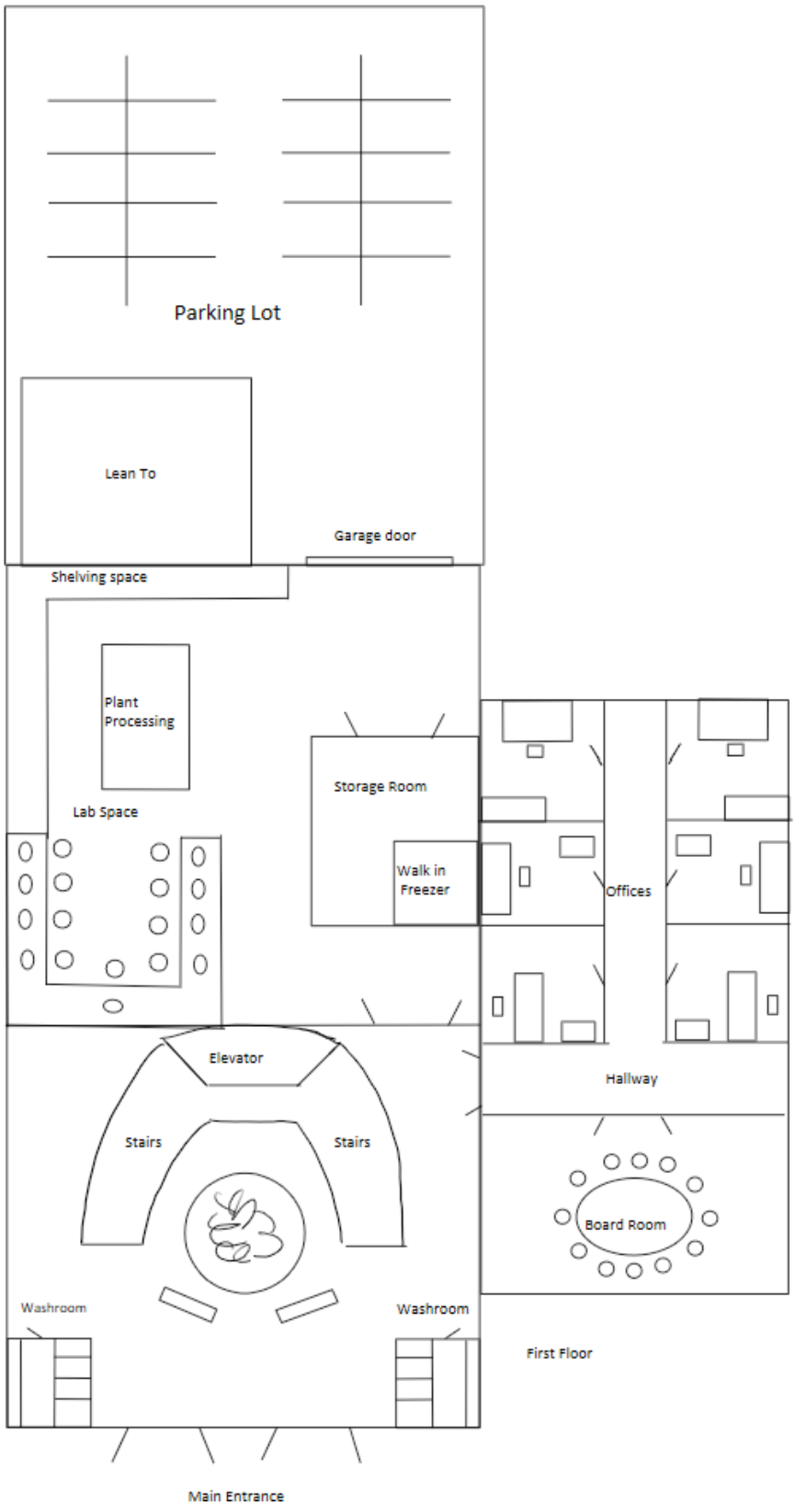
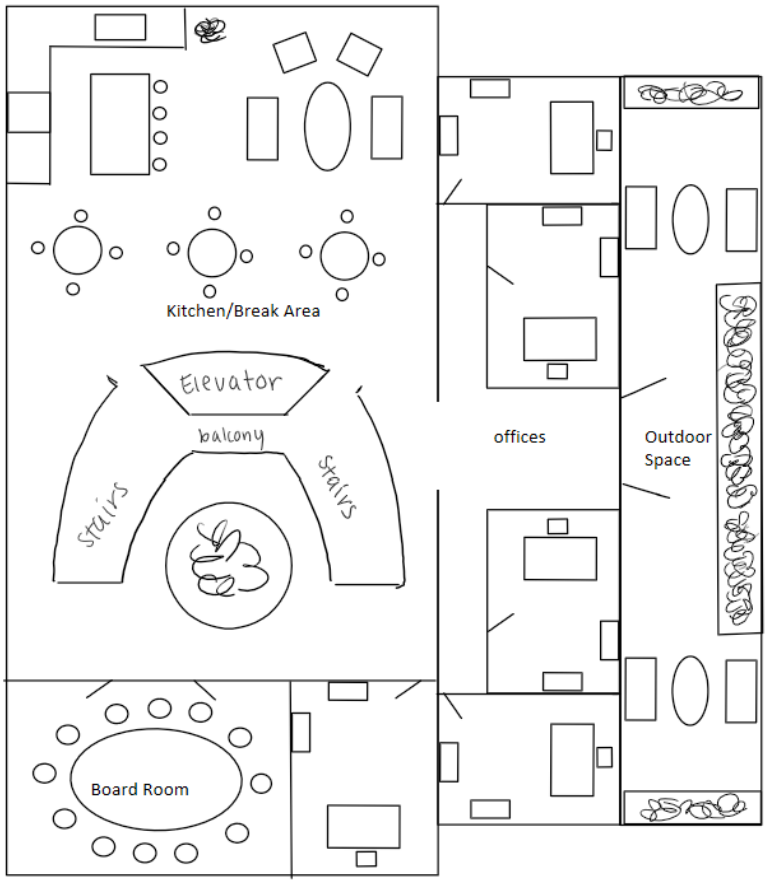
Deliverable E

Detailed Drawing





Second Floor

Our prototypes would be created with a 3D modelling system called Archicad. This software gives out a free 1 year licence to students, hence our total costs for building the prototypes would be $0. To display our designs though we would require a poster board and stationary for the display's aesthetic which would be $20.

