WSU DANA HALL PREDESIGN STUDY

03.25.24

INTRODUCTION

This report is an evaluation of the existing Dana Hall building at the Washington State University campus in Pullman, Washington. Dana Hall was originally built in the mid-1940's and has served a variety of academic needs during its lifetime. WSU has asked for input on how the building can be repurposed, an evaluation of the challenges, limitations, and opportunities for enhancement, and viability of continued use of the building.

CHALLENGES AND OPPORTUNITIES

The existing Dana Hall building was constructed with reinforced concrete and a heavy timber roof structure. Previous structural evaluation shows a robust live load capacity and potential for adding up to two additional floors with lighter floor assemblies. Some of the challenges and opportunities for this building are listed below.

CHALLENGES

- Condition of infrastructure – need for systems upgrades
- Non-sprinklered – requires current rated corridor and other constraints
- Tightly spaced column lines and shallow bay depths at some locations
- Compromised use of 3rd Floor for occupancy (okay for utility use)
    - Low ceiling height
    - Limited amount of windows
- Limited accessibility options and no direct accessible entry into building
- Existing electrical vault needs to be verified for removal or integration into design

OPPORTUNITIES

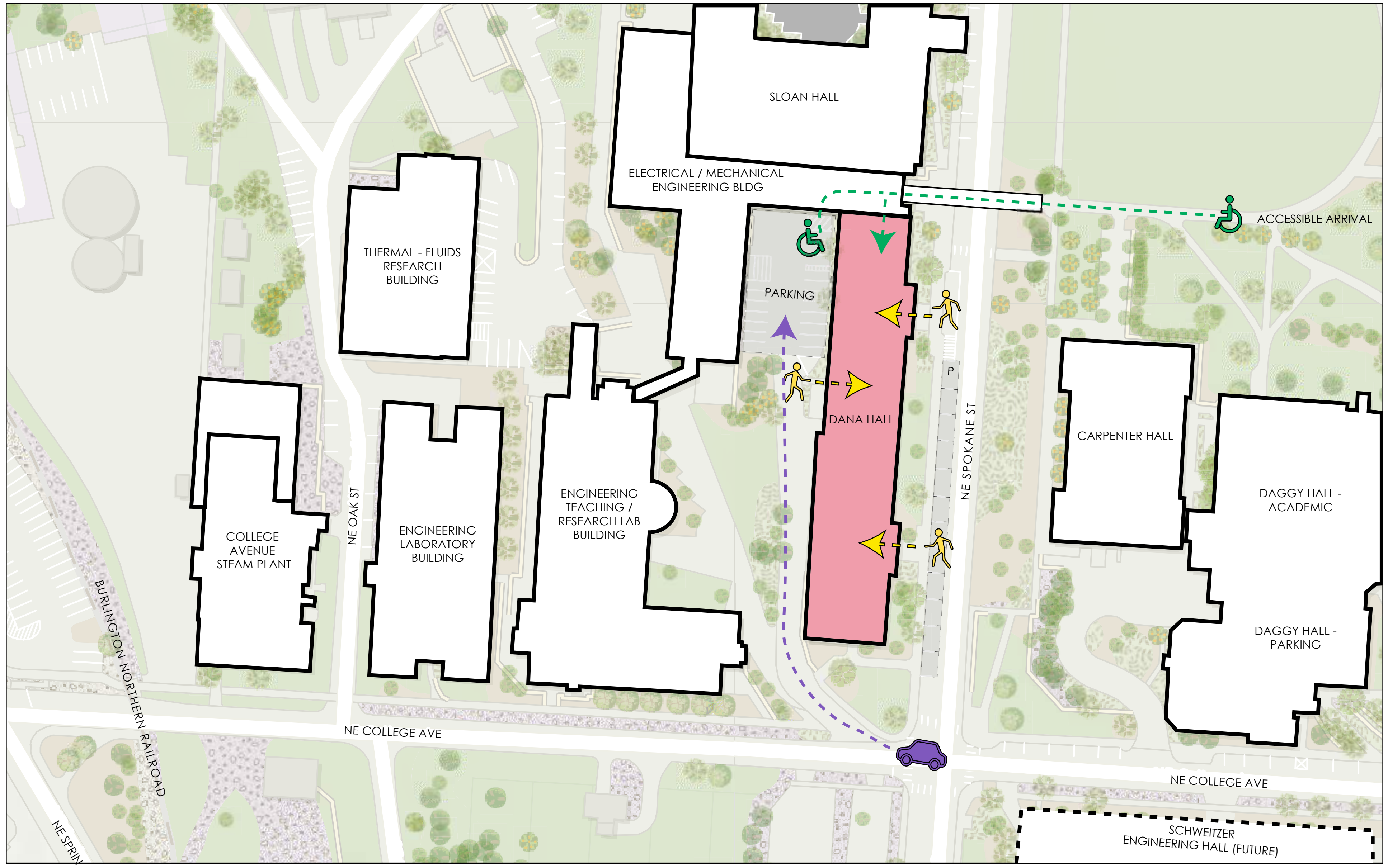
- Existing structure will accommodate additional floor levels
- Structural system allows liberal penetrations through the floor slab at every column bay, with little impact to the existing structure
- Building has architectural components recognized as significant to the campus
- Replacement building would still have a similar long and skinny footprint to fit the site
- Re-use of building allows for continued use of materials with embodied carbon which reduces landfill waste

SECTION 1

EXISTING CONDITIONS

While the existing Dana Hall building has several positive features worth preserving, it also has some limitations that need to be addressed for future use.

