



# An Investigation of an Emergency Department in a Hospital: Improving Efficiency by Using Elements of Design to Benefit Nurses and Staff

Capstone Final Oral Defense Presentation

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**ROCHESTER**  
**REGIONAL HEALTH**  
Unity Hospital

**RIT** | College of Art and Design  
**Interior Design**

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# The Committee



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Committee Member,  
Experienced Travel Nurse at  
Unity Hospital

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# 1 Introduction

# Why is this Capstone important?

- Burnout, a syndrome caused by work related stressors, is nearly **twice** as prevalent in healthcare workers than it is in US workers in other fields
- Before the COVID-19 pandemic, **35%-54%** of nurses reported experiences of **burnout**
- After the pandemic, that value has increased to **70%**

Today's typical Emergency Design solutions do not fit the growing needs of the healthcare industry workers and they do not maximize efficiency.

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**How can design help to make an Emergency Department nurses and staff members jobs more efficient in a hospital?**

# 2 Literature Review



## Literature Review Topics:

- 01 Trauma Level Types
- 02 Profession Related Stressors
- 03 Providing In-house Imaging and Testing
- 04 The Entry
- 05 Storage and Supplies
- 06 Designing for the Senses: Sound and Sight
- 07 Size, Capacity, and Flexibility
- 08 Nurse Station Design**
- 09 Typical Layouts**
- 10 Spatial Adjacencies and Acuity Adaptability
- 11 Wayfinding
- 12 Safety, Security, and Privacy
- 13 MCI'S and Design Issues Revealed from the COVID-19 Pandemic



## Literature Review Summary:

- Design suggestions that facilitate better communication, teamwork, and security in EDs, centralized nurse stations specifically arranged in a racetrack-like configuration with the patient rooms creating an orbit around the perimeter of the nurses stations was the most common spatial layout (Gharaveis, 2019)
- A well designed layout can reduce the distances that users have to travel and in terms of staff productivity, can improve the overall efficiency of the department (Rismanchian, 2016)



# 3 Research Agenda

## Research Agenda Methods:

- **Survey**

18 Responses from local healthcare providers who specialize in Emergency Care  
8 questions pertaining to efficiency, design, and personal preferences  
Goal: to identify design related issues and possible design strategies from the perspective of someone who works in an ED

- **Interviews**

One-on-one interviews with 2 nurses who work at Unity ED  
9 questions based on how design impacts efficiency and what it is like to work in an ED  
Goal: to gain perspective on job difficulty and how it relates to design

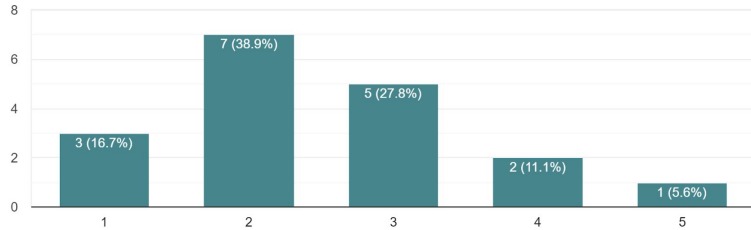
- **Observational Site Visit**

Shadowed a nurse at Unity ED for 6 hours during a night shift  
Recorded notes about the experience related to each topic of the Literature Review  
Drew observational diagrams  
Captured images and drawings of the built environment

# Survey Findings:

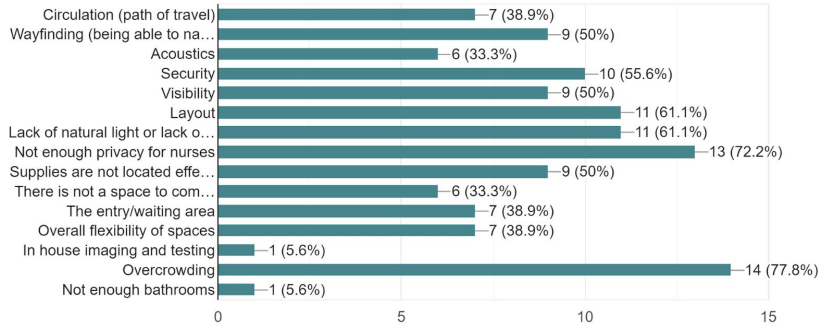
## Rate the efficiency of the design of your hospitals' ED

18 responses



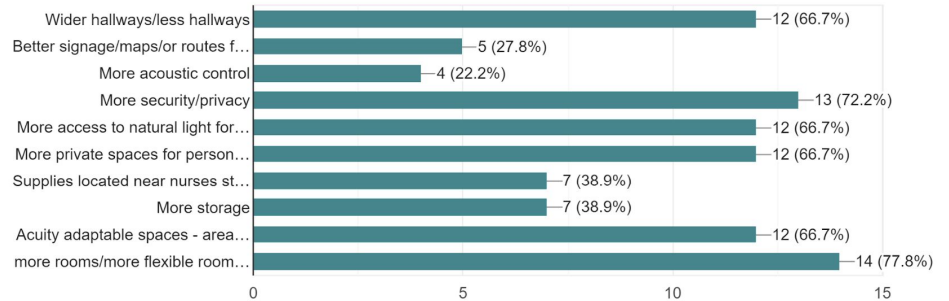
## What are the main design related issues that affect efficiency in your ED? check all that apply.

18 responses



## What design approaches do you think will improve efficiency? Check all that apply

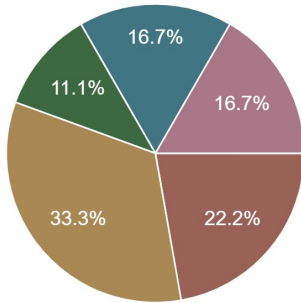
18 responses



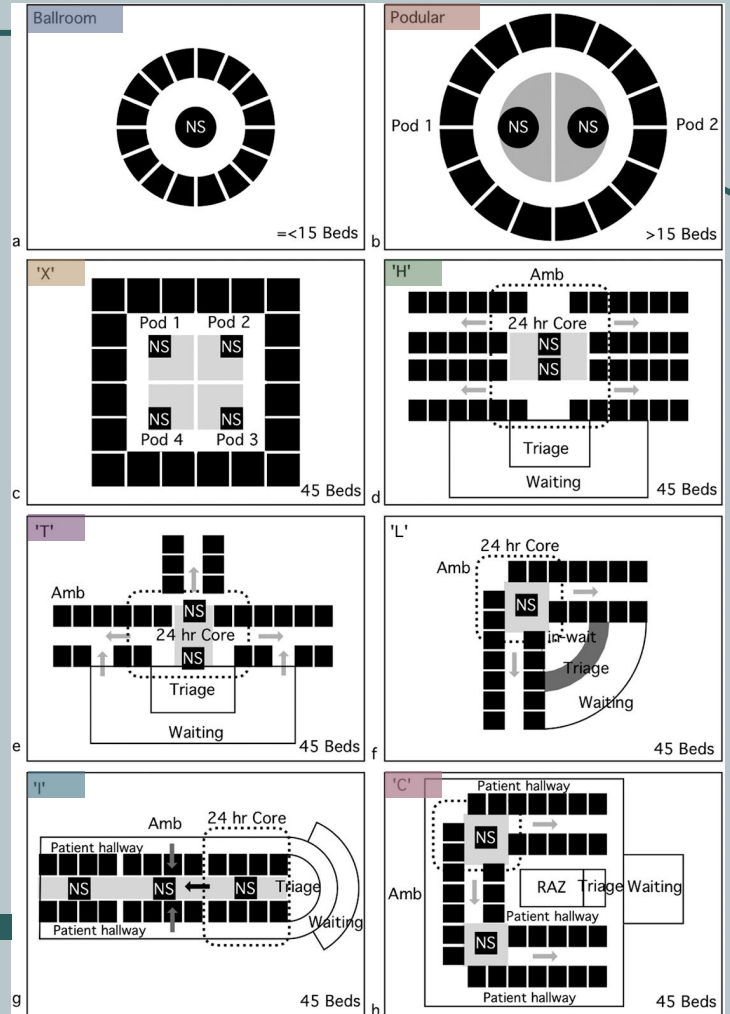
# Survey Findings:

Using the image, which layout looks like the most efficient?

