

Sun/Shadow Study

Terms of Reference

December 2023

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1.0 INTRODUCTION

1.1 PURPOSE

The purpose of a Sun/Shadow terms of reference is to aid in the creation of a sun/shadow study. These studies contribute to and inform the design of buildings and the arrangement of buildings on sites. By understanding the nature of existing shadows and new shadows, new developments can proposals ensure adequate access to sunlight enhancing the livability and sustainability of public and private spaces.

Sun/shadow studies must demonstrate potential shadows and propose mitigation when excessive shadows result in negative impacts to their surroundings.

Contexts can vary, therefore the scope and requirements in these terms of reference can be adjusted when preparing a sun/shadow study to suit the nature of the subject proposal. The sun/shadow studies must consider local official plan policies and any relevant local design guidelines when being prepared.

1.2 WHY ARE SUN/SHADOW STUDIES IMPORTANT?

Sun/shadow studies are important for several reasons:

- Knowing how the position of the sun can affect the size of the shadow cast.
- Knowing where shadows fall within and outside a site.
- Knowing where to optimally locate buildings and site elements such as landscaped spaces, parking areas, trees, amenity spaces and more.
- Knowing how shadows from new developments impact streetscapes and public spaces.

1.3 WHEN IS A SHADOW STUDY REQUIRED?

A Sun/Shadow study may be required in support of a complete application for development proposals within the urban settlement areas of the City. A Sun/Shadow Study is prepared for buildings that are 10 storeys or greater in height. Buildings that are lower than 10 storeys may require a Sun/Shadow study in certain circumstances (see Section 2.1). The City may exempt developments above 10 storeys if the planned context or the prevailing building heights surrounding the development are more than 10 storeys. In all cases, the requirement for a sun/shadow study must conform to the Official Plan policies and relevant urban design guidelines.

1.4 WHO CAN PREPARE A SHADOW STUDY?

A Shadow Study can be prepared by a design professional such as an architect, landscape architect, urban designer, engineer, or a qualified Consultant with experience in this field.

1.5 HOW IS A SHADOW STUDY PREPARED?

Shadow studies should be generated through computer software that can simulate shadows. The software must be able to geo-reference the subject site, create massing models of proposed buildings and surrounding buildings and cast shadow accordingly.

2.0 TRIGGERS FOR A SHADOW STUDY

2.1 INTRODUCTION

Shadow Studies may be requested for development proposals with building heights of 10 storeys or more. The City may also require a shadow study if one or more of the following is triggered:

Building height is less than 10 storeys but greater than 5 storeys and in proximity to shadow-sensitive areas, including but not limited to low rise residential neighbourhoods, civic and cultural spaces, Heritage districts or buildings, private outdoor amenity spaces, parks and open spaces, places where children play, pedestrian predominant streetscapes and/or mixed use districts, and where Official Plan policies or area specific design guidelines require these.

3.0 METHODOLOGY

3.1 INTRODUCTION

The dates and times for preparing a Shadow Study may differ depending on the specific Shadow Impact Criteria that is being evaluated (see section 4.0) and other relevant factors.

The study must include the following:

TABLE 1: SHADOW STUDY TIMES		
TEST DATES	TEST TIMES	TIME ZONE
• April 21st • June 21st • September 21st (March 21 has the exact amount of daylight) • December 21st	Hourly intervals from 10am to 6pm	• Time Zone: Eastern • Standard Time: Universal Time minus 5 hours (Winter Solstice - December 21st) • Daylight Saving Time: Universal Time minus 4 hours (Vernal Equinox - March 21st; Summer Solstice - June 21st; and Autumnal Equinox - September 21st) Universal Time (UT) is Greenwich Mean Time

4.0 SHADOW IMPACT CRITERIA

4.1 INTRODUCTION

Sun/Shadow studies must consider the unique site-specific context and the surrounding features, built-form, and land uses. Each context requires a specific level of consideration and assessment. Below are typical conditions with corresponding criteria of exposure, coverage, times, dates, and standards.

4.2 PRIVATE REALM

4.2.1 – Outdoor Residential Amenity Spaces on Adjacent Properties

To minimize the impact of shadow on existing adjacent properties from new development, adjacent residential amenity areas should receive at a minimum of 6 hours of sunlight between 10am to 6pm.

- April 21 to September 21

4.2.2 - Outdoor Residential Amenity Spaces within the proposed development

To maximize the functionality of private outdoor amenity spaces associated with new developments with rear yards, rooftop spaces, balconies, decks, and other shared common spaces, amenity areas should receive at least 4 hours of sun between 10am to 6pm.

- April 21 to September 21

4.3 PUBLIC REALM

4.3.1 – Public Outdoor Amenity Spaces

Communal Outdoor Amenity Spaces include school yards, children's play areas, public outdoor pools, community gardens, privately owned public spaces, Civic and Cultural Spaces, and other outdoor public areas.

Shadows cast by existing buildings and shadows from proposed buildings should allow for 5 hours of full sun between 10am-6pm on:

- April 21

School yards and children's play areas should receive at least 3 hours of sun on:

- December 21st (10am to 3pm)

4.3.2 – Sidewalk areas and boulevards along the frontage of the development

Streets with residential and mixed-uses, enlivened with people on sidewalks, patio spaces, trees, and where significant numbers walk, cycle, or ride transit should continue to receive a minimum of 4 hours of sun 10am to 6pm.