Prototype Testing Plan:

Test ID	Test Objective (Why)	Description of Prototype Used and Basic Test Description (What)	Description of Results to be Recorded and How these Results will be Used (Why)	Estimated Plan Test Duration and Start Date (When)
1	- This is a communication in order to get feedback on the design in order to	- The prototype will consist of a 3D comprehensive (focused when	- The main results will be measured on a pass or fail basis if the reviewer feels	- The main dependency would be the actual creation of

	make any adjustments in order to better fulfil requirements or needs, or more practically or aesthetically realise design concepts. - Feedback will be given by peers, TAs, PMs and the Professor, however ultimately receiving feedback from the client directly (via client feedback) would be the most optimal way to test the prototypes as they understand their needs and personal preferences best. However, as there is an accessibility constraint where we are limited with the meetings we are able to conduct with them, the feedback from others who understand the project or are also working on it can still be beneficial. - The main way in which the test will determine if the prototype is successful or not would be if it meets all the criteria of the client, as if it at least accomplishes such then it is functional. - The testing will thus consist of a	only one subsystem is evaluated) analytical model. In order for multiple people to generate the design with multiple subsystems it is more efficient to all separately work on the same overall system. Additionally, there may be many minor changes which are much more practically done using software. Finally, in order to test the prototype a physical model isn't truly necessary as there are no performance tests than can truly be done on the models that we would have access to making due to time and monetary constraints such as load testing. - The actual creation of the prototype will involve using Archicad which is free and as a backup AutoCAD which will be $320 per month. Each person will work	the expectation of the needs are met based on the presented solution. These results are recorded online in which a percentage can be compiled of all the data in order to gauge the average percentage of passing and compile all the feedback for each need or subsystem. - This data will be used to see when to stop. The stopping criteria in this case would be if 90% of all the feedback for each need indicates that it is successful. The individual feedback is also important to see what aspect of the design functions better than others and where most of the constructive feedback is found for each prototype. This aligns with the objectives of the test.	each prototype. In order to evaluate the effectiveness of them they must be entirely completed or updated in order to receive proper feedback of the design as it is not a physical model some unfinished aspects may not initially be noticed which although it was planned to be done can take away attention and feedback from smaller errors that were not considered. - The tests fundamentally depend on how much time the reviewer takes to evaluate the prototype; it is estimated to take a maximum of 10 minutes to review. - The results

	checklist of all the client needs in which the person giving the feedback can evaluate if it succeeds in each criteria or not and then add additional comments for improvements.	on a subsystem or specific part as designated to a team's preference in order to generate a full model with either each floor and an exterior separate or all combined. It is most likely that for our team it will have to be separate as assembling it all together may be somewhat difficult and having it separate does make it more simple to analyse. - As previously mentioned the testing process simply involves putting all the criteria in a list that can be marked as successful or not with additional comments that allow for more personalised feedback beyond whether or not the criteria was met.		must be delivered at least 2 days before the next prototype is due in order to evaluate the feedback and make changes to the prototype in order to then follow up with more feedback using the new design. - It is more difficult for the group to receive proper feedback due to the allocated lab time and thus customer meetings and peer meeting time being so close to the due date and thus it is possible that it may not be enough time to have people respond and interpret the data and make changes. If somehow substantial feedback could be delivered

				before Thursday then it would be more reasonable or if the due date was pushed. It is still worthwhile to compile this data in order to improve the product regardless of the deadline to better understand where the gaps in the design are present. The Gant Chart allocates 6 days in order to compile data which would be more than enough alone however as mentioned the prime time on thursday morning simply does not provide enough time for the changes to be made properly.

Link To the Google Form That Will Be Used:
https://docs.google.com/forms/d/e/1FAIpQLScSfwZy2TLMCnb8X54if7yByi3lo61zfTRrYDiX290SdjfVBQ/viewform?usp=sf_link

Editor Version:
https://docs.google.com/forms/d/1BGIrll4oGucdR-48O9OvhX9CyN_O0vn1uPXmujICkuE/edit

Possible Project risk:

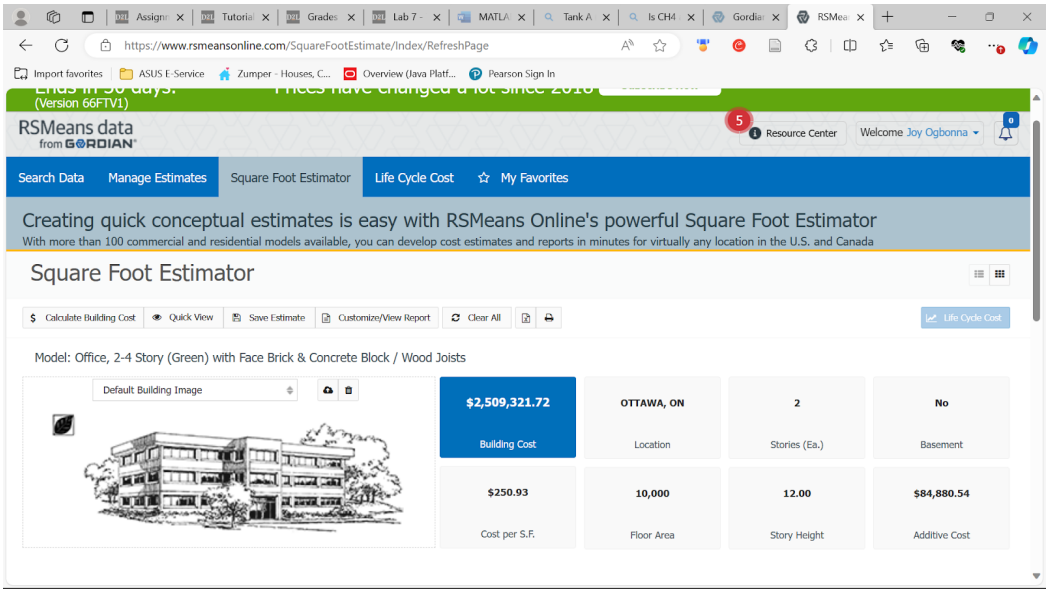
Materials are unavailable/ increase in price: If materials that we have built into our design all of a sudden become unavailable, we plan to alter the design to accommodate the unexpected shortages to change our materials to ones that are currently available and in the client's price range.