18 responses



- Ballroom
- Podular
- X
- H
- T
- I
- C
- None



## Interview Findings:

### 1.) How would you describe your day to day experience working in an ED?

“Chaos Controlled chaos” –Participant 1

“The ED is always sometimes a little bit of organized chaos” –Participant 2

### 3.) What are some design related issues that make the ED run less efficiently?

“Patients in the halls. That’s a big one. The problem with having people in the hallway, especially lining every hallway, is you can never get away from a patient and you need that as a nurse.” –Participant 1

### 5.) What type of layout do you prefer in an ED?

“I hate it when I'm taking care of people around corners, it's super hard” –Participant 1

“Where the rooms are to where the nurses stations are does not make the nurses station central.” –Participant 2

## Interview Findings:

### 6.) As an ED professional, what are your needs?

“Having my patients closer to me and more accessible. Having supplies there when I need them. Keeping things stocked. Need more mobile equipment.” –Participant 2

### 8.) If you could change or add anything to the design of your hospital's ED, what would it be?

“mainly the layout. I'm walking a lot to just get basic stuff done. Having stuff that is out of the way instead of carts full of stuff you know inlaid cabinet to store stuff that's in the wall so that the room is the room and all you have is the bed”  
–Participant 1

“Dim lighting for night shift. ED lights are always bright and loud but it would be really nice to have a night shift lighting. You can't have it dark but a dim, softer light would be nice.”-Participant 2



**“It’s as efficient as probably any ED but that’s kinda the problem because we have just accepted that this is how an emergency department is. Implementing change is difficult but if we implemented change that’s beneficial to the workflow then people would be like ‘oh this is a really good thing’”**

**-Participant 1**

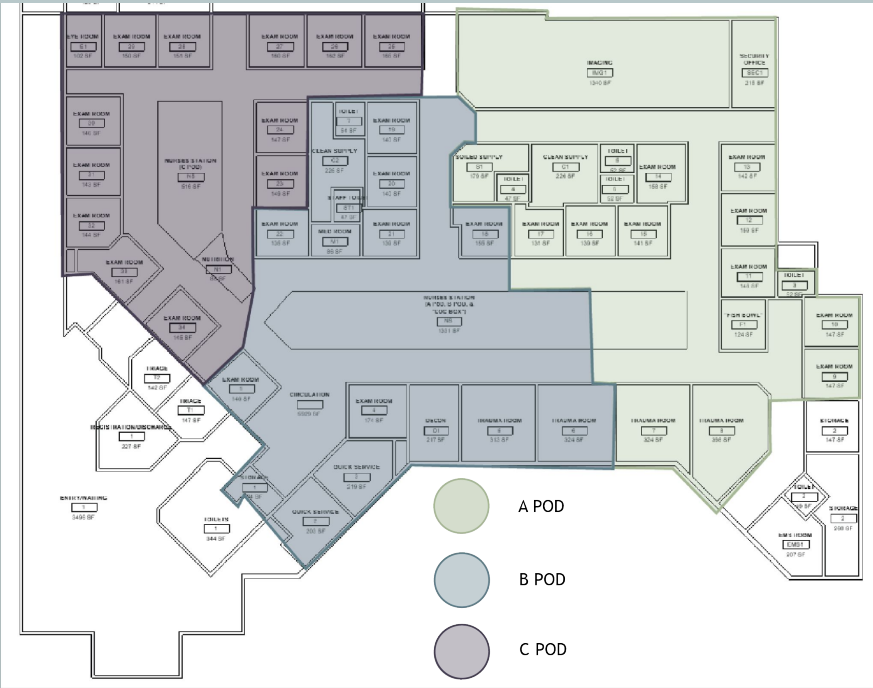
# Observational Visit to Unity ED:



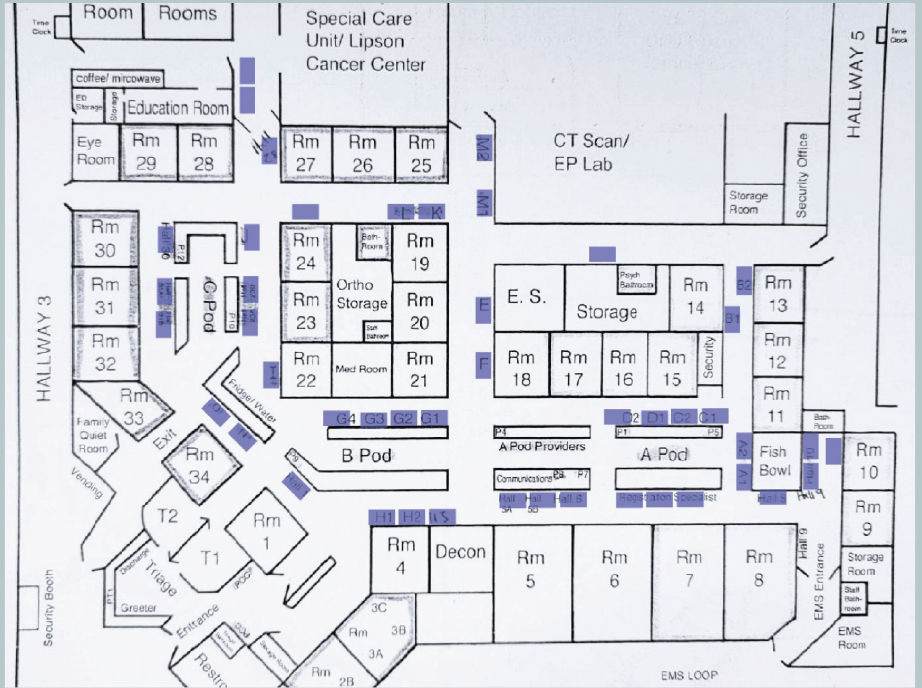
- Entrance & waiting
- Ambulance entrance
- Patient rooms
- Medicine
- Nurses stations
- Security
- Triage
- Education/Training
- Nutrition Station
- ED overflow
- Clean utility/supply
- Soiled utility/supply
- Isolation/Decontamination
- Storage
- Trauma rooms
- Toilet rooms
- Imaging
- Staff break rooms and locker rooms
- Eye Room
- Registration & Discharge

Color Coding Diagram and Legend of Unity ED Map

# Observational Visit to Unity ED:



Color Coded Podular Organization of Unity ED



1 stretcher with a patient on it

Hallway Stretcher Locations at Unity ED

## Key Findings:

In order for an ED to maximize efficiency it should ....

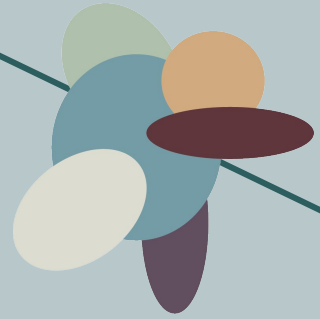
- have multiple bathrooms
- keep utility areas central
- have a racetrack layout for better wayfinding and visibility/accessibility of patient rooms to the nurses station
- have ample storage
- have adjustable and flexible options
- have wide hallways to account for circulation, overcrowding, and wayfinding
- strategically located utility areas to minimize unnecessary worker path of travel
- have acoustic control, especially in the nurses station
- include an area for doctors to quietly and privately work and/or for workers to take a personal moment privately

# 4 Design Agenda

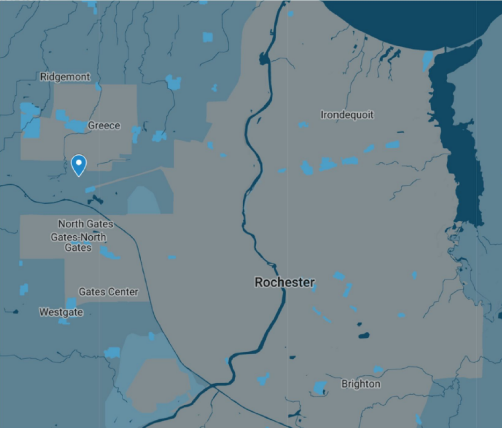
# Concept:






## Efficiency

An ED of a hospital serves to treat a plethora of medical issues ranging various different severities. It is the role of the ED to treat and/or stabilize these medical conditions very **quickly**. Therefore, **efficiency** is of the utmost importance. Furthermore, the job of a nurse is extremely **physically and mentally exhausting** which often decreases the ability to work efficiently. The proposed new design of **Unity ED in Rochester, NY** that features a **reconfigured floor plan** and **fully developed nurses stations** focuses on efficiency. Elements of Design such as **layout, circulation, storage, size, and programming** are taken into consideration in order to provide a **more efficient environment**.



