RESEARCH REPORT

KAITLYN KANE ARCH 771 DR. GANAPATHY MAHALINGAM NORTH DAKOTA STATE UNIVERSITY



THE METHODOLOGY OF CALCULATING THE CARBON FOOTPRINT OF A BUILDING

INTRODUCTION

The thesis research topic I chose is the methodology of calculating the carbon footprint of a building. I chose this topic because I care a lot about our environment and sustaining it. How can I take a site and not wipe it clean and start with my own ideas and design, but to sit back and look at how the site itself can guide my design? I've been working on studying different types of building materials and calculating their individual emissions. I will further research how to adapt or change those materials to reduce carbon emissions. I think it is important to realize that we are first and foremost integrating into nature and not throwing up a build and then going back to integrate nature back within the site. I was at a hunting cabin a couple of weeks ago and they told the story of how they built the cabin and they had said that each tree that was cut down for the location of the cabin was planned out and used for the structure and finishes. Materials that belong on the site are used on the build. I really want to work towards being more aware of the existing site and working more on my perspective of existing elements and how important they are. Destroying existing elements within a single site is "small" & "unimpactful" is not the way to think while designing architecture because the Earth is our site. The more we ruin and destroy individual sites will result in destroying our Earth. I started researching how to calculate a buildings carbon footprint and struggled to find enough information to realistically find out results. This thesis topic intrigued me to study a deeper way to be able to understand the carbon footprint of a design before it is built and how to reduce an existing building's carbon emissions.

METHODOLOGY

My first plan off attack was to "simply" figure out how to calculate the carbon footprint of a building. I found out that this was not so simple. I was able to find a lot of websites that businesses can pay for and use to find out their results; but this didn't help me. I wanted to know HOW to calculate, not just the results. So, first things first, what makes a carbon footprint? This is the question that needs to be defined before anything else. This is the problem, so I need to fully understand what the problem is before trying to solve it.

CARBON FOOTPRINT

What is a carbon footprint? It is spoken about worldwide. The term is used to specify a problem; seems like a big problem at that. Nobody seems to use this term in joyful way. The definition of carbon footprint it "the total amount of greenhouse gas emissions caused by an individual, event, organization, service, place or product, expressed as carbon dioxide equivalent". So, this led to further investigating. With guidance from Professor Ganapathy Mahalingam, I was introduced to Building Transparency's EC3 tool. This was the start to it all.

EC3 TOOL

Building Transparency is a website that fosters a better building future by addressing embodied carbon's role in climate change. It allows you to create an account and import Revit models in. You can also upload multiple models to be able to compare them. This site also allows to explore many different material types and learn about each of those material's emissions. EC3 is a great tool for my thesis. It has really allowed me to learn in so much detail about material choices and carbon emissions.

TALLY

I found the Tally extension through Building Transparency website. They provide Tally as a sister software. Tally is a Revit extension that allows the flow of data from Revit to the EC3 tool. This software was game changer. It plugs right into Revit and is easy to learn. It takes all of your components on your model (floor, doors, windows, roof etc.) and allows you to choose a specific material to define it. Once all of the components are defined, you are then able to convert it over to EC3 to collect your results.

RESULTS

Throughout researching, I have found a way of using multiple software that can be used together to calculate existing data. I have created a YouTube video that allows anyone to see the process I used to covert a Revit model to the EC3 tool. I have included all of my slides that make up my video. These slides capture the majority of what I have learned while researching the methodology of calculating the carbon footprint of a building.

CONCLUSIONS & PROJECTIONS

From here I will go on in the spring semester to pick an existing building and create a model of it in Revit. Then I will insert the current materials that are being used. I will then run it through EC3 and figure out the starting carbon emission data. Then I will go back into Revit and Tally and choose different materials and work to reduce the carbon emission for an end result.

I am very proud of where I am at this point. I hope that this process that I have went through will benefit not only the way we design but also the Earth. I hope to find additional ways to help reduce carbon emissions in the future to help do my part to help our world.

YOUTUBE VIDEO

I am including the link to my YouTube video for ease of access.

https://www.youtube.com/watch?v=sfgvYCzDcmo

Below are my slides of my video, but they are missing the audio so make sure to check out the full video with audio.

Converting Revit Model to ⊑C3 Tool



Created By: Kaitlyn Kane Guided By Professor Ganapathy Mahalingam



User left click on "Add-Ins User left click on " lally"



Step 4: Step 3: User left click on "Full Building Study" User left click on "Type" dropdown box 01 10 TH © 2022 Building Trans 🕀 Help = 🔍 Define Scope 🛸 Refresh 🖷 Save Report 👘 Manage Def © 2022 Building Trans 🛞 Help = 🔍 Define Scope 🚿 Refresh 🗐 Save Report 🗊 Manage Defin Type: Full Building Study Type Apply Cancel Apply Cancel crieccal categories; R#

Step 5: User left click on "Categories" box

Step 6:

User left click on the current project box (RACbasic_sample_project)







Step 12:

User left click on "Finishes" drop down arrow

- 03 Concrete
- 04 Masonry
- 05 Metals
- 06 Wood/Plastics/Composites
- 07 Thermal and Moisture Protection
- 08 Openings and Glazing
- 4 09 Finishes
- Ceiling systems
- Coatings and paints
- Flooring
- Plaster and gypsum board
- ▷ Tile
- D Trim/base
- Wall finishes

Step 13: User left click on "Flooring" drop down arrow

- 03 Concrete
- 04 Masonry
- 05 Metals
- 06 Wood/Plastics/Composites
- 07 Thermal and Moisture Protection
- 08 Openings and Glazing
- 4 09 Finishes
- Ceiling systems
- Coatings and paintsFlooring
 - Carpet, nylon
 - Flooring, brick
 - Flooring, engineered wood plank
 - Flooring, resilient
 - Flooring, solid wood plank
 - Flooring, underlayment, cementitious
- Plaster and gypsum board
- Tile
 Trim/base
- Wall finishes
- Han minutes



	St User left c	ep 15: lick on "Apply"		
Image: Second strength Marce Control Strength Marce Control Strength Marce Control Strength Marce	1 € (10) X Stand 1 ★ 10/6 Environment Impact fact (2014).004.0040.004.0040.0040.0040.0040.00	servent – – – – – – – – – – – – – – – – – – –	D X Inngenning In Science	
Ame Hafan Lines By Drugshee Hann Analysin C. Harres Man Earls Terry View Arres Statistics Constraints Statistics Constrai	20 - Converging and Conversion 20 - Converging and Conversion 20 - Carling under parise 20 - Carling under parise, committions 20 - Carling under parise, committions	tade Branchersen († 44 m George Trockness) († 44 m George Trockness) († 44 m Carpet Holes Not angel trockness of adhesive and tacking Composed Nat gist dafored		91.
Stark Analysis Difference				

Step 16:



Step 17: User left click on a specific material type



Step 18: User left click out to allow for default input



Step 19: User left click on the material definition drop down for "Underlayment"

ete Et 40	e to x Basel		
a	Tully* Environmental (mpact Tool (HON-COM/MEICH4) - RAC_basic_semple_project	- = ×)	
3D View •	🛞 Help * 🔍 Define Scope 🖷 Refeeth 🖲 Seve Report 💮 Manage Definitions	© 2022 Building Transparency LCA Data by thinkstep	-
View: (3D) - 🖽 Edit Type		~1	In Test
w Scale Cuntom	Lange enteremental impact idea (neuro cumareneuro) - roc-pasie-pampie prejact	~	100
le Value 1: 100	Define Components and Quantity Takeoffs	Save Cancel	
al Level Medium	Creat mine		48
bitto/Graphics 0., Edg.	Nvins carrier inclusion of arthenion and fractions		
phic Display Opt. Edit.,			
cipline Architectural			
auft Amakonin Dia			
w Grids Edit.	I iii Carpet type Commercial low-traffic carpet, medium pile, GUT - EPD		
Path			
nts &	 Undersymetric 		
e Racion Veible			
and at here a	Service Life		
CALINE OFFICE	years Existing or salvaged material		
ct Browser - RAC_basic_sample_project	Televit Method		
- Floor Plans			No Contraction
Evel 1			
Level Z			
- sa She			
El Approach	Adhesive -Material not defined-		
- III From Yard			
Kitchen			
Li Living Room			
Solar Anaksis			
(30)			
Elevations (Building Elevation)			
East This and			
South		and the second se	
West.			
Sections (Building Section)		in the second second	
Building Section			
Longitudinal Section	- Make of a second		
11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	A PR DE LA REAL PR LA REAL PR DE LA		

Step 20: User left click on User left click on a specific material type He R G erter Taty-2 01 1 © 2022 Bui Help * Q. Define St S Reberth B E. 4 Telly® Enviro mental Interact Tool (NON-COMM Carpet, nylon Nylon carpet in ive and backing) © Carpet type • Underlay 24 • Adhesive -Material not defined 2 🖸 🛄 🕅 Main Moo * # 4 # . 0 74

