



FEDERATION OF
CALGARY COMMUNITIES

FLOOR AREA RATIO & 3D VISUALIZATION HOW-TO

PURPOSE & STEPS

Ever wondered what a proposed development would actually look like? This guide will help you visualize it!

The supplemental resource, “FAR spreadsheet” is meant to be used alongside this guide, City resources found online, and the free software SketchUp.

1. USING CITY RESOURCES:

City resources we will use include:

- [My Property](#): This gives us the dimensions of the property to be developed.
- [Planning and Development Map](#): PD Map tells us where current Land Use Redesignations and Development Permits are issued. It gives details on the existing designation, the proposed designation, and what that means in plain terms. It also tells us who the Applicant is, who the File Manager is and what the File Number is, among other things.
- [City of Calgary Interactive Land Use Bylaw](#): The LUB tells us what the technical requirements are for the zone (or designation), including required setback area (area of a parcel between the property line and line parallel to the property line).

We will use information from both My Property and Planning and Development Map as inputs for our spreadsheet. The spreadsheet will then allow us to model what the proposed development could look like in 3D.

2. WORKING IN EXCEL:

The Excel spreadsheet lets you model what the mass of a proposed development could look like given the dimensions of the lot, max Floor Area Ratio (FAR) and max height. The spreadsheet enables us to calculate Floor Area Ratio floor by floor. The calculation is based on the relationship between the area of the parcel (information from City resources) and the cumulative area of each floor of the proposed building.

3. WORKING IN SKETCHUP:

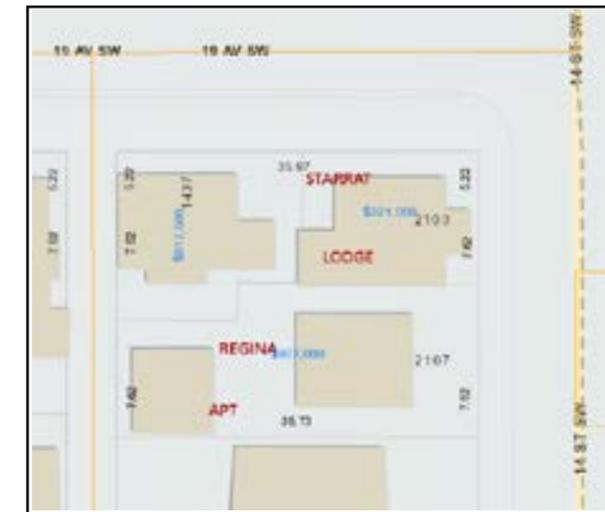
SketchUp is a free 3D modelling software which allows us to visualize the information from our Excel spreadsheet. SketchUp is a fun software to use, but it takes some practice to get used to. This resource will cover the basic tools that you will use to model the proposed development. There are also many SketchUp how-to videos online. You can download a free version of the software (SketchUp Make) [here](#).

1. CITY RESOURCES

A. MY PROPERTY

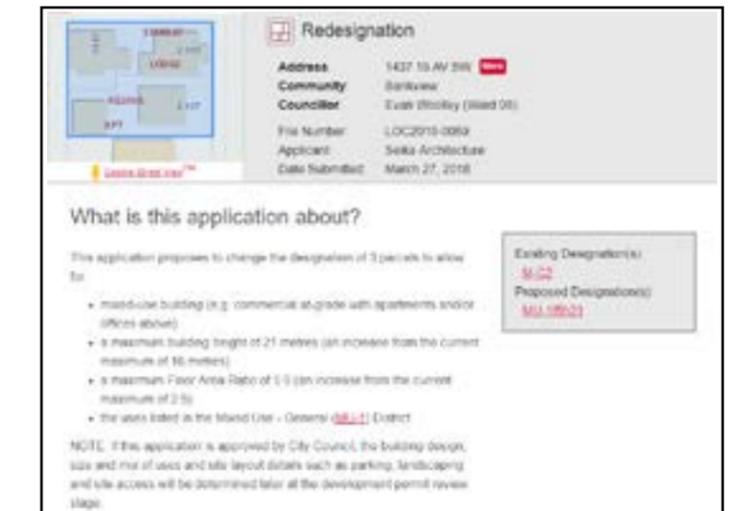
First, we need to measure the length and width of the parcel. Go to [My Property](#) and find the parcel in question.