- April 21st (*The south sides of streets with East and West orientations may receive less sunlight*)

4.3.3 – Parks, Open spaces, and natural heritage areas

Shadows cast by existing buildings and proposed developments surrounding parks and other open spaces should not exceed 3 hours in duration between the hours of 10am to 6pm on:

- April 21st
- September 21st

(Natural heritage areas subject to an Environmental Impact Study (EIS) that requires additional sunlight should be identified).

5.0 MITIGATION MEASURE

5.1 DESIGN STRATEGIES FOR SHADOW MITIGATION

Sun/Shadow Studies should identify and describe mitigation measures taken by the proposal to limit and control impacts from shadows.

There are several design strategies that could be deployed to mitigate the impacts of shadows on neighbouring properties, public spaces, and natural features. The most effective ways to mitigate shadows involves the shaping and massing of buildings along with consideration for the placement, arrangement, and orientation of buildings on a site. A sun/shadow study can identify one or more ways and explain how these have been deployed to decrease impacts from shadow in the following ways:

Building heights:

Discuss and describe how the building has been sculpted and massed to minimize the shadowing on the subject site, adjacent sites, and the public realm.

Describe setbacks and stepback have been considered through the design to reduce shadowing and optimize access to sunlight.

Building orientation and layout:

Discuss and describe how buildings have been placed and arranged on the subject site to minimize shadows within the subject site, adjacent sites, and the public realm. Describe how the site design optimizes exposure to sunlight.

6.0 SUBMISSION FORMAT

A Sun/Shadow study should comprise the following parts:

Part A: Project Description:

- Introduction: Description of the project
- Location: Address and site latitude and longitude.
- Surrounding uses and spaces.

Part B: Analysis

B1: Drawings:

Drawings should include the following:

- Minimum distance (i.e. coverage area) of 10 times the building height to the north, east and west of the subject property
- Minimum distance of 2 times the building height to the south of the subject property
- Drawings may be based on 2D mapping showing shadows from the proposal. Alternatively, drawings may be based on 3D mapping and include shadows from the proposed building and all buildings within the coverage area.

The drawings should include:

- A north arrow, scale and scale bar
- Reference bearing for at least one street adjacent to the subject property
- Scale suitable to depict the entire coverage area
- Name of individual who prepared the drawings
- Shadow information:
 - Existing shadow conditions in the coverage area (Shown in a distinct colour)
 - Proposed shadow conditions of the development (Shown in a distinct colour)
 - For proposals seeking increased building heights, indicate the incremental difference between as-of-right shadows compared to shadows of proposed building height
 - Approved but unbuilt buildings within the coverage area
 - Each of the above shadow conditions should be illustrated graphically using a different colour or hatch pattern
- Legend, describing colour/hatch pattern for each of the shadow conditions

B2: Mitigation

Describe the design strategies used to mitigate the extend and coverage of shadows falling on private and public areas.

Part C: Conclusion

Provide a conclusion of the scale of the impacts of shadow on relevant adjacent spaces. Include recommendations that can be relevant to minimization of shadows.

Glossary

Photovoltaic Panel: A device that converts solar energy into electricity using solar cell technology.

Thermal Gain: Solar gain is the amount of solar radiation that builds up within the interior of a building, residential dwelling or structure.

Pedestrian predominant: Areas that are suited for pedestrian traffic and movement. Examples include bike lanes, parkettes, patios and sidewalks etc.

Latitude: the angular distance, measured in degree between the equator and an observer's location. North of the equator is positive; south is negative.
Checklist of items to include in the study.

Checklist

1.General	
A. Name of the Project:	B.Date:
C. Address of Application:	D.Name of Consultant:
E. Phone number and email of the Consultant:	

2.Project Description	
A.Short Description of the Project:	
B. Number of buildings for this Application:	
C.Number of Floors :	D. Height in Metres :
E.Did you submit the 3d Model for this project? Yes..... No.....	
File Format Submitted:	

3.Massing Information	
A.Software Used	B.Terrain Corrected :
If Other describe below:	Yes..... No.....

4.Massing Model Location	
A.Coordinates Used:	B.Solar North Matches True North?
Longitude: Latitude:	Yes..... No.....

5.Shadow Diagrams Information	
A.Are you fully compliant with all of the technical specifications in the Terms of Reference?	
Yes..... No.....	
B.Do the Shadow Diagrams use a standard metric scale?	Yes..... No.....
C.Are the Shadow Diagrams provided in Colour?	Yes..... No.....
D.Does the Shadow Diagrams use The City's Shadow Study Drawing Standards – Colour Analysis?	
Yes..... No.....	

5.Shadow Diagrams Information – Continued		
D.Date Used for Shadow Analysis:	Year.....	Month.....
E.Daylight Savings Time considered?	Yes.....	No.....

6.General Comments

Declaration of Consultant
I (Print name) certify that I have examined the contents of the application, certify that the information submitted with it is accurate and concur with the submission of the application. Date: Signature of Consultant: