

## Solar Access

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

A solar access permit is available to those who have installed or who plan to install a solar energy system and need more protection than is provided automatically in Solar Access Areas I and II. The permit application must include detailed information describing the solar energy system, existing structures and vegetation on adjacent properties and the location and dimensions of the solar easement requested. Solar access permits do not affect vegetation which exists at the time of permit application submittal. Solar access permit application forms are available from the City Department of Planning and Community Development. The Board of Zoning Adjustment will review applications and award permits.

Members of the City of Boulder planning staff are available to answer questions regarding solar access and will be responsible for assuring that all plans are in compliance with the ordinance.

## Compliance

When applying for a building permit, an adjusted shadow analysis must be submitted to Inspection Services. Identifying the height and orientation of the proposed building and the slope of the land, the shadow that it will cast on the 21st of December between 10 a.m. and 2 p.m. can be approximated. Complete the following steps and submit the results with the building permit application:

1. *Draw the proposed site plan.* The solar access site plan should be drawn to a scale of measurement (preferably 1:10) and show existing improvements, and the proposed building or addition, property lines, and a north arrow.
2. *Determine the height of the shadow casting portion of the roof.* Label the height of corners and peaks of the proposed roof structure on the site plan.



House to be analyzed below

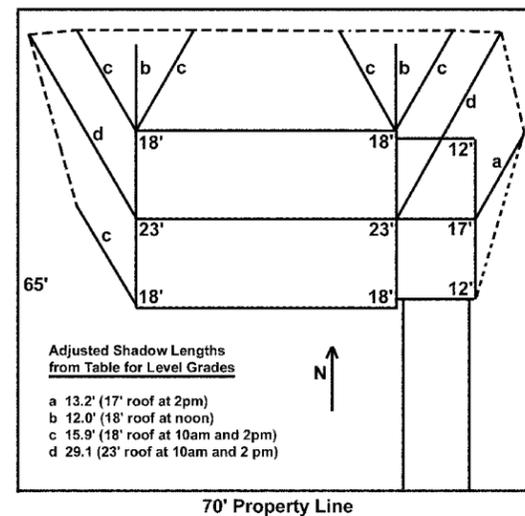


Figure 1. Simplified Shadow Analysis for House in Solar Access Area I (Illustration only—not to scale)

Table 1. Adjusted Solar Shadow Lengths for Level Grades

Solar Access Area I				Solar Access Area II			
Bldg Ht	10am	Noon	2pm	Bldg Ht	10am	Noon	2pm
13'	2.6'	2.0'	2.6'	26'	2.6'	2.0'	2.6'
14'	5.3'	4.0'	5.3'	27'	5.3'	4.0'	5.3'
15'	7.9'	6.0'	7.9'	28'	7.9'	6.0'	7.9'
16'	10.6'	8.0'	10.6'	29'	10.6'	8.0'	10.6'
17'	13.2'	10.0'	13.2'	30'	13.2'	10.0'	13.2'
18'	15.9'	12.0'	15.9'	31'	15.9'	12.0'	15.9'
19'	18.5'	14.0'	18.5'	32'	18.5'	14.0'	18.5'
20'	21.2'	16.0'	21.2'	33'	21.2'	16.0'	21.2'
21'	23.8'	18.0'	23.8'	34'	23.8'	18.0'	23.8'
22'	26.5'	20.0'	26.5'	35'	26.5'	20.0'	26.5'
23'	29.1'	22.0'	29.1'	36'	29.1'	22.0'	29.1'
24'	31.8'	24.0'	31.8'	37'	31.8'	24.0'	31.8'
25'	34.4'	26.0'	34.4'	38'	34.4'	26.0'	34.4'
26'	37.0'	28.0'	37.0'	39'	37.0'	28.0'	37.0'
27'	39.7'	30.0'	39.7'	40'	39.7'	30.0'	39.7'
28'	42.3'	32.0'	42.3'	41'	42.3'	32.0'	42.3'
29'	45.0'	33.9'	45.0'	42'	45.0'	33.9'	45.0'
30'	47.6'	35.9'	47.6'	43'	47.6'	35.9'	47.6'
31'	50.3'	37.9'	50.3'	44'	50.3'	37.9'	50.3'
32'	52.9'	39.9'	52.9'	45'	52.9'	39.9'	52.9'
33'	55.6'	41.9'	55.6'	46'	55.6'	41.9'	55.6'
34'	58.2'	43.9'	58.2'	47'	58.2'	43.9'	58.2'
35'	60.9'	45.9'	60.9'	48'	60.9'	45.9'	60.9'
				49'	63.5'	47.9'	63.5'
				50'	66.2'	49.9'	66.2'
				51'	68.8'	51.9'	68.8'
				52'	71.5'	53.9'	71.5'
				53'	74.1'	55.9'	74.1'
				54'	76.7'	57.9'	76.7'
				55'	79.4'	59.9'	79.4'

3. *Draw the approximate shadow cast by the proposed structure.* If your building is on a level lot and if the adjacent property to the north, east and west is part of the same solar access area, use Table 1 to check that your building's shadow is in compliance with the ordinance. Use the shadow pattern illustrated in Figure 1 as an example. Noon shadow lengths are projected directly north. Draw the 10:00 a.m. and 2:00 p.m. shadows at 30 degrees west of north and 30 degrees east of north. After the shadow lines have been drawn, connect the outer band of points to determine the four hour shadow pattern.

Note: If your proposed structure is not located on a level lot, please contact the Planning Department for information on adjusting actual shadow lengths for changes in grade.

4. *If the shadow cast is entirely within your property lines, the proposed building or addition is in compliance.*

5. *If the adjusted shadows cast by the proposed structure do not fall within your property lines, redesign your project or prepare a shadow analysis based on the actual shadows cast by the proposed structure.* An actual shadow analysis illustrates the true impact of all proposed shading on adjacent properties, and is required to demonstrate that the portion of the shadow which exceeds the solar fence falls within an exempt area. An actual analysis is also required as part of an application for an administrative or a board level solar exception. Apply shadow lengths listed in Table 2 to prepare an actual solar analysis.

Table 2. Actual Shadow Lengths On December 21 Solar Shadow Analysis Table for Level Grades

Bldg. Ht.	Length of Shadow		
	10 am	Noon	2 pm
10'	26.5'	20.0'	26.5'
11'	29.1'	22.0'	29.1'
12'	31.8'	24.0'	31.8'
13'	34.4'	26.0'	34.4'
14'	37.0'	28.0'	37.0'
15'	39.7'	30.0'	39.7'
16'	42.3'	32.0'	42.3'
17'	45.0'	34.0'	45.0'
18'	47.6'	36.0'	47.6'
19'	50.3'	38.0'	50.3'
20'	52.9'	40.0'	52.9'
21'	55.6'	42.0'	55.6'
22'	58.2'	44.0'	58.2'
23'	60.9'	46.0'	60.9'
24'	63.5'	48.0'	63.5'
25'	66.2'	50.0'	66.2'
26'	68.8'	52.0'	68.8'
27'	71.5'	54.0'	71.5'
28'	74.1'	56.0'	74.1'
29'	76.7'	58.0'	76.7'
30'	79.4'	60.0'	79.4'
31'	82.0'	62.0'	82.0'
32'	84.7'	64.0'	84.7'
33'	87.3'	66.0'	87.3'
34'	89.9'	68.0'	89.9'
35'	92.6'	71.0'	92.6'
36'	95.3'	72.0'	95.3'
37'	97.9'	74.0'	97.9'
38'	100.6'	76.0'	100.6'
39'	103.2'	78.0'	103.2'
40'	105.9'	80.0'	105.9'
41'	108.5'	82.0'	108.5'
42'	111.1'	84.0'	111.1'
43'	113.8'	86.0'	113.8'
44'	116.4'	88.0'	116.4'
45'	119.1'	90.0'	119.1'
46'	121.7'	92.0'	121.7'
47'	124.4'	94.0'	124.4'
48'	127.0'	96.0'	127.0'
49'	129.7'	98.0'	129.7'
50'	132.3'	100.0'	132.3'
51'	135.0'	102.0'	135.0'
52'	137.6'	104.0'	137.6'
53'	140.3'	106.0'	140.3'
54'	142.9'	108.0'	142.9'
55'	145.6'	110.0'	145.6'

## Solar Exemptions

In certain circumstances, if the proposed structure shades an adjacent lot more than shades cast by the solar fence, the structure may still be in compliance. Compliance may be demonstrated through completion of an actual shadow analysis.

