BUILDINGENERGY NYC

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Northeast Sustainable Energy Association

Provider Number G338

Commercial Buildings Can Go Passive: New Build & Retrofit Examples

Course Number

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NESEA

Learning Objectives

At the end of this course, participants will be able to:

1. Outline Passive House methodology and how commercial building methodology may differ from residential.
2. Describe specific examples of applying Passive House in new build and retrofit scenarios.
3. List critical HVAC systems and enclosure attributes
4. Outline process impediments and strategies to overcome them.

Project Background

- Client: Manufacturer of health products
- Building: Production facility and staff offices
- TFA:1,400m^2 (15,000 ft^2)
- Location: Central Ontario
- Design Temp: -27^{o}C (-17^{o}F)

Project Requirements/Goals

- Business: Serve the current and future needs of a fast growing business
- Well-being: Healthy, comfortable environment for staff
- Longevity: Lifespan of 7 generations!
- Sustainability: LEED or Passive House

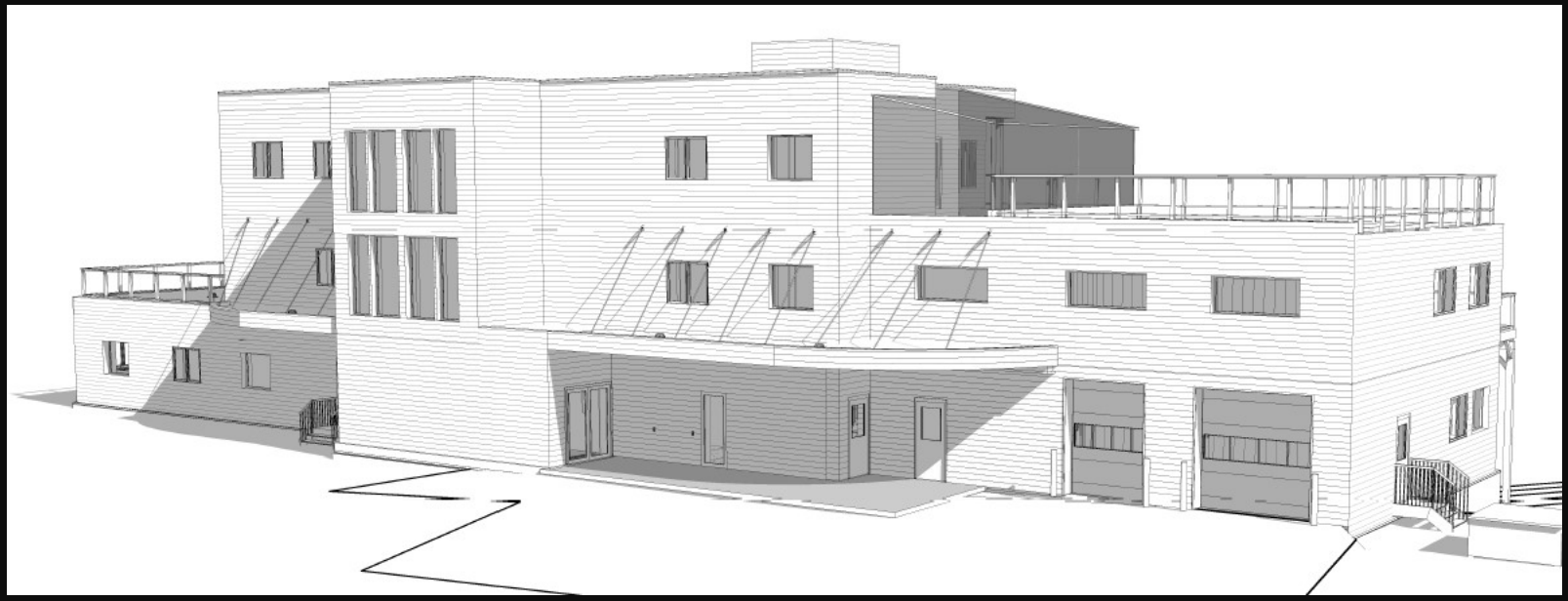
Cold Climate Overview

- Cold temperatures
  - Every decision matters more
  - Airtightness has huge impact
  - Defrost, (low) humidity become problematic
  - Design temps influence functionality of equipment
- Product Availability
  - No local manufacturer of cold climate products
  - Very few on EU market
  - Some EU companies won’t export

