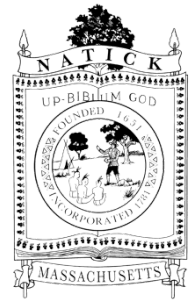


Memorandum



To: Natick Board of Selectmen, Planning Board and Finance Committee

CC: Martha White, Town Administrator

William Chenard, Deputy Town Administrator

James Errickson, Director, Community and Economic Development

Ted Fields, Senior Planner, Community and Economic Development

From: Jillian Wilson Martin, Sustainability Coordinator

Nicole Sanches, SolSmart

Date: September 12, 2017

Subject: SolSmart Review of Article 31

Dear Natick Board of Selectmen, Planning Board and Finance Committee:

In 2017, Natick became a participant in SolSmart, a national designation and technical assistance program run by the U.S. Department of Energy that recognizes leading solar communities and empowers additional communities to expand their local solar markets. As part of our participation, we are fortunate enough to receive the support of a technical advisor to review and provide feedback on solar zoning requirements, analyze the solar permitting process for solar PV systems, and create and implement solar training programs for municipal staff.

In this capacity, Natick's solar technical advisor, Nicole Sanches, has completed a review of Article 31, which seeks to "encourage the use of solar energy systems and protect solar access." Her review is attached here for your Board or Committee's consideration as you evaluate the benefits of the Article 31 ahead of Town Meeting.

Thank you,

Jillian Wilson Martin
Sustainability Coordinator
Town of Natick

Review of Article 31: Impact of Proposed Sky Exposure Planes on Solar Access:

Submitted by Nicole Sanches, SolSmart Technical Advisor
September 12, 2017

One of the goals of the language proposed in Article 31 is to “encourage the use of solar energy systems and protect solar access”. This is a worthy goal and aligns with measures in the U.S. Department of Energy’s SolSmart program.

Article 31 proposes to limit construction outside of a set of sky exposure planes that raise at an angle from the lot line to accomplish this goal. This is a slightly different approach from those that other communities have taken to protect solar access, where the focus has been on where shading will occur.

The idea of applying 1:1 sky exposure planes to lot lines was first discussed with our team as a potential means of regulating the height of solar energy systems as part of the Town’s separately proposed solar zoning regulations (Article 30). At that time, we were curious to see what these proposed sky exposure planes would look like in practice in Natick, and what impact they could have on solar energy systems, so we conducted an analysis based on the 1:1 sky exposure plane.

Analysis of existing Natick homes with solar installations:

To assess the impact of the sky exposure planes on solar energy systems, we chose ten homes with roof-mounted solar installations throughout Natick and measured their lot lines, elevations and roof heights. This information was used to create models of the sky exposure planes and buildings to see whether the existing solar systems would have been allowed under the proposed sky exposure planes.

We found that:

- Of the 10 houses studied, 9 buildings were found to be non-conforming with the 1:1 sky exposure planes from the lot line.
- Of the 10 properties, 7 of the 10 solar energy systems are in violation of the proposed sky exposure planes.
- 5 of the 10 homes studied were built or significantly remodeled in the past 15 years; each of these 5 were found to be non-conforming with the 1:1 sky exposure plane.
- The impact of the proposed 1:1 sky exposure plane is more significant when structures are not centered inside their lot lines.

The models for the ten houses and proposed sky exposure planes can be found in Appendix A.

How other communities have protected solar access:

The proposed sky exposure planes are similar to language in New York City's zoning, where the main concern is preventing sky scrapers from shading adjacent streets. New York's zoning allows for a 60 foot tall front wall before the sky exposure planes take effect.

The City of Brookline has taken a similar approach to NYC in their Davis Path Special District. After 20 feet of height, structures must be set back according to a sky exposure plane.

Other communities focus on where a structure will cast shade on the winter solstice, and regulate construction based on how much shade is permitted on abutting lots. This is a way to directly protect abutting neighbors from living in the shadow of their neighbors and provides different options for determining whether a proposed structure will be conforming. Malden takes this approach for structures more than six stories tall.

