

October 10, 2026

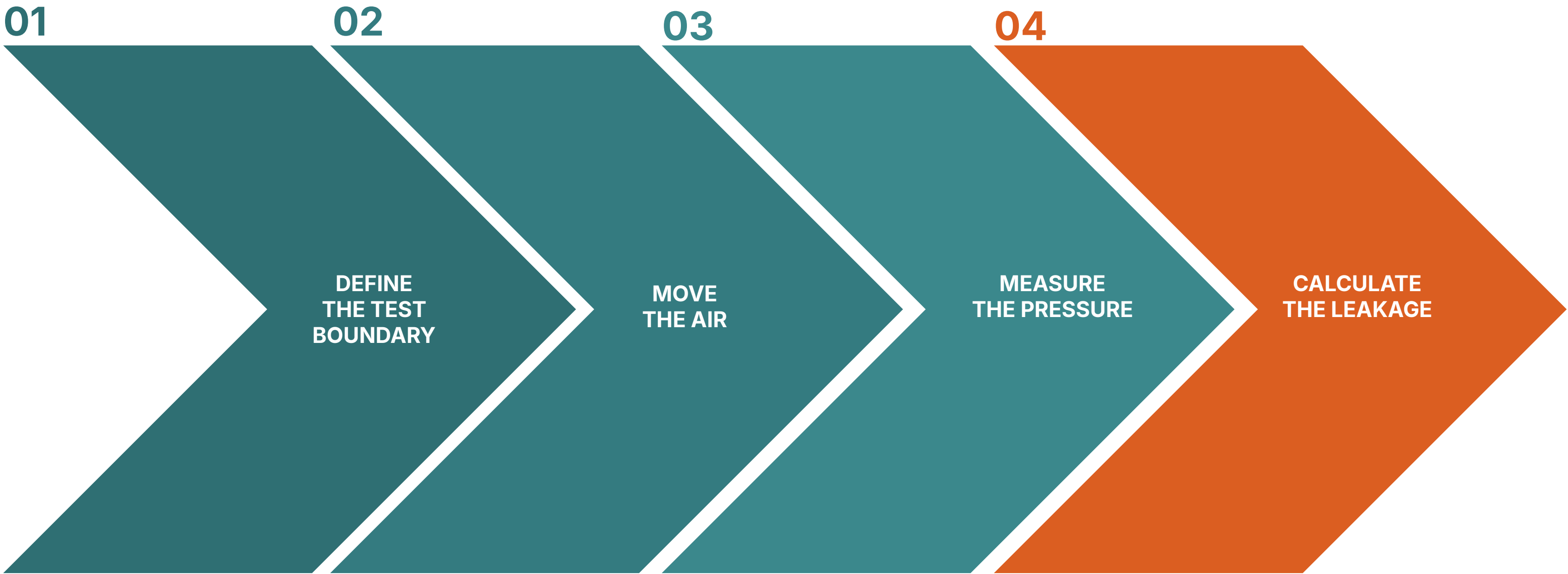
Don't Panic!

The Hitchhikers Guide to Whole Building Air Tightness Testing

- Mike Browne | Phius Verifier, HERS Rater
- John Mann | EIT, CPHC, Phius Verifier, HERS Rater



A Perfectly Simple Procedure

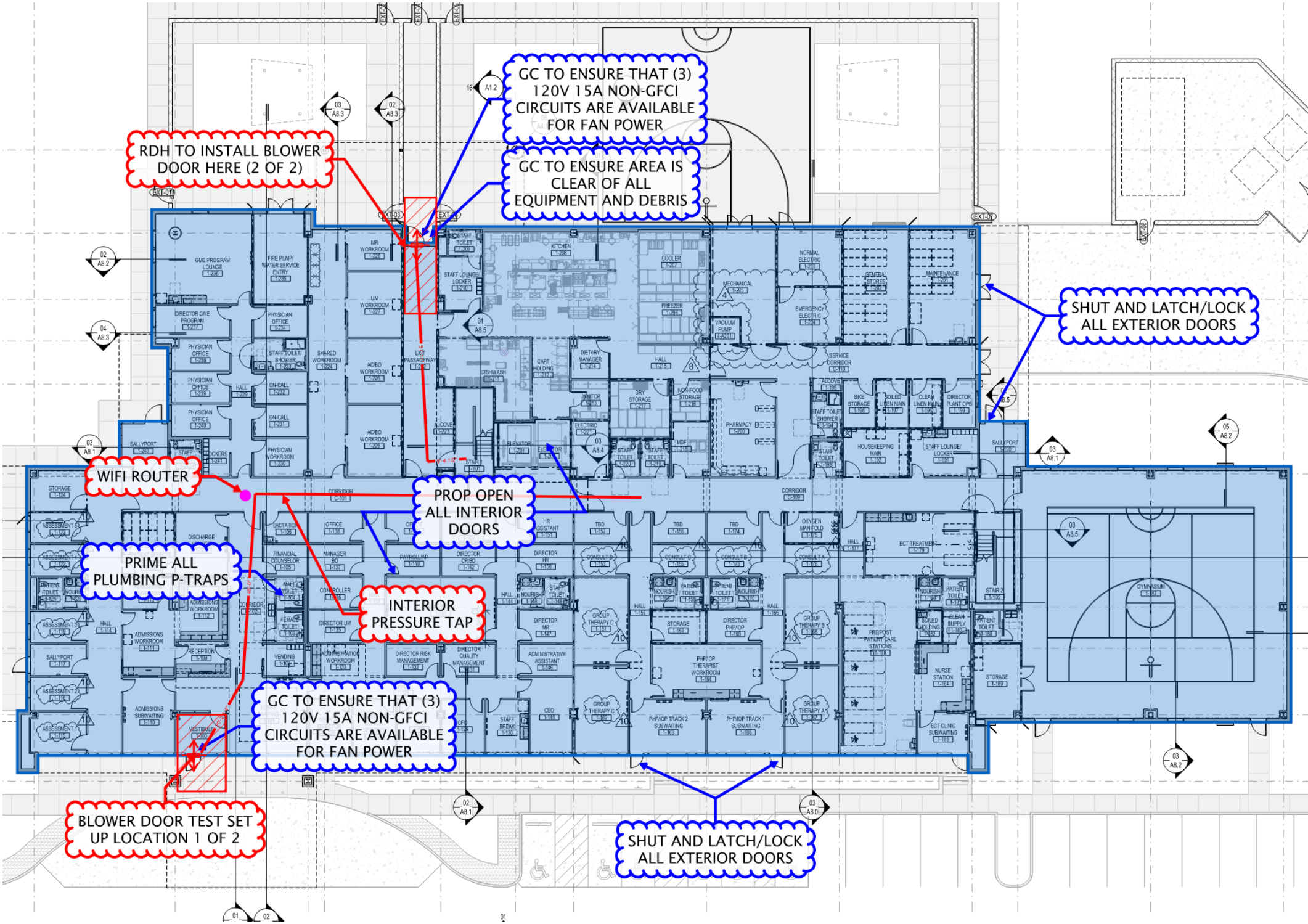


The Building Is Part Of The Test Equipment

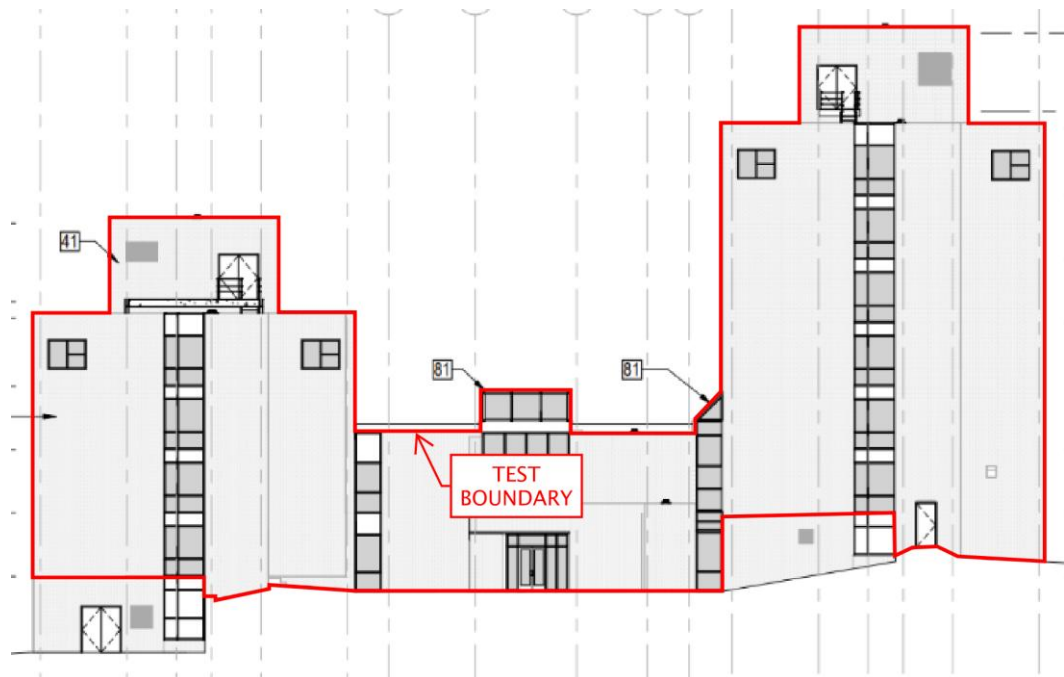
Purpose: State the core argument.

On-slide content: Building + pressure field + measurement system = one coupled system

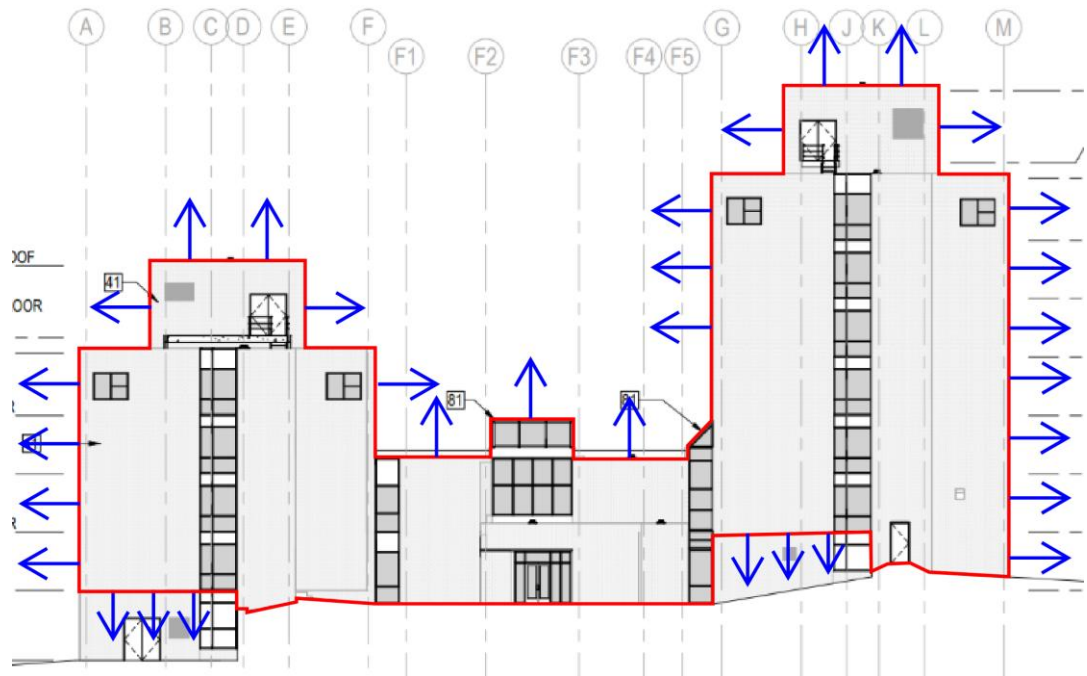
Visual direction: Three interlocking circles with one highlighted failure path in each.