Building Design

- Design: 3 storeys plus walk-out basement
- Compact Form
- Rational use of glazing
  - South: 25%
  - Other: 9-14%

North Facade



Massing

- Balance between daylight, solar gain, thermal, comfort, cost
- Glazing between offices enhances daylight
- Repeated window sizes
- Optimized shading elements

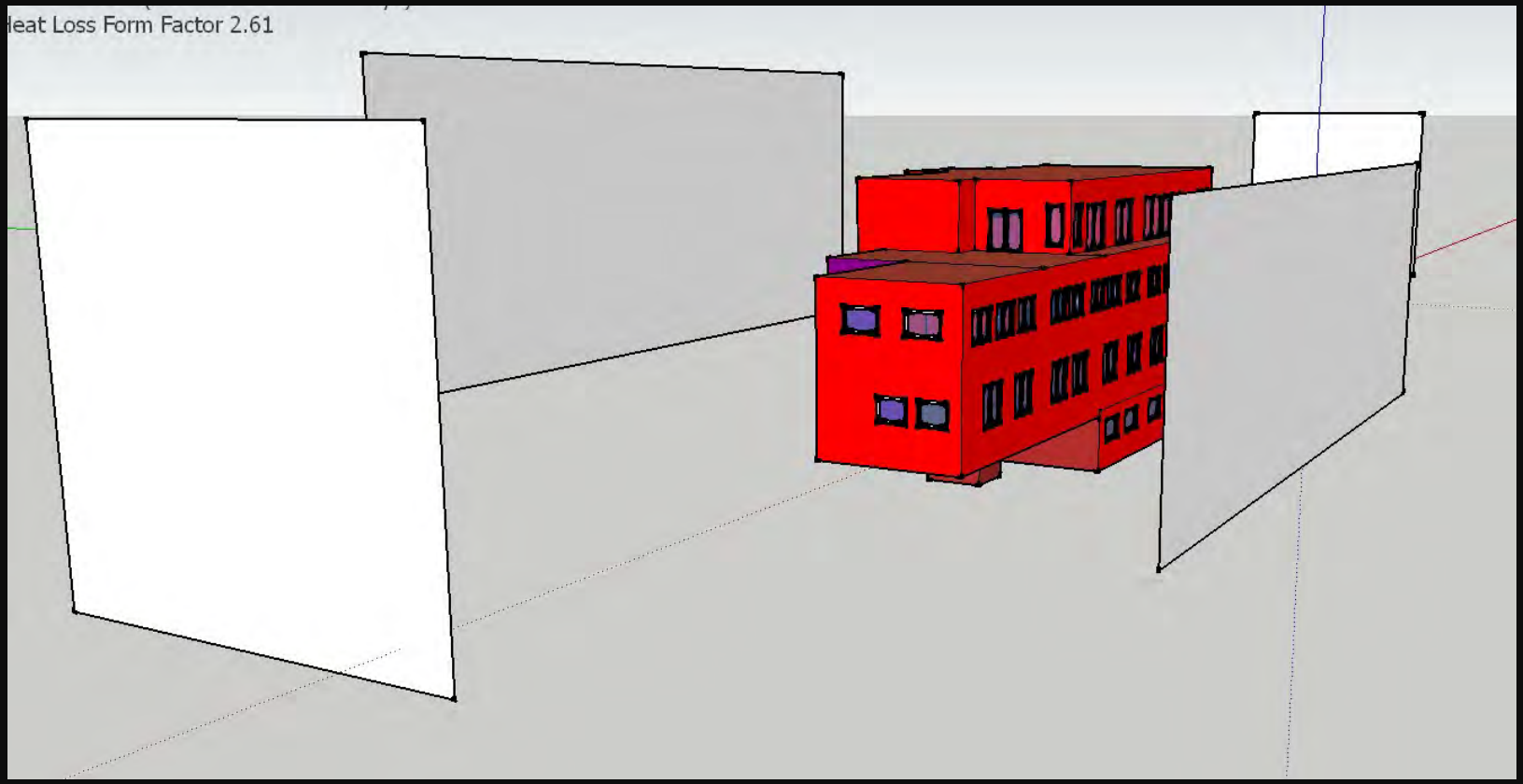
South Facade

Shading