A significant difference between Natick's proposed sky exposure planes and these measures in practice in other communities, is the starting height of the setbacks. In Article 31, most of the zones do not have starting elevations for the sky exposure planes. Without these starting heights, the sky exposure planes may have the unintended consequence of incentivizing shorter and wider construction to fit under the pyramid of the intersecting sky exposure planes. This may also have the consequence of many existing structures in Natick suddenly being out of compliance.

Boulder, CO does not include a minimum height, but instead uses a "solar fence" to regulate shading between properties and protect solar energy systems.

The language and illustrations referenced in this section can be found in Appendix B.

Suggestions for Article 31:

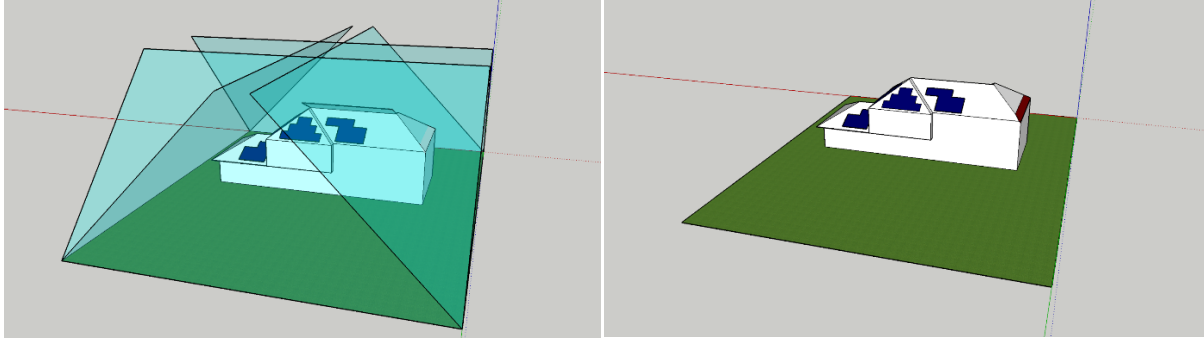
In light of our analysis, I would make the following suggestions to bring the language of Article 31 closer to its stated goals in practice:

- Consider exempting existing non-conforming buildings from the sky exposure planes.
- Consider a higher base height to protect existing buildings' ability to adopt solar energy and to promote building shapes that complement existing structures in Natick.
- Consider exempting solar energy systems from the sky exposure planes, since typical roof-mounted systems add minimal height to a building.
- Consider higher base heights for zones with smaller lot sizes to protect the interests of low-income families in Natick. Smaller, more affordable lots would have a smaller space to build in with the sky exposure planes than larger ones. Raising the base height can address this imbalance.
- Consider adopting solar ready requirements for new construction as a way to further this goal.

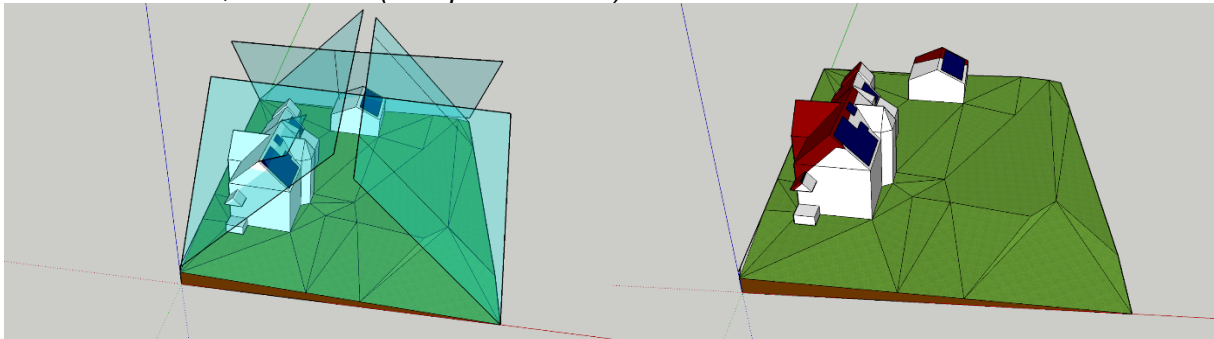
Appendix A: Models of Existing Natick Homes with Solar

Two pictures are provided for each address studied. The first depicts 1:1 Sky Exposure Planes from each lot line and their relation to existing buildings. The second picture shows the same lot and structure(s); the portion that is shaded red is in violation of one or more of the 1:1 Sky Exposure Planes.

