

Shadow Study

208 Main Street

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July 30, 2019

Introduction

This study presents the the minimal impact of shadows cast by the proposed building at 208 Main Street, specifically the impacts of a proposed addition at the 4th floor of the previously approved 3 story building on surrounding properties, and in particular, on the adjacent residential property to the north at 6 Digger Phelps Court.

The proposed 4th story is set back on 3 sides of the 3rd story roof, as required by Zoning. The setbacks strongly mitigate the effect of shadows in addition to those generated by the approved 3 story building.

The Planning Board asked for documentation that the 4th story does not create an additional adverse condition of shade and shadow onto the neighboring residential property.

Shadows are variable, and depend on factors such as the height and size of buildings, proximity of buildings to each other, intervening features such as topography and vegetation and the angle of the sun. The angle of the sun varies based on the rotation of the earth (i.e. time of day) and it's elliptical orbit (i.e. change in seasons). The longest shadows are cast during the winter months, and the shortest shadows are cast during the summer months.

It is also important to note that shadows are in constant motion, and the limited impacts noted herein will affect the adjacent property for only short periods of time. Additionally, the shadow conditions depicted in the following computer generated images make no allowance for cloud cover of overcast skies, which occur randomly, but with greater frequency and duration in the late fall and winter (corresponding to the worst case autumnal equinox shadow impact described above). These factors have the affect of reducing the actual (and perceived) shadow impact.

As documented below, the shadow diagrams indicate that the building will result in slightly longer shadows on the neighboring property during certain times of the day, during certain times of the year. However, the effect of shadows on the neighboring house itself is minimal.

Shadow Study Methodology

The study uses a computer generated 3-dimensional model of the project. The 3D model is geo-located to its precise physical location in the software program using real world scaling and geodata mapping coordinates. Data on solar declination (angle) and position and time of day on exact dates are accurately calculated by the software program, and then the program generates shadowed images of the proposed building and the adjacent house for key dates in the solar calendar: the summer and winter solstices, and the spring and autumn equinoxes. The selection of morning , noon, and afternoon times to calculate shadows, in addition to the seasonal variations, is standard practice for this type of study.

On June 21st at solar noon (the summer solstice), the sun reaches its highest point in the sky for the year. On December 21st at solar noon (the winter solstice), the sun is at its lowest elevation in the sky for the year.

On March 21st and September 21st (vernal and autumnal equinoxes), daylight and darkness each last for 12 hours.

All times referenced are standard or daylight savings time, as appropriate for the season. The 21st of each month is used as the standardized approximation. Depending on the calendar year, these dates may be up to two days off from the actual equinox or solstice. Shading is not strongly effected by this variation.

Images

24 images are presented in this study. For each of the four seasonal periods images are presented at 9:00 AM, Noon and 5:00 PM. The images show these time periods for both the previously approved 3 story building (with the adjacent house shown in red) and the proposed 4th story addition (with the adjacent house shown in yellow).

Shadow Study Diagram Observations

The following observations of the shadows cast by the proposed building by season, with and without the proposed 4th story addition.

Spring Equinox:

At 9:00 AM the sun is rising and low in the sky. The proposed building addition causes no change to these conditions as the sun is located to the east at this time. There are no shadows on the adjacent house at this time with or without the proposed 4th story addition.

At noon, The proposed building addition causes no change to these conditions as the sun is located more directly overhead at this time. There are no shadows on the adjacent house at this time with or without the proposed 4th story addition.

At 5:00 the sun is setting, low on the horizon, and the proposed building addition causes no change to these conditions as the sun is located to the west at this time. There are minimal shadows on the lowest east corner of the adjacent house at this time with or without the proposed 4th story addition. There is no additional shadow coverage due to the proposed 4th story addition.

Summer Solstice:

At 9:00 AM the sun is rising and low in the sky. The proposed building addition causes no change to these conditions as the sun is located to the east at this time. There are no shadows on the adjacent house at this time with or without the proposed 4th story addition.

At noon, The proposed building addition causes no change to these conditions as the sun is located more directly overhead at this time. There are no shadows on the adjacent house at this time with or without the proposed 4th story addition.

At 5:00 the sun is setting, low on the horizon, and the proposed building addition causes no change to these conditions as the sun is located to the west at this time. There are minimal shadows on the lowest east corner of the adjacent house at this time with or without the proposed 4th story addition. There is no additional shadow coverage due to the proposed 4th story addition.