	Step 21:	
	User left click out to allow for default input	
	eser left chek out to unow for default input	
(8) (8)	6	
toury humanit a modul About Convert R	Tay 4	
te Formit	ter Taby®	
	an any -	
parties	🗈 anti-Thebase 🛛 😥 (10) 🛛 🗙 Efficient	
6	😧 Tally® Environmental (impart Tool (INON-COMMERCEL) - RAC_basic_sample_project =	×
10 30 Year -	🛞 Help * 🔍 Delive Scope 🐁 Refresh 🗎 Save Report 🕅 Manages Delivitions 🛛 0.2022 Building Transport	ney
View: (3D) - 🖽 Edit Type	LA Line by three	
phics B	At Tably © Environmental Impact Tool (NCH+COMMERCUR.) - RAC_basis_sample_project 🛛 🛛 🗙	and the second
ale Value 1: 100	Define Components and Quantity Takeoffs Save Cancel	
tail Level Medium	Commentary Sector Secto	- 50 - 50
ts Vedsfely Show Original	Carpeter reproto Notion automatication of authorizing and fear-fairs	
aphic Display Opt. Edit,	A set a state sta	9
cov Hidden Lines By Discipline		唱
fault Analysis Dis. None	1 III Camet taxe. Commercial low-traffic camet medium ale GUT - EPD	
n Path		
ents &	Ondersymmetry Detromational from Benchmark from Benchmark	
op Ragion Visible	Lunaetaywere, toan appropriate for fearned plantic backing for	
perfits help Apply	Service Life virgit or subber or to be used as accurate The default (10 used) > The default (1	
ject Browser - RAC_basic_sample_project	of 2 mm trickness appropriate for acoustic	
(C) Wews (all)	tendense of Alles Density	and the second sec
Level 1		
Site		
G 30 Views	1 Adhenye Matanial not defined-	
- Call Approach		
- Kitchen		
III Section Perspective		
Solar Analysis		
- Elevations (Building Elevation)		
East North		
South		
Sections (Building Section)		
West Sections (Building Section) Building Section		

<text>

Step 23: User left click on User left click on a specific material type

Meany Panerit a model About Convert B	s. Tanya antar Tanya			
N				
Properties	Eliscol-surgeous A (co) x (Toports			
3D View	U say - Dr. romana impact o	on Denier connects with new pairs multiple build		
×	(1) Help * 🔍 Define Scope	🕾 Refresh 🖲 Saver Report 👘 Manage Definitions	© 2022 Building Trans LCA Data by th	anercy ristep
30 View: (3D) - El Edit Type		Tan I MARIA COMMISSION DEC Annual annual		
Graphics &	20 Laty a Christmania Impa	et roor (NCN+-CONTINENCOV.) - RAC_basic_sampra_project		
Scale Value 1: 100	Define Components and Quant	Ry Takeoffs	Save Can	8
Detail Level Medium	Court alter			
Parts Visibility Show Original	Carpet nyion	And a second second		
Graphic Display Opt. Edit.	repair carper measure of earlier	An and second		8
Discipline Architectural				
Show Hidden Lines By Discipline				
Show Grids Edit.	> @ Carpet type	Commercial low-traffic carpet, medium pile, GUT - EPD		
Sun Path				
Extents &) @ Underlayment	Underlayment, foam		
Crop View	d 单 Johnston			
HERE ADD	None N			
Project Browser - RAC basic sample project	Floor adhesive, carpet			
Elser Plans				and the second sec
Level 1	Takeoff Method			
Level Z				
She				
- su news				
From Varid				
- Kitchen				
Living Room				
Section Perspective				
(30)				
- Elevations (Building Elevation)				
- East				
North		and second and		
South Mart				
- Sections (Building Section)			P and a second	
Building Section			and the second se	
Longitudinal Section				
Stair Section	1:222 四日 (1 (1 (1 (1 (1 (1 (1 (1 (1 (1 (1 (1 (1			
Click to select, TAB for alternates, CTRL adds, SHIFT (nselects.	61	 Main Model 	第44 章 0 95

Step 24: User left click on "Save"



<section-header><complex-block>

Step 26: User left click the box to the right of "Gross Building Area" Convert RFA Tally* Halp memit a model About Da Modify Taty 4 🊸 Tally® En 0 Telp * Q © 2022 Building Transpo UCA Data by this 00. R. Export to EC3 (BETA) Save Cancel Eit of Mater Tidie Date Author Compa Project Edit transportatio Contribution Assess Contribution Assess Division Revit Category Building Element (#) Ind Locatio Cover Map Gross B 4rea Elec Heating Water Map Eed Heating 1.22 20<mark>0%</mark>%^#^##@**B#### **** 20 20

	Type tł	ne building area	amount		
Adding Tomment a model Adding Tomment a model Adding Tomment a model Adding Tomment a model Tomment	 (2) (10) X (2) love 1 (3) 40 financement impact from (2009 COMACIC) 	1) - BAC, Janis, sample, grejort	- 0	×	
Winner (3D) → ⊞ faite Type	🕑 Halp * 🔍 Define Scope 😁 Refresh 🕮 Sa Report Details	ve Report 👘 Manage Debritions	© 2022 Building Tri UCA Data by	rapaverey y thiskatep	(and
env Scale (Custom) cale Values 1: 150 web Loval Mediaen test Visibility Show Original Values Original Software Datase Oct. 5610.	Report Information Trite Euli building summary	Transporation Impacts ®	Export to EC3 (BETA) Save Can Output Summaries St Bit of Materials (Excel) Contribution Assessments (PDP)	cel	
rophne Architectural nor Hidden Lines Dy Discipline fact Analysis Dis. None au Girids <u>60%.</u> nº Bath <u> </u>	Author kaitynSane Company Autodesk Project Sample House Erber addess here	Biogenic Carbon () Pinclude biogenic carbon (default) Ciclude biogenic carbon	 Ø Division Ø Ravit Category Ø Building Element 		- n
p View p Region Visible p Region Visible Apply Apply ct Browser - RAC, basic, sample, project X	Cover - set image - Gross Building Area I - Espected Building UR 60 years	Include Construction Impacts ® On-site Construction Electricity Heating	Source	P	1
A, Vens (240) Floor Plans Level 1 Level 2 30 Marce	Boal and Scope of Assessment.	Weiter			
Approach From Yard Kitchen Living Room Section Perspective		Annual Stie Energy Use Electricity Heating	Source		
Solar Analysis Do		-			
Sections (Building Section) Building Section Building Section School Stair Section 1: 303 Diag	©< ▲ ∴ ##66 ♥ ? B#674				

Step 28: User left click on the box to the right of the building area amount Convert RFA B Taly® Help al About 🦚 Tally® En 0 () Help * © 2022 Building Tra UCA Data by Report D Export to BC3 (BETA) Save Cancel 2 Tide Date Author Edit transportation de tribution e... Life Cycle Stage Division Revit Category Building Element N N N N Compar Project Inc
 Esc Cover Map N Gross B 3000 Ehi Heating Water Heating * 4 % C * 0 % 1 0 0 0

ka Egy Help Egy Sov Steff Tammi e medi Abot Carvell 5- Le) 4	User le	Step 29: ft click on the de	sired unit	
lect • «Tansmit Formit Converter Tally®				
pertes X 🖾 ADD1 - Title Sha	et 😧 (30) X 🔚 Level 1	CHIN BACK - Comments and a		
🔗 3D View 🔹	any any a characteriance impact tool (notre-considering	cost) - roc_banc_tampit_project	D 2022 Ruiden Terreparen	
	Belp * Species Scope Stefeesh B	Save Report I Manage Definitions	LCA Data by thinkets	
NG 8	Report Details			and the second
Scale Customs	and the second second		Export to EC3 (BETA) Save Cancel	
8 Level Medium	Report Information	Transporation Impacts (2)	Output Summaries	
elity/Graphics 0 Edit,	Tide Full building summary	Edit transportation distances	Contribution Assessments (PDP)	6
pline Architectural	Date 10/31/2022		Division	
w Hidden Lines By Discipline	Company Automatic	Biogenic Carbon @	Revit Category Relation Fernant	
w Grids Edito,	Project Serrole House	Exclude biogenic carbon		
Path C &	Location Enter address here			
View	Cover - set image -	Include Construction Impacts ©		
nieshep Apply	Gross Building Area 3000	On-site Construction	Source Map	
t Browser - RAC basic sample project X	Expected Suilding Life 60 ft	Electricity		
Wews (all)	Goal and Scope of Assessment	Heating		and the second sec
Level 1		Water		
Level Z		Include Operational Energy Impacts		
10 Wews		Annual Site Friendy Use	Source	
- S. Approach - C. From Yard		Electricity		
- Gitchen		Heating		
- Section Perspective				
Solar Analysis	<u> </u>			
- Bevations (Building Bevation)		A Comment of the second		and the second se
East North			3	
South				
Sections (Building Section)				
- Building Section				
set congruente section	00000000000000000000000000000000000000		-	



			Fill in "Cool of		scossmont" boy	
<complex-block></complex-block>	<complex-block></complex-block>		Fill In Goal a	and Scope of A	ssessment dox	
<complex-block></complex-block>	<complex-block></complex-block>					
	<complex-block></complex-block>					
		😼 📑 ньр 🔝 🦃				
		Modify Transmit a model About Convert RFA Tally® to Formit				
		Select - elkansmik Formik Converter Tally/R				
		ropertes X El A001 - Title She	eet 19 (30) X 🖸 Level 1			
		3D View -	A Tally® Environmental Impact Tool (NON-COMMERCIA	L) - RAC_basic_sample_project	- ¤ ×	
			🛞 Help * 🔍 Delise Scope 🛸 Refresh 🗏 Sa	rer Report 👘 Manage Definitions	© 2022 Building Transportery LCA Data for thirdintee	
NPAC Table 1 Name Name 1 Name 1 <		30 View: (3D) 🗢 🖽 Editi Type	And the second sec			
		Stephics 8	Naport Detain		Ferrort to IC3 (IETA) Save Castel	the contract of the
India La Matan India	And Law Mulan manufactor Mulan	Scale Value 1: 100				
The first fir		Detail Level Medium	Report Information	Transporation Impacts (2)	Output Summaries	-43
Dark Unit Operation Barrier <td>Signed: Signed: Signed:</td> <td>Vnibility/Graphics 0 Edit.</td> <td>Tidle Full building summary</td> <td>Edit transportation distances</td> <td>Contribution Assessments (PDP)</td> <td>•</td>	Signed:	Vnibility/Graphics 0 Edit.	Tidle Full building summary	Edit transportation distances	Contribution Assessments (PDP)	•
Author Market Author Ma	<pre>matrix information matrix matrix</pre>	Graphic Display Opt. Edit	Date 10/31/2022		Life Cycle Stage	9
Initial Action Line	Data A taxing time: Data A taxing ting time: Data A taxin	Discipline Architectural Show Hidden Lines By Discipline	Author kaitynkane	Biogenic Carbon @	M Division	
Aber dief Officient Officient Opposition Opposition <		Default Analysis Dis. Norm	Company Autodesk	Include biogenic carbon (default)	Building Element	
Introduction Introduction <td>Interiment Provide Provide</td> <td>Show Grids Edit ,</td> <td>Project Sample House</td> <td>C Exclude biogenic carbon</td> <td></td> <td></td>	Interiment Provide	Show Grids Edit ,	Project Sample House	C Exclude biogenic carbon		
<pre>implice the first f</pre>		atents &	Location Enter address here			
Startistical data Apply Option Starting data Apply<		Crop View C	Cover + set image -	Include Construction Impecta @		
Bender Market Schwarz (Sampferginger Market) Bender Market Schwarz (Sampferginger Mar		And	Gross Building Area 3000 th ²	On-site Construction	Source	
Vector Note: Status Note: Status Note: Status Vector Note: Status Note: Status Note: Status Note: Status		New Street Street	Expected Buildion Life 80 years	Electricity		
Poor Net	Poor Training Poor Tr	3 [0] Wews (all)		Heating		
Image: Second Procession Provided Procession Provided		Floor Plans	Goal and Scope of Assessment.	Watar		Party States
Ber Ber Bortes B	Image: State Image: State Image: State	Level 2	r			
Borney Barren Barr		- 🗱 She		Include Operational Energy Impacts	0	
Bechnight Bechnight B		- CI Approach		Annual Sita: Energy Use	Source	
Bohom Shark S		- Erom Yard		Electricity		
Extrant Presentine	Strate Proposition Strate Propositio	La fotchen		Heating		
Border Analysis Define Analysis	Storkrauges Downlawers	- Section Perspective				
Brandwin Talaking Bennon Barrow	Turner Turne	Solar Analysis				
Infr	■ End ■ Monh ● Soche Skullely Scenol ■ Sectore Skullely Scenol ■ Sectore Skullely Scenol ■ Sectore Skullely Scenol ■ State Sceno ■ S	Elevations (Building Elevation)				
Second Biology Second Second Se Second Second Se	ာ အက်က အက်က အက်က အက်က အက်က အက်က အက်က အက်က	East				
Sectors Bulleting Sectors	- ● Wer - ● Extra Building Section - ●	- La North			8	
setter di divista jettero	Setter Building Setter) ම Luing Setter I Star Setters I Star Setters I Star Setters	West Vest			1	
Executive second	■ Dopplement formo ■ Target Section ■ Target	Sections (Building Section)				
	🧱 Star Section 1: 222 区 🗗 🚱 😧 小森 約 税 🎐 🔍 路 約 巻 🖬 🥢	Longitudinal Section			and the second sec	