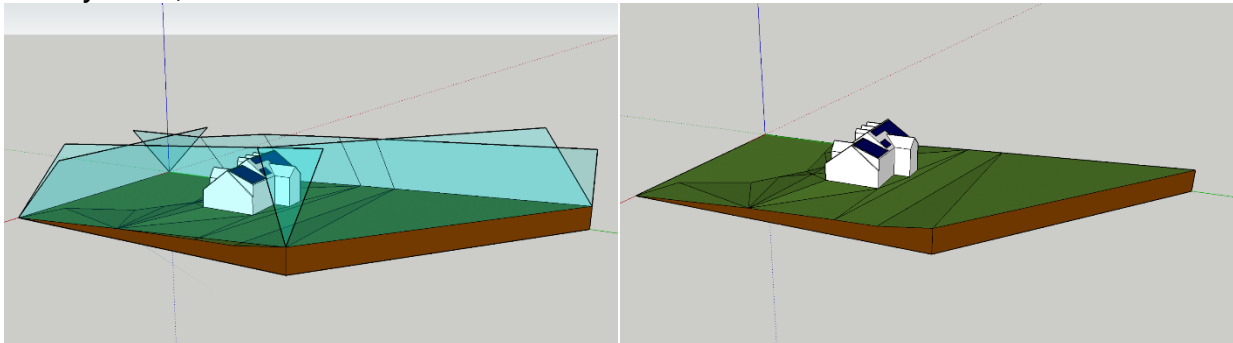
36 Hemlock Drive, Built 1954, Second Floor Added 2013 (est. based off permit data)



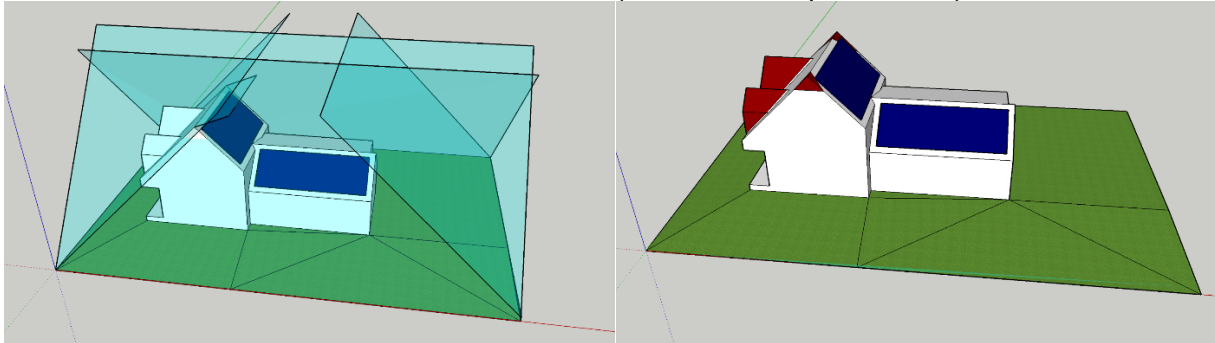
9 Kinsman Place, Built 1913 (Multiple additions)



