



Northeast Sustainable Energy Association
Provider Number G338

A Commercial Building Retrofit With Passive Detailing: A Case Study

Course Number

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November 3, 2016

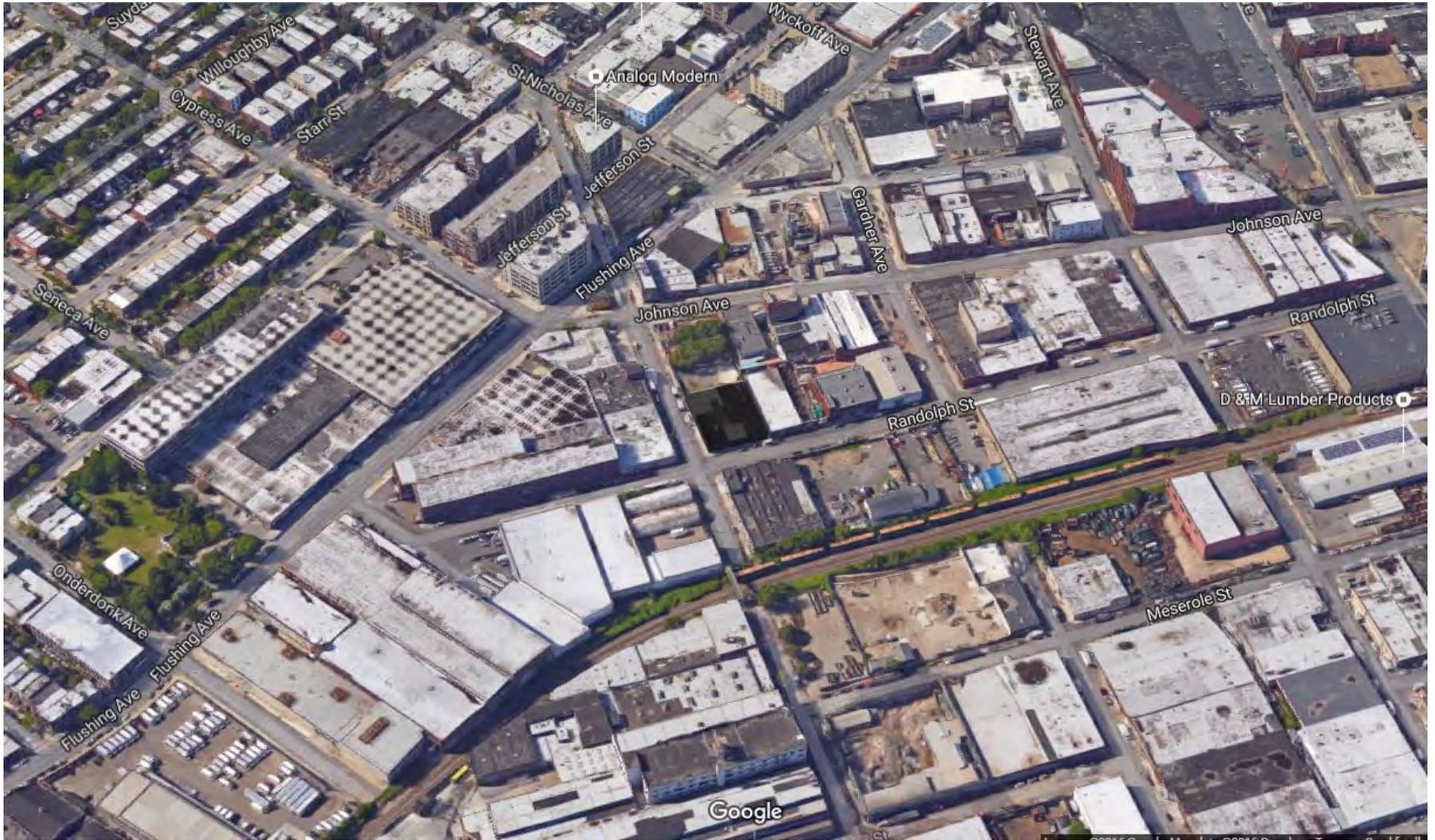