In the example below, the LOC (Land Use, Outline Plan, and Road Closure) is a land use redesignation for 3 parcels (1437 19 AV SW, 2103 14 ST SW & 2107 14 ST SW). The numbers in black give the measurements of the property. The length is 35.73m on the south side and 35.97 on the north side (we will use the average of the two numbers, or 35.84 m for simplicity sake). The width is 20.46m (7.62 + 7.62 + 5.22). The lot is 733.28 sq m (35.84 x 20.46). This is the number that will go in Cell A1 of the Excel spreadsheet.



B. PD MAP

In this example, we will be modelling a Mixed-use Building with a Maximum Floor Area Ratio of 5 and a Maximum Building Height of 21m. The information for the proposed development is obtained from PD Map:



C. LAND USE BYLAW

By checking the Land Use Bylaw, we know that the minimum rear setback is 6.0m, and the minimum side setback is 3.0m:



2. EXCEL

The FAR spreadsheet is intended to be used with the free software SketchUp. The spreadsheet enables you to model what the mass of a proposed development could look like given the dimensions of the lot, the max FAR, and max height indicated for the LOC in PD Map.

Open the FAR spreadsheet. You can assume that the first floor will be 4m high, and the remaining floors will each be 3m high. If you have more detailed information to input, please do.

The following fields exist in the spreadsheet:

- **Floor:** Which floor is this? 1,2,3 and so on
- **Height of Floor:** The height of each floor
- **Total Height:** The cumulative height. For example, at floor 2 this will be the sum of the height of floor 1 and floor 2 (4 + 3 = 7)
- **Width:** The width of the floor
- **Length:** The length of the floor
- **Area:** The width x length of the floor
- **Total Area:** The Cumulative area. For example, at floor 2 the number will be the sum of the Total Area for Floor 1 and Floor 2 (429.7 + 429.7 = 859.39)
- **FAR:** Total Area for that floor / Cell A1 (Cell A1 is the total area of the parcel which we found using My Property)

Cell A1 contains the area of the parcel. Type 733.28 in Cell A1 (information obtained from the “My Property” City resource).

In the “Floor” column, type 1 in Cell B2, 2 in Cell B3, 3 in Cell B4, 4 in Cell B5, and 5 in Cell B6.

| | A | B | C | D | E | F | G | H | I |
|---|-----------------|-------|-----------------|--------------|-------|--------|--------|------------|------|
| 1 | 733.28 | floor | height of floor | total height | width | length | area | total area | FAR |
| 2 | (35.84 x 20.46) | 1 | 4 | 4.00 | 14.40 | 29.84 | 429.70 | 429.70 | 0.59 |
| 3 | unit: metres | 2 | 3 | 7.00 | 14.40 | 29.84 | 429.70 | 859.39 | 1.17 |
| 4 | | 3 | 3 | 10.00 | 14.40 | 29.84 | 429.70 | 1289.09 | 1.76 |
| 5 | | 4 | 3 | 13.00 | 14.40 | 29.84 | 429.70 | 1718.78 | 2.34 |
| 6 | | 5 | 3 | 16.00 | 14.40 | 29.84 | 429.70 | 2148.48 | 2.93 |
| 7 | | 6 | 5 | 21.00 | 14.40 | 29.84 | 429.70 | 2578.18 | 3.52 |
| 8 | | | | | | | | | |

The developer attended the development committee meeting and shared that he is planning to have commercial at-grade and penthouse apartments on the top floor. (Usually, the first floor in these types of buildings will be 4m high, and the remaining floors will be 3m each if they are residential, or 4m each if they are office). In this case, we have assumed that the first floor will be 4m high, with the next 4 floors at 3m high each, and the 6th (top) floor at 5m high to reach a total height of 21m. (Please see sample spreadsheet column C).