Step 32: Fill out any other information needed to define the project Hab R Convert RFA Taby® Tab-R × **1** тыу е в (1) Help () () 8. ret Detail rt to EC3 (BETA) Save Cancel utput Summaries Edit transp Tide Date Author Compar Project Location Cover Contribution Assess Life Cycle Stage Division Ravit Category Building Elemen Autoclesk Map Gross Buildie Expected Bu ft² ing Life Heating Water Goal and Scope of Ass ecal 1 In Electr ******

		Step 33:		
	User click	on "Export to E	C3 (BETA)"	
toff Tennent a model Adapt Example 13. Tennent a model Adapt Example 13. Ten/s toff tennent 13. Ten/s toff tennent Example 13. Ten/s toff tennet Example 13. Ten/s toff tennet Example 13. Ten/s toff tennet Example 13. Ten/s toff te	€ 400 x ⊡seet t			
30 View -	Tally® Environmental Impact Tool (NON-COMMERCIA)	L) · RAC_bunic_sumple_project	- 🗆 X	
See 13D	Thelp * C. Define Scope Stefresh 🖲 Se	ve Report Definitions	LCA Data by thinkstep	
hks & R State Euntreen	Report Details		Ferrent to FCT/HETAL Swee	100 Tan 1000 100
e Value 1: 100	Report Information	Transporation Impacts (5)	Output Summaries	
Visibility Show Original	Title Full building summary	Edit transportation distances	Bill of Materials (Excel) Contribution Assessments (ROD)	
his Display Opt. Edit.	Date 10/91/0022		Life Cycle Stage	0.
#Hidden Lines By Discipline	Author keitlynkene	Biogenic Carbon @	Revit Category	
v Grids Edit,	Company Autodesk Project Sample House	Include biogenic carbon (default) Exclude biogenic carbon	Suiding Element	
Peth C R	Location Enter address here			
Region Visible	Cover - set image -	Include Construction Impacts @		
ntes help Apply	Gross Building Area 3000 ft ^e	Electricity	Source Map	
t Browser - RAC_basic_sample_project X	Expected Building Life 60 years	Heating		
Floor Plans	Goal and Scope of Assessment ec3	Water	1	The second se
Level Z Store		Include Operational Energy Impacts		
3D Wews		Annual Site Energy Use	Source Map	24
From Yard		Electricity	1	
Liking Room		Heating	-	
Section Perspective	L'		1	
[] (3D)	-	No. of Concession, Name		
East				
- L. North			3	
Sections (Building Section)				
The second se			and the second	

Step 34: Fill in EC3 account information



Step 35: User left click on "Building Use" drop down



Step 36: User left click on "Building Use" drop down EC3 = PRIVATE USER A 0 # EC3 / Plan & Compare Building SAMPLE HOUSE SAVE... \$ BUILDING NAME / ADDRESS / IMAGE Project Name * Sample House Building Use None 2 Project eddress 225 Paul Bunyan Dr SE, Bernidji, MN 56601, USA BUILDING USE BREAKDOWN × Map Satellite [3] Floor Area Abs 3,000 ft2 Floor Area Balow Grade Gross Floor Area 3,000 ft2 Building Us antity * Other × -Dz 100.% . + DONE NOTES & LINKS BUILDING CLASSIFICATI • EMBODIED VS OPERATIN + FLOOR AREA Gross Floor Area 3k n2 ir Area Above Grade 3.000 ft2 Floors 2 Stories .12M too Roor Area Below Grade