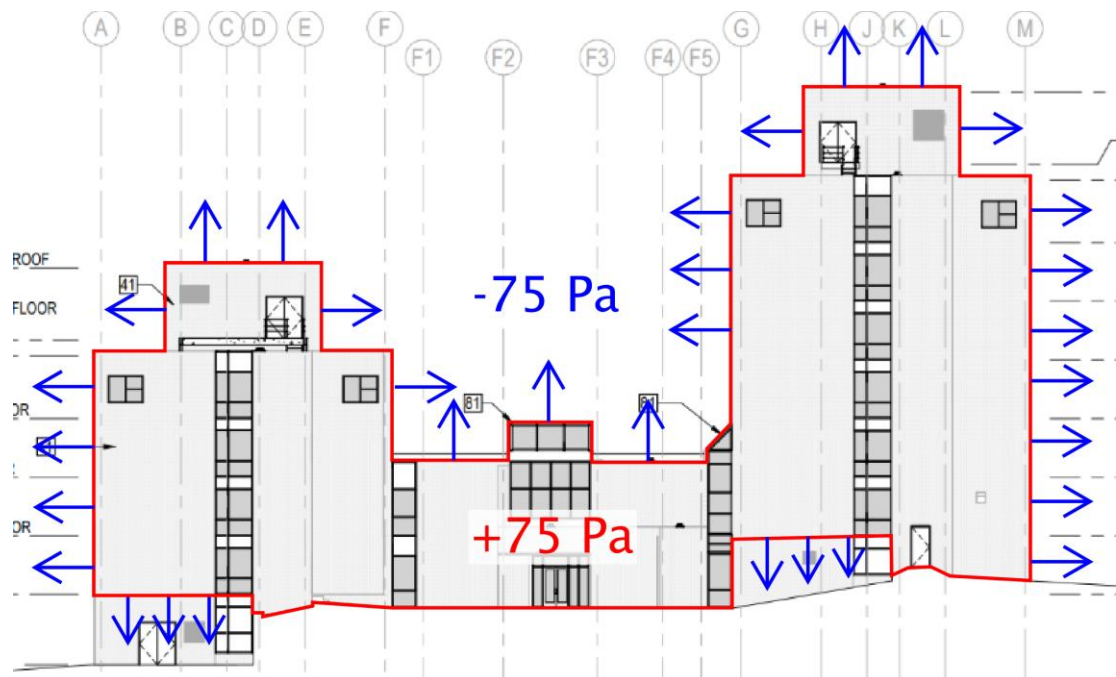
Four Questions Before The Fans Start



1. What is the boundary?



2. Where can air move?



3. Is pressure adequate everywhere?

Nominal Building Pressure (Pa)	Baseline adjusted Building Pressure (Pa)	Fan Pressure (Pa)	Nominal Flow (cfm)	Adjusted Flow (cfm)	% Error
-2.6					
-25.0	-22.5	-	66224	63377	-1.0
-24.7	-22.3	-	66433	63577	-0.0
-35.1	-32.7	-	82958	79392	0.1
-34.6	-32.2	-	82437	78894	0.4
-40.6	-38.2	-	90779	86877	0.2
-40.8	-38.3	-	91046	87133	0.2
-44.1	-41.6	-	95833	91714	0.6
-44.5	-42.1	-	95710	91596	-0.1
-30.3	-27.8	-	75745	72489	0.3
-29.9	-27.5	-	75260	72025	0.4
-45.1	-42.6	-	96562	92411	0.0
-45.0	-42.6	-	96530	92381	0.1
-48.2	-45.8	-	100967	96627	0.4
-48.5	-46.1	-	100847	96512	-0.1
-48.7	-46.3	-	100734	96404	-0.5
-48.7	-46.2	-	100705	96376	-0.4
-48.8	-46.3	-	100571	96248	-0.7
-2.3					

- Pressure Measurement Devices
- 1.) DG1000-17085. Calibration Date: 2024 Jun 26
 - 2.) DG1000-17086. Calibration Date: 2024 Jun 28
 - 3.) DG1000-17087. Calibration Date: 2024 Jun 28
 - 4.) DG1000-17088. Calibration Date: 2024 Jun 28
 - 5.) DG1000-17089. Calibration Date: 2024 Jun 28
 - 6.) DG1000-17090. Calibration Date: 2024 Jun 28
 - 7.) DG1000-150. Calibration Date: 2022 Nov 18
 - 8.) DG1000-233. Calibration Date: 2025 Oct 07
 - 9.) DG1000-234. Calibration Date: 2025 Apr 23
 - 10.) DG1000-2685. Calibration Date: 2023 Apr 26
 - 11.) DG1000-6071. Calibration Date: 2024 Sep 26
 - 12.) DG1000-9242. Calibration Date: 2025 Aug 29
 - 13.) DG1000-12829. Calibration Date: 2022 Nov 18
 - 14.) DG1000-16661. Calibration Date: 2024 May 10
 - 15.) DG1000-151. Calibration Date: 2024 Jan 08
 - 16.) DG1000-152. Calibration Date: 2024 Sep 26

4. Can we trust the measurement chain?

The Standards Are Not The Villain

ASTM E3158: Standard Test Method for Measuring the Air Leakage Rate of a Large or Multizone Building

ASTM E3474: Standard Test Method for Measuring the Air Leakage Rate of the Building Envelope of an Individual Test Zone within a Multizone Building



Know What You're Testing

Every Condition Matters

University Residence Hall

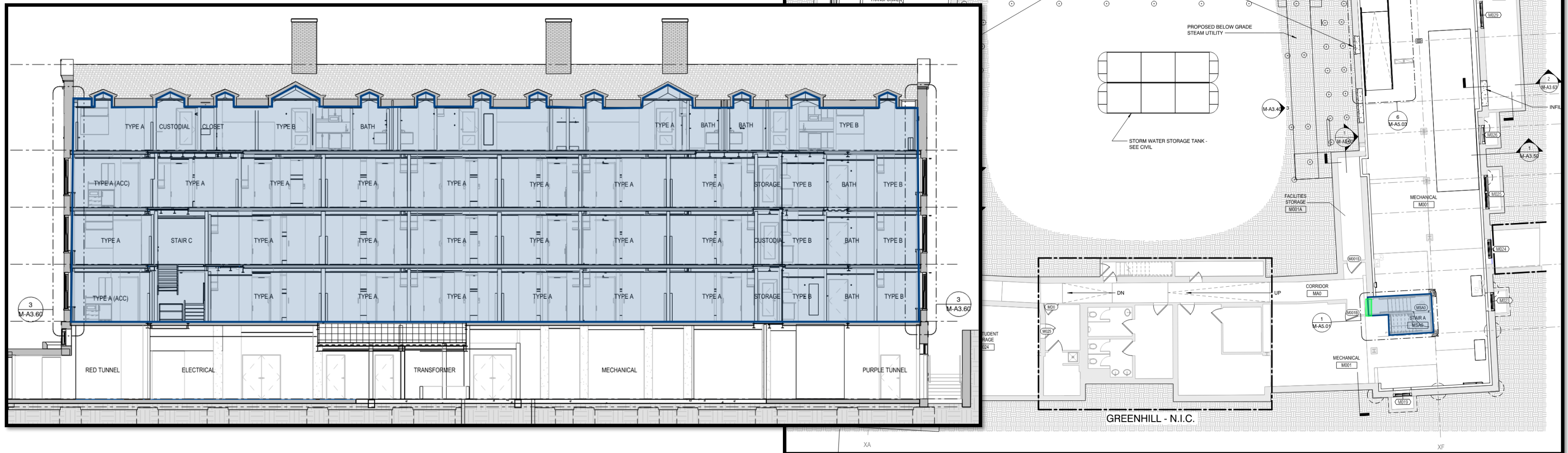
- **Testing a historic masonry building**
- How do you isolate the basement?
- How do the tunnels impact our zone?
- Are existing chimneys a problem?



Every Condition Matters

University Residence Hall

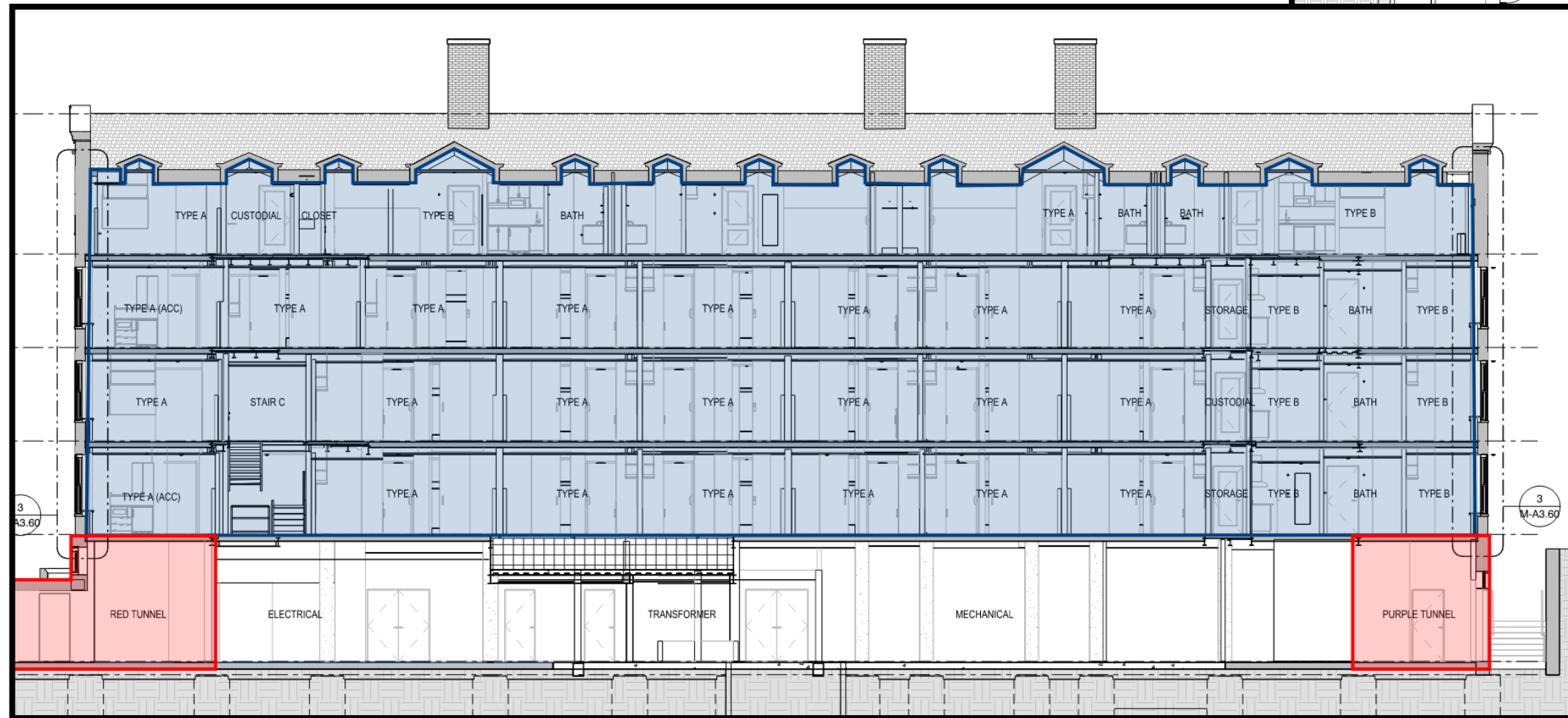
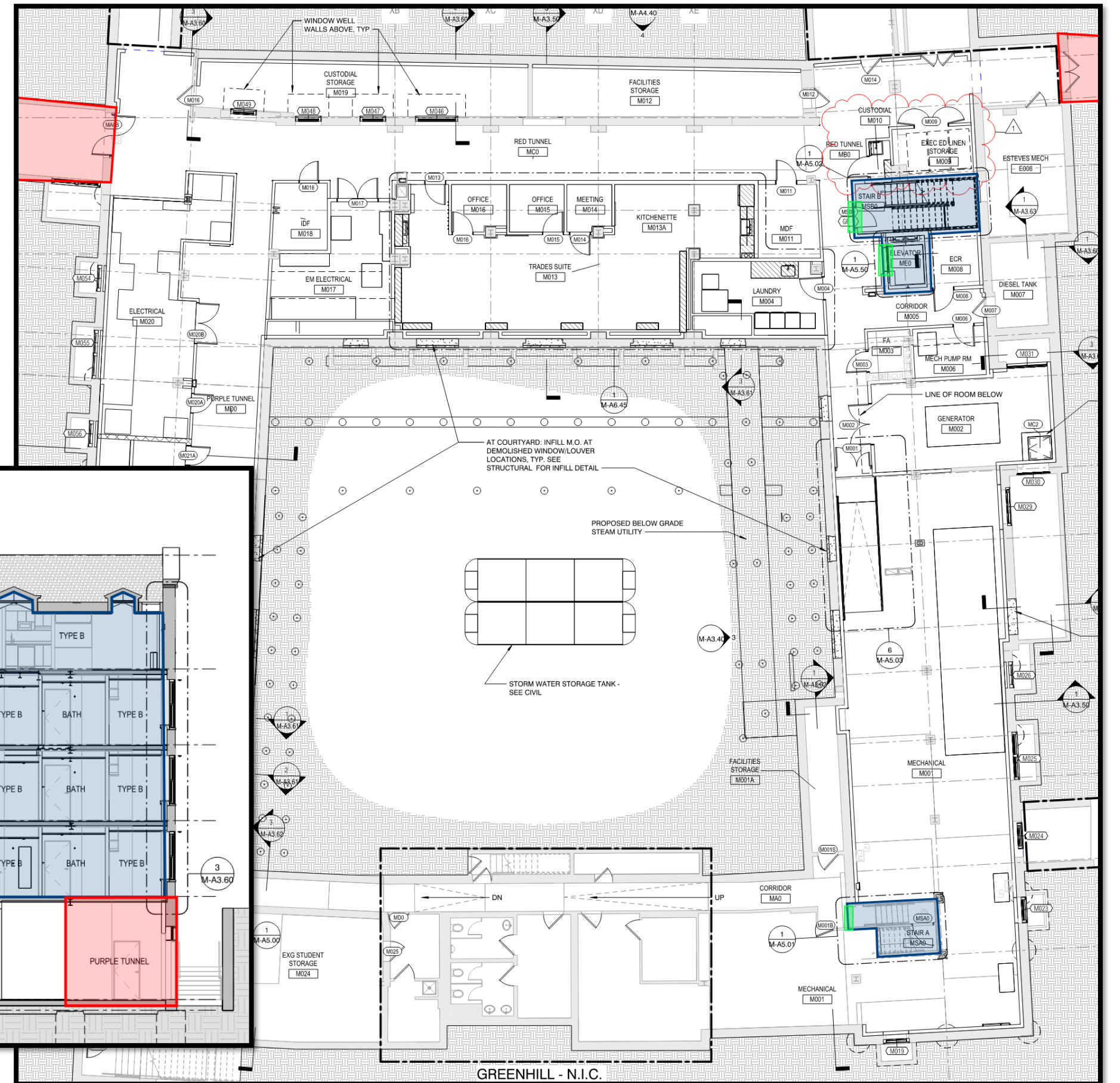
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Everything Condition Matters

University Residence Hall

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- How do the tunnels impact our zone?
- **Are existing chimneys a problem?**



Same Building, Better Result

University Residence Hall

- **Same building type, size, and layout.**
- Tunnels and basement can be easily removed.
- Better result by adding the basement to the boundary.



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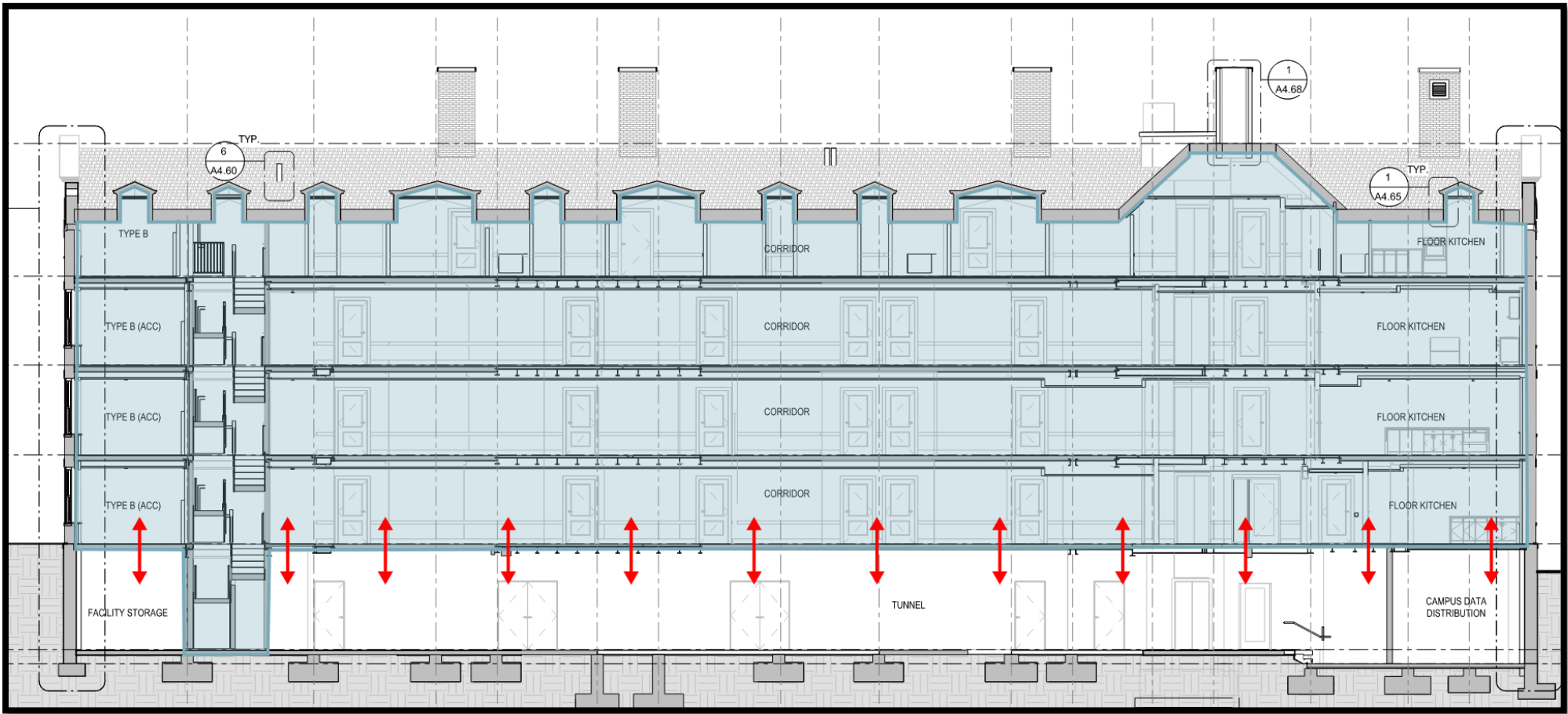
Airflow at 75 Pascals
35656 CFM

0.6957 CFM @75/ft² (0.6957 to 0.6957)

VS.

Airflow at 75 Pascals
29689 CFM

0.4930 CFM @75/ft² (0.4930 to 0.4930)



VS.



When 100 CFM Matters

University Office Building

Enclosure
Area (SF)

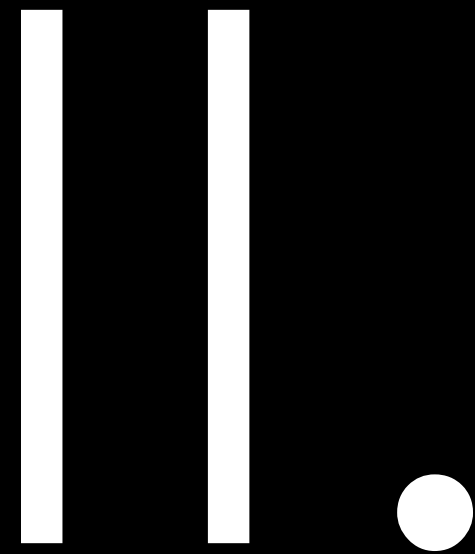
×

Target
(CFM/SF)

=

Allowable
Leakage
(CFM)





**Test While Leaks Are
Exposed**

Even Good Plans Need Backup Plans

University Lab Addition

Plan:

- Fans scattered around building
- Power centrally located
- Walls fully installed

Backup Plan:

- Fans in 2 central locations
- Lots of extension cords (and motion sensors)
- New boundary with walls in place



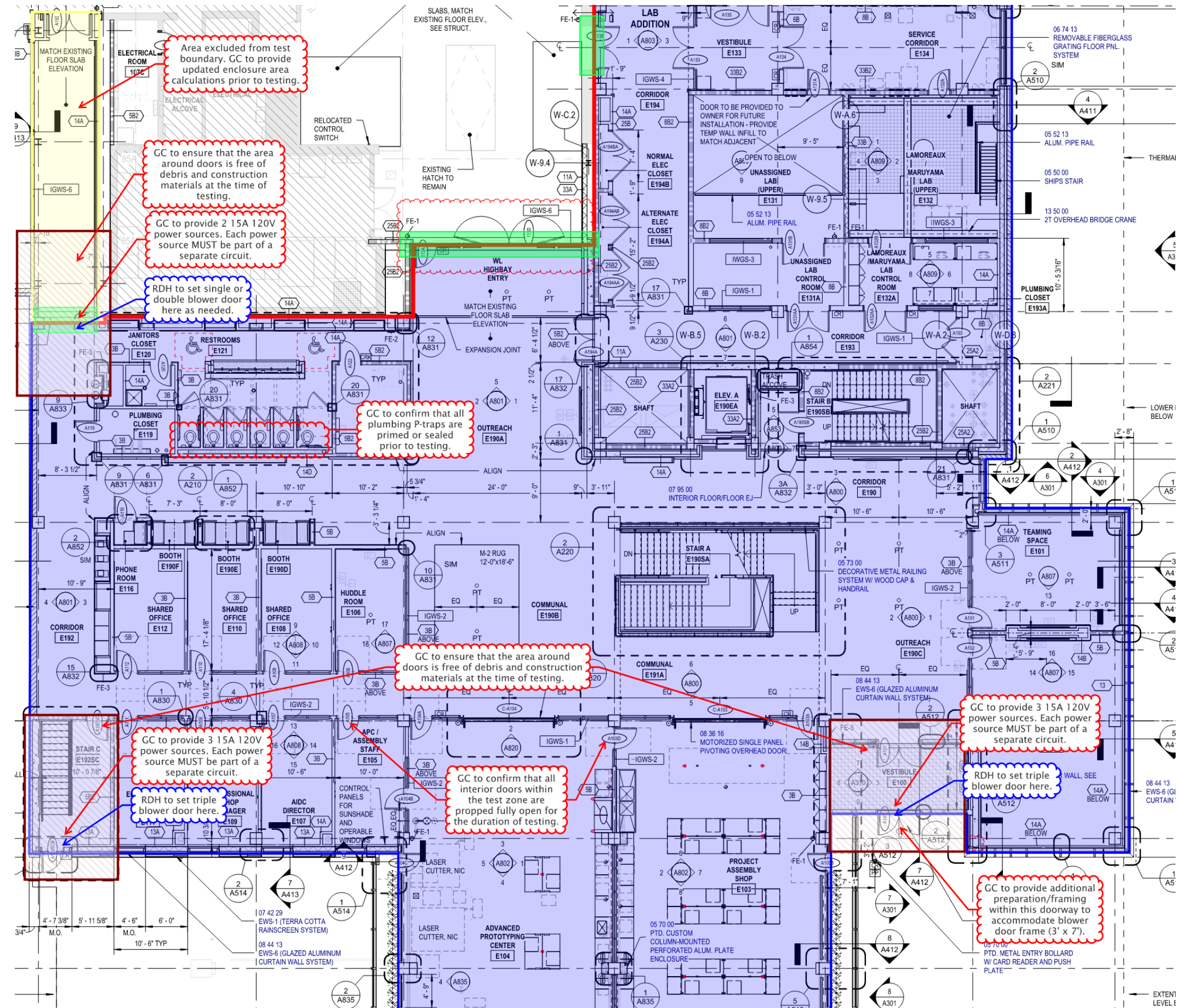
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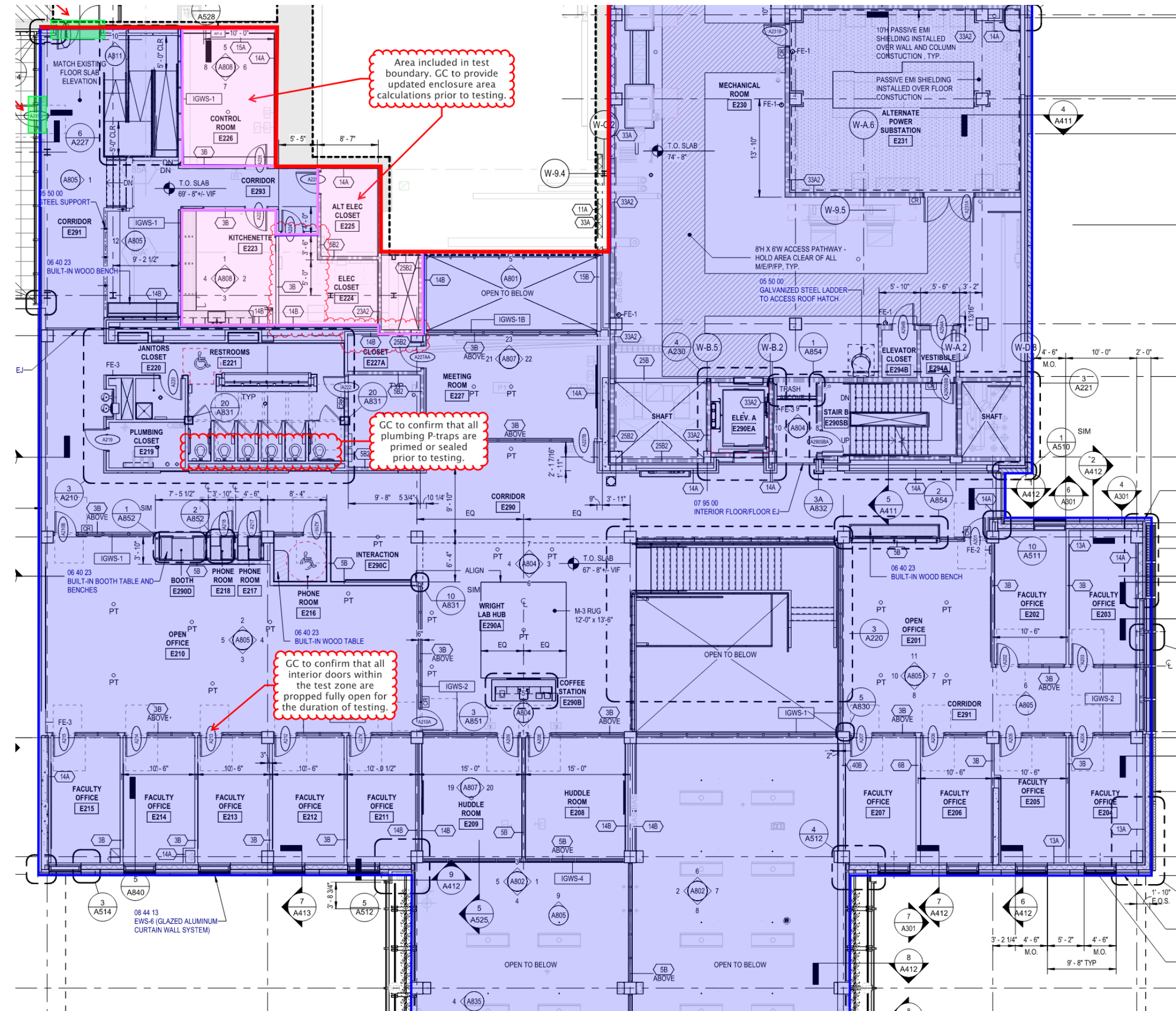
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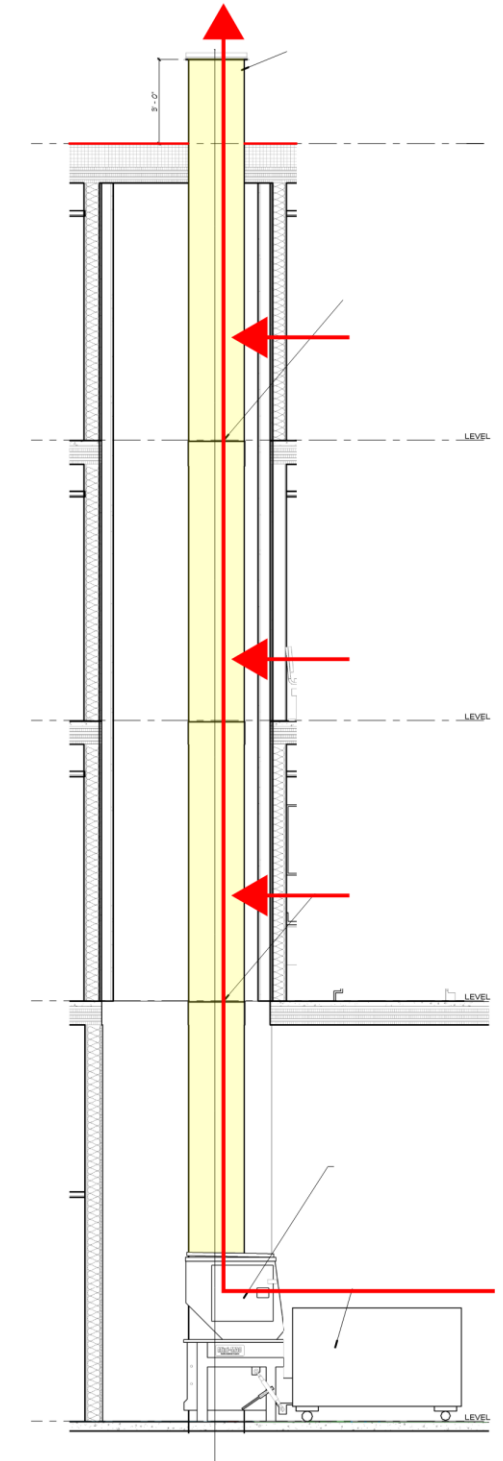
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The Trash Chute Gets a Vote

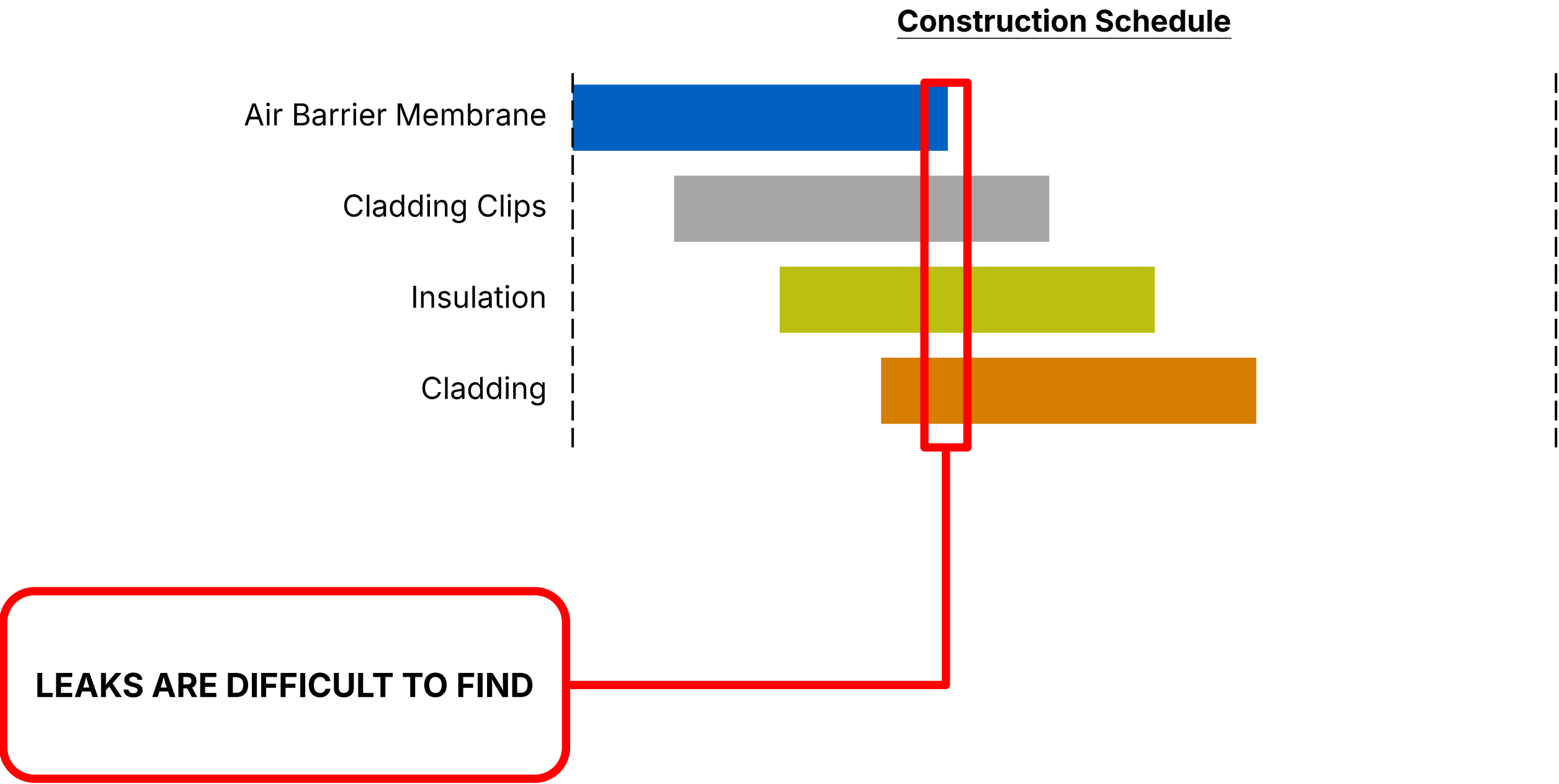
57-Unit Multifamily Passive Building

- Trash chutes are leaky
- Remove from test boundary?
- Run continuous exhaust?



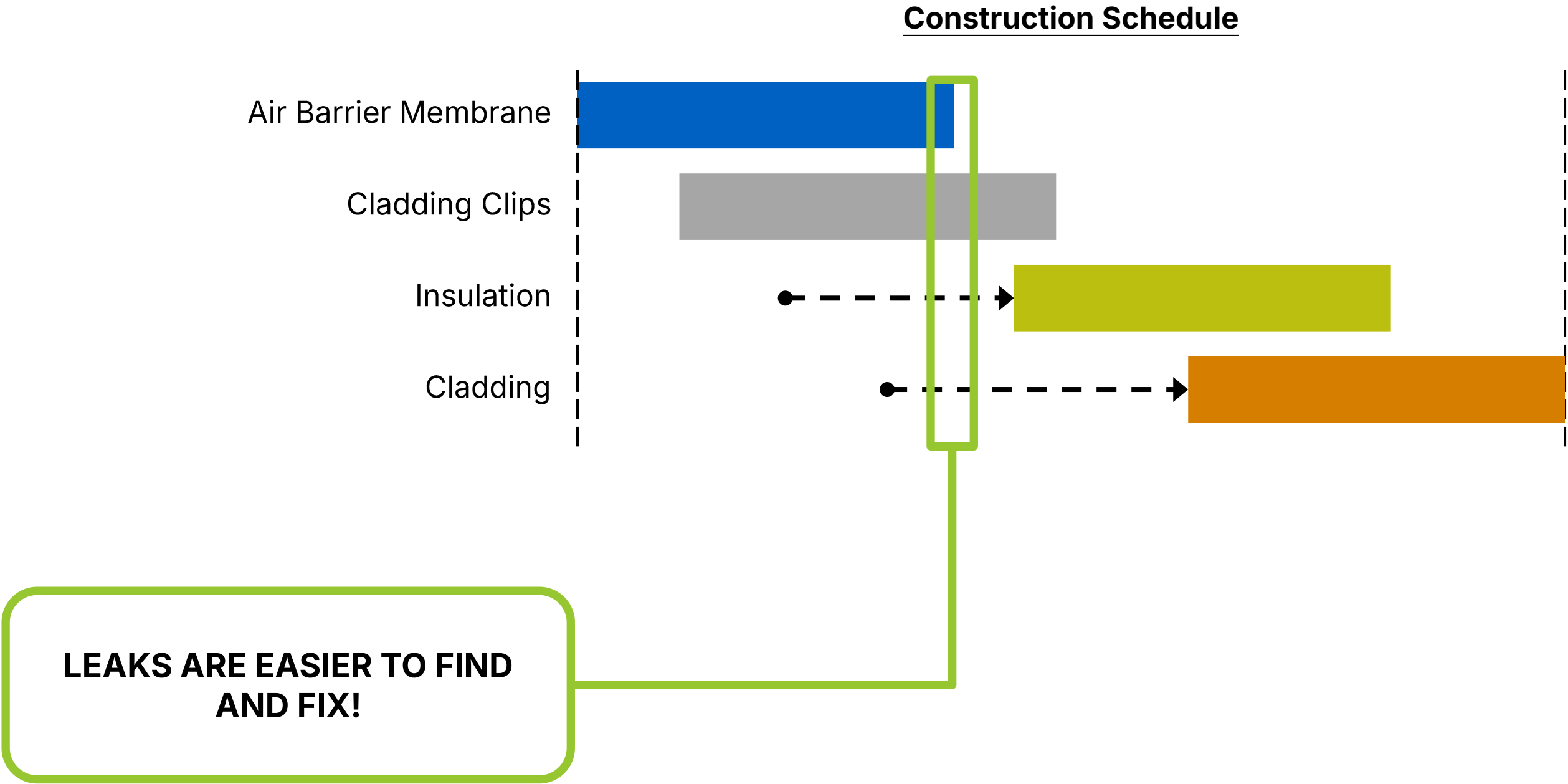
Future Lesson

Test Before Concealment



Future Lesson

Test Before Concealment

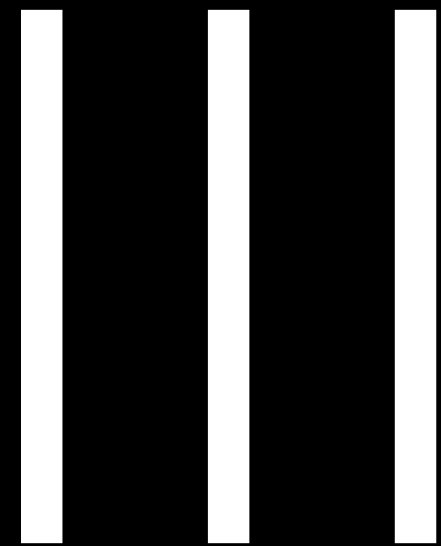


Phased Work:

Which building are we testing today?

- What do we do when buildings are assembled in phases?
- Is the building still open on one side?
- Is half the building occupied?





The Building Will Misbehave



Dampers Have Their Own Opinions

11-Story Bio-Medical Research Building

- 18 total fans required
- Large mechanical dampers aren't secure
- MEP penetrations into rooftop units are often unsealed



Twenty Fans, Two Zones

7-Story Existing Residence Hall

- Occupied building
- Existing (and old) building
- Guarded testing
- Diagnostic measures



The Wrong Manometer Was Right

9-Story Hotel

Purpose: Teach full-chain instrumentation troubleshooting and confirmation bias.

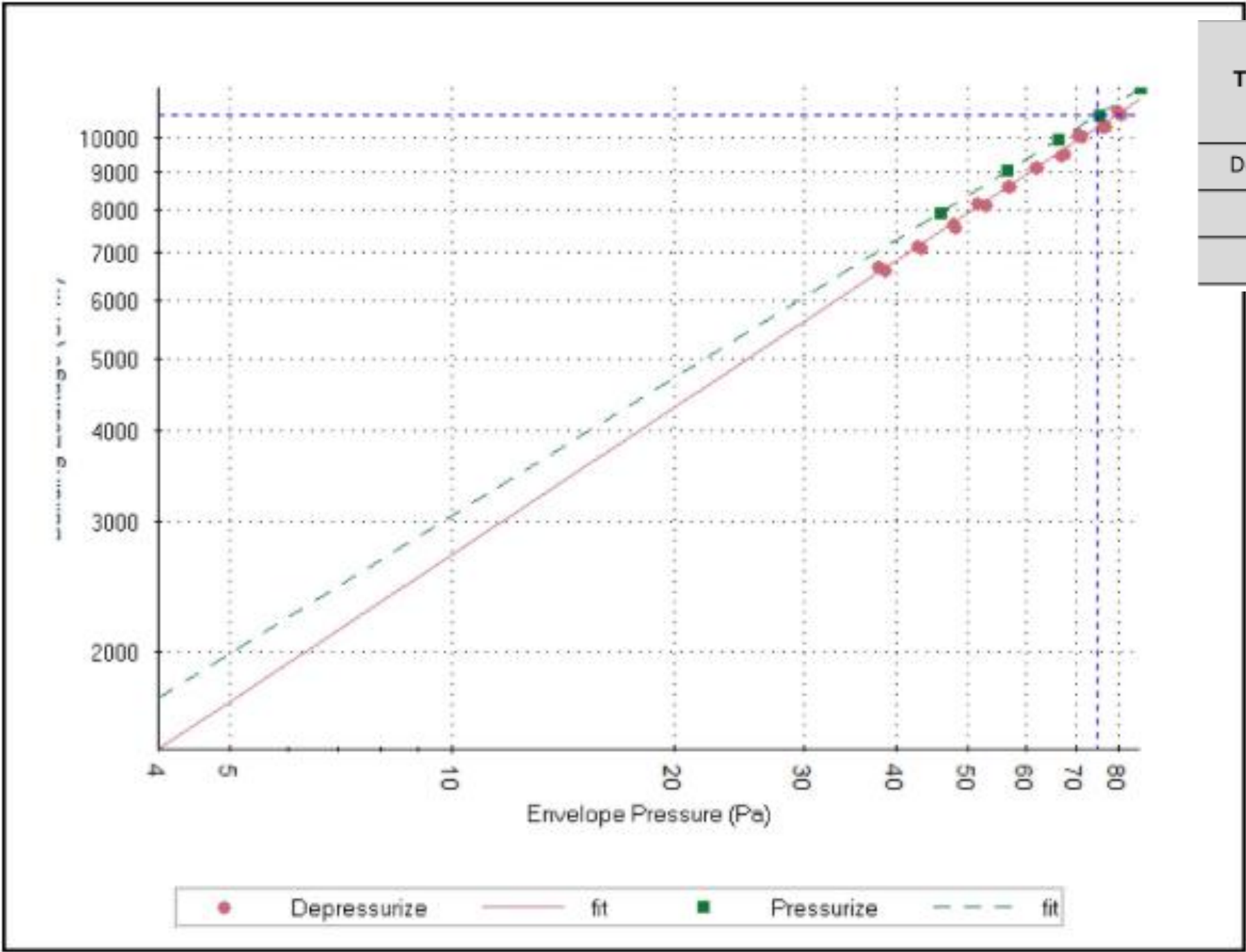
On-slide content: Unexpectedly good result → suspected gauge → clogged tube elsewhere

Visual direction: Simple chain diagram: reference point → tube → connection → channel → gauge → interpretation. Mark the clogged tube.



Unexpectedly Excellent

9-Story Hotel

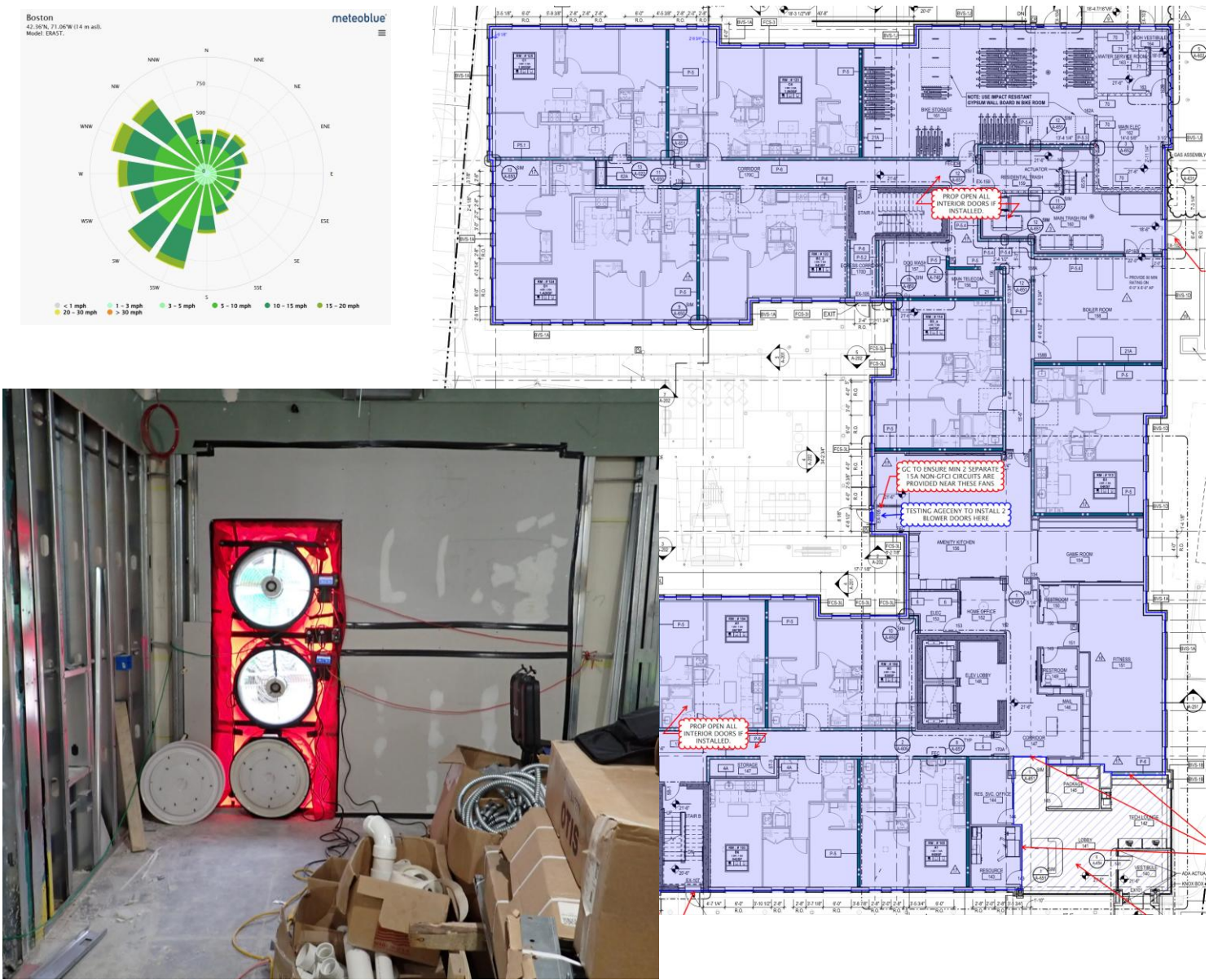


Test Condition	Leakage Rate cfm/ft ² @ 75 Pa	Total Leakage cfm @ 75 Pa	Equivalent Leakage Area in ² @ 10 Pa	Flow Exponent (n)	Test Data Correlation (r ²)
Depressurization:	0.111	10,362	796.4	0.666	0.996
Pressurization:	0.115	10,747	901.3	0.622	1.000
Average:	0.113	10,555	848.8	0.644	0.998

The Courtyard Had Other Plans

6-Story, 102-Unit Multifamily Passive Building

- Fan locations matters
- Courtyards and windy days don't mix



The Test Became the Investigation

Life Sciences Research Building

Purpose: Show diagnostic testing, repair, and retesting.

On-slide content: Test → diagnose → repair → retest

Visual direction: Four-panel story: soffit boundary, fan setup, fog or IR diagnostic, improved result.



What Failed Was Not Always The Building

Boundary

Preparation

Pressure Field

Measurement

Interpretation

IV. Field Guide

Before Test Day

- Mark the Boundary
- Confirm the Test Area
- Review all Openings
- Verify Power
- Discuss Alternate Options
- Check all Tubes and Manometer Channels

RDH BUILDING
SCIENCE

18 Tremont Street, #530, Boston, MA 02108
RDH BOSTON

Airtightness Preparation Checklist (ASTM E 3158)

Project Name:
RDH Contact:
RDH Cell:
Attendees:
Pre-test Meeting:
Final Walkthrough:
Test Day:

RDH Project No.:
GC Contact:
GC Cell:
Date:

Completion of Air Barrier

✓	ITEM	NOTES
	All exterior windows and doors, including hardware, in the test boundary are installed.	
	Airtightness layer is fully installed per contract documents within the test zone.	
	Storefront/curtainwall glazing, including all gaskets & sealant, installed.	
	Sheet or liquid applied air barrier products, such as building wraps, self-adhered membrane, fluid applied water resistive barrier installed.	
	Transition details at mechanical, electrical and plumbing penetrations installed and sealed.	
	All mechanical, electrical, and plumbing penetrations through the test boundary are fully sealed.	
	Garage/Lobby vestibules, including door gaskets and sweeps/thresholds, are fully installed.	
	All exterior door hardware installation is complete, allowing doors to latch shut.	
	Fire/acoustic seals at interior walls that form part of the air barrier are installed.	

Preparation of the Building

✓	ITEM	NOTES
	All exterior doors and operable windows are closed and latched, including trickle vents.	
	All interior doors are propped fully open, not just left open.	
	Remove 1% of all drop ceiling tiles in each room as applicable.	
	Combustion equipment is powered off and sealed (if combustion air is drawn from interior).	
	All plumbing p-traps are primed.	
	Shut all dampers to outdoor air intake and exhaust outlets for any ventilation system (ERV/HRV). If ducts not present, temporarily seal with plastic sheathing.	

Making Buildings Better™

The Field Guide:

During the Test

- Ensure Stable Connection
- Compare Similar Equipment
- Record ALL Changes
- Diagnose Discrepancies
- Repair When Needed
- Retest as Required

The Field Guide:

After The Test

- Define the boundary
- List test conditions
- Differentiate temporary conditions from permanent
- Detail deviations from the standard
- Preserve evidence

Don't Panic. Prepare to Improvise.

1. Know the Boundary
2. Test Early
3. Validate Equipment
4. Improvise (without abandoning the standard)



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Introduction

USING THE NEW TEMPLATE

BEFORE YOU START:

- Click “File” and “Save a Copy”, to rename and save locally.
- Click “New Slide” to see drop-down menu of all template slides to begin building your presentation.

TO EDIT FOOTER:

- Navigate to “View” → “Slide Master”
- Edit left-side footer text (Project name, number, title, etc) on Slide #2
- Edit right-side footer text by filling in the table of contents slide
- When finished editing, click “Close Master View”

AS YOU EDIT:

- Font size should be at least 14 and must not exceed 32.

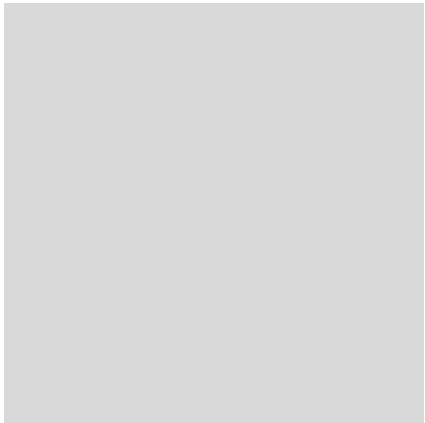
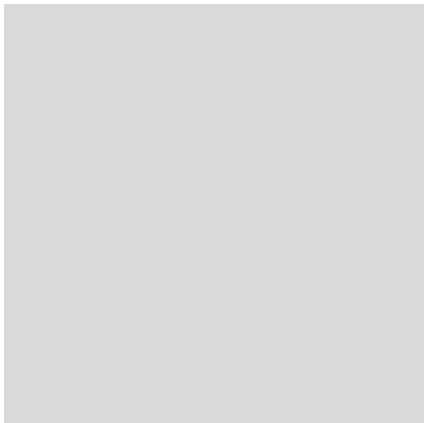
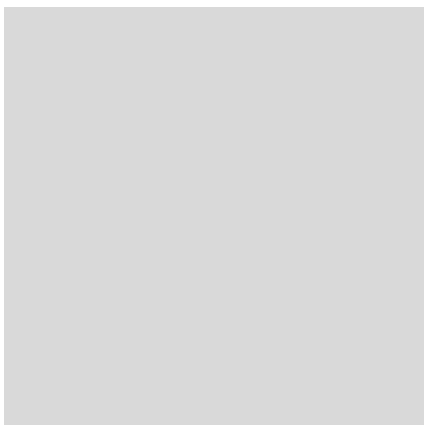
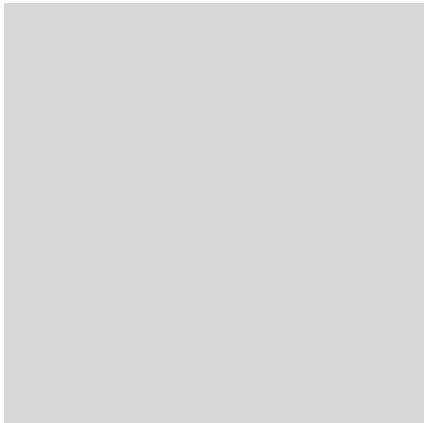
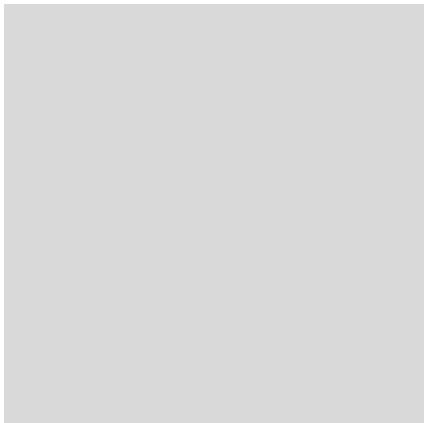
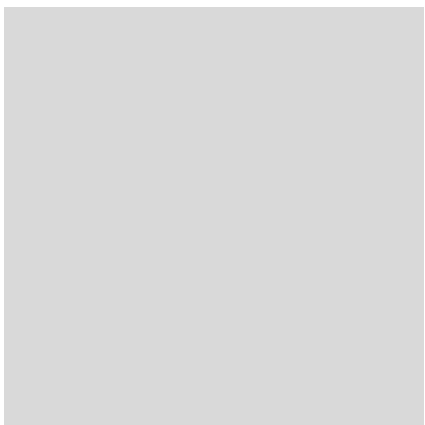


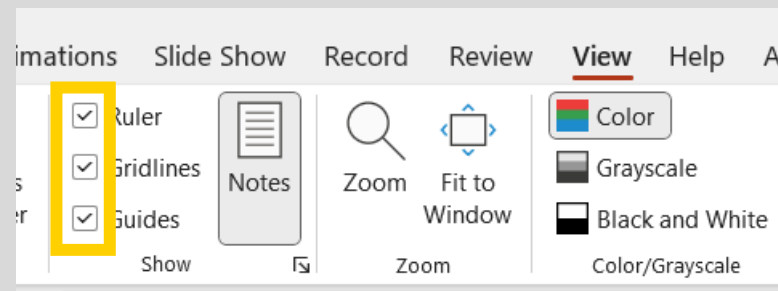
Table of Contents



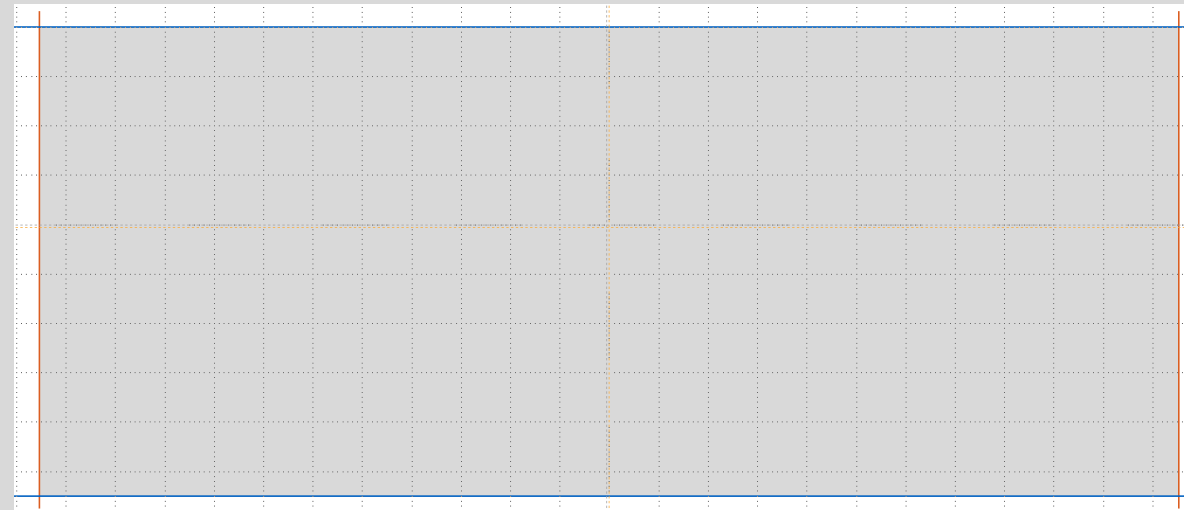
Overview

GRAPHIC ELEMENT LAYOUT RULE

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2. You will notice that the gray area is within this specified range.



When pasting images, please do not exceed this range, and when editing any content, please avoid touching the footer.

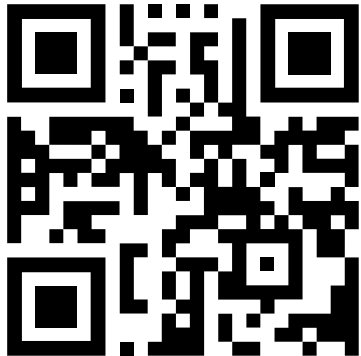
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Contact info layout

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Element

BULLET POINT STRUCTURES

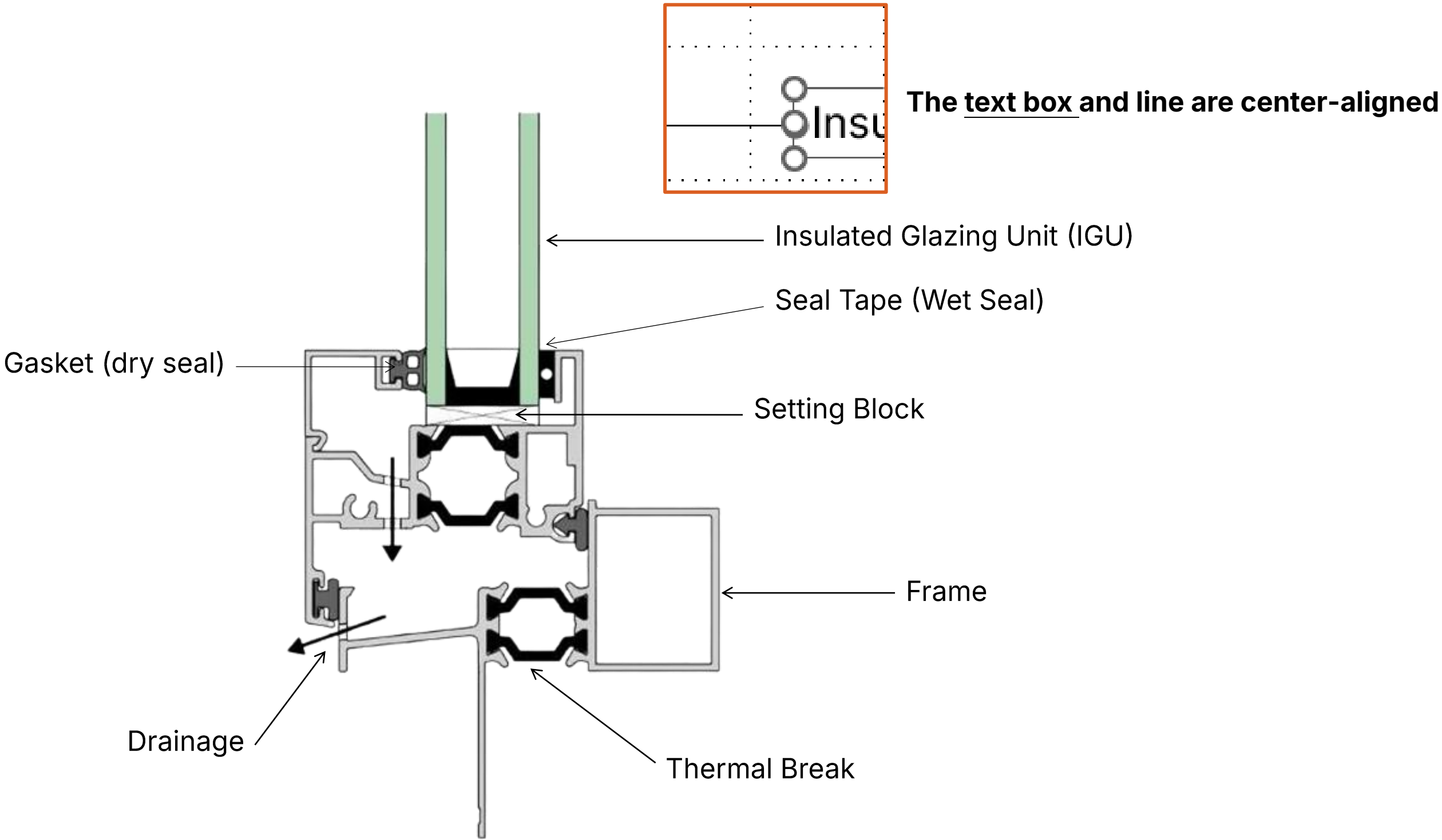
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 - Sub Section
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- **Section**
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 - Sub Section

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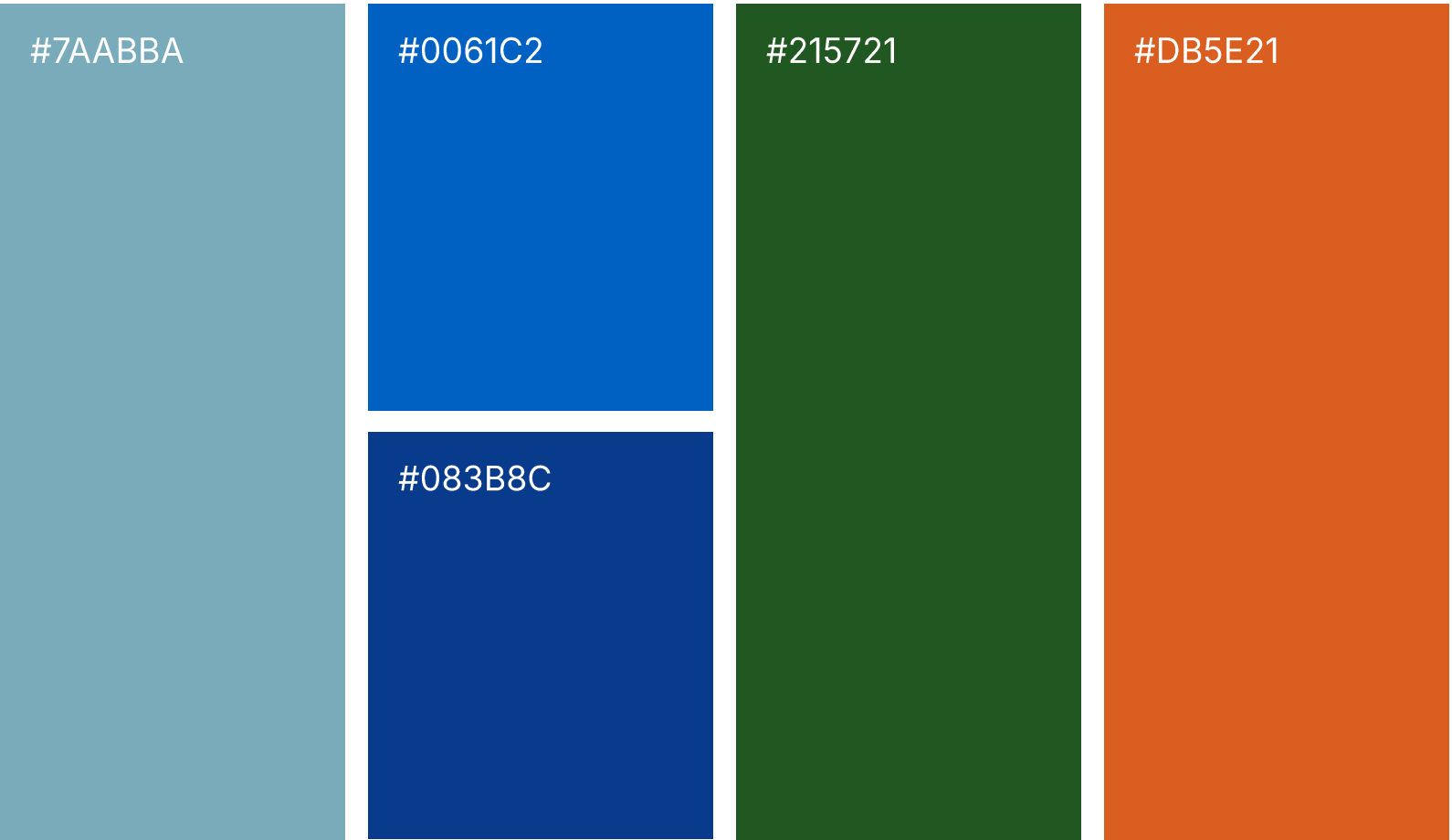