Looking at the spreadsheet, you will notice that Total Height is calculated automatically (For example, if you click on Cell D3, the formula in the function (fx) bar above is =D2+C3, or 4 + 3).

For simplicity sake, we’ve assumed that there are no setbacks (ie. The width and length of the floor are the same for each floor).

Area is calculated for each floor by multiplying width x length.

Total area is calculated in column H by adding the area for each floor to the cumulative area. For example, cell H4 is the sum of cell H3 and cell G4.

Cumulative FAR (column I) is a function of the cumulative total area at that floor (column H) divided by the total area of the parcel (cell A1). For example, cell I3 is calculated by dividing cell H3 by cell A1 then adding cell I2.

The next step is to play with the Width and Length numbers in Columns E and F to create a building footprint. Remember, the Maximum FAR for this development is 5, so we need to keep an eye on Cell I7 to make sure that it does not go over 5. Also keep in mind the setback requirements stated in the Land Use Bylaw. Working with the numbers, it is evident that a max FAR of 5 cannot be reached on this parcel without going over the maximum allowable height of 21m (as indicated in PD Map).

3. SKETCHUP

A. SOFTWARE BASICS

Now that we have a working spreadsheet, we are ready to visualize the numbers in a simple 3D model. In SketchUp, the main tools that you’ll use to visualize the massing of the proposed development are:

- **Select:** Selects entities to modify when using other tools or commands
- **Eraser:** Erases entities. Click on entity to erase
- **Lines:** Draws edges or line entities. Tool Operation: 1. Click at starting point of the line 2. Move cursor 3. Click at ending point of line 4. (optional) Move cursor 5. (optional) Click to create connected line 6. (optional) Repeat step 4 to create connected lines, or return to starting point of first line to create a face
- **Shapes:** Draws shapes. We will use the rectangle tool for the purposes of this exercise. Tool Operation: 1. Click to set first corner 2. Move cursor diagonally 3. Click to set second corner 4. Esc = Cancel Operation
- **Push / Pull:** Adds and subtracts volume from your 3D model. Tool Operation: 1. Hover cursor to select a face 2. Click on the face 3. Move cursor to push or pull face into 3D form 4. Click to finish push/pull operation 5. Esc = Cancel operation
- **Offset:** Creates copies of lines at a uniform distance from originals. Tool Operation: 1. Click on a face 2. Move cursor 3. Click to finish offset operation 4. Esc = Cancel operation
- **Move:** Moves, stretches, or copies entities. Tool Operation: Click on an entity. Alternatively, pre-select multiple entities with the Select tool 2. Move cursor to new location 3. Click to finish move operation

- **Rotate:** Rotates, stretches, distorts, or copies entities along a rounded path. Tool Operation: 1. Click on entity 2. Move cursor in circle until it is at starting point of rotation 3. Click to set starting point of rotation 4. Move cursor in circle until it is at ending point of rotation 5. Click to complete rotation
- **Tape Measure:** Measures distances, creates guide lines or points, or scales model. Tool Operation: 1. Click at starting point of measurement 2. Move cursor 3. Click at ending point of measurement
- **Orbit:** Rotates camera around model. Tool Operation: 1. Click anywhere in drawing area 2. Move cursor in any direction to rotate around center of drawing area
- **Pan:** Move camera (your view) vertically or horizontally

3. SKETCHUP (continued)

B. MODEL THE DEVELOPMENT

In SketchUp, we will 1. Draw the parcel, and 2. Draw the building. Optionally, you can add neighbouring parcels, buildings, shadows and other details for context.