Autumnal Equinox:

At 9:00 AM the sun is rising and low in the sky. The proposed building addition causes no change to these conditions as the sun is located to the east at this time. There are no shadows on the adjacent house at this time with or without the proposed 4th story addition.

At noon, The proposed building addition causes no change to these conditions as the sun is located more directly overhead at this time. There are no shadows on the adjacent house at this time with or without the proposed 4th story addition.

At 5:00 the sun is setting, low on the horizon, and the proposed building addition causes no change to these conditions as the sun is located to the west at this time. There are no shadows on the adjacent house at this time with or without the proposed 4th story addition.

Winter Solstice:

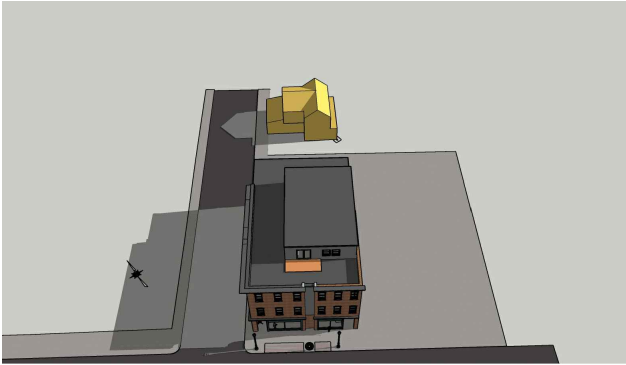
At 9:00 AM the sun is rising and low in the sky. The proposed building addition causes no change to these conditions as the sun is located to the east at this time. There are no shadows on the adjacent house at this time with or without the proposed 4th story addition.

At noon, The proposed building addition causes no change to these conditions as the sun is located more directly overhead at this time. There are minimal shadows on the adjacent house at this time with or without the proposed 4th story addition. There is no additional shadow coverage due to the proposed 4th story addition.

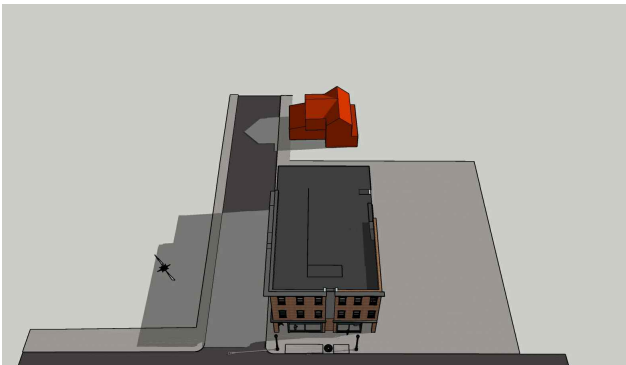
At 5:00 the sun has set, and the project area is in darkness.

Conclusion

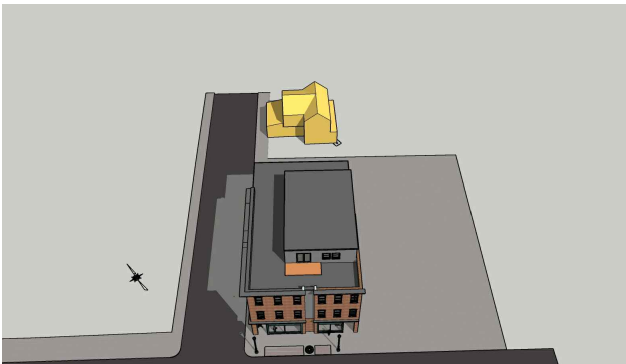
The study indicates that there are no significant shadows from the building at 208 Main Street on the adjacent house at 6 Digger Phelps Court for the majority of the year, and that the minimal shadows that do reach the house are the same whether or not the 4th story addition is included.



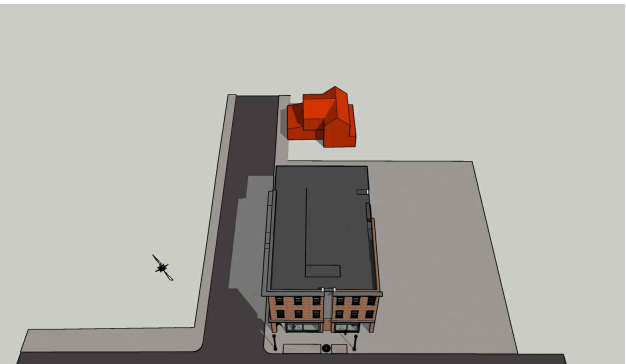
March 21 - 9am
 4th Floor Addition
 No Shadow on Neighboring House



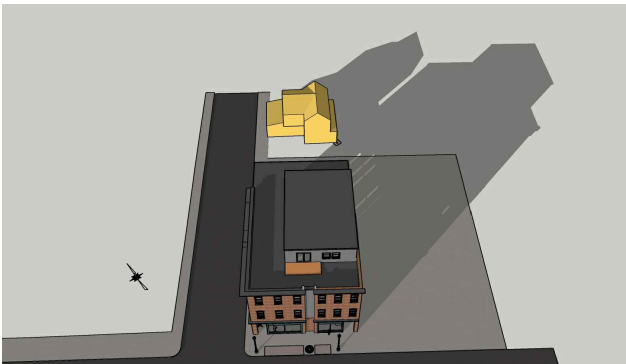
March 21 - 9am
 Approved 3 Story Building
 No Shadow on Neighboring House



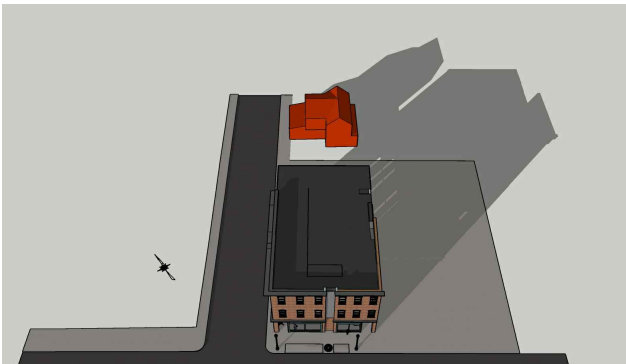
March 21 - 12pm
 4th Floor Addition
 No Shadow on Neighboring House