- Substantial south shading

Shading

- Substantial south shading
  - Basement window winter reduction factor = 21%

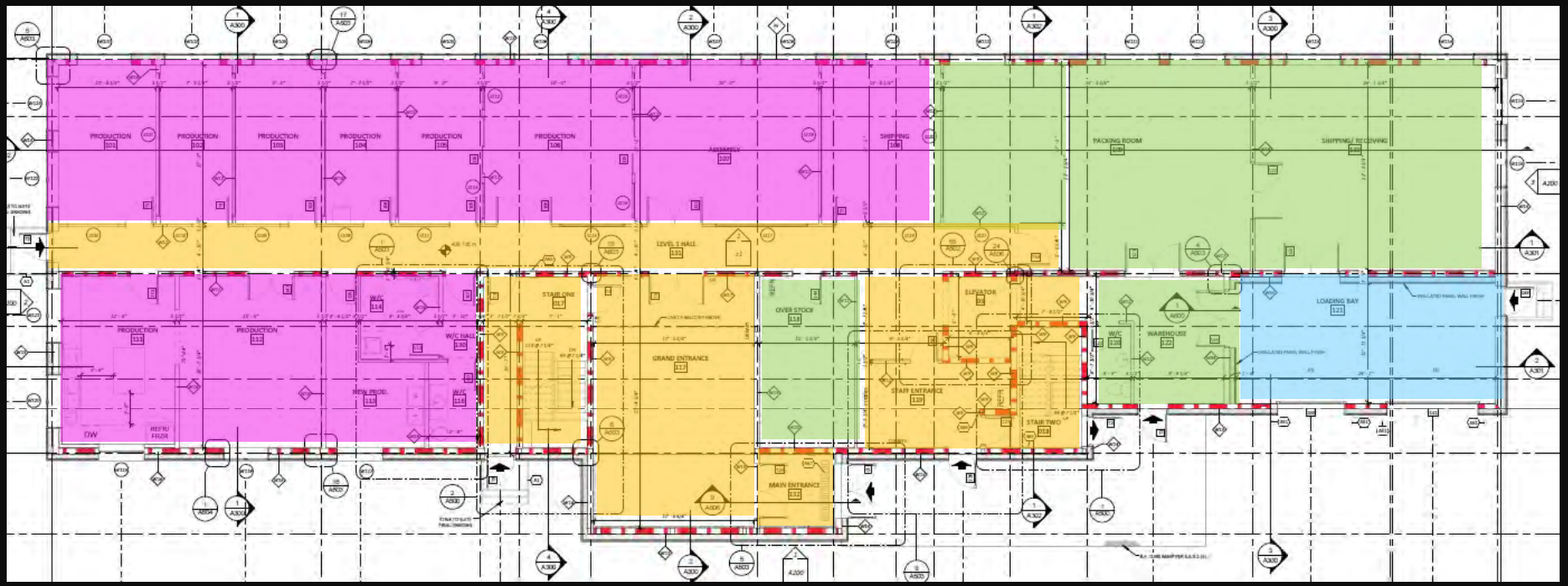


Floor Plans

Rooms grouped by use

- Basement
  - Storage, M&E rooms
- Ground
  - Production, packing, shipping
- Second
  - Office
- Third
  - Canteen, lounge, board room
- Exception: Washrooms spread out – longer pipes!