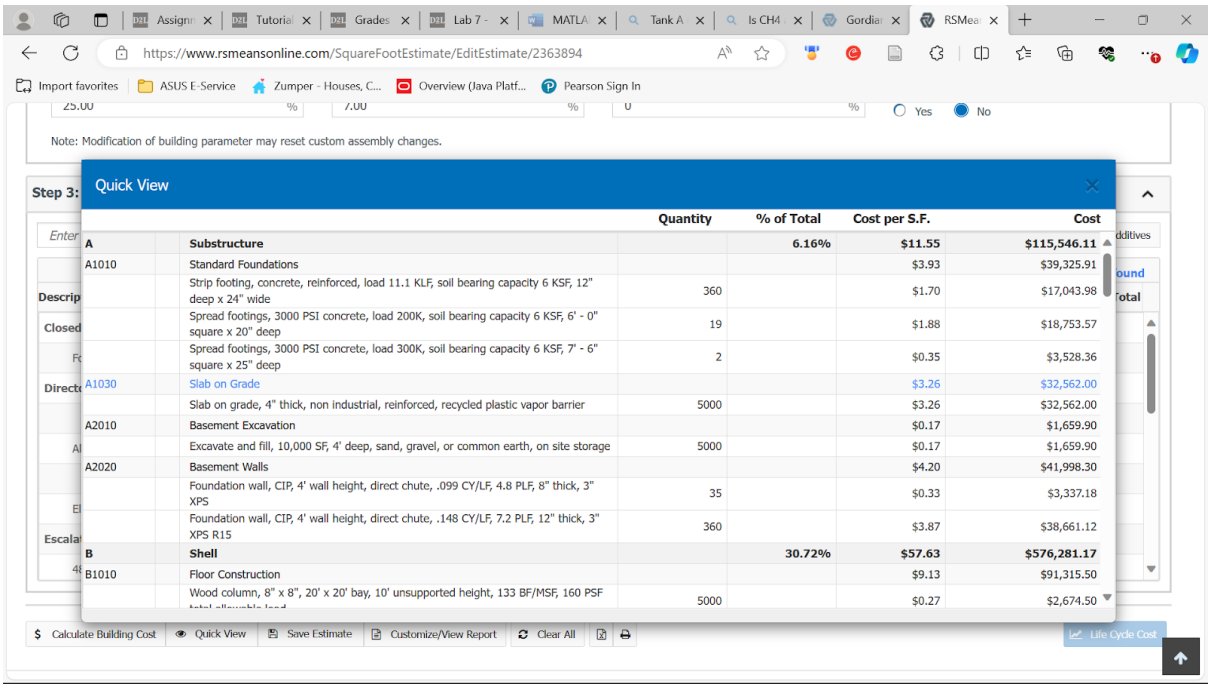
Cannot build during bad weather: the project will be planned to start come springtime so that there is as much workable weather as possible. That way the majority of the exterior can be completed before winter and the construction crew can then use the inclement weather days to construct the interior of the design. If the construction is halted due to poor weather conditions or unexpected natural disasters. The team will increase the project's completion date to a more acceptable and manageable timeline that fits both the budget and the construction company's abilities.

Equipment malfunctions: Built into the budget is wiggle room for possible equipment malfunctions and shortages as well as possible backup machines that can be used on-site as well. This will ensure that the plan can move forward without too much delay.

Cannot build on the ground: If the ground intended for the laboratory site is not fit to withstand the stress of the final building then the group will need to either reconvene with the client to come up with a better placement for the infrastructure, or the design of the final building will need to be redone in order to fit the constraints of the land.

Building Budget:

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Import favorites
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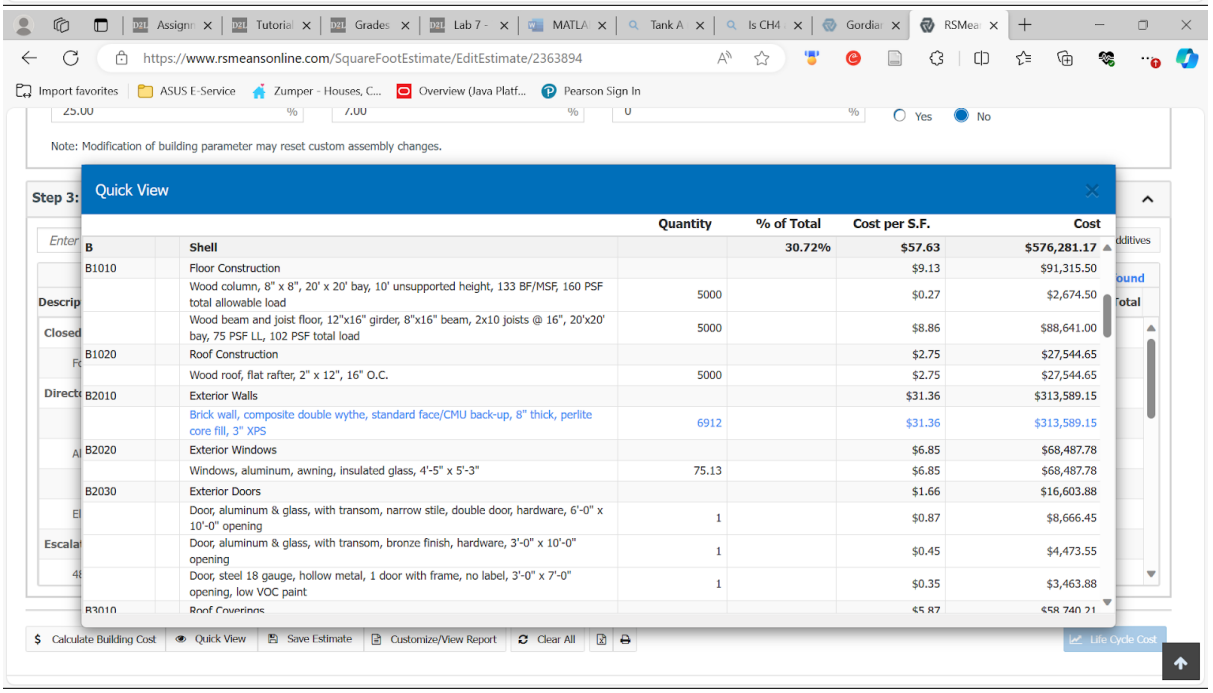
Overview (Java Platf...
Pearson Sign In
Note: Modification of building parameter may reset custom assembly changes.
Step 3:
Quick View
Quantity
% of Total
Cost per S.F.
Cost
A Substructure 6.16% $11.55 $115,546.11
A1010 Standard Foundations $3.93 $39,325.91
Strip footing, concrete, reinforced, load 11.1 KLF, soil bearing capacity 6 KSF, 12" deep x 24" wide 360 $1.70 $17,043.98
Spread footings, 3000 PSI concrete, load 200K, soil bearing capacity 6 KSF, 6' - 0" square x 20" deep 19 $1.88 $18,753.57
Spread footings, 3000 PSI concrete, load 300K, soil bearing capacity 6 KSF, 7' - 6" square x 25" deep 2 $0.35 $3,528.36
A1030 Slab on Grade $3.26 $32,562.00
Slab on grade, 4" thick, non industrial, reinforced, recycled plastic vapor barrier 5000 $3.26 $32,562.00
A2010 Basement Excavation $0.17 $1,659.90
Excavate and fill, 10,000 SF, 4' deep, sand, gravel, or common earth, on site storage 5000 $0.17 $1,659.90
A2020 Basement Walls $4.20 $41,998.30
Foundation wall, CIP, 4' wall height, direct chute, .099 CY/LF, 4.8 PLF, 8" thick, 3" XPS 35 $0.33 $3,337.18
Foundation wall, CIP, 4' wall height, direct chute, .148 CY/LF, 7.2 PLF, 12" thick, 3" XPS R15 360 $3.87 $38,661.12
B Shell 30.72% $57.63 $576,281.17
B1010 Floor Construction $9.13 $91,315.50
Wood column, 8" x 8", 20' x 20' bay, 10' unsupported height, 133 BF/MSF, 160 PSF 5000 $0.27 $2,674.50
Calculate Building Cost
Quick View
Save Estimate
Customize/View Report
Clear All
Life Cycle Cost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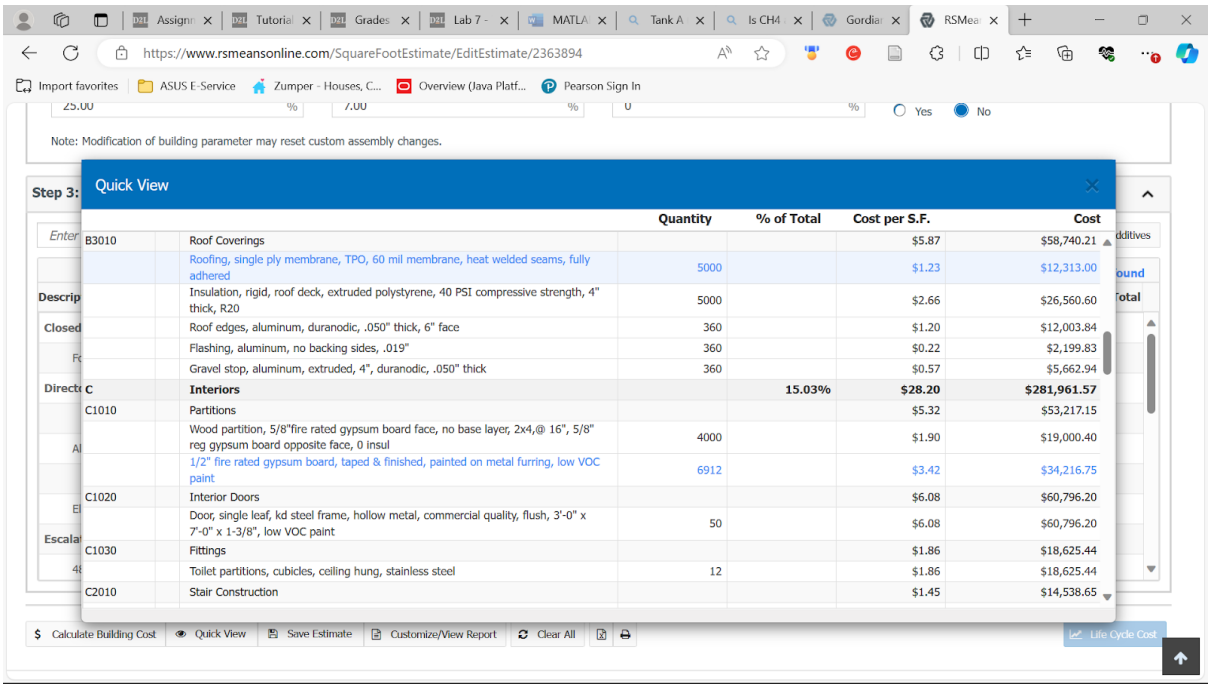
Cost
B Shell 30.72% $57.63 $576,281.17
B1010 Floor Construction $9.13 $91,315.50
Wood column, 8" x 8", 20' x 20' bay, 10' unsupported height, 133 BF/MSF, 160 PSF total allowable load 5000 $0.27 $2,674.50
Wood beam and joist floor, 12"x16" girder, 8"x16" beam, 2x10 joists @ 16", 20'x20' bay, 75 PSF LL, 102 PSF total load 5000 $8.86 $88,641.00
B1020 Roof Construction $2.75 $27,544.65
Wood roof, flat rafter, 2" x 12", 16" O.C. 5000 $2.75 $27,544.65
B2010 Exterior Walls $31.36 $313,589.15
Brick wall, composite double wythe, standard face/CMU back-up, 8" thick, perlite core fill, 3" XPS 6912 $31.36 $313,589.15
B2020 Exterior Windows $6.85 $68,487.78
Windows, aluminum, awning, insulated glass, 4'-5" x 5'-3" 75.13 $6.85 $68,487.78
B2030 Exterior Doors $1.66 $16,603.88
Door, aluminum & glass, with transom, narrow stile, double door, hardware, 6'-0" x 10'-0" opening 1 $0.87 $8,666.45
Door, aluminum & glass, with transom, bronze finish, hardware, 3'-0" x 10'-0" opening 1 $0.45 $4,473.55