March 21 - 12pm
 Approved 3 Story Building
 No Shadow on Neighboring House

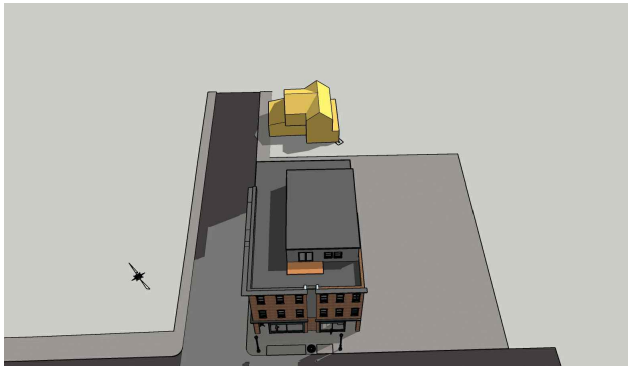


March 21 - 5pm
 4th Floor Addition
 No Shadow on Neighboring House

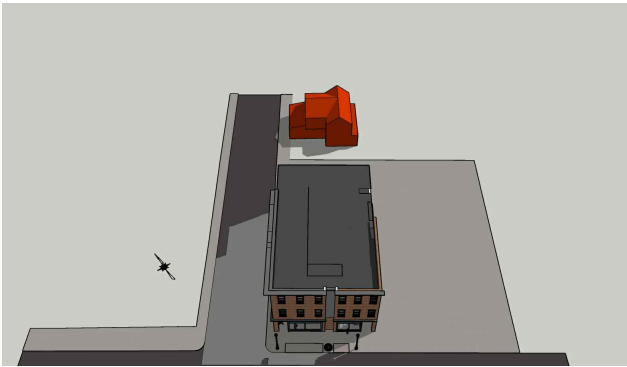


March 21 - 5pm
 Approved 3 Story Building
 Minimal Shadow on Neighboring House

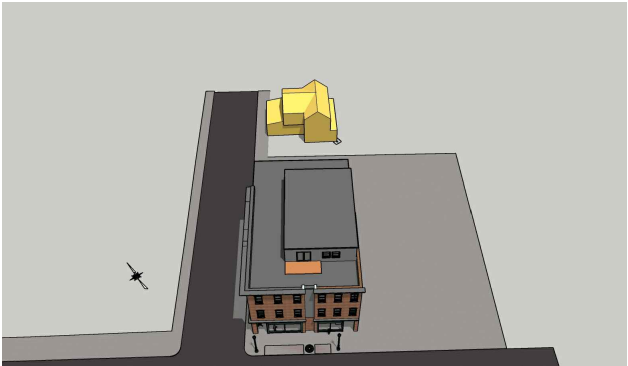
Shadow Study - Spring Equinox



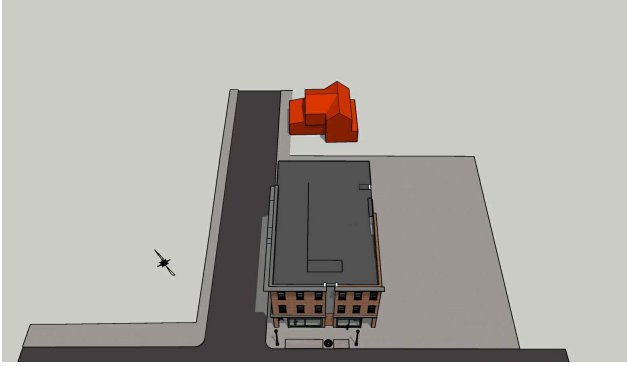
June 21 - 9am
 4th Floor Addition
 No Shadow on Neighboring House



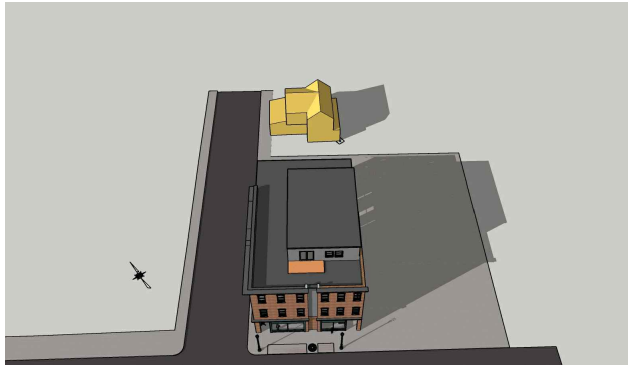
June 21 - 9am
 Approved 3 Story Building
 No Shadow on Neighboring House



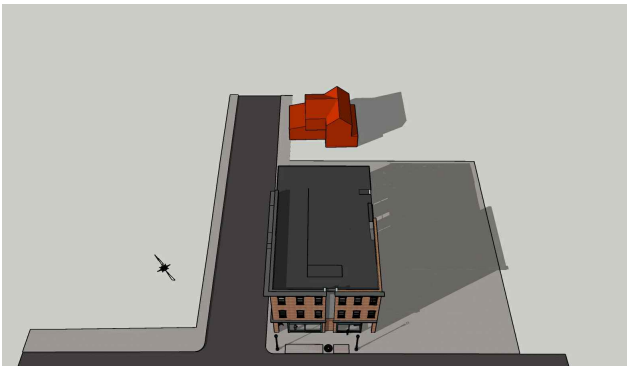
June 21 - 12pm
 4th Floor Addition
 No Shadow on Neighboring House



June 21 - 12pm
 Approved 3 Story Building
 No Shadow on Neighboring House



June 21 - 5pm
 4th Floor Addition
 No Shadow on Neighboring House



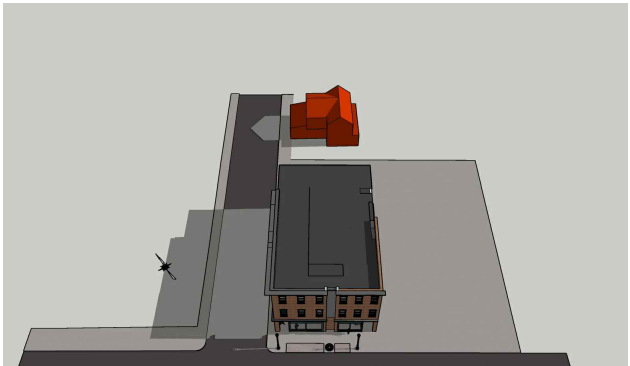
June 21 - 5pm
 Approved 3 Story Building
 Minimal Shadow on Neighboring House
 No difference between Approved 3 story and 4th Story Addition

