

Deliverable C
Design criteria

GNG 1103

Group 20

Abstract

This document contains the design criteria of the building project, benchmarked information on the purchasable products required, and a reflection on the feedback of the first client meeting.

Table of Contents

1. Objective:	5
2. Design Criteria:	6
3. Benchmarking:	8
3.1. Plant dryer benchmarks:	8
3.1.1. Plant dryer specification:	9
3.2. Plant Freezer Benchmarks:	9
3.2.1. Freezer design specifications:	11
3.3. Walk-in freezer benchmarks:	12
3.3.1. Walk-in freezer specifications:	13
4. Reflection on first client meeting:	13
4.1. Updated user needs:	14

1. Objective:

Define a list of prioritized design criteria, do technical benchmarking and determine target specifications which can be used in the development of your final solution.

Instructions:

Based on the team's list of interpreted needs, teams will define a list of prioritized design criteria, including functional and non-functional requirements, as well as constraints (and metrics, where appropriate).

Teams will perform technical benchmarking (i.e. researching existing products that already satisfy one or many of the interpreted needs) and update user benchmarking information (user perceptions of similar products).

Teams will determine target specifications (numerical values or a range of values which represent reasonable product attributes) such as minimum or maximum weight, dimensions, amount of time needed for a user to become familiar with the product (ease of use), number of items on an interface, etc. This will aid in evaluating potential solution ideas and provide measurable design goals which can be fulfilled by the final solution.

Remember: Target specifications are just design specifications with ideal or marginal values and metrics are measurable design criteria, as explained in the lectures. The same list of metrics must be used in each step of this deliverable (prioritized list, benchmarking and target specifications).

Reflect on how the client meeting impacted the development of your design criteria and specifications, when deciding on the relative importance of your criteria and explicitly state any updated needs that have changed from deliverable B.

Ensure that each identified need has at least one design criterion which can be used to measure the ability of different solutions to satisfy that specific need. Note that one design criterion can be used for multiple needs. A comprehensive set of design criteria must be generated to avoid missing key or critical design parameters. The tables developed in the lecture can be used as a guide for doing this. This should be a maximum of 5 pages.

Task Plan Update:

Update your Wrike task boards to include any changes in estimated task duration, missing tasks, task responsibilities, milestones, or dependencies, based on your better understanding of the project or based on feedback that you have received from your PM/TA.

Include more detailed sub-tasks for the tasks that will need to be completed over the next few weeks.

Important note: It should be possible for ONE person to complete each identified task or sub-task in the allotted time. The allotted time should also be reasonable, based on the task owner's availability. Everyone should be doing their fair share of the work.

Verify and update the task start dates and end dates for each task, based on your project progress.

Ensure that you have taken into account each team member's actual availability over the next two weeks, as well as significant events, such as particularly high course loads, exams or travel, which might be going to limit actual project work progress.

For each person in your group, it should be possible to determine:

What was completed last week (i.e. "Completed" tasks),

What will be done next (i.e. "In Progress" tasks)

If tasks are going to be put "On Hold" or "Cancelled" altogether

Any and all group "Issues" should be discussed and dealt with, ideally with the assistance of your Project Manager (PM). This should happen during each of your lab sessions or can happen earlier, using your defined communication methods. As already explained, it is essential to keep your PM/TA "in the loop" throughout the term. It is usually not a good idea to ignore conflicts between team members. Instead, you should deal with them in a constructive way.

2. Design Criteria:

Functional: **F** Non-Functional: **NF**

	User need	Design criteria
1.	The building needs 6 - 15 office spaces that allows for computer use. (with 4 additional work spaces in one area)	-Floor area (m ²) -Desk size (m ²) -Amount of disturbance -Sufficient internet service to provide for at minimum 10 different devices.
2,	The building needs an adequately sized space for several lab benches.	Floor area (m ²) Lab bench size (m ²) Minimum door clearance width (m)
3.	The building needs a working area usable by at least 10 people.	Floor area (m ²) Capacity (number of people) Minimum door clearance width (m)
4.	The building needs accessible storage spaces for hand-held devices.	Floor area (m ²) Internal volume (m ³)
5.	The project needs a space for parking 2 trucks.	Land coverage (m ²) Minimum space (m ²)
6.	The building needs a space for a freezer.	Floor area (m ²) Internal volume (m ³) Minimum temperature (*C) -Environmental controls of freezer
7.	The building needs a dry and spacious space for drying plants.	Humidity (%) >The percent from maximum saturation Floor area (m ²)
8.	The entire building needs to be accessible with wheelchairs.	Wheelchair ramps