1. Draw the Parcel: Use the Rectangle Shapes tool to draw the parcel. Click the Shapes (Rectangle) Tool. The cursor will turn into a pencil. Click the Origin (the junction of the blue, red and green lines), and pull to the right (do not hold the mouse button down as you do this). As you pull to the right, you will see the numbers in the Dimensions box at the bottom right changing. By pressing the Tab key, you can enter the desired dimensions (which you noted using My Property earlier). (If you wanted to create a polygon that was 10m by 20m, you would enter it in the format 10m, 20m). Press enter and your polygon will be created.

After you have drawn the parcel, you will need to click the Select tool and click and drag the mouse to select the parcel that you have just drawn. Right click and click “Make Group”. Grouping will prevent issues with sticky geometry when you draw the building.

2. Draw the Building: The size of the building footprint is determined by the numbers in your spreadsheet. Follow the same steps that you took in drawing the parcel to draw the building footprint. Remember to group the object. You can use the move tool to place this polygon within in the larger parcel polygon (keeping a rear setback of 6m and side setbacks of 3m).

Right click the object and click edit group. Select the push/pull tool and click on the building polygon to pull the polygon up to the desired height (you can also hit Tab after selecting the push/pull tool and click the polygon to enter 21m in the Distance measurement box in the bottom right).

For additional detail, you can draw the floors. Click the lines (pencil) tool. You can measure 4m from the base by clicking on a lower corner of the building, clicking Tab, and typing 4m. You can then use the top of the line you just drew to start the line for the first floor. Drawing the floors is accomplished with the lines and the rotate tool.

Optional: Add neighbouring buildings: Repeat steps 1 and 2 above to add neighbouring parcels and buildings for context.

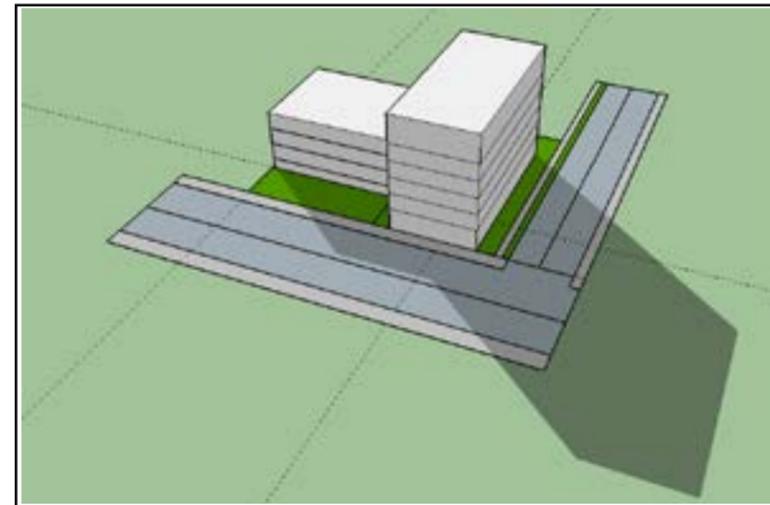
Optional: Add Streets: Add adjacent streets for context.

Optional: View shadows: Click View – Shadows. On the right-hand side (Under the Default Tray menu), click Shadows. You can model the shadows during different times of the day and different times of the year by moving the sliders.

Optional: Change Styles: Landscape Architecture Style and Default Style usually work well.

Optional: Change Materials: Use the colour palette to colour grass green etc.

Here is the final model with adjacent building, roads and sidewalks for context. Shadows are set for January at 3pm:



LINKS

- My Property: maps.calgary.ca/MyProperty/?redirect=/myproperty
- Planning and Development Map: developmentmap.calgary.ca/#map
- City of Calgary Interactive Land Use Bylaw: lub.calgary.ca/
- SketchUp Software Download: sketchup.com/download/sketchup-make/windows/thank-you
- Free Members Only Online Resource: calgarycommunities.com/members-only/

Our urban planners are here to help you! If you have questions, comments or ideas, contact us at:

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This resource and many others available to our members can be found on our FREE members only online resource library [here](#).