Shadow Study - Summer Solstice



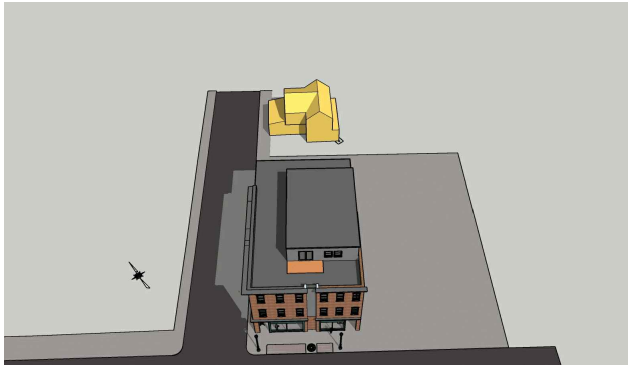
September 21 - 9am

4th Floor Addition
No Shadow on Neighboring House



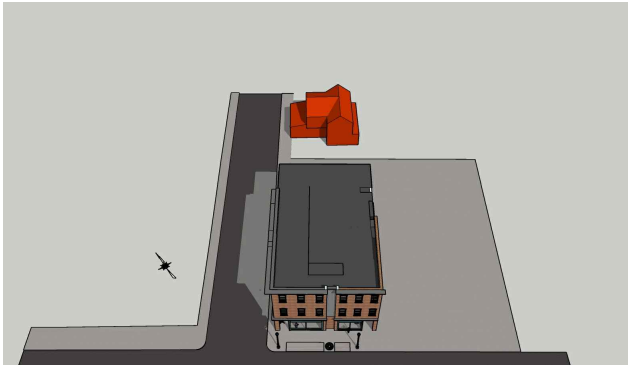
September 21 - 9am

Approved 3 Story Building
No Shadow on Neighboring House



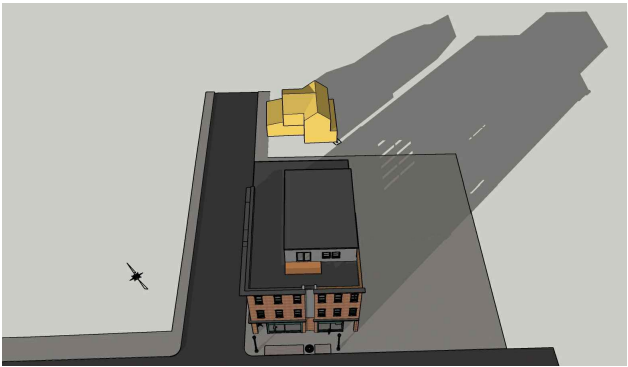
September 21 - 12pm

4th Floor Addition
No Shadow on Neighboring House



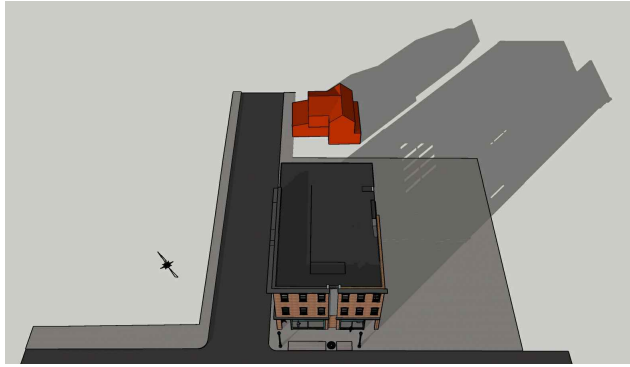
September 21 - 12pm

Approved 3 Story Building
No Shadow on Neighboring House



September 21 - 5pm

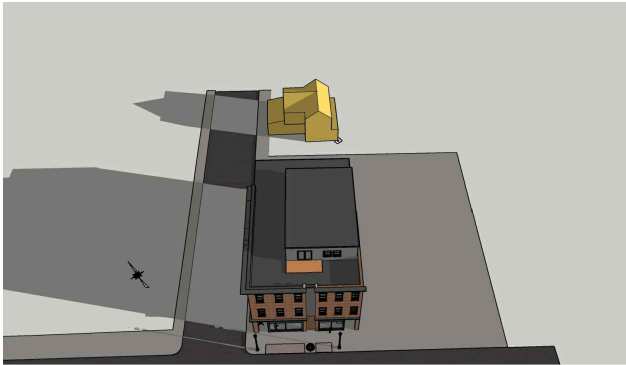
4th Floor Addition
No Shadow on Neighboring House