		<p>Maximum rate of change in elevation.</p> <p>Elevator(s) if multiple floors</p> <p>Enough room to turn around and not bump into things</p> <p>Open spaces and floor plans.</p>
9.	The building needs a room for accommodating essential needs.	Floor area (m ²)
10.	The building needs a room for meetings and training.	<p>Floor area (m²)</p> <p>Capacity (number of people)</p>
11.	The building needs to have 2 restrooms with 2 stalls at least each.	<p>Floor area (m²)</p> <p>Water capacity/access (L)</p>
12.	The building needs to accommodate occasional large groups of visitors.	<p>Capacity (number of people)</p> <p>Hallway clearance width (m)</p> <p>Fire safety standards: appropriate number of exits and limit to people/m² in accordance with the expected number of visitors.</p>
13.	The building needs to consider secluded spaces that is set apart from public spaces.	<p>Amount of disturbance</p> <p>Separation of rooms from public space</p>
14.	The building needs to be accessible in all weather conditions.	<p>Minimum temperature tolerance (*C)</p> <p>Roof weight tolerance (N/m²) (snow/ice)</p> <p>Drainage of water</p> <p>>Away from building to protect foundations</p> <p>-Proper Insulation</p> <p>-Proper environmental controls.</p>
15.	The building needs to incorporate Algonquin identity.	Matching aesthetics
16.	The building needs to be environmentally sustainable.	<p>Sustainable material</p> <p>Low energy usage</p> <p>Minimal impact on local environment</p>
17.	The project needs to include a large external open space.	Land coverage (m ²)

18.	The building needs to be adequately sized to allow for increased capacity. (As in, more people than usual)	Capacity (number of people)
19.	The building needs to have an appropriate construction time.	Completion in about 2 years
20.	The building needs a loading area for transport trucks.	Parking area (m ²) Loading area weight limit (kg)

3. Benchmarking:

could be buildings, freezers, movable lab benches, or plant dryers etc.

3.1. Plant dryer benchmarks:

~~Power usage:~~

~~Capacity:~~

~~Environmental Control:~~

~~Automation:~~

~~Size:~~

~~Cost:~~

Hamilton Beach 32100C Food Dehydrator:

Power usage: 500 Watts

Capacity: 5 26.29 x 33.45cm stackable trays with limited vertical space

Environmental Control: Continuous airflow for even drying, temperature range of 100-160f, isolated from ambient climate.

Automation: 48-hour timer with automatic shut off. Adjustable digital thermostat.

Cost: \$99.94

Unit Size: 26.29 x 33.45 x 28.65 cm

https://www.amazon.ca/Hamilton-Beach-32100C-Hamilton-Beach-Dehydrator/dp/B013JL6J7Y/ref=asc_df_B013JL6J7Y/?tag=googleshopc0c-20&linkCode=df0&hvadid=292896339311&hvpos=&hvnetw=g&hvrnd=11241369283770881768&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=9000665&hvtargid=pla-434995878602&psc=1

Lee Valley Herb Drying Rack:

Power usage: None

Capacity: 2.6 sq.ft. of space on each 22" shelf, and the shelves average 8" apart.

Unit Size: 22"x64", can be folded and stored so the only major dimension is 22" diameter.

Environmental Control: Relies on ambient climate, exposed to ambient climate

Automation: None

Cost: \$42.50

https://www.leevalley.com/en-ca/shop/garden/garden-care/harvesting-tools/70628-herb-dryers?item=09A0464&utm_source=free_google_shopping&utm_medium=organic&utm_campaign=shopping_feed&utm_campaign=CAN-EN%7CPLA%7CPMax%7CGarden%7CMidPriceTier&gclid=Cj0KCQjwpompBhDZARIsAFD_Fp8xVckijNFhe-xII8ThLpZP9G8M8GTE4T35lyQzYaHPELCFiaJt6jcaAuk7EALw_wcB

3.1.1. Plant dryer specification:

Could consider using natural drying methods, involving dry, warm, and circulated air. Not suggested to dry with sun.