- The long, enclosed, hallway that divides the floors into separate halves and requires doors to be closed. The corridor is wider than it needs to be.
- Terrazzo flooring in the corridor is timeless with architectural character. It is a good candidate to consider for re-purposing in a creative way to preserve this feature.
- Robust structural system: significant gravity load capacity beyond what would be expected for institutional use. This allows for additional floors to be added to the structure with comparatively minimal structural upgrades. See plans and sections for more structural information.
- Shear walls: The existing concrete structure is conducive to adding shotcrete shear walls without extensive formwork at many locations.
- Existing service shaft at restroom locations could be utilized for additional plumbing and other services. Additional shafts would be needed for the best use for updated functions.
- Fire Sprinkler System: Upgrading to include fire sprinklers will allow the corridor to open up and give more opportunities for program use, transparency, daylighting, and modulating the circulation corridor.
- Elevators: The existing passenger elevator is not adequate for current functional requirements and would be impractical to extend to additional floors. The existing openings could be utilized for other vertical components, either elevators or service distribution.
- Accessibility: Adjacent building is currently the only means of access from Spokane Street, the upper campus skybridge, and the accessible parking. There is no direct accessible entry into the building from the exterior.



INACCESSIBLE ENTRY

ACCESSIBLE ENTRY

VEHICLE ACCESS

Voiland College of Engineering & Architecture
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NORTH