Ground Floor



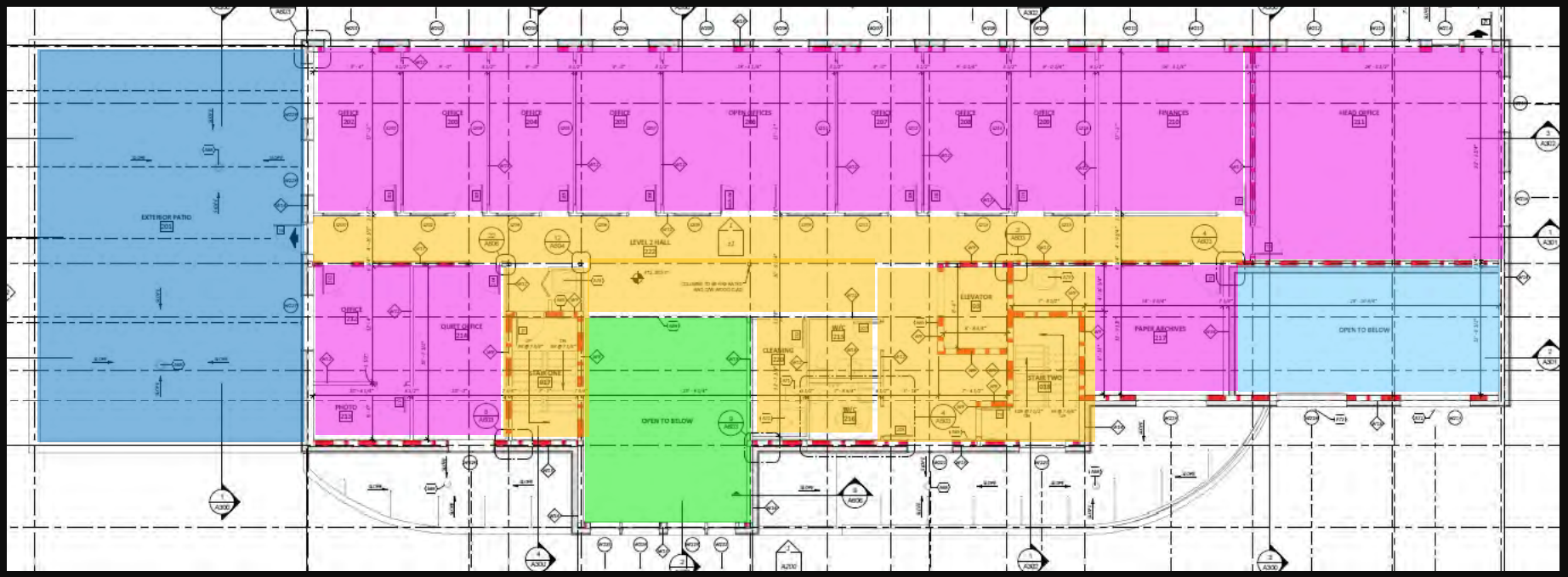
Production

Circulation/WC

Packing/Shipping

Loading

Second Floor



Office | **Circulation/WC** | **Outside**

Void | **Sheltered**

Third Floor

Communal | **Circulation/WC** | **Outside**

Void | **Sheltered**

Original Layout

- Basement
  - Storage, M&E rooms

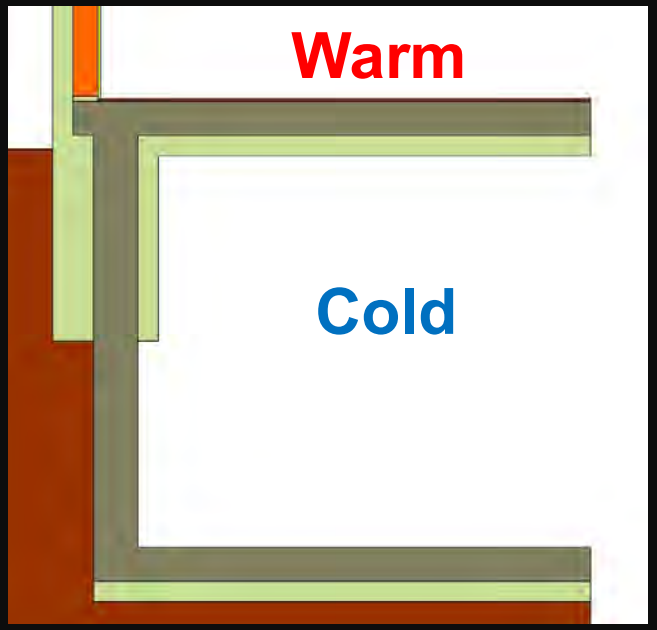
Unexcavated

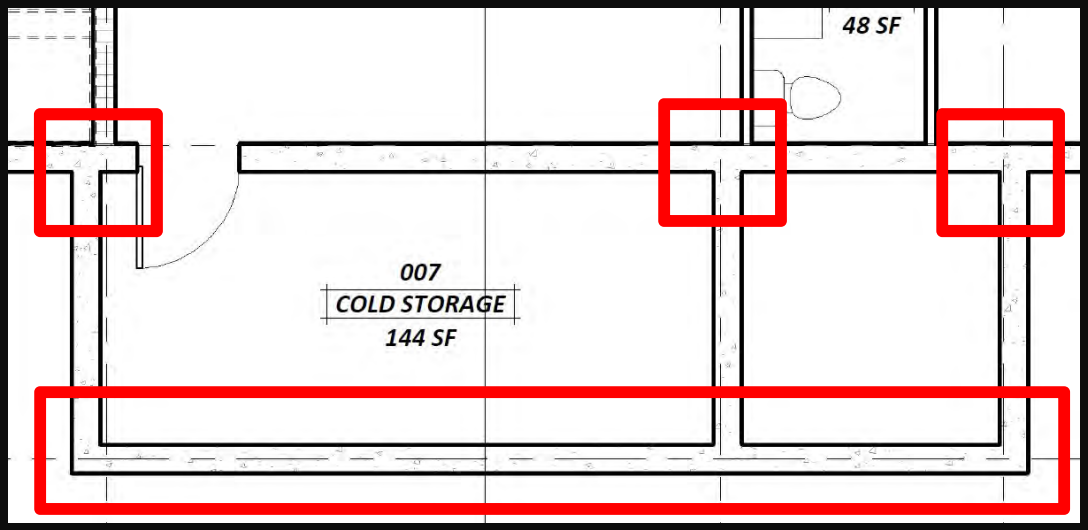