Design specification	Hamilton Beach	Lee Valley	Reasoning
Power usage	500 W	0	
Capacity	879.4cm ² (26.29cm x 33.45cm)	2415.48cm ²	Both have around the same number of racks.
Environmental controls	Continuous airflow for even drying, temperature range of 100-160f, isolated from ambient climate.	Relies on ambient climate, exposed to ambient climate.	
Automation	48-hour timer with automatic shut off. Adjustable digital thermostat.	None	
Cost	\$99.94	\$42.50	
Size	26.29 W x 33.45 L x 28.65 H cm	55.88 D x 62.56 H cm	Smaller size allows for better space effectiveness.

3.2. Plant Freezer Benchmarks:

(All freezers are -20 degrees capable)

Futura Silver Series 1.3 Cu. Ft. Countertop Laboratory Freezer (-20°C) | Auto Defrost:

ENERGY STAR Certified

Cu. Ft.: 1.3

Door(s): One solid swing door, right hinged, not reversible

Color: white

Temperature Range: -15°C to -25°C; factory preset to -20°C

Auto defrost cycle every 6 hours, max air temp in empty freezer: +4.34°C; max air temp in loaded freezer: -2.89°C. Max sample temp in empty freezer: -4.76°C; max sample temp in loaded freezer: -9.58°C.

Exterior Dimensions: 23 3/4"W x 24"D x 20 3/8"H

Alarm: Audible and visual high and low temperature alarms

Remote alarm contacts

Casters: N/A

Shelves: 2, removable

Door Lock: front

Shipping Weight: 106 lbs.

Electrical Requirements: 115V, 60Hz, 1/8 HP; 1 amp

This unit must have 4" clearance on sides and back for adequate ventilation.

Cost: 1,247.40

<https://www.labrepc.com/product/futura-silver-series-1-3-cu-ft-countertop-laboratory-freezer-auto-defrost/>

CliniCool© Series 1.7 Cu. Ft. Undercounter NSF Certified Pharmacy/Vaccine Freezer | Freestanding:

Temperature setpoint range: -15°C to -28°C (Controller settings must remain unaltered to ensure thermal performance compliant with NSF/ANSI 456 Standard for Vaccine Storage requirements)

Operational environment: Indoor use only. Optimal operating range: +18°C to +26°C (+65°F to +78°F), 70% RH

Exterior Dimensions (WxDxH): 23 5/8" x 23" x 20 3/8"

Interior Dimensions (WxDxH): 17 3/4" x 16" x 12 7/8"

Storage capacity: 1.7 cu. ft. gross volume

Door: One swing solid door, self-closing, right hinged, non-reversible, magnetic sealed gasket, keyed lock

Shelves: Three shelves (two adjustable/one fixed) with guard rail on back

Mounting: Leveling legs. Note: 4" of clearance on all sides must be maintained for adequate ventilation

Interior lighting: N/A

External probe access: Rear wall port (3/8") dia.

Insulation: Cabinet is foamed-in-place with EPA compliant high density urethane foam

Exterior materials: White powder coated steel

Access control: Pyxis®, Omnicell® and AcuDose RX® compatible

Warranty: 2 years parts and labor with an additional 3 years parts only on the compressor

Product Weight: 80 lbs.

Shipping Weight: 106 lbs.

Rated Amperage: 1.0 Amps

Power Plug/Power Cord: NEMA 5-15 plug, 8 to 10 ft typical, conforms to UL471 requirements, Vaccine storage power cord warning label

Facility Electrical Requirement: 110-120V AC: 15 A (minimum)

Agency Listing and Certification: Certified in accordance with the NSF/ANSI 456 Standard for Vaccine Storage. UL, C-UL, ETL, C-ETL listed (either single or dual agency listings) and certified to UL471 standard, hydrocarbon refrigerant safety.

Cost: \$1783.32

<https://www.labrepc.com/product/clinicool-series-1-7-cu-ft-undercounter-nsf-certified-pharmacy-vaccine-freezer-freestanding-solid-door/>

3.2.1. Freezer design specifications:

Design specification	Futura Silver	CliniCool	Reasoning
Highest temperature (*C)	-15	-15	
Coldest temperature (*C)	-25	-28	A temperature below -20*C is required for preservation.
Door opening method	One solid swing door, right	One swing solid door, self-closing,	

	hinged, not reversible	right hinged, not reversible, magnetic sealed gasket, keyed lock	
Exterior dimensions (inches)	23 5/8"W x 24"D x 20 3/8"H	23 5/8"W x 23"D x 20 3/8"H	Impacts mobility of the freezer, if needed.
Storage capacity (ft ²)	1.3	1.7	
Shelves	2, removable	Three shelves (two adjustable/one fixed) with guard rail on back	
Cost (\$ CAD)	1,247.40	1783.32	
Shipping weight (lbs)	106	106	
Minimum electrical requirement	115V, 1 A	110-120V, 1 A	High electrical usage increases maintenance costs. (W = V x A)

3.3. Walk-in freezer benchmarks:

Note that many suppliers offer custom walk-in freezers according to client specifications, so larger doors, more internal space, and better cooling systems can be decided separately.