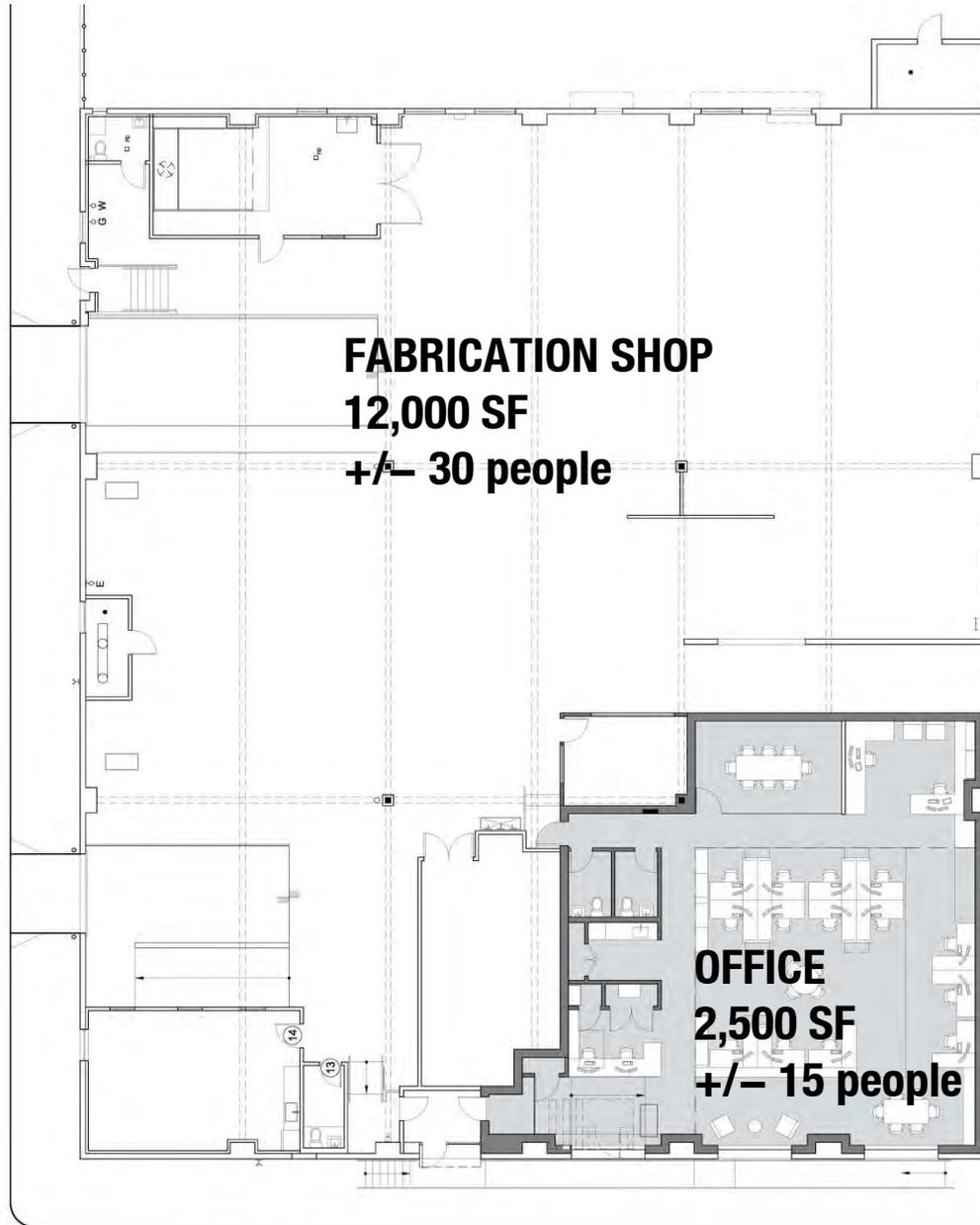


Course Description

Take an in-depth look at a commercial case study: a retrofit of an industrial office space in NYC. See new challenges and solutions as Passive House moves from residential to commercial construction.