Door, steel 18 gauge, hollow metal, 1 door with frame, no label, 3'-0" x 7'-0" opening, low VOC paint 1 $0.35 $3,463.88
B3010 Roof Coverings $5.87 $58,740.21
Calculate Building Cost
Quick View
Save Estimate
Customize/View Report
Clear All
Life Cycle Cost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Yes
No
Note: Modification of building parameter may reset custom assembly changes.
Step 3:
Quick View
Quantity
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Cost
B3010 Roof Coverings $5.87 $58,740.21
Roofing, single ply membrane, TPO, 60 mil membrane, heat welded seams, fully adhered 5000 $1.23 $12,313.00
Insulation, rigid, roof deck, extruded polystyrene, 40 PSI compressive strength, 4" thick, R20 5000 $2.66 $26,560.60
Roof edges, aluminum, duranodic, .050" thick, 6" face 360 $1.20 $12,003.84
Flashing, aluminum, no backing sides, .019" 360 $0.22 $2,199.83
Gravel stop, aluminum, extruded, 4", duranodic, .050" thick 360 $0.57 $5,662.94
C Interiors 15.03% $28.20 $281,961.57
C1010 Partitions $5.32 $53,217.15
Wood partition, 5/8"fire rated gypsum board face, no base layer, 2x4,@ 16", 5/8" reg gypsum board opposite face, 0 insul 4000 $1.90 $19,000.40
1/2" fire rated gypsum board, taped & finished, painted on metal furring, low VOC paint 6912 $3.42 $34,216.75
C1020 Interior Doors $6.08 $60,796.20
Door, single leaf, kd steel frame, hollow metal, commercial quality, flush, 3'-0" x 7'-0" x 1-3/8", low VOC paint 50 $6.08 $60,796.20
C1030 Fittings $1.86 $18,625.44
Toilet partitions, cubicles, ceiling hung, stainless steel 12 $1.86 $18,625.44
C2010 Stair Construction $1.45 $14,538.65
Calculate Building Cost
Quick View
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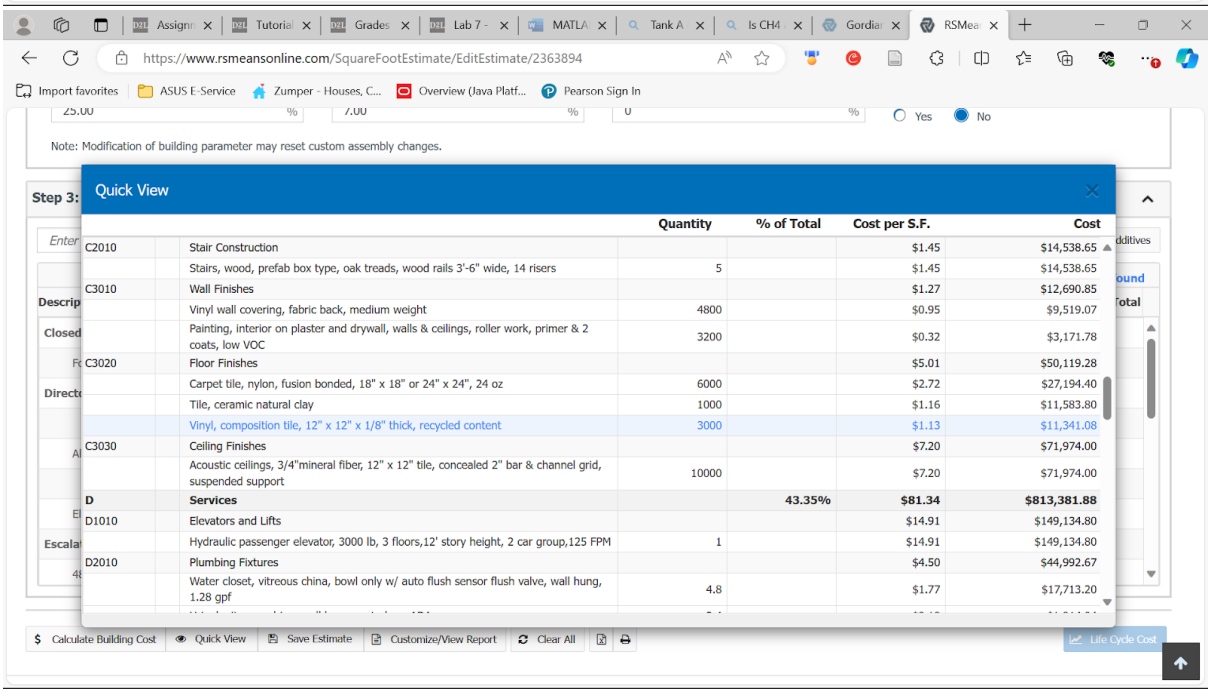
Clear All
Life Cycle Cost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Yes
No
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Step 3:
Quick View
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Cost
C2010 Stair Construction $1.45 $14,538.65
Stairs, wood, prefab box type, oak treads, wood rails 3'-6" wide, 14 risers 5 $1.45 $14,538.65
C3010 Wall Finishes $1.27 $12,690.85
Vinyl wall covering, fabric back, medium weight 4800 $0.95 $9,519.07
Painting, interior on plaster and drywall, walls & ceilings, roller work, primer & 2 coats, low VOC 3200 $0.32 $3,171.78
C3020 Floor Finishes $5.01 $50,119.28
Carpet tile, nylon, fusion bonded, 18" x 18" or 24" x 24", 24 oz 6000 $2.72 $27,194.40
Tile, ceramic natural clay 1000 $1.16 $11,583.80
Vinyl, composition tile, 12" x 12" x 1/8" thick, recycled content 3000 $1.13 $11,341.08
C3030 Ceiling Finishes $7.20 $71,974.00
Acoustic ceilings, 3/4"mineral fiber, 12" x 12" tile, concealed 2" bar & channel grid, suspended support 10000 $7.20 $71,974.00
D Services 43.35% $81.34 $813,381.88