Reference to: [Bally Custom Walk-In Cooler / Freezer Combo with Remote Refrigeration \(webstaurantstore.com\)](http://webstaurantstore.com)

Preferred lowest temperature: -28 degrees Celsius (as determined in the freezer benchmarking)

Door size should be like that of the above referenced walk-in freezer.

K2 SCIENTIFIC - 10x10 Walk-In Freezer

Internal Volume	670.98 cu ft
Exterior (D x W x H)	9.8 ft x 9.8 ft x 7.87 ft
Door (W x H)	2.33 ft x 6.23 ft
Compressing Unit	Straddle System OR Top Mounted
Adjustable Temperature Range	-10°C to -25°C
Cost (\$ USD)	20 995

- 100mm thick panels.
- Steel coated anti-sliding floor.

[10x10 Walk-In Freezer – K2 Scientific](#)

Norlake KLF87810-C Kold Locker 8' x 10' x 8' 7" Indoor Walk-In Freezer

External size: 8' W x 10' L x 8.6' H

Internal volume: 547.6 cubic feet

Door width: 2.1 feet

Lowest temperature: -23.3 degrees Celsius

Compressing unit: top mounted

Cost (\$ USD): 18 325

100mm insulations.

[Norlake KLF87810-C Kold Locker 8' x 10' x 8' 7" Indoor Walk-In Freezer \(webstaurantstore.com\)](http://webstaurantstore.com)

3.3.1. Walk-in freezer specifications:

Design specification	K2 Scientific	Norlake	Reasoning
External size (ft)	9.8 W x 9.8 L x 7.87 H	8 W x 10 L x 8.6 H	Width contributes to land area, while more height increases comfort.
Internal volume (ft^3)	670.98	547.6	
Door width (ft)	2.33	2.1	
Lowest temperature (degrees Celsius)	-25	-23.3	At least -20°C for reliable preservation.
Compressing unit	Straddle or top mounted	Top mounted	The compressing unit refers to the system that treats the coolant, while the cooling unit (not mentioned) brings in the cold air.
Insulation thickness (mm)	100	100	
Cost (\$ USD)	20 995	18 325	

Note that as stated in the beginning of the section, some suppliers allow custom installations, the above table is for reference.

4. Reflection on first client meeting:

- No mentioning of the need to keep the costs low.

- Space is a big requirement, 30 people working in the building daily.
- High consideration for accessibility and maintainability in harsh winter conditions.
- Connection between buildings is not a current consideration.
- Preferably less glass, easily broken.
- Large public space for up to 300 people.
- Elders will occasionally visit.
- Occasional large specimens such as deer.
- Adequate space between loading bay and lab.

4.1. Updated user needs:

Light blue highlighting for new user need.

Orange highlighting for increased importance.

User need	Importance ranking
The building needs at least 6 office spaces and 4 open workspaces that allows for computer use.	5
The building needs an adequately sized space for several lab benches.	5
The building needs a laboratory area usable by at least 10 people.	5
The building needs accessible storage spaces for hand-held devices.	4
The project needs a space for parking trucks.	4
The building needs a space for a freezer.	5
The building needs a dry and spacious space for drying plants.	5
The entire building needs to be accessible with wheelchairs.	4
The building needs a room for accommodating essential needs.	4
The building needs a room for meetings and training.	5
The building needs to have at least 1 restroom with 2 stalls minimum each.	5
The building needs to accommodate occasional large groups of visitors.	4
The building needs to consider secluded spaces that is set apart from public spaces.	4
The building needs to be accessible in all weather conditions.	5
The building needs to incorporate Algonquin identity.	4
The building needs to be environmentally sustainable.	5
The project needs to include a large open space.	4
The building needs to be adequately sized to allow for increased capacity.	4
The building needs to have an appropriate construction time.	2
The building needs a loading area for pickup trucks.	5
The Laboratory subsystem needs a spacious walk-in freezer.	5
The building needs to be cost effective.	3