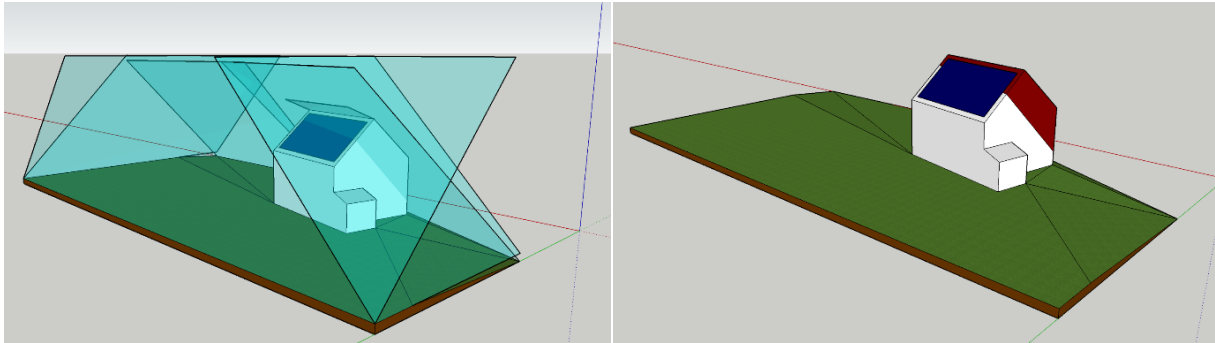
5 Libby Road, Built 2000



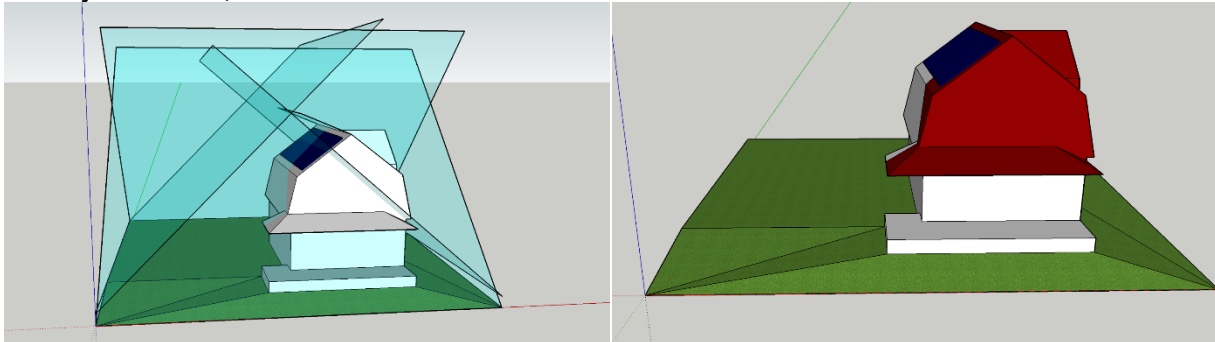
18 Lincoln St, Built 1880, Addition Added 1998 (est. based off permit data)