D1010 Elevators and Lifts $14.91 $149,134.80
Hydraulic passenger elevator, 3000 lb, 3 floors,12' story height, 2 car group,125 FPM 1 $14.91 $149,134.80
D2010 Plumbing Fixtures $4.50 $44,992.67
Water closet, vitreous china, bowl only w/ auto flush sensor flush valve, wall hung, 1.28 gpf 4.8 $1.77 $17,713.20
Calculate Building Cost
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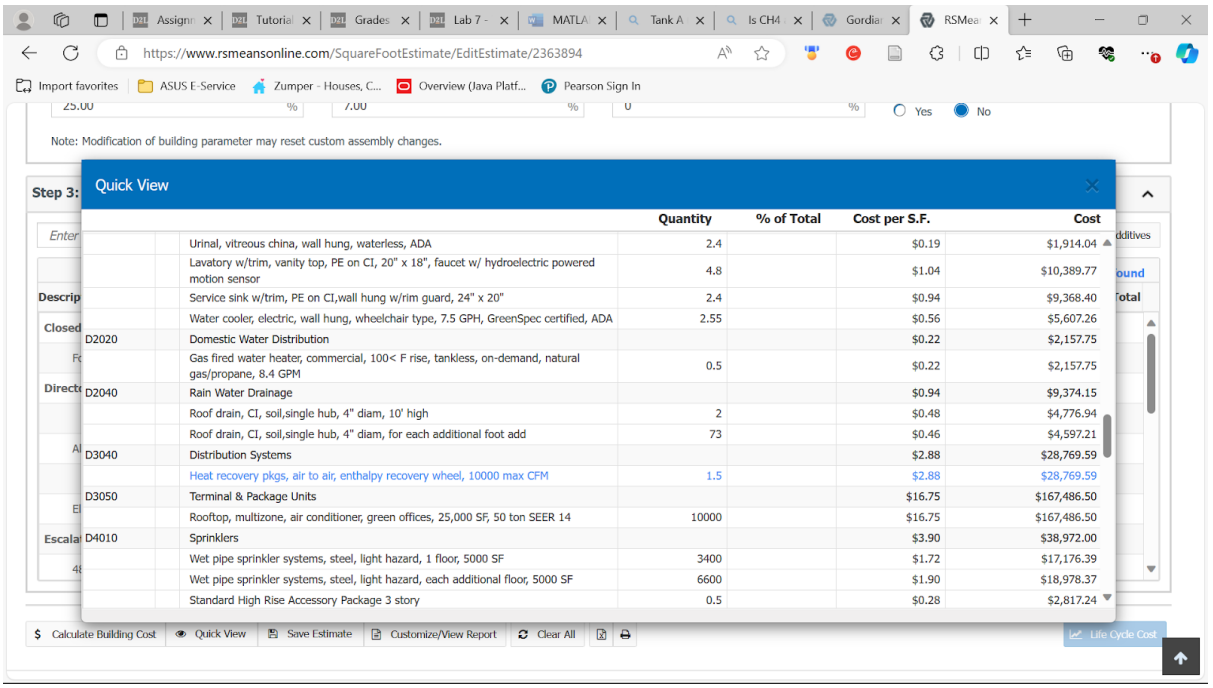
Life Cycle Cost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Yes
No
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Step 3:
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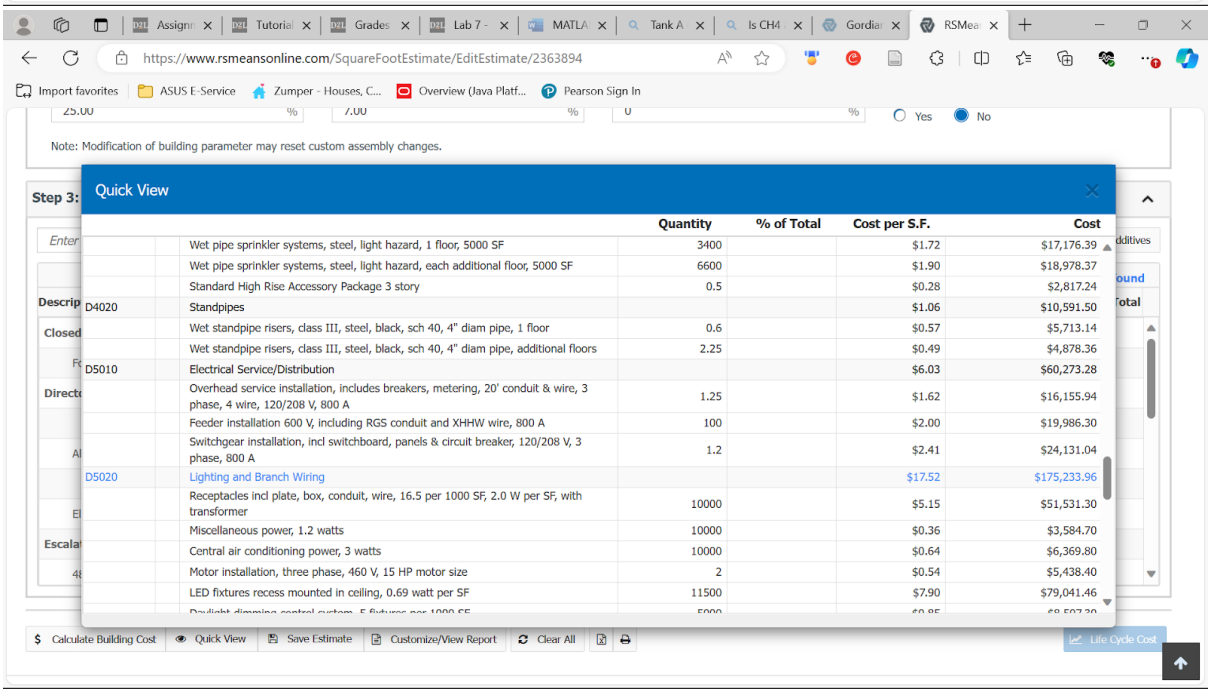
Cost per S.F.
Cost
Urinal, vitreous china, wall hung, waterless, ADA 2.4 $0.19 $1,914.04
Lavatory w/trim, vanity top, PE on CI, 20" x 18", faucet w/ hydroelectric powered motion sensor 4.8 $1.04 $10,389.77
Service sink w/trim, PE on CI,wall hung w/rim guard, 24" x 20" 2.4 $0.94 $9,368.40
Water cooler, electric, wall hung, wheelchair type, 7.5 GPH, GreenSpec certified, ADA 2.55 $0.56 $5,607.26
D2020 Domestic Water Distribution $0.22 $2,157.75
Gas fired water heater, commercial, 100< F rise, tankless, on-demand, natural gas/propane, 8.4 GPM 0.5 $0.22 $2,157.75
D2040 Rain Water Drainage $0.94 $9,374.15
Roof drain, CI, soil,single hub, 4" diam, 10' high 2 $0.48 $4,776.94
Roof drain, CI, soil,single hub, 4" diam, for each additional foot add 73 $0.46 $4,597.21
D3040 Distribution Systems $2.88 $28,769.59
Heat recovery pkgs, air to air, enthalpy recovery wheel, 10000 max CFM 1.5 $2.88 $28,769.59
D3050 Terminal & Package Units $16.75 $167,486.50
Rooftop, multizone, air conditioner, green offices, 25,000 SF, 50 ton SEER 14 10000 $16.75 $167,486.50
D4010 Sprinklers $3.90 $38,972.00
Wet pipe sprinkler systems, steel, light hazard, 1 floor, 5000 SF 3400 $1.72 $17,176.39
Wet pipe sprinkler systems, steel, light hazard, each additional floor, 5000 SF 6600 $1.90 $18,978.37
Standard High Rise Accessory Package 3 story 0.5 $0.28 $2,817.24
Calculate Building Cost
Quick View
Save Estimate
Customize/View Report
Clear All
Life Cycle Cost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Yes
No
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Step 3:
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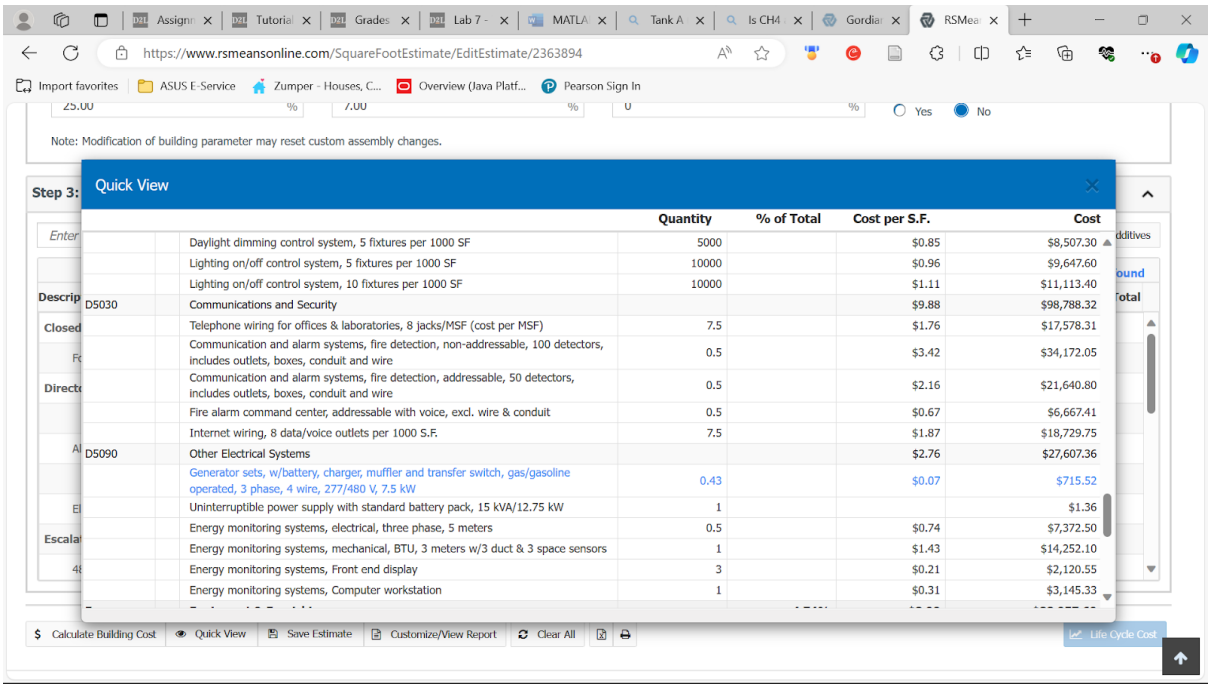
Cost
Wet pipe sprinkler systems, steel, light hazard, 1 floor, 5000 SF 3400 $1.72 $17,176.39
Wet pipe sprinkler systems, steel, light hazard, each additional floor, 5000 SF 6600 $1.90 $18,978.37
Standard High Rise Accessory Package 3 story 0.5 $0.28 $2,817.24
D4020 Standpipes $1.06 $10,591.50
Wet standpipe risers, class III, steel, black, sch 40, 4" diam pipe, 1 floor 0.6 $0.57 $5,713.14
