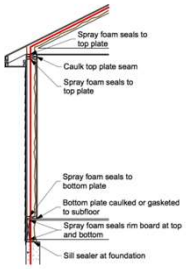
Spray Foam Method

- Notes:
  - Spray foam only effective in cavities and relies on sealed framing joints.



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Sheathing/ Framing Method

- Notes:
  - Sheathing method can be both interior and exterior air barrier.

https://www.knaufnorthamerica.com/

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- Using an integrated OSB such as ZIP or LP Weatherlogic works as both a WRB and air barrier combined

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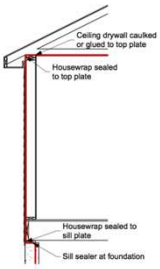
Housewrap Method

- Notes:
  - Many builders believe this is their method but are forgetting some of the key details.



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AeroBarrier

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Question?

- What method do you currently use to Achieve 3 ACH50

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Inflation Reduction Act

- As part of the recently passed Inflation Reduction Act, the Section 45L Tax Credit for Energy Efficient New Homes has been updated and extended. For homes and units acquired on or after January 1, 2023, the base-level tax credit is specifically tied to meeting ENERGY STAR program requirements for single-family, manufactured, and multifamily homes, and the tax credit has been extended through 2032. $2,500.00
  - EPA is awaiting guidance from the IRS on the applicability of state/regional versions of the ENERGY STAR program requirements.
- A larger tax credit is available for homes that are certified to DOE's Zero Energy Ready (ZERH) Program, which requires ENERGY STAR certification as a prerequisite. $5,000.00

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