# Project Site - Macro:



-  Greenspace
-  Roads
-  Parking lots
-  Hospital Buildings
-  The ED

## Programming Charts:

Name of space	Existing design Quantity	Proposed Design Quantity	Existing Square Feet	Approximate Proposed Square Feet
Waiting Area/public entrance	1	1	3,496	3,496
Registration and discharge	1	1	227	227
Triage rooms	1	1	142 & 147	142 & 147
Quick Service rooms (rms 2 & 3)	2	2	203 & 209	203 & 209
Patient Rooms of various sizes	26	26	various sizes	all room sizes to remain the same
Psych patient rooms	2	2	142 & 158	142 & 158
Trauma rooms	4	4	313, 324, 324, 398	313, 324, 324, 398
Decon room	1	1	217	217



## Programming Charts:

Name of space	Existing design Quantity	Proposed Design Quantity	Existing Square Feet	Approximate Proposed Sqft
EMS entrance, break room & toilet	1	1	207	207
Areas for security personnel	3	3	215	215
Nursing stations pods	3	3	1,756	2,000
"doc box" stations for doctors	1	1	124	124
Med room	1	1	130	130
Nutrition station	1	2	74	(x2) 148
Staff bathrooms (excluding locker room toilets)	1	3	47	minimum 200
Patient/visitor bathrooms not connected to patient rooms	4	8	640	1,280

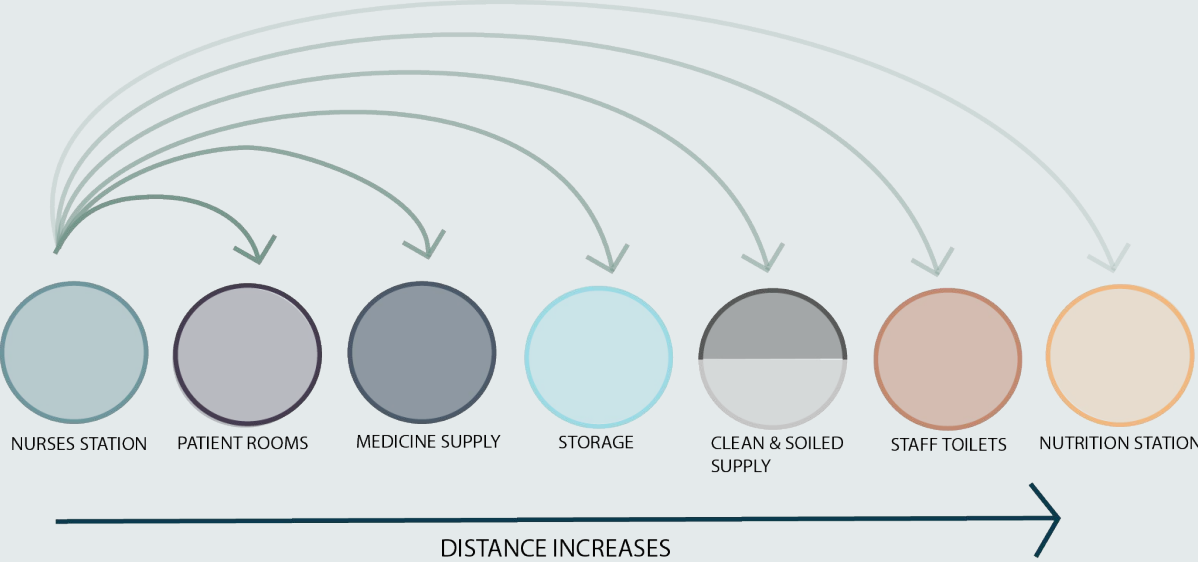
## Programming Charts:



Name of space	Existing design Quantity	Proposed Design Quantity	Existing Square Feet	Approximate Proposed Square Feet
Soiled supply room	1	2	179	358
clean supply room	2	2	225 & 226	225 & 226
equipment and supplies storage rooms	4	6 minimum	454	600
Education room	1	1	244	244
eye room	1	1	102	102
break room	1	1	349	349
staff locker room	1	1	546	546
ED Overflow space	1	1	7909	7909

## Programming Charts:

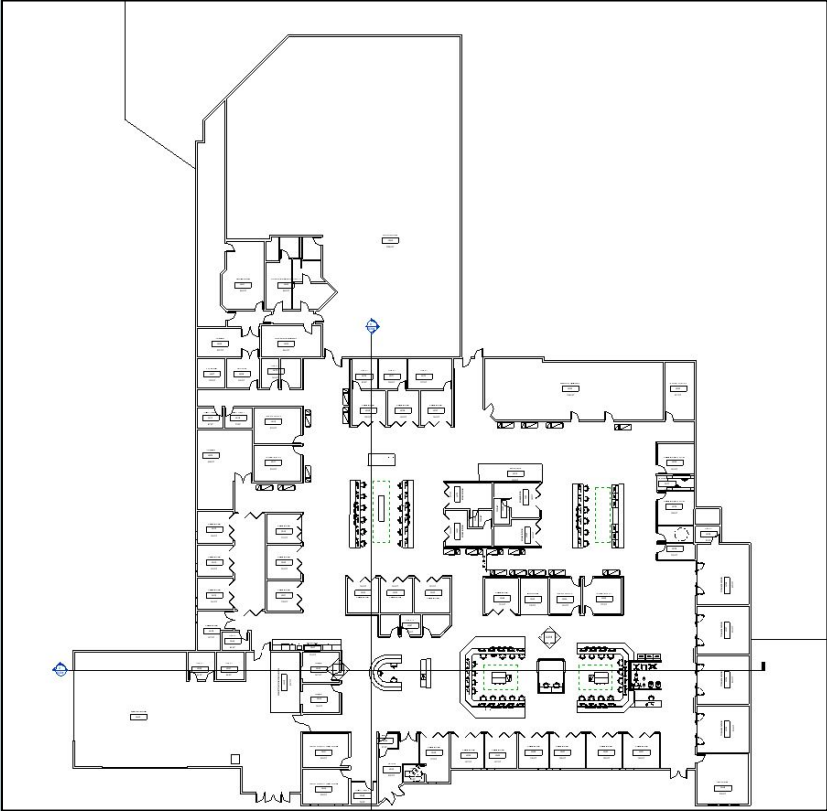
Furniture and Equipment	
Individual computers with mouse and keyboard, preferably mounted onto a retractable monitor arm	Noise control fixtures/materials
Small monitors in a common area to display patient vitals	Dimmable light fixtures - possibly individual station lighting solutions
ED Track board (large monitor or interactive large ipad)	telephone(s) and radio(s) to communicate with EMS
Fixed and mobile storage - both shared and individual	Transaction counter
Printer and Scanner	Waste management
Mobile office chairs	Mobile stools