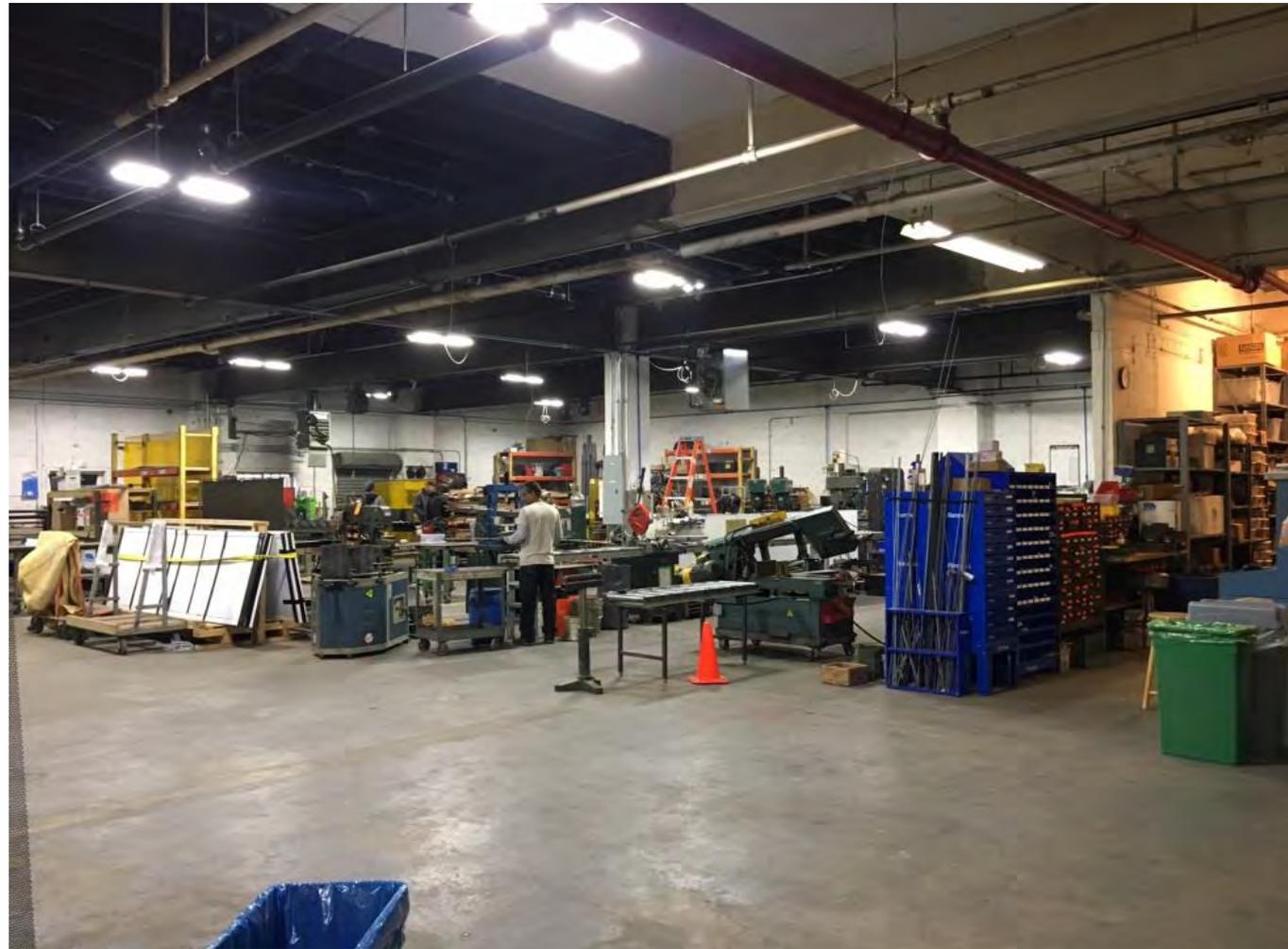






The Shop

- Can be loud
- Produces fumes & therefore requires lots of ventilation
- Is kept at a cooler temp in Winter (60 deg)
- Is not cooled in summer