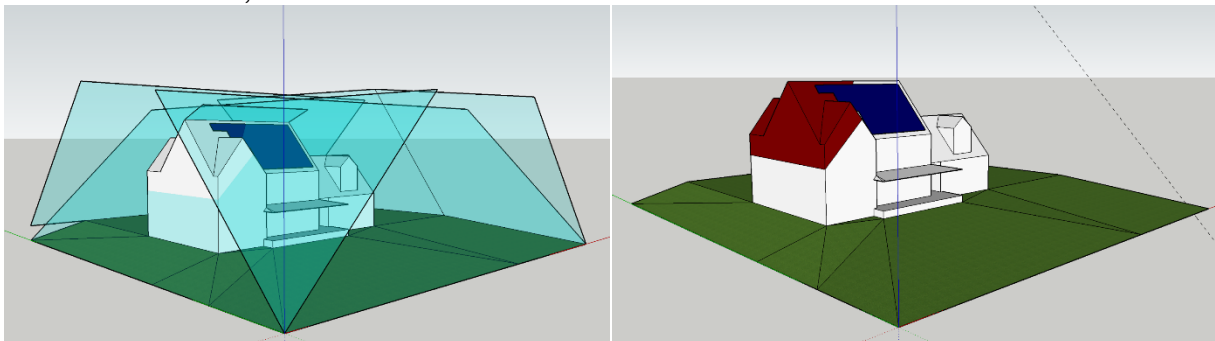
7 Morse Lane, Built 1901



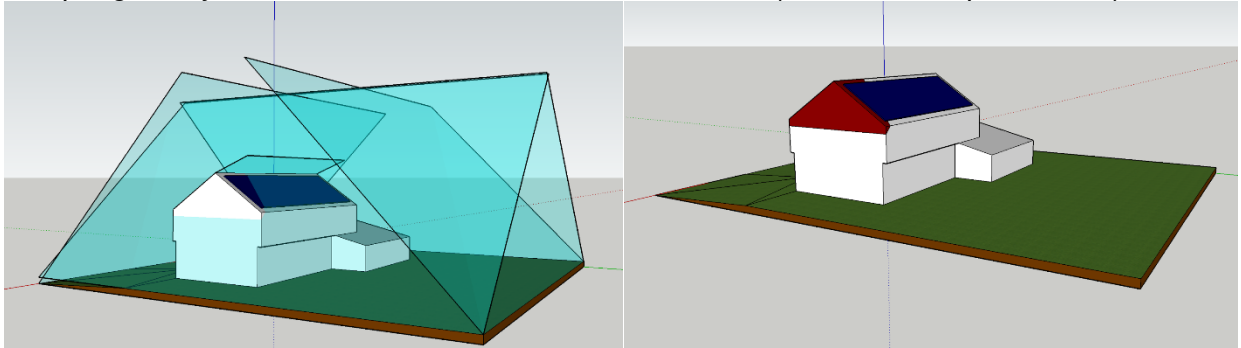
25 Reynolds Ave, Built 1900



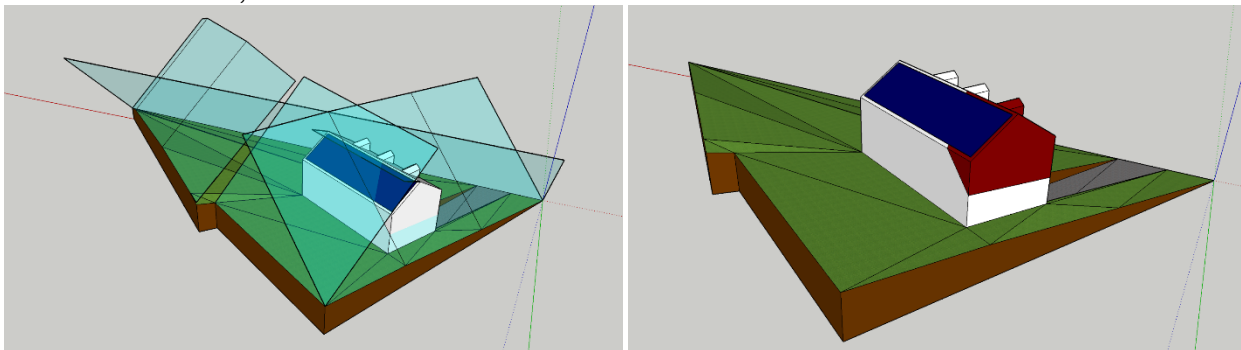
215 South Main St, Built 2016



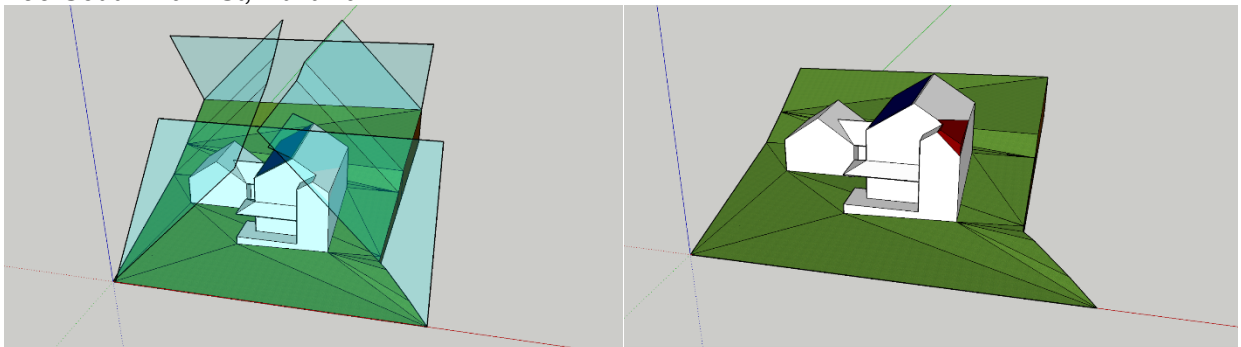
12 Spring Valley Rd, Built 1952, Second Floor Added 2008 (est. based off permit data)