September 21 - 5pm

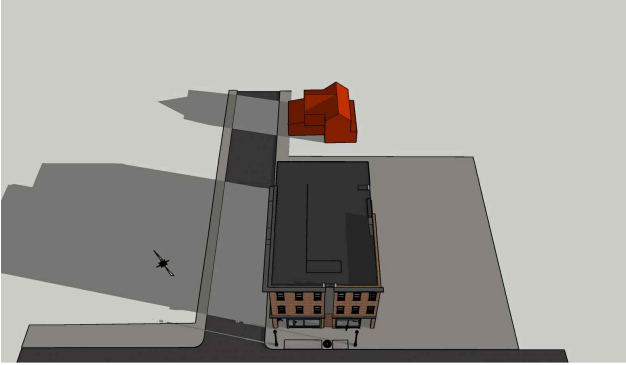
Approved 3 Story Building
No Shadow on Neighboring House

Shadow Study - Autumnal Equinox



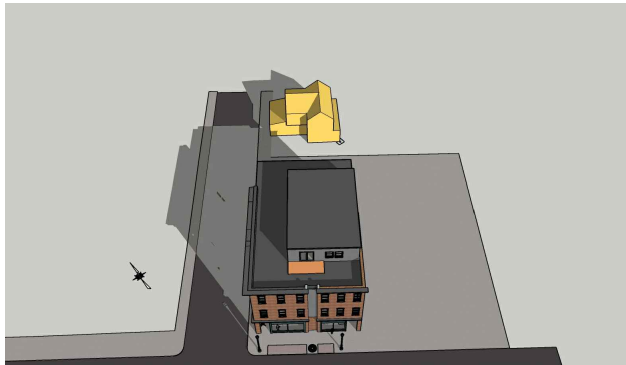
December 21 - 9am

4th Floor Addition
No Shadow on Neighboring House



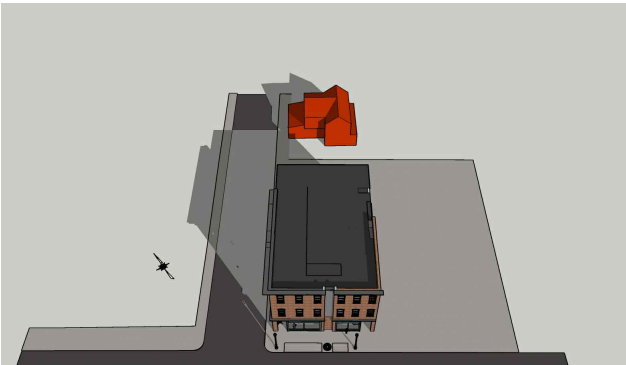
December 21 - 9am

Approved 3 Story Building
No Shadow on Neighboring House



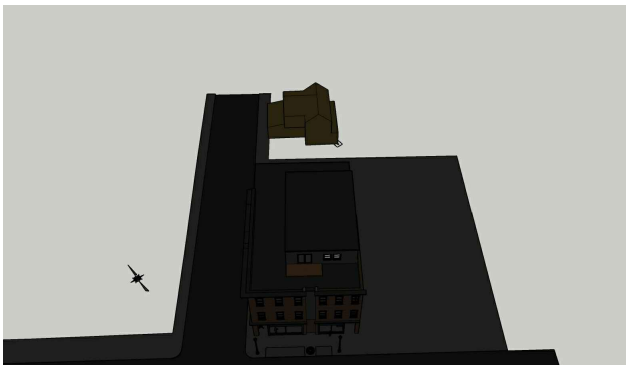
December 21 - 12pm

4th Floor Addition
Minimal Shadow on Neighboring House



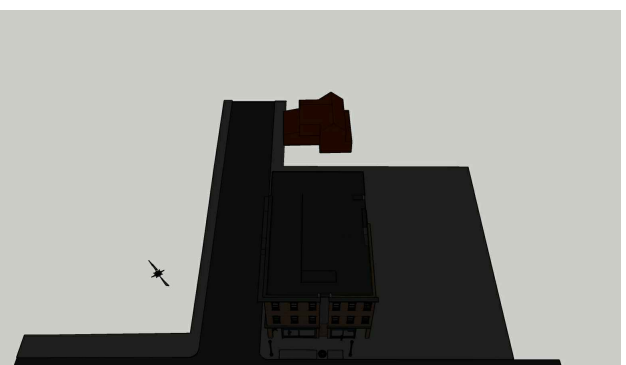
December 21 - 12pm

Approved 3 Story Building
Minimal Shadow on Neighboring House
No difference between Approved 3 story and 4th Story Addition



December 21 - 5pm

4th Floor Addition
After Sunset



December 21 - 5pm

Approved 3 Story Building
After Sunset

Shadow Study - Winter Solstice