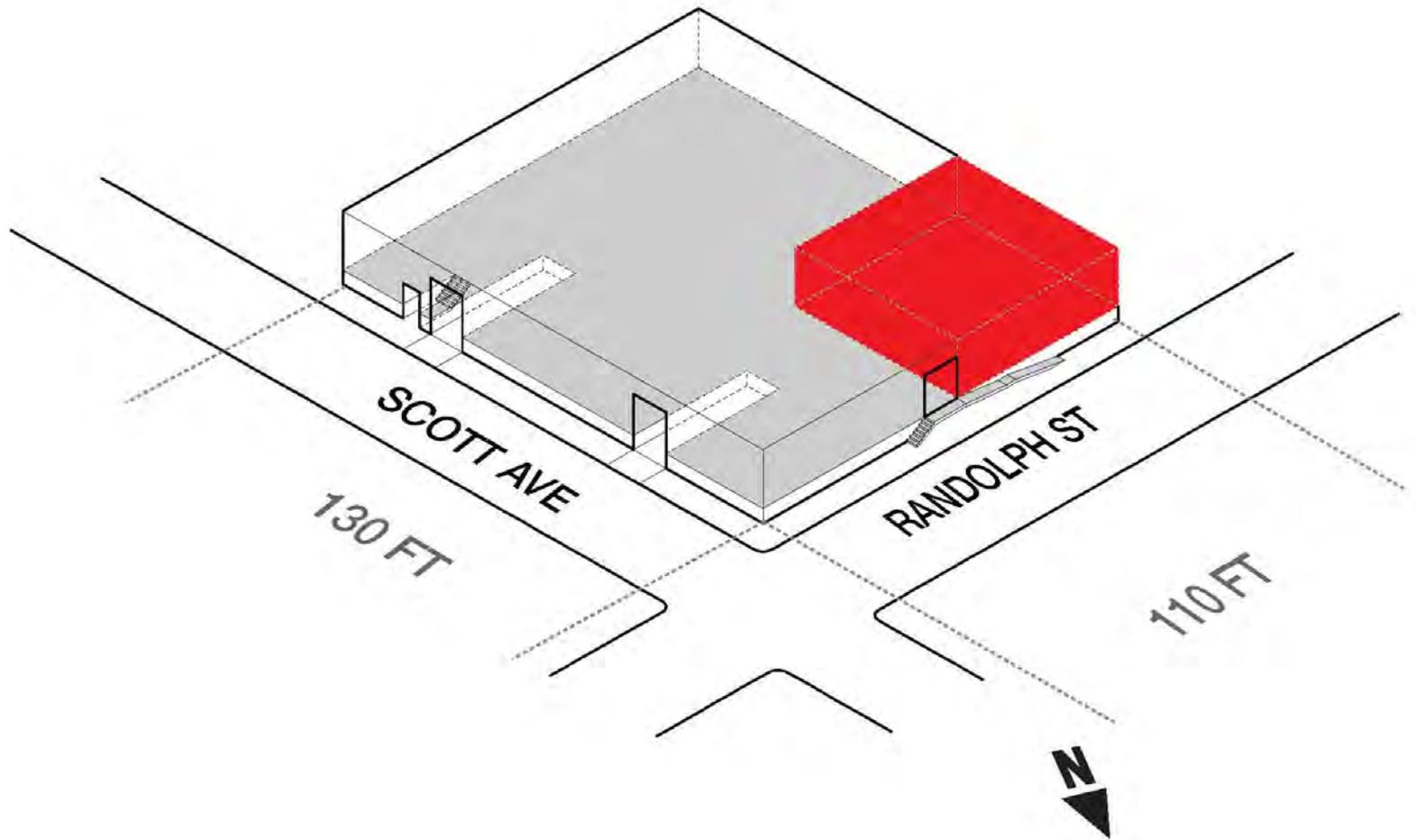


The Office

- Should be quiet
- Requires much less ventilation
- Should be warm in the winter
- cool in summer



BOX WITHIN A BOX



PHPP + RHINO 3D + GRASSHOPPER

The image displays the integration of three software tools: Grasshopper, Rhino 3D, and PHPP. The left window shows a complex Grasshopper script with various components and connections. The center window shows a 3D model of a building in Rhino. The right window shows the PHPP energy simulation spreadsheet, which includes a table of results for various energy metrics.