# Space Planning:

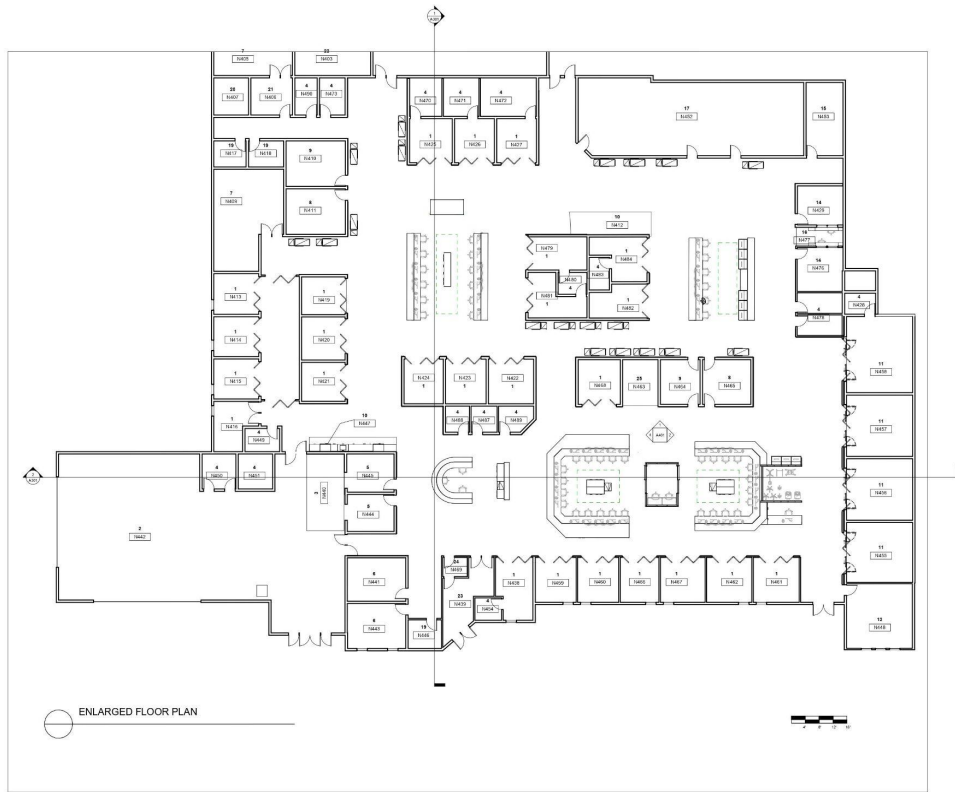


-  SPACES
-  A DIRECT ADJACENCY - THE DEEPER THE COLOR, THE MORE SIGNIFICANT IMPORTANCE

# Entire Proposed Floor Plan:



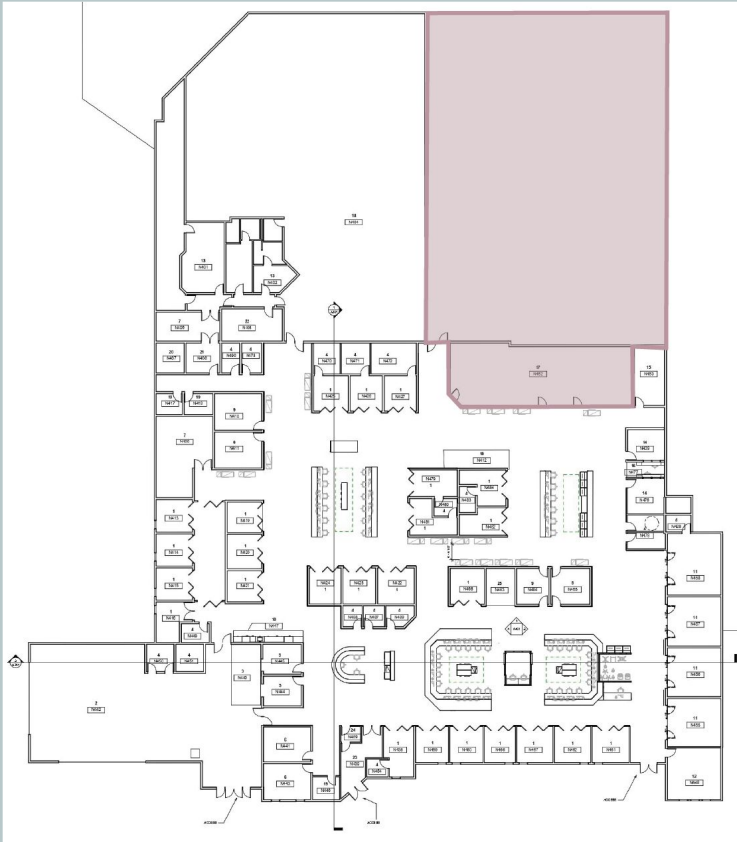
# Enlarged Floor Plan:



## TAG TYPES

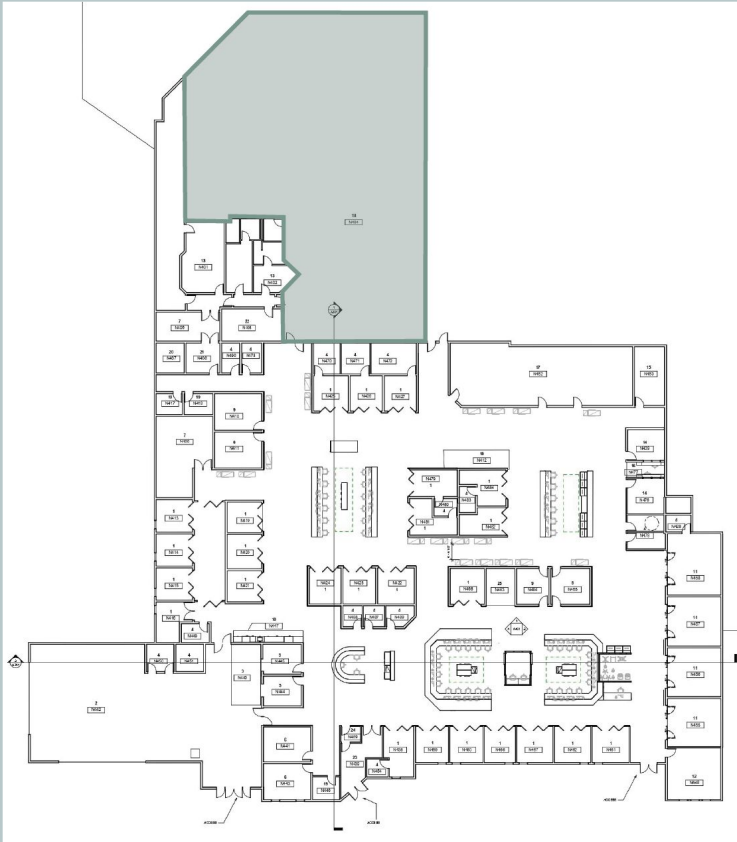
- 1 - EXAM ROOMS
- 2 - PATIENT & VISITOR ENTRANCE AND WAITING AREA
- 3 - REGISTRATION & DISCHARGE DESK
- 4 - PUBLIC/PATIENT RESTROOMS
- 5 - TRIAGE ROOMS
- 6 - QUICK SERVICE CARE ROOMS
- 7 - STORAGE ROOMS
- 8 - CLEAN SUPPLY ROOMS
- 9 - SOILED SUPPLY ROOMS
- 10 - NUTRITION STATIONS
- 11 - TRAUMA ROOMS
- 12 - EMS BREAK ROOM
- 13 - STAFF BREAK ROOM & LOCKER ROOM
- 14 - PSYCH EXAM ROOMS
- 15 - SECURITY OFFICE
- 16 - SECURITY SURVEILLANCE
- 17 - IN-HOUSE IMAGING
- 18 - ED OVERFLOW
- 19 - STAFF TOILETS
- 20 - EYE EXAM ROOM
- 21 - DOC BOX
- 22 - EDUCATION AND TRAINING
- 23 - DECONTAMINATION/ISOLATION ROOM
- 24 - ANTE
- 25 - MEDICINE SUPPLY

# Proposed Unity ED Map:



○ Imaging

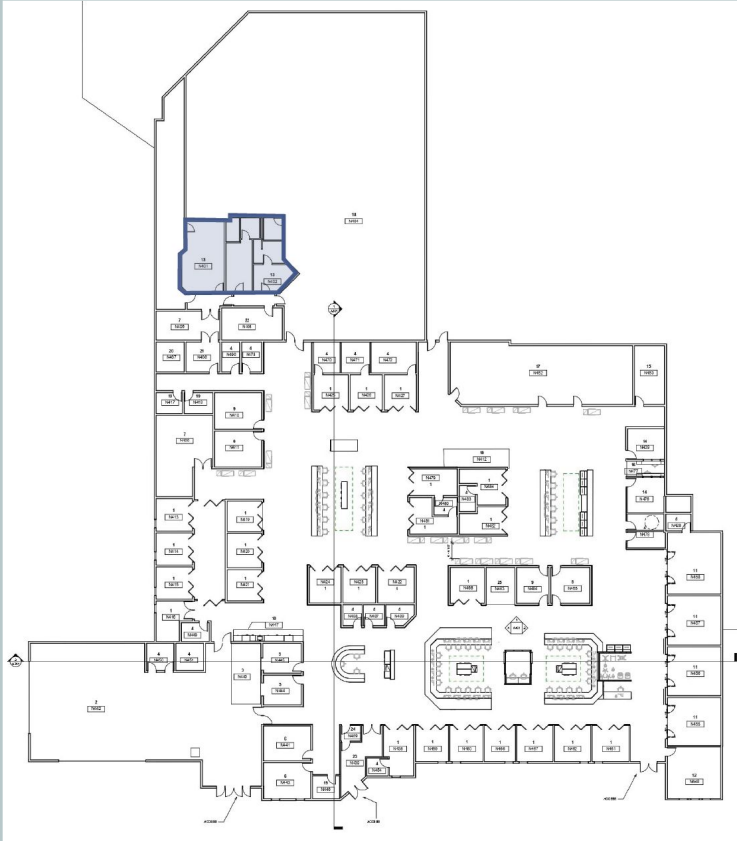
# Proposed Unity ED Map:



○ ED overflow



# Proposed Unity ED Map:



○ Staff break rooms and locker rooms

# Proposed Unity ED Map:



Entrance & waiting

# Proposed Unity ED Map:



- Entrance & waiting
- Ambulance entrance & EMS office

# Proposed Unity ED Map:



- Entrance & waiting
- Ambulance entrance & EMS office
- Registration & Discharge

# Proposed Unity ED Map:



- Entrance & waiting
- Ambulance entrance & EMS office
- Registration & Discharge
- Triage

# Proposed Unity ED Map:



- Entrance & waiting
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- Registration & Discharge
- Triage
- Patient rooms

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- Entrance & waiting
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- Trauma rooms