1. If an adjacent property is already shaded by existing buildings, mountains or other permanent objects (not including vegetation such as trees), you can build anything which does not add to those existing shadows.
2. If the proposed building or addition would shade part of an adjacent property which is outside the building envelope, the building or addition is exempt from the provisions of the solar ordinance.
3. A minimal amount of shading, as outlined in the solar ordinance, may qualify for an exemption and is not prohibited.

## Solar Exception

If your plans actual shadows shade the building envelope of an adjacent property greater than the shadow cast by the solar fence, your options are to redesign your project or apply for a solar exception. Administrative exceptions can be considered if the owners of impacted lots have no objection, and the application complies with the criteria for exception found in section 9-9-17(f) Boulder Revised Code 1981.

A public hearing before the Board of Zoning Adjustment will be required when either the affected property owner objects to the increased shading or staff finds the proposal does not meet the criteria for a solar exception. Applications for an administrative exception or an exception from the Board of Zoning Adjustment are available from the Planning Department.

## Solar Siting in New Construction

The ordinance sets standards for the siting of new development. It requires that all units in new developments which will not incorporate solar features include to the maximum extent possible:

1. long axis within 30 degrees of east-west;
2. roofs which are physically and structurally capable of supporting at least 75 square feet of solar collectors per dwelling unit; and
3. unimpeded solar access through the provisions of this ordinance or through private covenants.

Non-residential buildings have similar requirements for siting. Figure 2 is an example of a small project where 100% of the units are sited in accordance with the provisions of this ordinance.

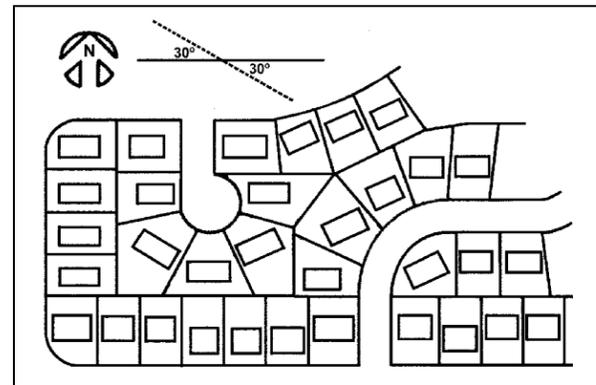
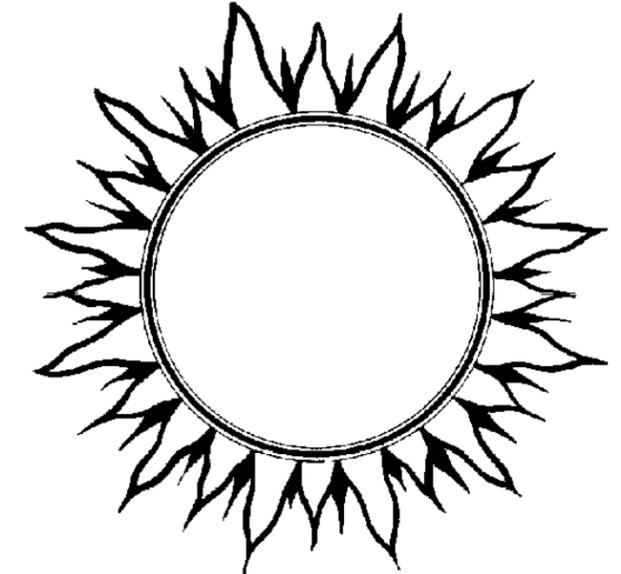


Figure 2. Typical Subdivision Site Plan

The planning staff or the Planning Board may waive the solar siting requirement for reasons of topography or lot configuration; substantial planning and design expenditures incurred before ordinance passage; or reduction in other aspects of energy efficient site planning. The incorporation of solar energy systems or other renewable energy sources may also be viable alternatives to the solar siting requirements.

If you have any questions or would like more information about the requirements of the solar access ordinance, please contact the City of Boulder Planning and Development Services Department at 303-441-1880. Also, the complete ordinance is available on the City website at: [www.boulderplandev.net](http://www.boulderplandev.net)

# Solar Access Guide



## or Solar Shadow Analysis



### City of Boulder

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