Category	Value	Requirements	Fulfillment
Space heating	Heating demand: 4.82 MBtu/yr-ft ²	90% of 4.75 MBtu/yr-ft ²	yes
Space cooling	Overall specific space cooling demand: 2.27 MBtu/yr-ft ²	90% of 3.07 MBtu/yr-ft ²	yes
	Cooling load: 2.35 MBtu/yr-ft ²	90% of 3.07 MBtu/yr-ft ²	yes
Primary energy	Frequency of overheating (> 77 °F): 29.6 MBtu/yr-ft ²	70% of 36.0 MBtu/yr-ft ²	yes
	Specific primary energy reduction through solar shading: 27.7 MBtu/yr-ft ²	90% of 30.0 MBtu/yr-ft ²	yes
Airtightness	Pressurization test result: 0.6 1/h	≤ 0.6 1/h	yes

Grasshopper - evaluate_geometry-phpp EXPORT

File Edit View Display Solution Help

Params Maths Sets Vector Curve Surface Mesh Intersect Transform Display LunchBox TT Toolbox Human

Geometry Primitive Input Util

125%

Wall Selector

Wall Type Selector 2

0 01ud Wall-1 NC
1 02ud Wall-2 NC
2 03ud Wall-3 NC
3 04ud Wall-4 NC
4 05ud Wall-5 NC

Ceiling Selector

Ceiling Type Selector 3

0 06ud Ceiling-1 NC
1 07ud Ceiling-2 NC
2 08ud Ceiling-3 NC
3 09ud Ceiling-4 NC
4 10ud Ceiling-5 NC

Floor Selector

Floor Type Selector 1

0 11ud Floor-1 NC
1 12ud Floor-2 NC
2 13ud Floor-3 NC
3 14ud Floor-4 NC
4 15ud Floor-4 NC

0 (0.945519, 0.325568, 0.0)
1 (0.325568, -0.945519, 0.0)
2 (0.945519, 0.325568, 0.0)
3 (0.325568, -0.945519, 0.0)
4 (-0.945519, -0.325568, 0.0)

0
1
2
3
4
5

0.9.0076

12:07 PM
10/27/2016

Grasshopper - evaluate_geometry-php EXPORT*

File Edit View Display Solution Help

evaluate_geometry-php EXPORT

Params Maths Sets Vector Curve Surface Mesh Intersect Transform Display LunchBox TT Toolbox Human

Geometry Primitives Input Util

100%

Insulation Layers
(0)
0 1
1 2
2 3
3 4
4 5

WALL INSULATION

CEILING INSULATION

FLOOR INSULATION

WALL Cost/SF
-.75

CEILING Cost/SF
-.95

FLOOR Cost/SF
-.65

BUILDING COST
(0)
0.19948.297946

1

0.9.0076

Autosave complete (18 seconds ago)

Windows taskbar: Internet Explorer, Chrome, Outlook, File Explorer, Calculator, Photoshop, etc.

System tray: 12:22 PM, 10/27/2016

The image shows a Grasshopper script designed to calculate the total building cost based on insulation layers. The script starts with an 'Insulation Layers' list containing values 0, 1, 2, 3, 4, and 5. These values are used to calculate the cost for three different parts of the building: walls, ceiling, and floor. Each part has its own calculation block: 'WALL INSULATION', 'CEILING INSULATION', and 'FLOOR INSULATION'. Each block uses a 'TII' (Total Insulation Index) component, followed by an 'AxB' (Area) component, and then an 'MA' (Multiply) component. The 'WALL Cost/SF' is calculated as -.75, 'CEILING Cost/SF' as -.95, and 'FLOOR Cost/SF' as -.65. These three cost values are then summed together in a final 'MA' component to produce the 'BUILDING COST', which is 0.19948.297946. A '1' component is also present in the script, likely representing a multiplier or a constant value.

1. GLAZING

2. WALLS

3. ROOF

4. FLOOR

5. MECHANICAL