# Proposed Unity ED Map:



- Entrance & waiting
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- Entrance & waiting
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# Proposed Unity ED Map:



- Entrance & waiting
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- Patient rooms
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- Toilet rooms
- Nurses stations

# Proposed Unity ED Map:



-  Entrance & waiting
-  Ambulance entrance & EMS office
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-  Trauma rooms
-  Toilet rooms
-  Nurses stations
-  Storage

# Proposed Unity ED Map:



- Entrance & waiting
- Ambulance entrance & EMS office
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- Trauma rooms
- Toilet rooms
- Nurses stations
- Storage
- Clean utility/supply

# Proposed Unity ED Map:



- Entrance & waiting
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- Storage
- Clean utility/supply
- Soiled utility/supply

# Proposed Unity ED Map:



- Entrance & waiting
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- Soiled utility/supply
- Medicine

# Proposed Unity ED Map:



- Entrance & waiting
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- Nutrition Station

# Proposed Unity ED Map:



- Entrance & waiting
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- Nurses stations
- Storage
- Clean utility/supply
- Soiled utility/supply
- Medicine
- Nutrition Station
- Isolation/ Decontamination



# Proposed Unity ED Map:



- Entrance & waiting
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- Soiled utility/supply
- Medicine
- Nutrition Station
- Isolation/ Decontamination
- Security

# Proposed Unity ED Map:



- Entrance & waiting
- Ambulance entrance & EMS office
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- Patient rooms
- Trauma rooms
- Toilet rooms
- Nurses stations
- Storage
- Clean utility/supply
- Soiled utility/supply
- Medicine
- Nutrition Station
- Isolation/ Decontamination
- Security
- Office for private work

# Proposed Unity ED Map:



- Entrance & waiting
- Ambulance entrance & EMS office
- Triage
- Patient rooms
- Trauma rooms
- Toilet rooms
- Nurses stations
- Storage
- Clean utility/supply
- Soiled utility/supply
- Medicine
- Nutrition Station
- Isolation/ Decontamination
- Security
- Office for private work
- Eye Room

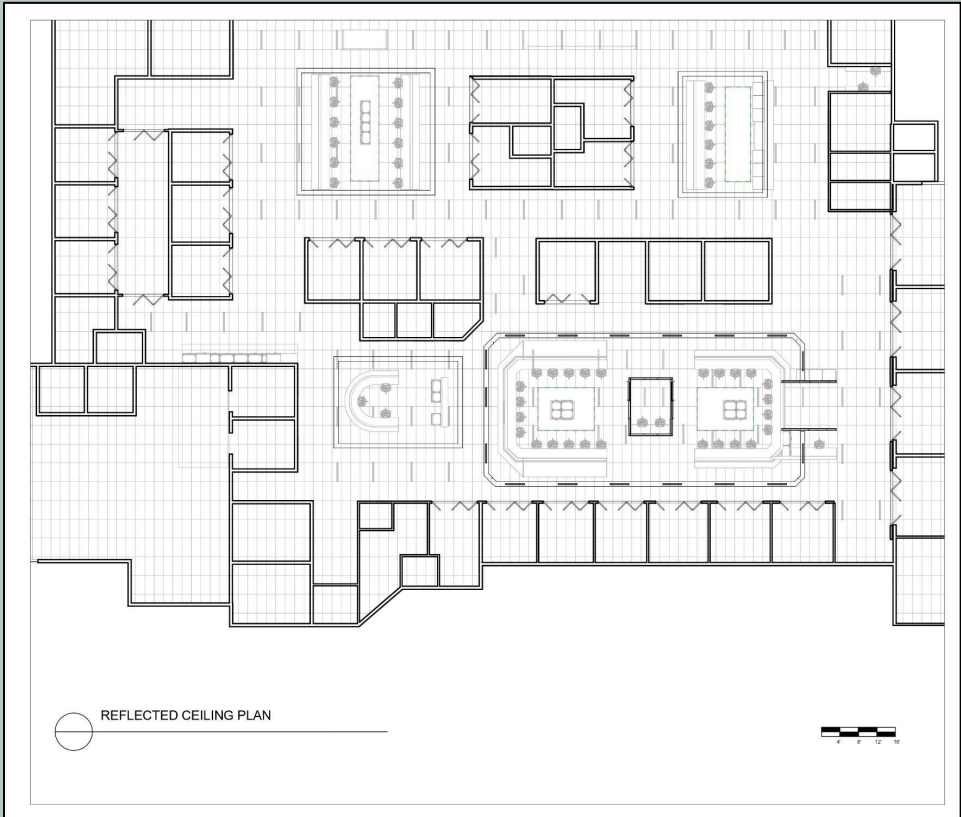
# Proposed Unity ED Map:



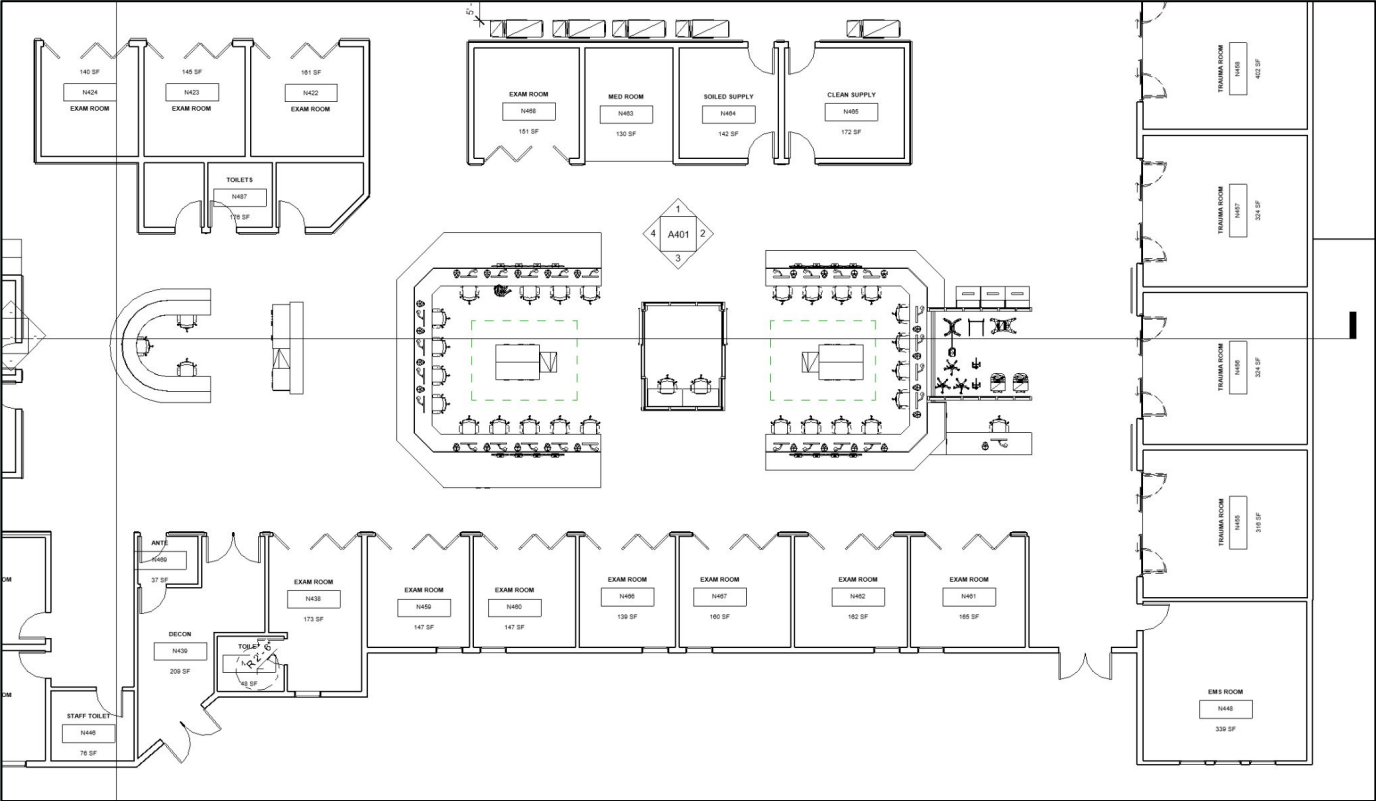
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- Office for private work
- Eye Room
- Education/Training