107 North Main St, Built 2006



155 South Main St, Built 2014



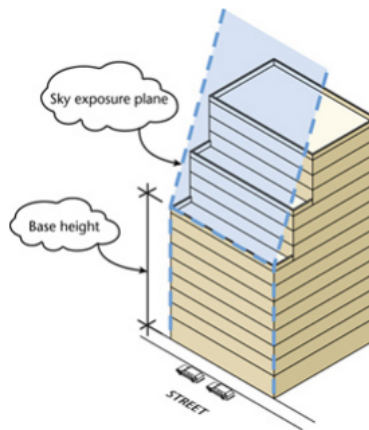
Appendix B: Examples of Zoning Language on Solar Access

New York, NY:

From the Zoning Glossary: <https://www1.nyc.gov/site/planning/zoning/glossary.page>

Sky Exposure Plane

A sky exposure plane is a virtual sloping plane that begins at a specified height above the street line and rises inward over the zoning lot at a ratio of vertical distance to horizontal distance set forth in district regulations. A building may not penetrate the sky exposure plane which is designed to provide light and air at street level, primarily in medium- and higher-density districts.



Brookline, MA:

From the Zoning By-Law: <http://www.brooklinema.gov/DocumentCenter/Home/View/10761>
(p.5-19 to 5-22)

g. Davis Path Special District G-(DP)

c) Height of Building shall be measured from the District Record Grade rather than as prescribed in Section 5.30. The District Record Grade shall be the record grade of Boylston Street at the edge of pavement opposite the midpoint of the southern boundary of the G-(DP) district. The Height of Building shall be in no case taller than 65'. Additionally, any elevator penthouse, mechanical equipment enclosure, water tanks and water towers, or cooling towers may in no case be taller than 80' from the District Record Grade. Notwithstanding the foregoing, in no case may any Building Construction exceed the Building Envelope set forth in Section 5.06.4.g.3.d below, except as expressly provided in Section 5.06.4.g.3.e below.

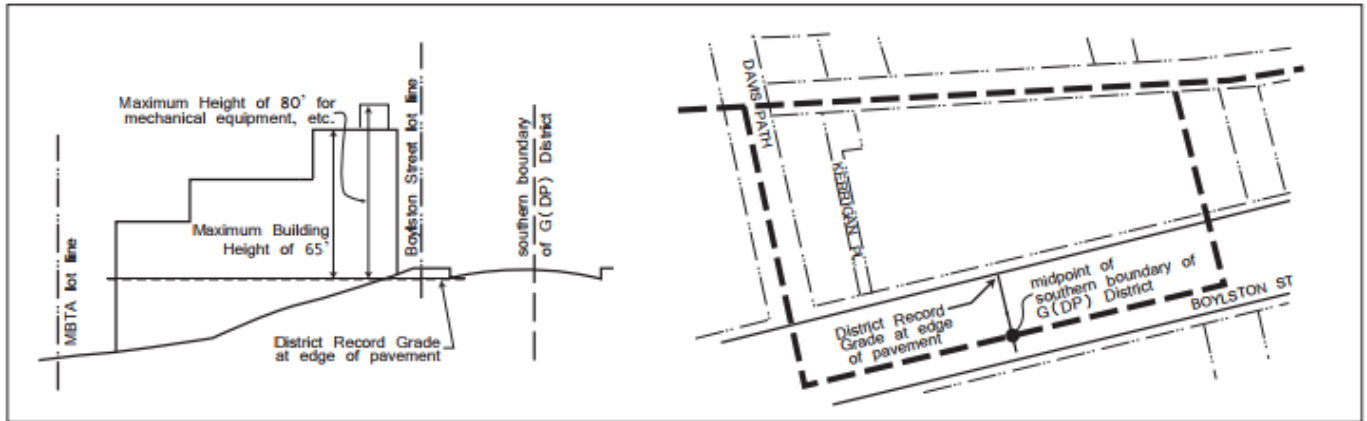


Figure 5.02b – Height of Building Measurements in the G-(DP) District

d) The Building Envelope shall be further restricted by an Angled Plane beginning at an elevation 20 feet above the District Record Grade and aligned with the MBTA property line, with such plane rising toward Boylston Street at an angle of one foot of vertical height for every 2.25 horizontal feet from the MBTA property line in a direction perpendicular to the MBTA property line.