Storage with special extract

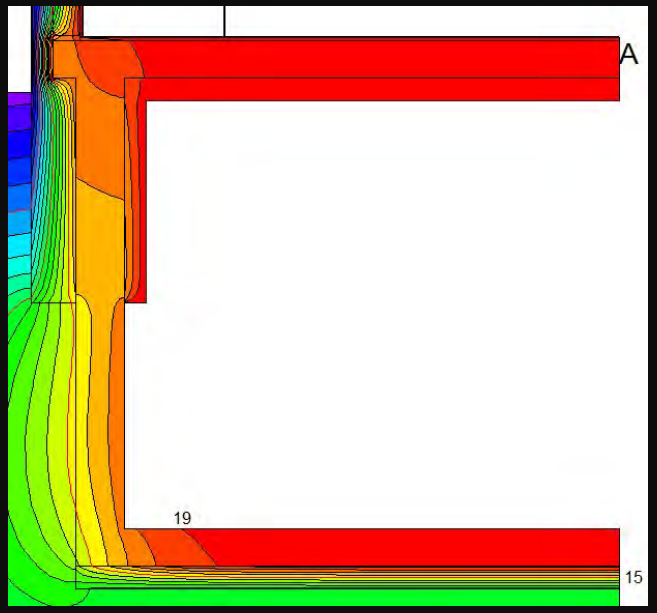
Cold Storage

Thinking through the details early

- Cold store outside thermal envelope
  - Created thermal bridges
  - Introduced awkward insulation detailing
- Additional insulation required just to deal with thermal bridging
- Early TB model revealed substantial bridging at floor
  - Psi-install = 0.107 W/mK (0.062 BTU)