Step 37: User left click on building use type

						1.00
EC3 / Plan & Compare Buildings						Tour: BUILDING PLANNER
AMPLE HOUSE						SAVE. CANCEL
BUILDING NAME / ADDRESS / IMAGE						
Project Name * Building Use						
Sample House None	Ø	Approximate Constr	uction Start Date 🛛 👻		1997	1917
Project address 275 Raul Burunan Dr SE, Baenudu JAN 155571 (153	BUILDING USE BREAKDOWN	4		×	串	_ =
Map Satelite [2]	Floor Area Above Grade 3,000 ft2	Floor Area Below Grade O ft2	Gross Floor Area 3,000 ft2			
	Building Use *		Quantity * %			
	pther	×	100.% 100%			
	Storage					
	Residential.Detached	ONE			Realized International Control of	Internet Included
	Residential Multi-Unit					
NOTES & LINKS	Parking					
	Industrial					
BUILDING CLASSIFICATION	Infrastructure Transport				100% Complete	
	Other	~				
EMBODIED VS OPERATING	2 ⁴					View Embodied Vs. Operating
FLOOR AREA						
Gross Floor Area	Floor Are	a Above Grade		Floors		Weight
3k no		3.000 ft2		2 Stories	8	1.12M tos

Step 38: User left click on "Done"

e con realities compare pranul(gs							
						Tour : BUILDING P	LANN
SAMPLE HOUSE							¢
BUILDING NAME / ADDRESS / IMAGE							
Project Name *	Building Lise						
Sample House	None	R	Approximate Constru	ction Start Date	w.	angent program	
Project address 225 Paul Bunyan Dr SE, Bernidji, MN 56601, USA		BUILDING USE BREAKDOWN	1		×	# #	
Map Satellite LG		Floor Area Above Grade 3,000 ft2	Floar Area Ballow Grade O ft2	Gross Floor Area 3,000 ft2			
		Building Use *		Quantity *	99		
		Residential Detached	× =	100.%	100%		
		+					
Gorge			DOME				
NOTES & LINKS							
BUILDING CLASSIFICATION						100% Complete	
EMBODIED VS OPERATING						Ø View Embodied Vs. Ope	rating
2/							
 FLOOR AREA 							



Select the drop down arrow for "Building Classification" and fill out additional building information Step 40:

Select the drop down arrow for "Embodied vs Operating" and fill out information about the buildings EUI

	IUN						100% Complete	
Level of Development		Material Quantity Source		AS Construction Source			Construction Project Scope	
100 : Concept Design	X +	Tally Import	× -	Early Estimate		× +	New	× ,
Primary Horizontal Gravity System		Primary Vertical Gravity System		Podium			Primary Lateral Resistance System	
Concrete: Non-PT Framing	X	Wood: Light-Frame	× -	N/A - Not a podium		Xw	Light Frame Shear Panels	×
rimary Foundation System		Seismic Design Category		Risk Category				
Shallow Foundations	× *	*	× *	II - Normal		× =		
EMBODIED VS OPERATI	NG	nciosure 🛄 intenors					@ View Embo	idied Vs. Operating
EMBODIED VS OPERATI	NG	nciosure 🔲 menors					@ View Embo	idied Vs. Operating
 EMBODIED VS OPERATI 	NG 20 %	Natgas USA		× *	keCO2e / MBtu		G View Embe	idied Vs. Operating
EMBODIED VS OPERATI	NG NetGat Heat 20 %	Natgas USA		× *	kgCO2e / MBtu		View Embo = 1.275 kgCO2e / sf / yr	idied Vs. Operating
EMBODIED VS OPERATI Operational EUI 120 kBtu / sf / yr	NG NetGas Heat 20 % Electricity 80 %	Natgas USA		× * × *	kgCO2e / MBtu 1250 lbCO2eq / MWh		© View Embe = 1.275 kgCO2e / sf / yr = 15.94 kgCO2e / sf / yr	died Vs. Operating
EMBODIED VS OPERATI Operational EUI 120 kBtu / sf / yr	NG NetGes Hear 20 % Bectricity 80 % Otherps	Natgas USA		× *	kgCO2e / MBtu 1250 IbCO2eq / MWh		View Ember = 1.275 kgC02e / sf / yr = 15.94 kgC02e / sf / yr	idied Vs. Operating
EMBODIED VS OPERATI Operational EUI 120 kBru / sf / yr	NG NetGes Heer 20 % Bettricity 80 % Other(s)	Natgas USA		× * × *	kgCO2e / MBtu 1250 IbCO2eq / MWh		View Embe = 1.275 kgCO2e / sf / yr = 15.94 kgCO2e / sf / yr Total Operating Carbon Intensity	died Vs. Operating

Step 41: Look at the bottom right of the "Embodied vs Operating" section to find the buildings Total Operating Carbon Intensity