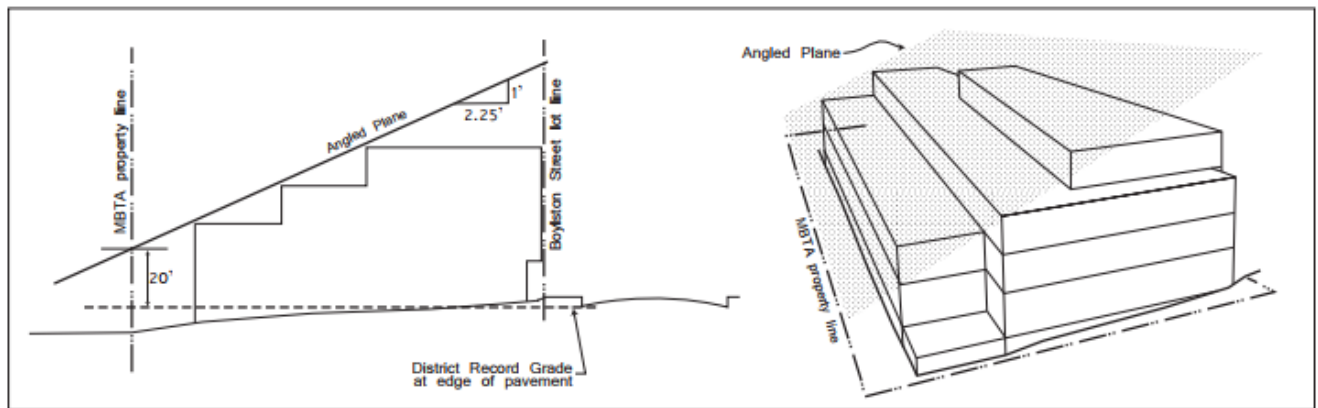


Figure 5.02c – Angled Plane Diagram

Malden, MA:

From the Zoning By-Law: http://www.cityofmalden.org/sites/default/files/code2016chap_1-12.pdf

Section, 300.10 – All Structures More than Six Stories (p.1215)

300.10. 2 The City Council must find that **the proposed structure will create no significant new shadow** for any properties in Residence A and B zoning districts. **To [e]nsure the protection of solar access for adjacent neighborhoods**, the developer must provide shadow analysis, drawn by a registered architect, for 9:00 A.M., 12:00 Noon, and 3:00 P.M. based upon standard time, for the winter solstice (December 21), spring and fall equinoxes (March 21 and September 21) and summer solstice (June 21).

400.11 Height Requirements:

400.11. 2 Parapets less than five (5) feet high, chimneys, flag poles, ventilators, water tanks, antennas, penthouses, **solar panels**, wind generators and associated towers, or other protections used for or intended to be used exclusively for utility services or access to the roof may exceed the height limitations of this ordinance by not more than twenty (20) feet.

Boulder, CO:

From their Solar Access Guide: <https://bouldercolorado.gov/plan-develop/solar-access-guide>
https://www-static.bouldercolorado.gov/docs/PDS/forms/815_Solar_Access_Brochure.pdf

In response to the diminishing supply and increasing cost of conventional energy resources, the City of Boulder enacted an ordinance to protect the use of solar energy. The ordinance guarantees access to sunlight for homeowners and renters in the city. This is done by setting limits on the amount of permitted shading by new construction and requiring that new buildings be sited to provide good solar access.

The degree of solar access protection is defined by either a 12 foot or 25 foot hypothetical "solar fence" on the property lines of the protected buildings. The ordinance is designed to protect access for a four hour period on December 21st. Under most circumstances, new structures will not be allowed to shade adjacent lots to a greater extent than the applicable solar fence.

There are three Solar Access Areas in the City of Boulder. Following is a list of zoning districts and which solar access area they fall into:

Solar Access Area I Lots are protected by a 12 foot "solar fence" as mentioned above. These lots are in RR-1, RR-2, RE, RL-1 and MH zoning districts.

Solar Access Area II Lots are protected by a 25 foot "solar fence". These lots are in RL-2, RM, MU-1, MU-3, RMX, RH, and I zoning districts.

Solar Access Area III All other zoning districts are in Solar Access Area III and are protected through the solar permit process