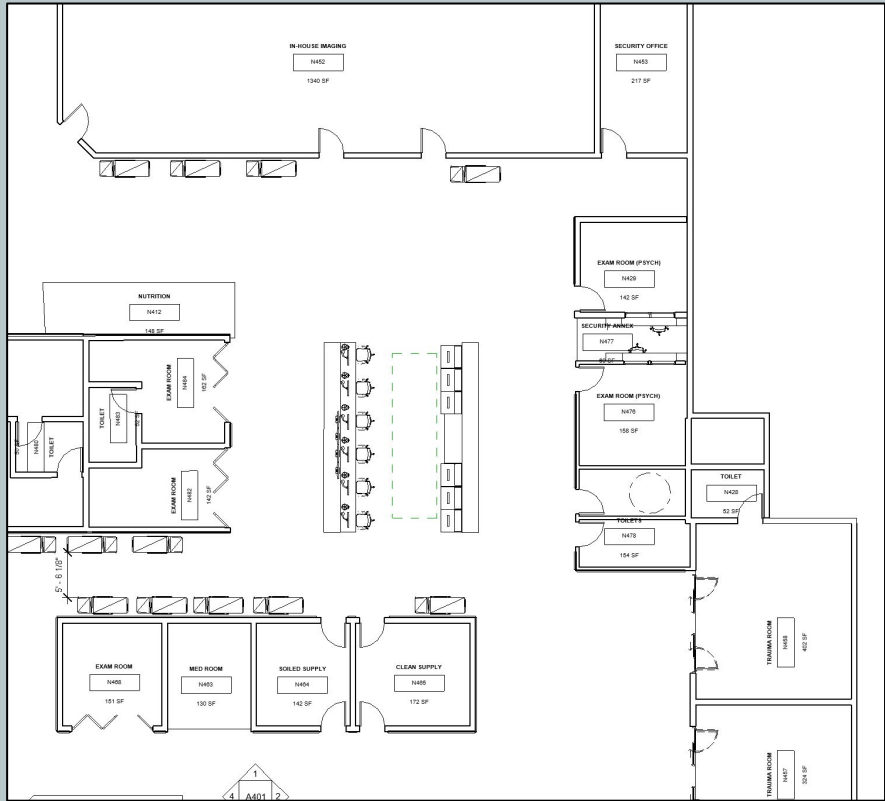
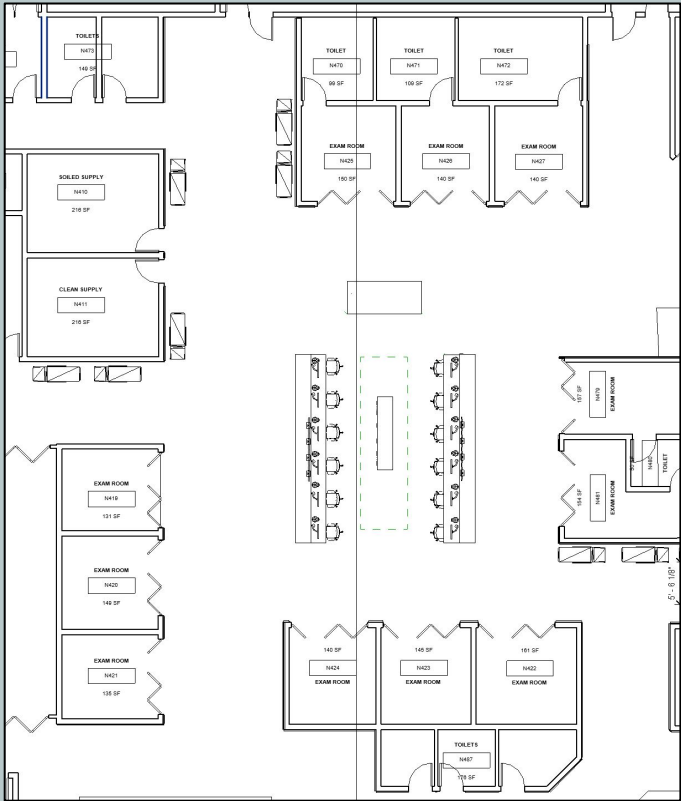
# Reflected Ceiling Plan:



# Plan Detail of the Main Nurses Station:

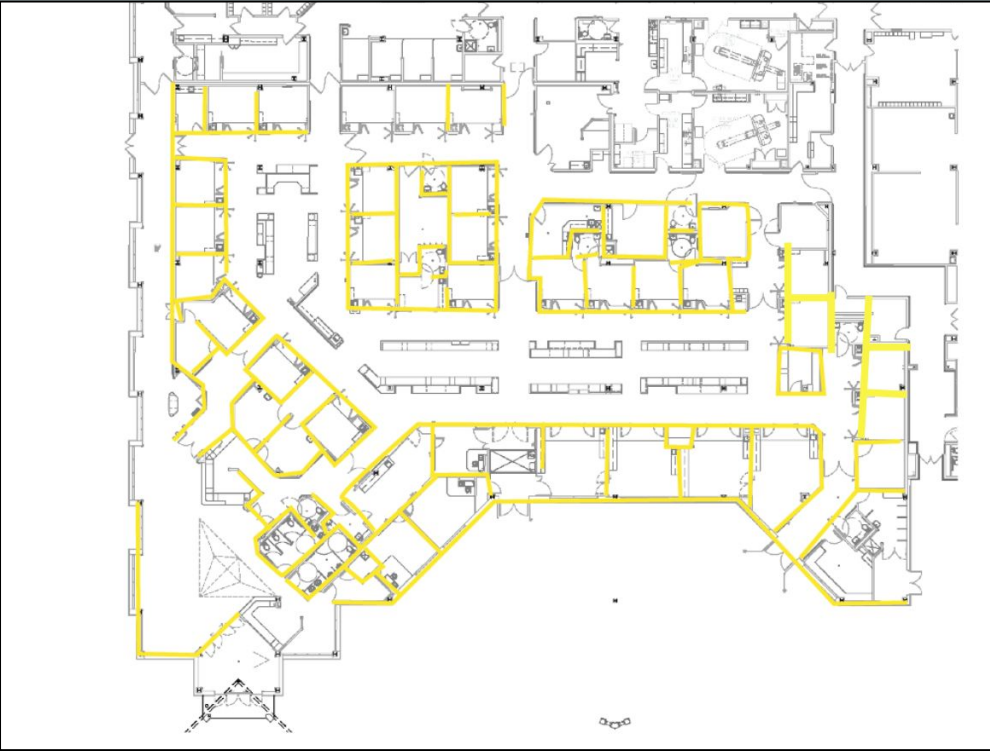


# Plan Detail of the Secondary and Tertiary Nurses Stations:



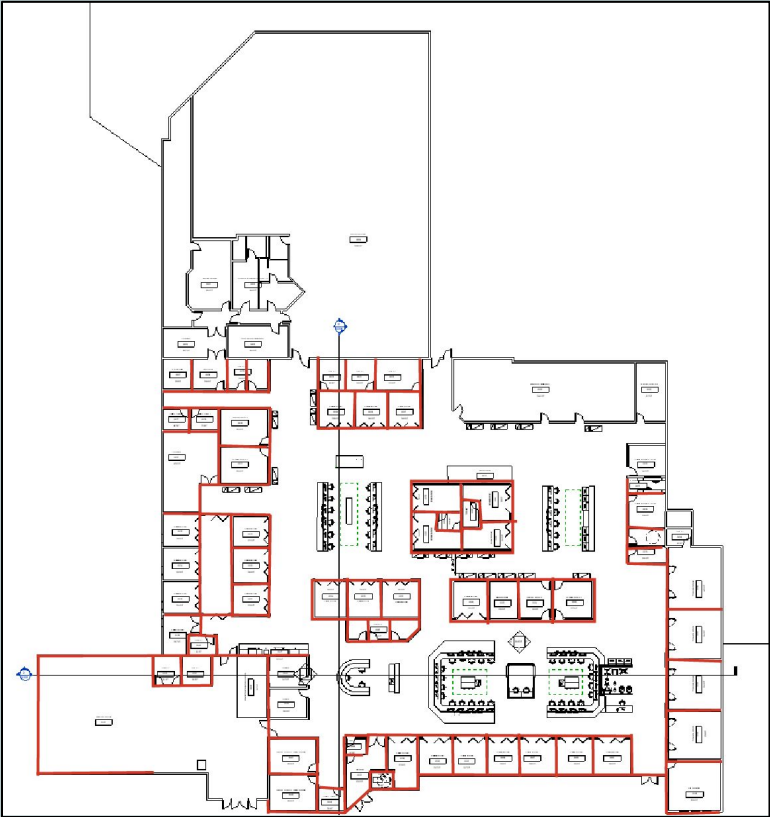


# Demolished Construction Plan:



 Demolished Walls

# New construction Plan:



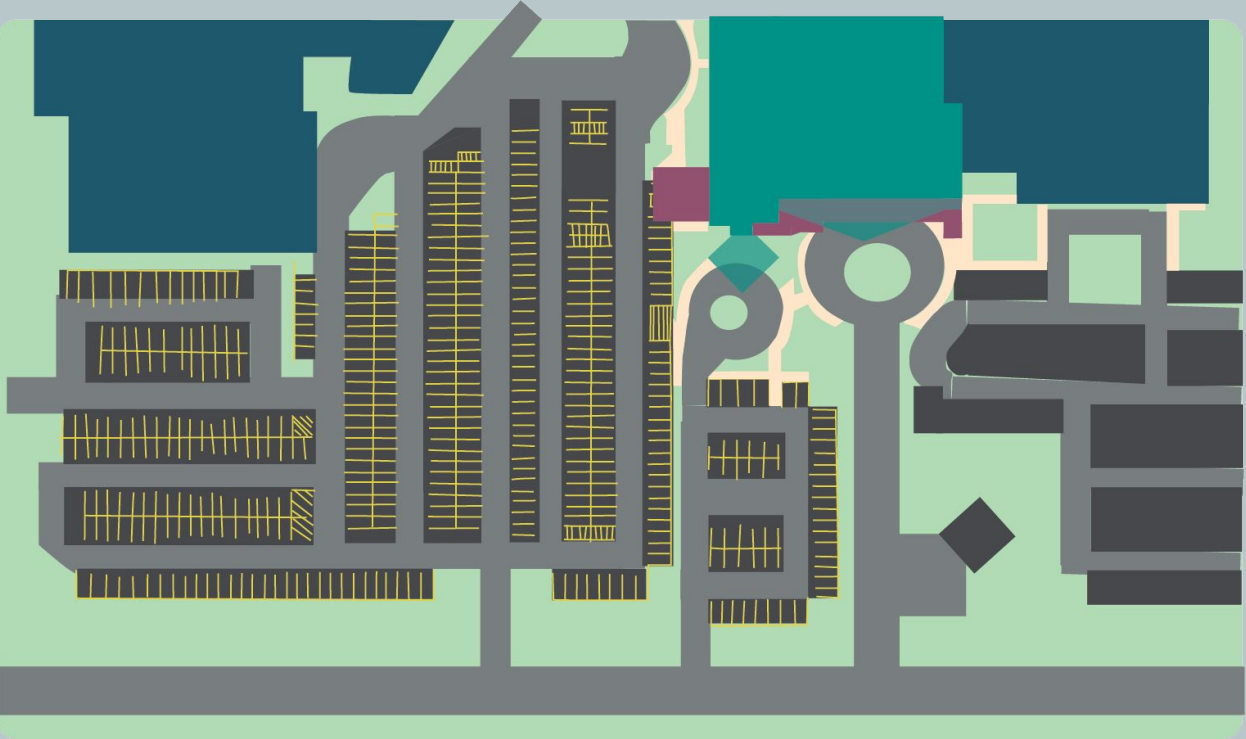
— Newly Constructed Walls

# Site Considerations - Existing:



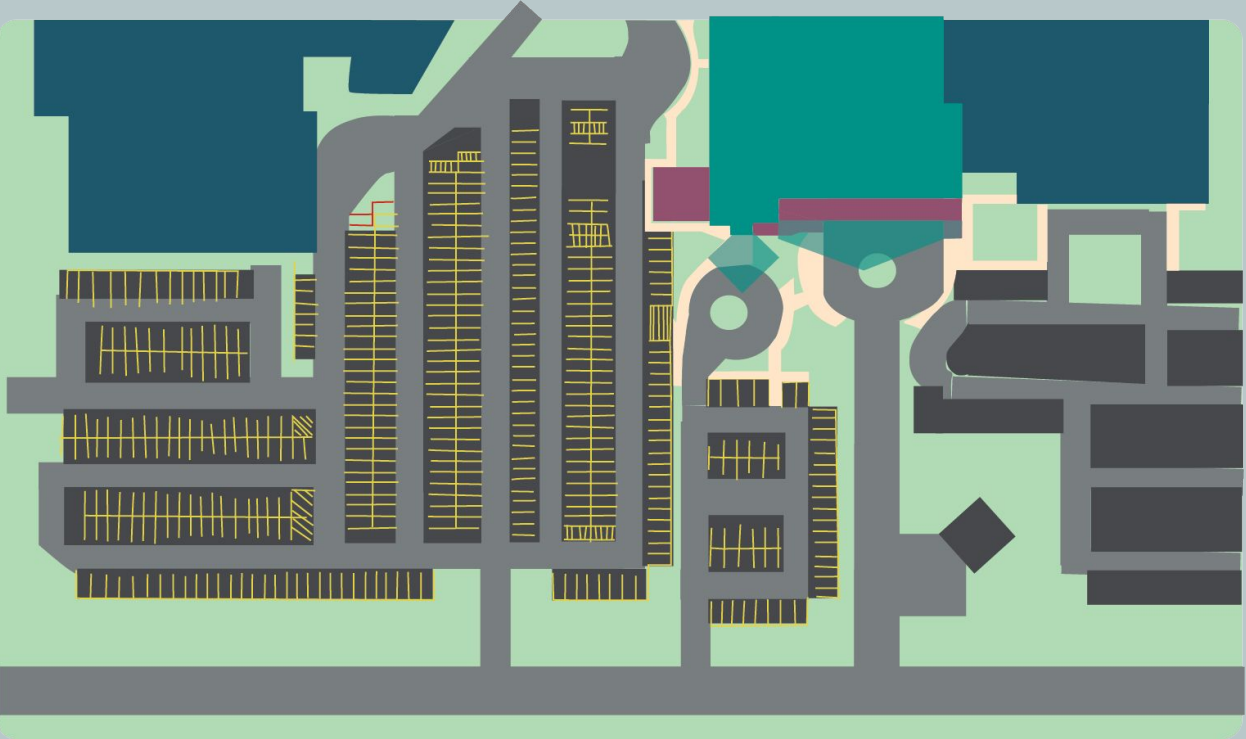
- Greenspace
- Roads
- Parking lots
- Hospital Buildings
- The ED
- Sidewalks
- Parking spots

# Site Considerations - Existing with Additions:



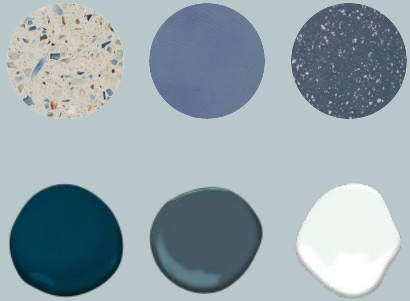
- Greenspace
- Roads
- Parking lots
- Hospital Buildings
- The ED
- Sidewalks
- Parking spots
- Building Additions

# Site Considerations - Proposed Changes:

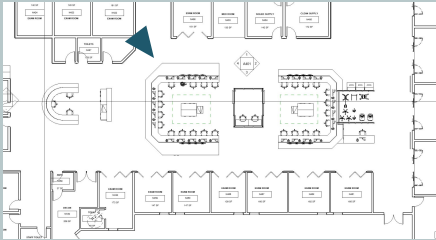
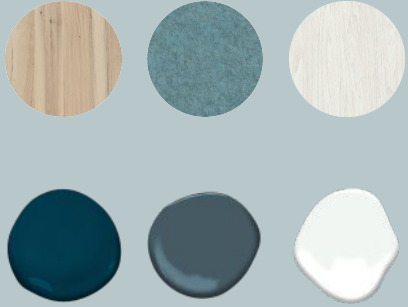


- Greenspace
- Roads
- Parking lots
- Hospital Buildings
- The ED
- Sidewalks
- Parking spots
- Building Additions
- Relocated Parking Spots

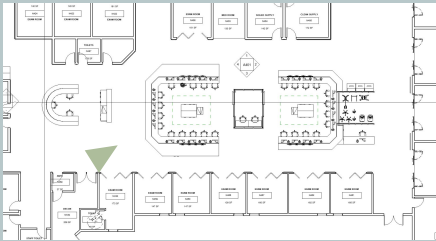
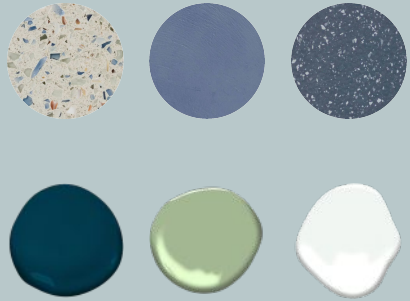
# Renderings:



## Renderings:

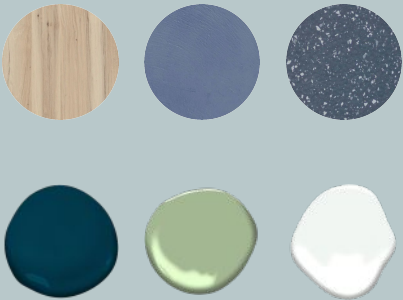


# Renderings:





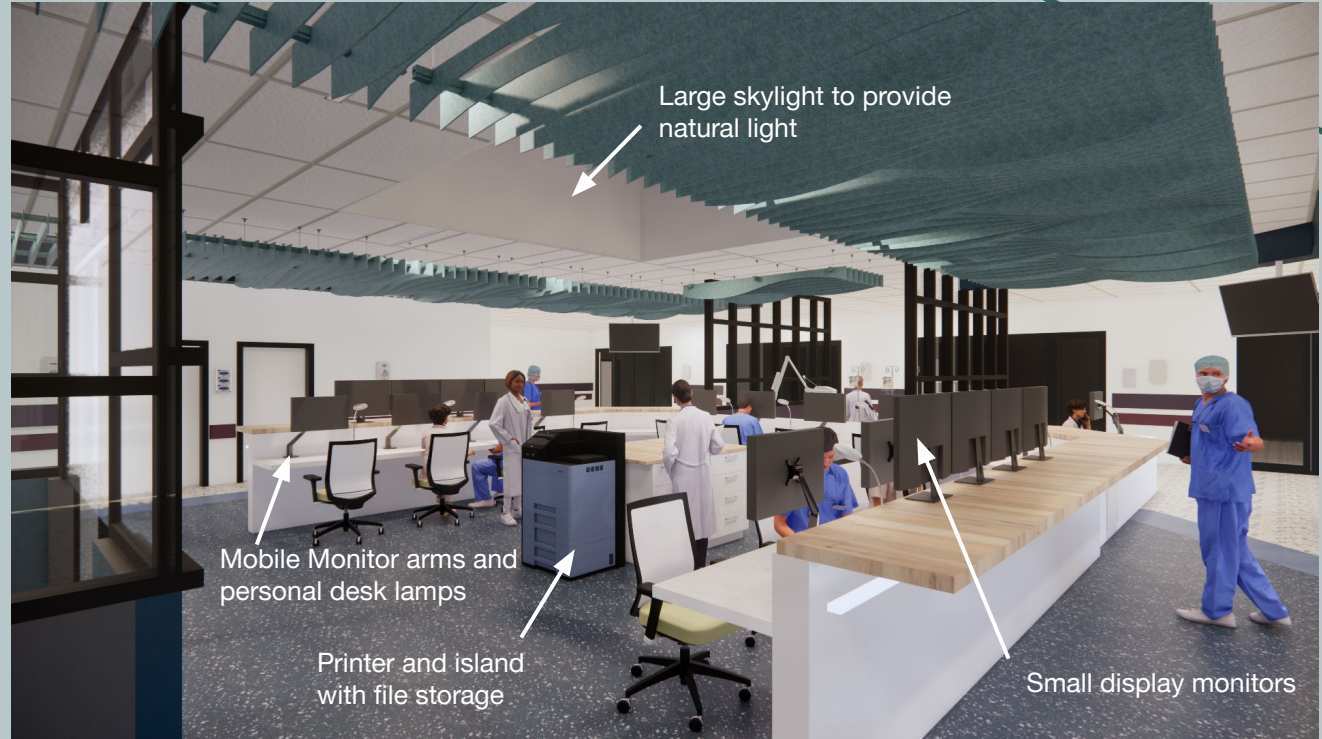
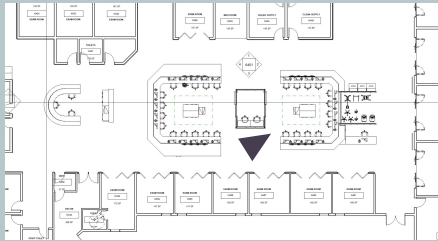
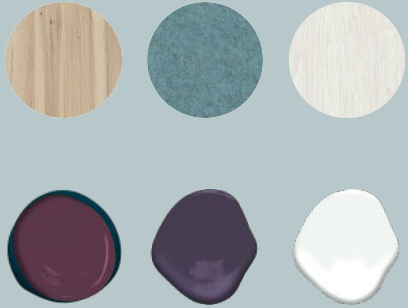
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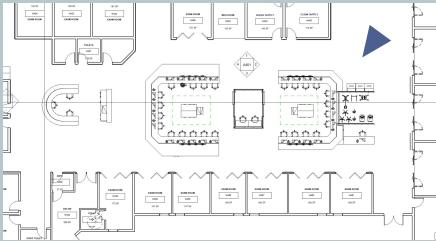
“Hub box” with automatic sliding doors on each side



## Renderings:

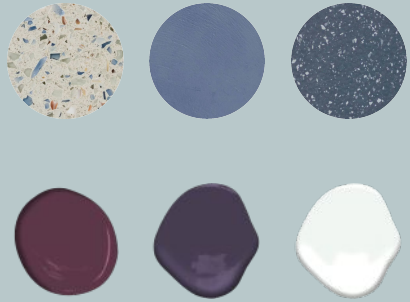


# Renderings:



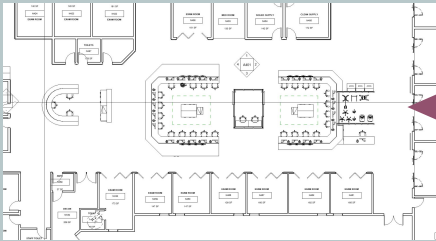
Omnicell Medicine dispensers

## Renderings:

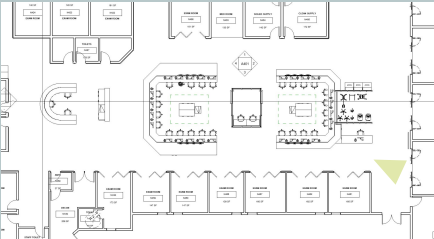
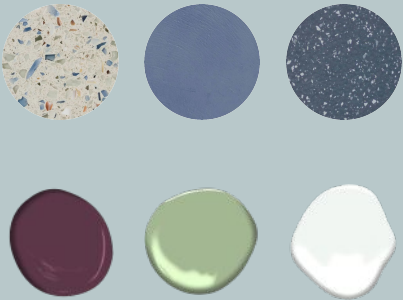


Workstation for the Trauma triage nurse  
right in front of the EMS entrance

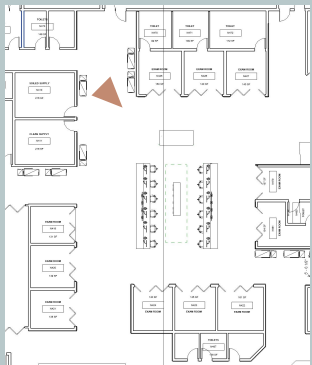
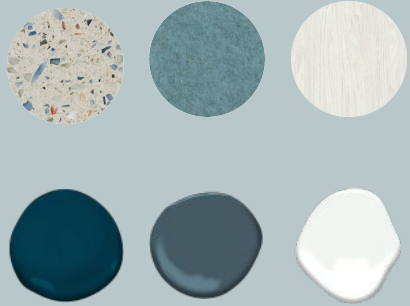
Large equipment storage alcove near  
the trauma rooms



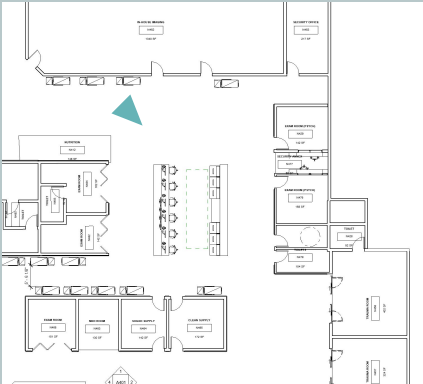
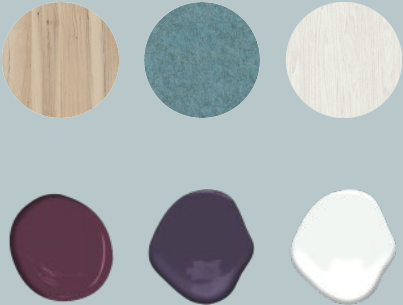
# Renderings:



# Renderings:



# Renderings:



# Leeann Perkowski

Interior Design BFA | Rochester Institute of Technology

Capstone Researcher | Class of 2023

**An Investigation of an Emergency Department in  
a Hospital: Improving Efficiency by Using  
Elements of Design to Benefit Nurses and Staff**

Capstone Final Oral Defense Presentation

**RIT** | College of Art and Design  
**Interior Design**