· EMBODIED VS OPERAT	ING			View Embodied Vs. Operating		
	NatGas Heat	NatGas Heat				
	20 %	Natgas USA ×	 kgCO2e / MBtu 	= 1.275 kgCO2e / sf / yr		
Operational EUI	Electricity					
120 kBtu / sf / yr	80 %	MRO West ×	1250 IbCO2eq / MWh	= 15.94 kgCO2e / sf / yr		
	Other(s)		1			
			-203	Total Operating Carbon Intensity		
				17.22 kgCO2e / sf / yr		
	Total (17.2)	Operating Carbon Intensity 2 kgCO2e / sf / yr				

Step 42:

Select the drop down arrow for "Floor Area" and fill out additional building area information

▼ FLOOR AREA			
Gross Floor Area	Floor Area Above Grade	Floors	Weight
3k #2	3,000 ft2	2 Stories	1.12M its
	Floor Area Below Grade		
	0 ft2	Height	
	Achtevable	Realized	Conservative
EC Building Intensity	139 kgC02e / h2	369 kgCD2e / #2	357 kgC02e / h2
	Achievable	Realized	Conservative
EC Building Total	417k kgC02e	1.11M kgC02e	1.07M kgC02e

		Step 43:	
		Review emission outputs	
	Achievable	e Realized	Conservative
EC Building Intensity	139 kgCO2e / ft2	12 369 kgCO2e / ft2	357 kgCO2e / ft2
	Achievable	e Realized	Conservative
EC Building Total	417k kgC02e	1.11M kgC02e	1.07M kgCO2e
	Achievable 139 kgC02e / ft2 Achievable 417k kgC02e Realized 369 kgC02e / ft2 Realized 1.11M kgC02e Conservative 357 kgC02e / ft2 Conservative 1.07M kgC02e	REALIZED ACHIEVABLE Basellne Conservative Achievable Conservative	Comparison Value Uncertainty range Reported Value

Step 44:								
Scroll	further	down to	review	materials	and	their	prope	erties.

Net Matarbyrat +		Call Conference 🚡 Taly Report As CM	🖢 Reports 🕼 Comparisons 🐧 Import
Japarbornat view is automatically generated at you attign literarial categories to building Beneros. Use the Search Netwerto start			
A PRES	QUANTIV	UNIT Estlection Selected *	Realized- To
V 00 00 No Nesterformer Cade			2.81K ogtobe
Portland commerc. PCA- BPD	33	 t Cement industry IPD 	3.81k spozal miles [
👽 15 00 10 Concrete			1.95H spots 1
💊 dä 21 dä Kendersener Kens			1.051/Fagtotal 🛔
- B Steel, reinforcing rod	594	1 3 RebarSteel	1.000 aprilie - mini-
- B Steel, concrete reinfording steel, CHC-SPD	100	- 1 ReberSteel	387 agintar - villa - 🚦
Ly 03 33 00 Carols-Place Concrete			S4C18 Lignation
🗴 Lignoveight concrete, 2000 pci, 20% fly ach	58	· · ··································	-6+ E
📵 Structural concrete, 4000 psi, 20% fly ach	187	- nik keadyddie	11.2k spotse i et s
🖕 🖷 Structural concrete, 4880 psi, 20% fbj aph	41	- nil kasiyata	2.74k ligotal 14 4
✓ 6608.00.0487.84.5			11.9 aprilar E
Austinum extration, painted, ACC - 010	1	 NE Aluminium Industry 070 	159 sprate - room - E
👽 65 00 100 Wood, Pleaster & Composition			t.tragener 🔋
Ly 05 10 00 Rough Carpentry-			1.1k spoza
- V 06 11 00 Webb framing-			68.7 spoos
Domestic setward, UK, KVC - EPD	01	 ^{m8} WoodFraming Industry IPD 	12.9 ymai (* 1
e Wahat lumber. 2 linch	0.3	- m3 WoodFraming	Blagmer to a 🚦
Weinztlumber, Titch	0.11	- m3 WoodFraming	14.8 ignar en
V 06 16 00 Sheathing			784 sprace
🕒 📵 Oriented strendboard (0390, AMC - RPD	2/	 ^{rri3} SheathingFarets Industry EPD 	794 syccar 100 s 🗄
C 1700 Shee Rebroared Structural Wood-			252 uptos [
V Bi 17 35 Wood Liperts-			283 sproor - 3
Composite wood lypist, KWC - EPD	27.	· · · Woodjakes	255 spraar 100 s [



Review and analyze EC3 data to find out individual material information and emissions along with total building emissions.

Use this information to obtain carbon emissions to set a new goal for improvement.

Visit https://www.buildingtransparency.org/ec3 resources/ec3-user-guide/ for more guidance in EC3 Tool