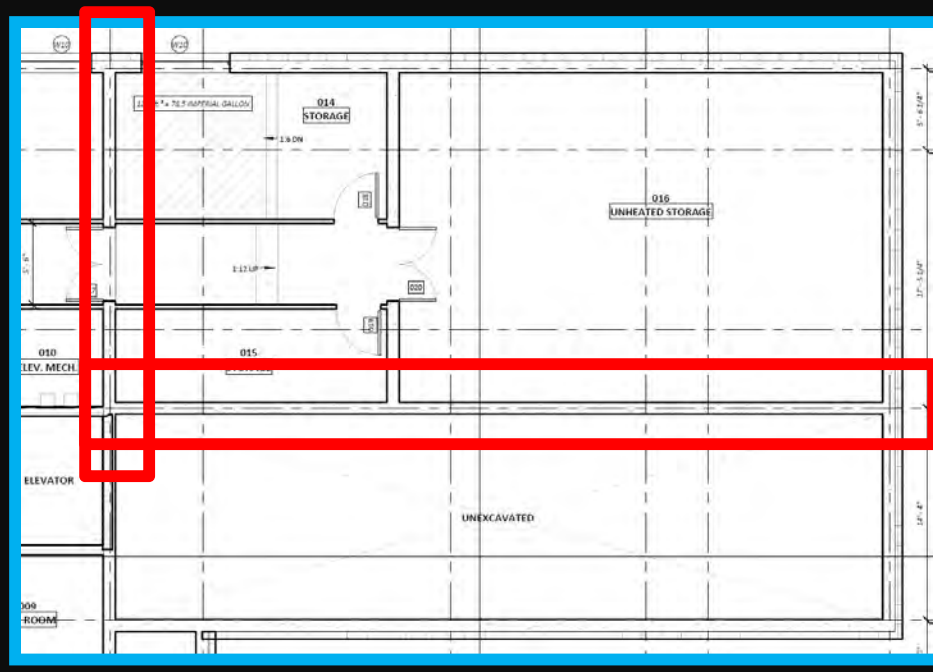


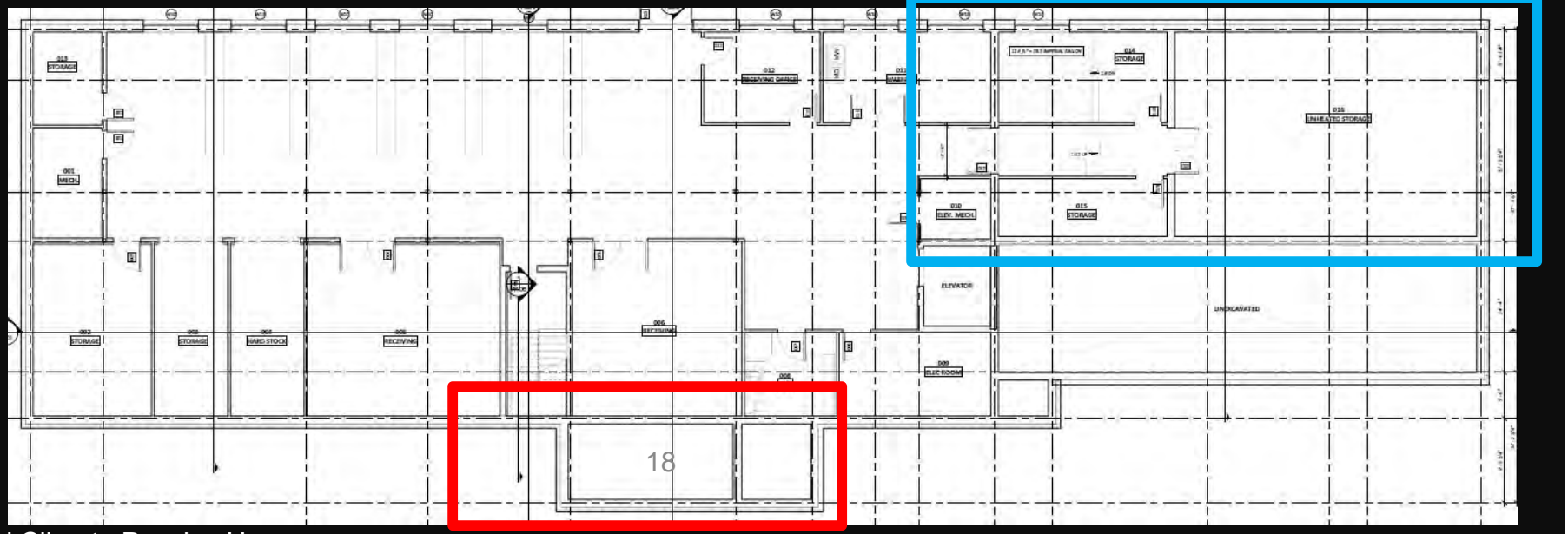




Basement Layout

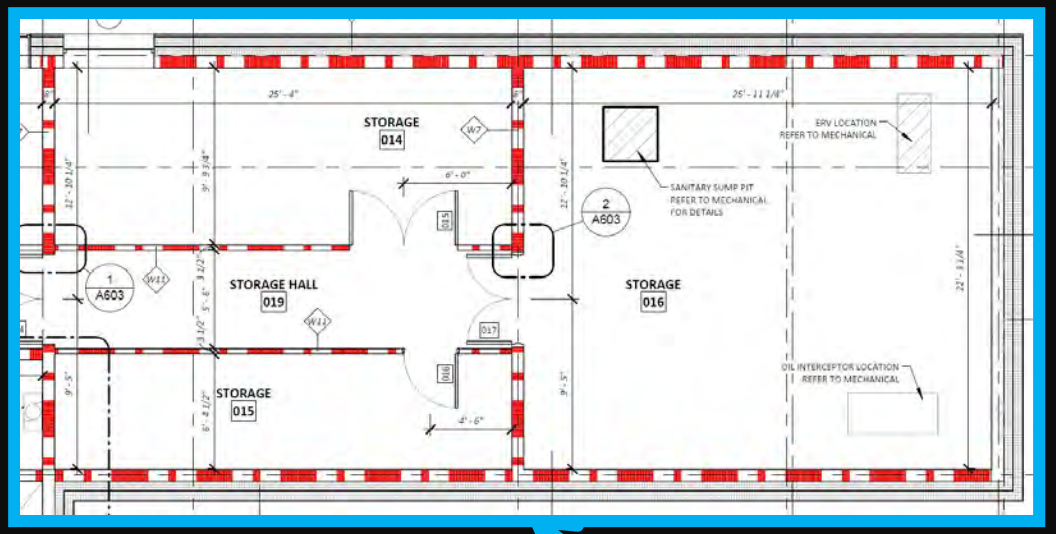
- Initial Solution:
  - Move rooms outside envelope
- Issue:
  - thermal bridging remains





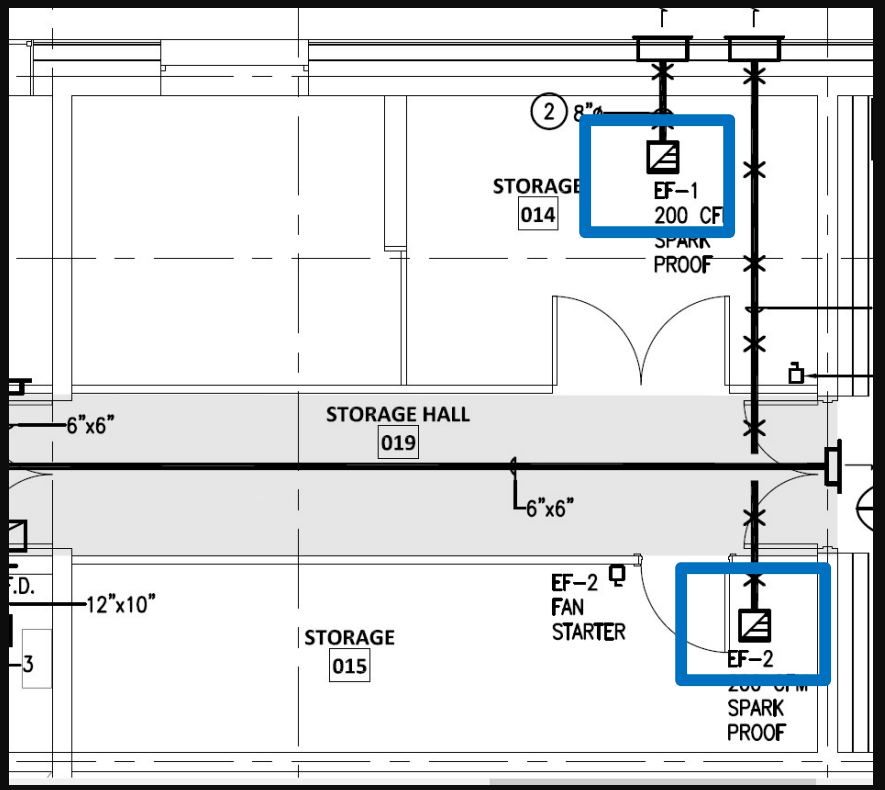
Basement Layout

- Alternative Solution:
  - Bring everything within envelope
  - Use raft slab
  - TB-free!
- Issue: extract losses



Special Extract Requirements

- Liquid storage required spark-proof motors
  - Cost prohibitive to specify in ERV
  - Required separate extract
- Solution: Reduce:
  - Ventilation - Timer controlled – only ventilates when person enters room
  - Penetrations - Combine ducts into single vent
  - Convection - Airtight damper



Thermal Envelope

Cold Climate Passive House
Production Facility

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