Wet standpipe risers, class III, steel, black, sch 40, 4" diam pipe, additional floors 2.25 $0.49 $4,878.36
D5010 Electrical Service/Distribution $6.03 $60,273.28
Overhead service installation, includes breakers, metering, 20' conduit & wire, 3 phase, 4 wire, 120/208 V, 800 A 1.25 $1.62 $16,155.94
Feeder installation 600 V, including RGS conduit and XHHW wire, 800 A 100 $2.00 $19,986.30
Switchgear installation, incl switchboard, panels & circuit breaker, 120/208 V, 3 phase, 800 A 1.2 $2.41 $24,131.04
D5020 Lighting and Branch Wiring $17.52 $175,233.96
Receptacles incl plate, box, conduit, wire, 16.5 per 1000 SF, 2.0 W per SF, with transformer 10000 $5.15 $51,531.30
Miscellaneous power, 1.2 watts 10000 $0.36 $3,584.70
Central air conditioning power, 3 watts 10000 $0.64 $6,369.80
Motor installation, three phase, 460 V, 15 HP motor size 2 $0.54 $5,438.40
LED fixtures recess mounted in ceiling, 0.69 watt per SF 11500 $7.90 $79,041.46
Calculate Building Cost
Quick View
Save Estimate
Customize/View Report
Clear All
Life Cycle Cost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Pearson Sign In
Yes
No
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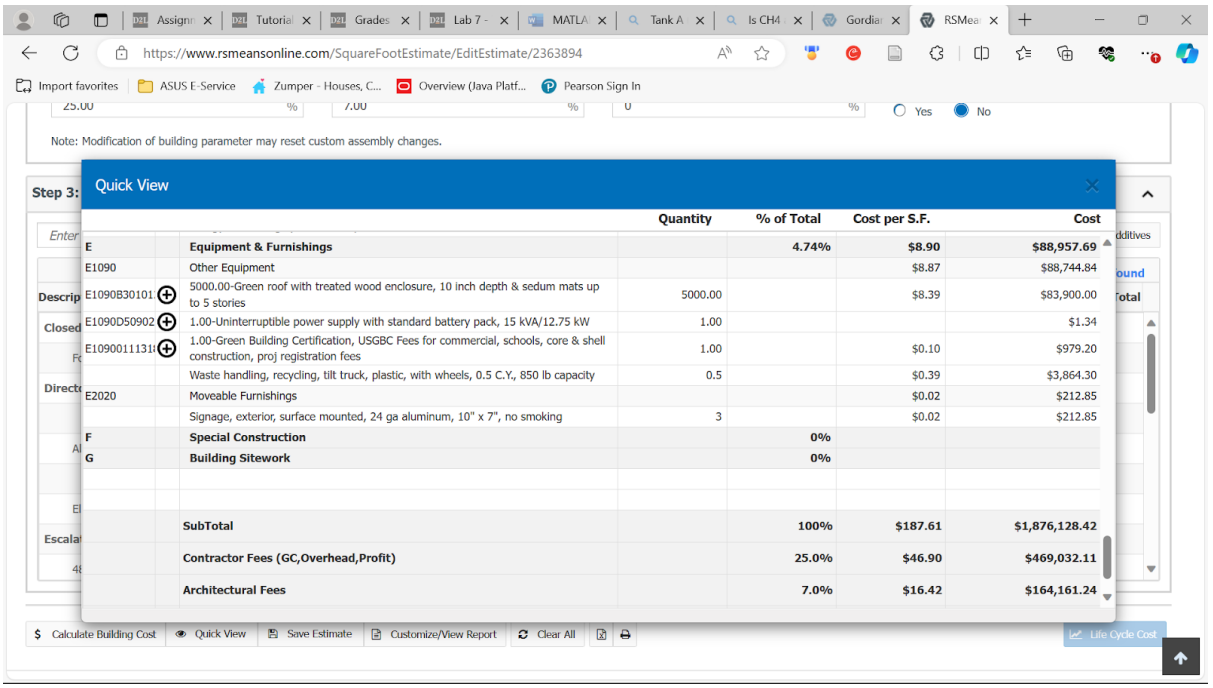
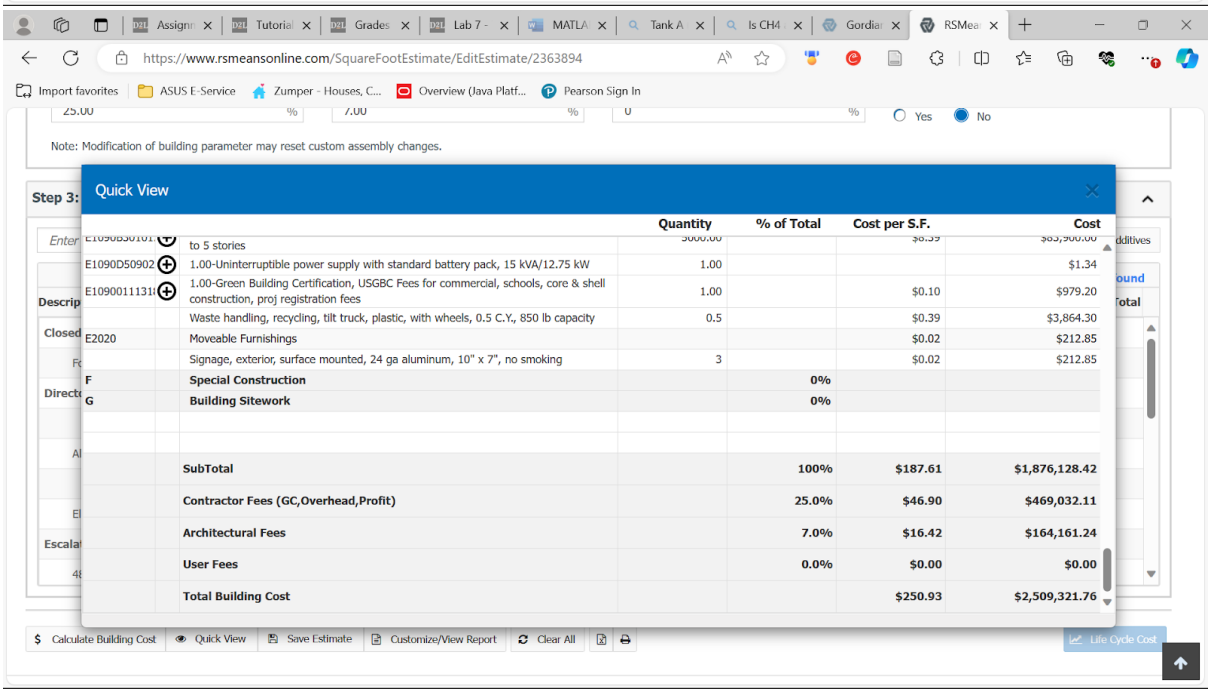
Cost per S.F.
Cost
Daylight dimming control system, 5 fixtures per 1000 SF 5000 $0.85 $8,507.30
Lighting on/off control system, 5 fixtures per 1000 SF 10000 $0.96 $9,647.60
Lighting on/off control system, 10 fixtures per 1000 SF 10000 $1.11 $11,113.40
D5030 Communications and Security $9.88 $98,788.32
Telephone wiring for offices & laboratories, 8 jacks/MSF (cost per MSF) 7.5 $1.76 $17,578.31
Communication and alarm systems, fire detection, non-addressable, 100 detectors, includes outlets, boxes, conduit and wire 0.5 $3.42 $34,172.05
Communication and alarm systems, fire detection, addressable, 50 detectors, includes outlets, boxes, conduit and wire 0.5 $2.16 $21,640.80
Fire alarm command center, addressable with voice, excl. wire & conduit 0.5 $0.67 $6,667.41
Internet wiring, 8 data/voice outlets per 1000 S.F. 7.5 $1.87 $18,729.75
D5090 Other Electrical Systems $2.76 $27,607.36
Generator sets, w/battery, charger, muffler and transfer switch, gas/gasoline operated, 3 phase, 4 wire, 277/480 V, 7.5 kW 0.43 $0.07 $715.52
Uninterruptible power supply with standard battery pack, 15 kVA/12.75 kW 1 $1.36
Energy monitoring systems, electrical, three phase, 5 meters 0.5 $0.74 $7,372.50
Energy monitoring systems, mechanical, BTU, 3 meters w/3 duct & 3 space sensors 1 $1.43 $14,252.10
Energy monitoring systems, Front end display 3 $0.21 $2,120.55
Energy monitoring systems, Computer workstation 1 $0.31 $3,145.33
Calculate Building Cost
Quick View
Save Estimate
Customize/View Report
Clear All
Life Cycle Cost