RDH BUILDING SCIENCE

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Making Buildings Better™

Colourways



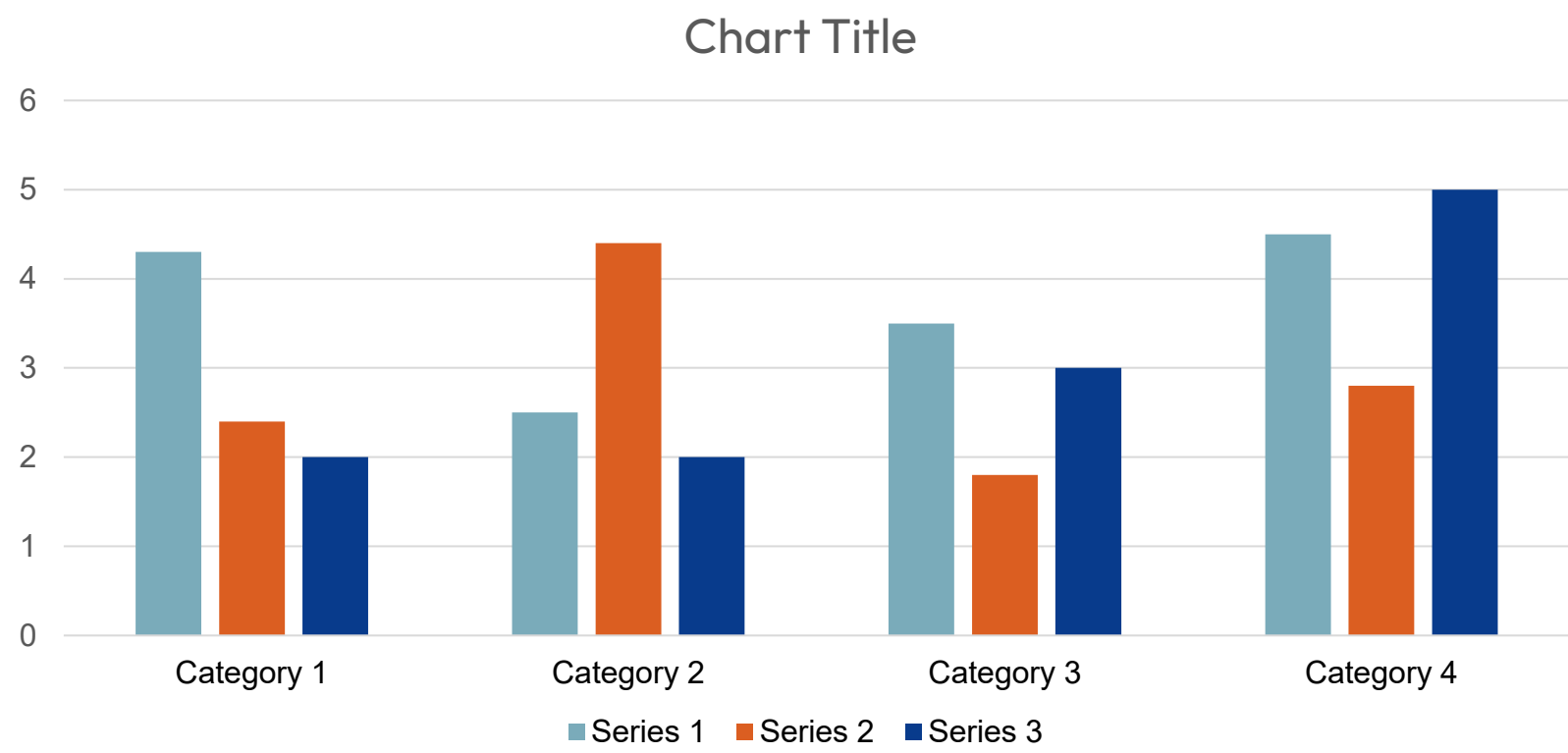
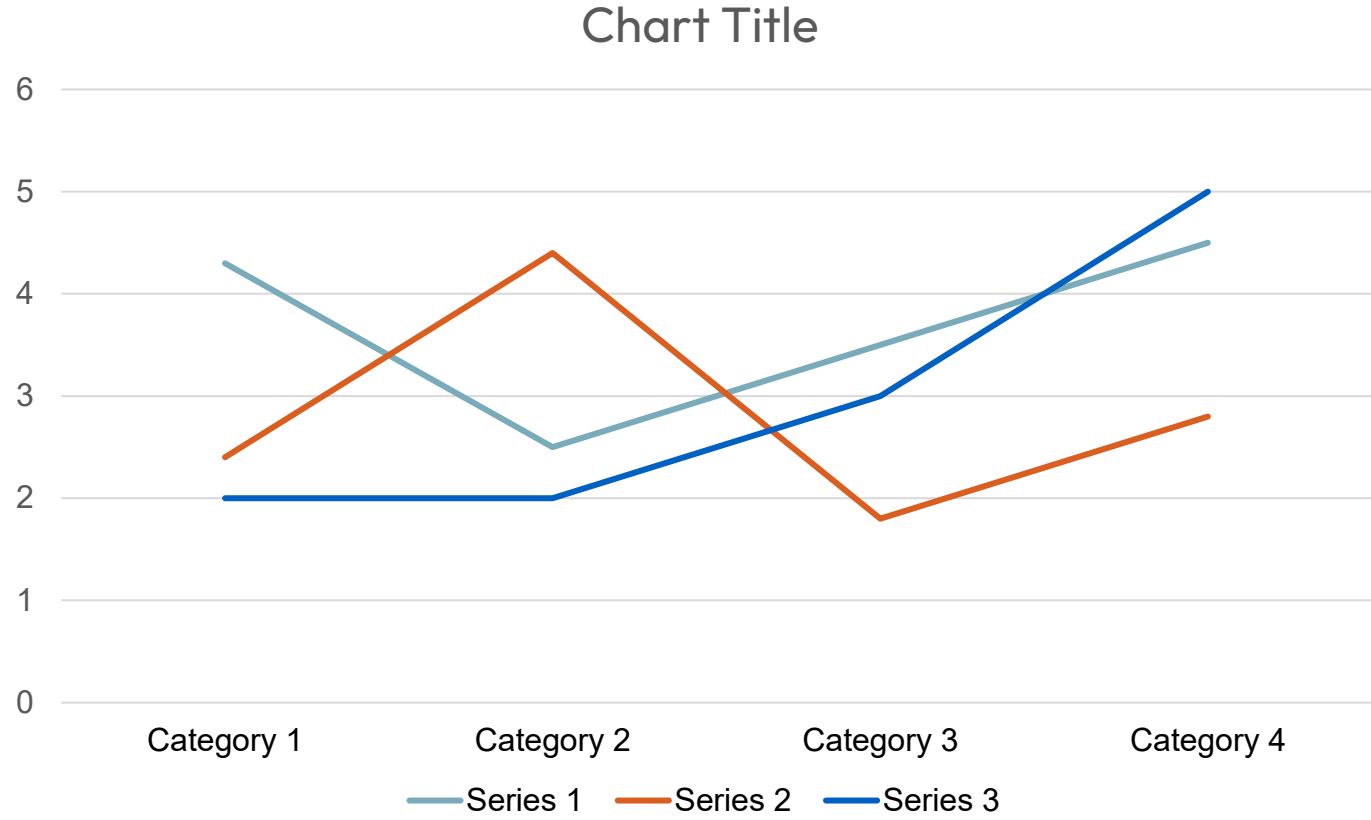
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TABLES AND CHARTS

Table Style

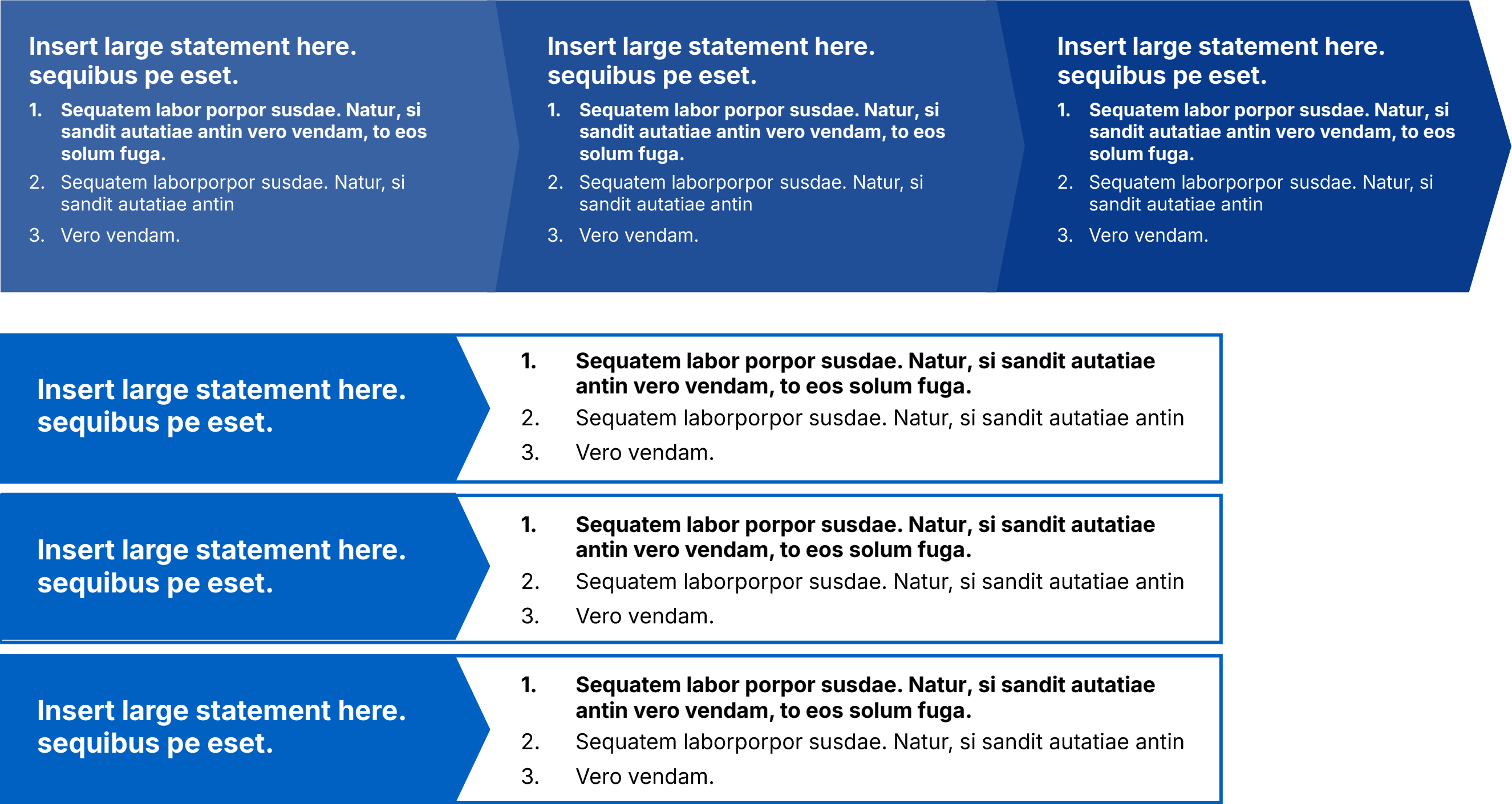
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1. XXXXX	49%	22%	29%	0%
2. XXXXX	62%	27%	11%	0%
3. XXXXX	100%	0%	0%	0%
4. XXXXX	23%	21%	4%	17%

Chart Style



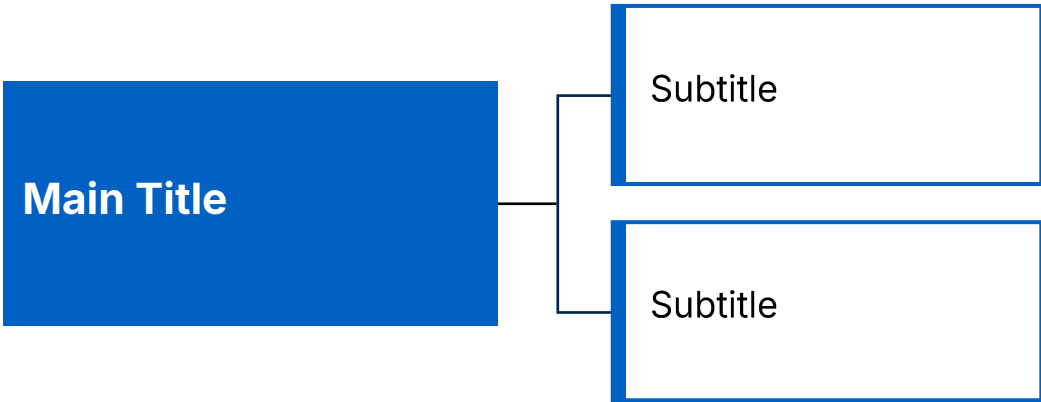
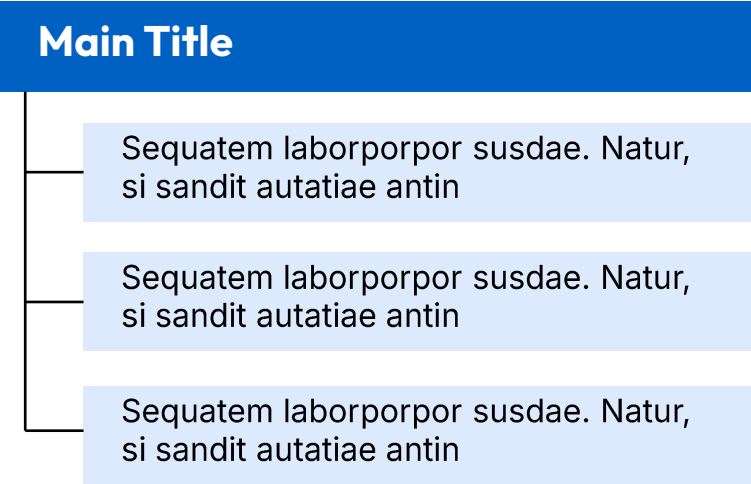
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PROCESS DIAGRAMS



Element

ORGANIZATIONAL CHART OR FLOW CHART



	Jun	Feb	Mar	Apr	May	Jun	Jul
XXX							
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