WRIKE SS:

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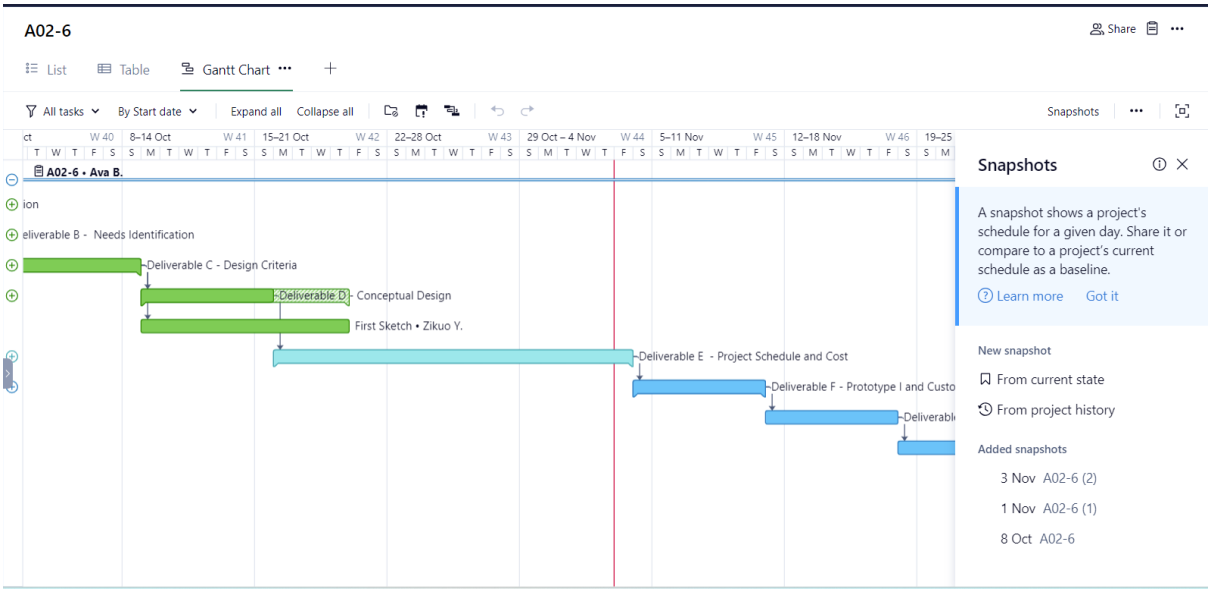
A02-6
Share
List
Table
Gantt Chart
All tasks
By Start date
Expand all
Collapse all
Snapshots
W 40
W 41
W 42
W 43
W 44
W 45
W 46
8–14 Oct
15–21 Oct
22–28 Oct
29 Oct – 4 Nov
5–11 Nov
12–18 Nov
19–25
A02-6 • Ava B.
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eliverable B - Needs Identification
Deliverable C - Design Criteria
Deliverable D
Conceptual Design
First Sketch • Zikuo Y.
Deliverable E - Project Schedule and Cost
Deliverable F - Prototype I and Custo
Deliverabl
Snapshots
A snapshot shows a project's schedule for a given day. Share it or compare to a project's current schedule as a baseline.
Learn more
Got it
New snapshot
From current state
From project history
Added snapshots
3 Nov A02-6 (2)
1 Nov A02-6 (1)
8 Oct A02-6