1:2,000

0 0.01 0.02 0.04 mi

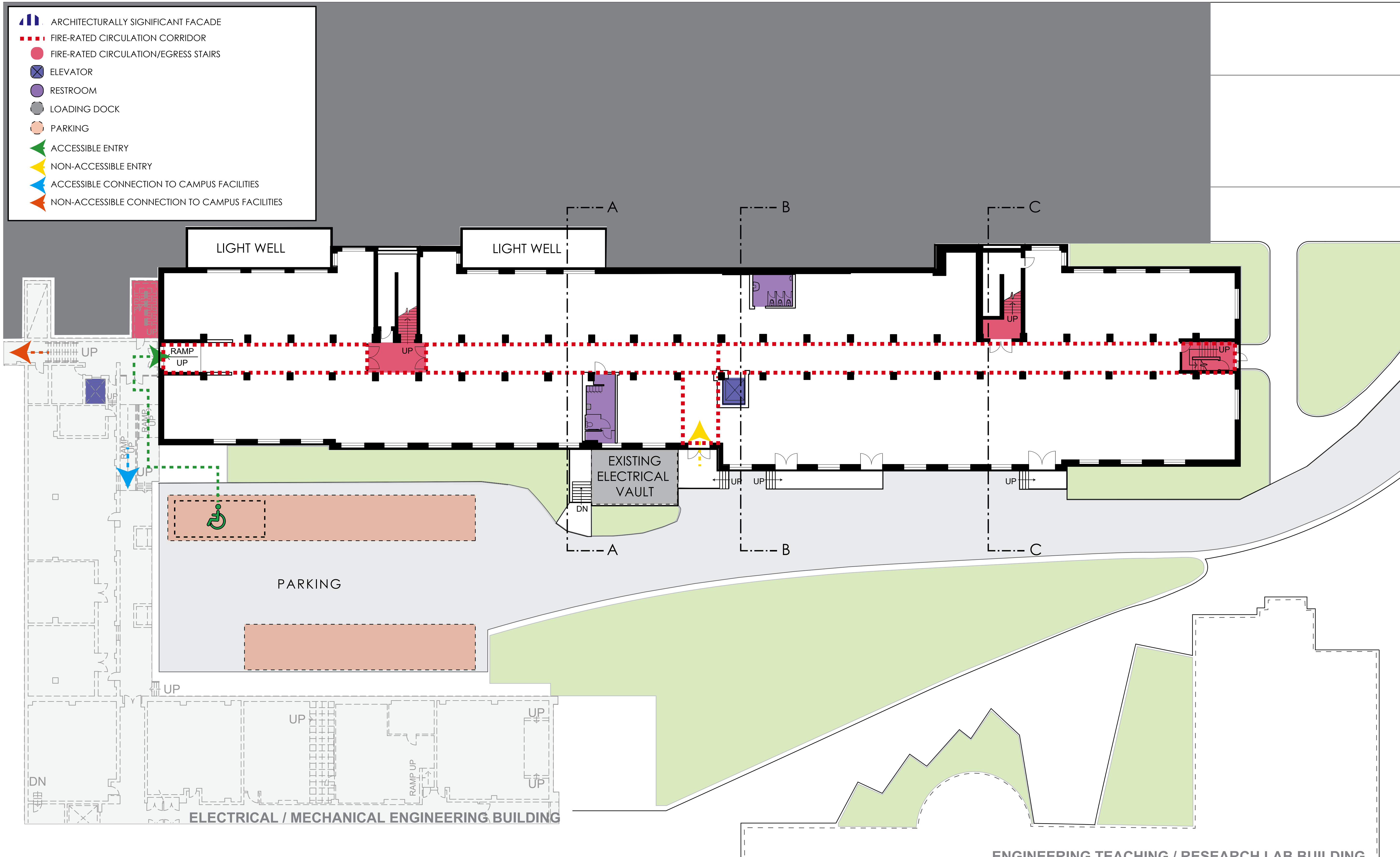
0 0.02 0.04 0.07 km

Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA,

DANA HALL

SITE PLAN

SABA · BA



Voiland College of Engineering & Architecture
WASHINGTON STATE UNIVERSITY

21,952

BLDG. TOTAL: 90,023 S.F.

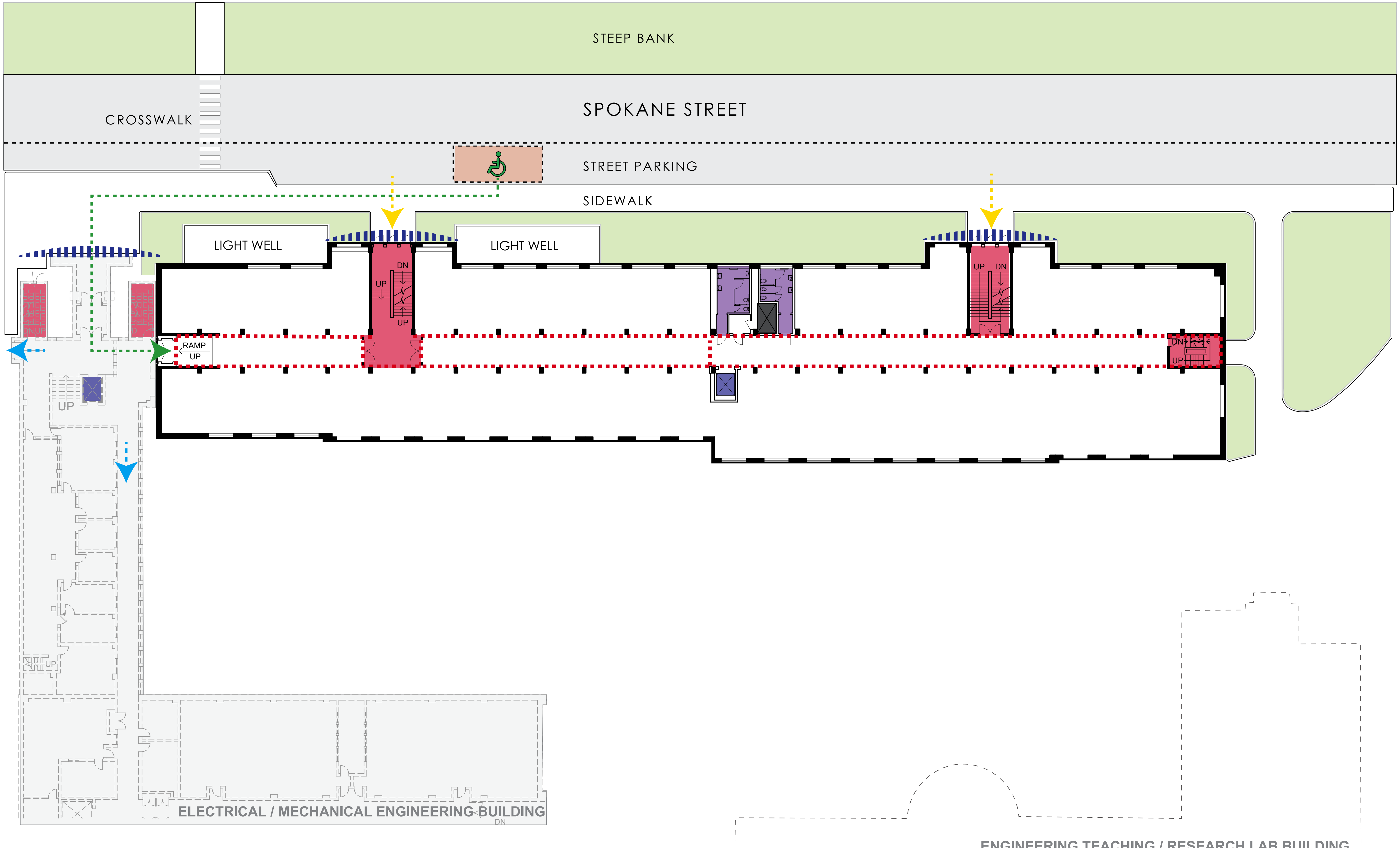
NORTH

SCALE: 1" =30'
0 5 10 20 30

EXISTING
GROUND FLOOR

6
SHEET NO.

SABA + BA



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NORTH

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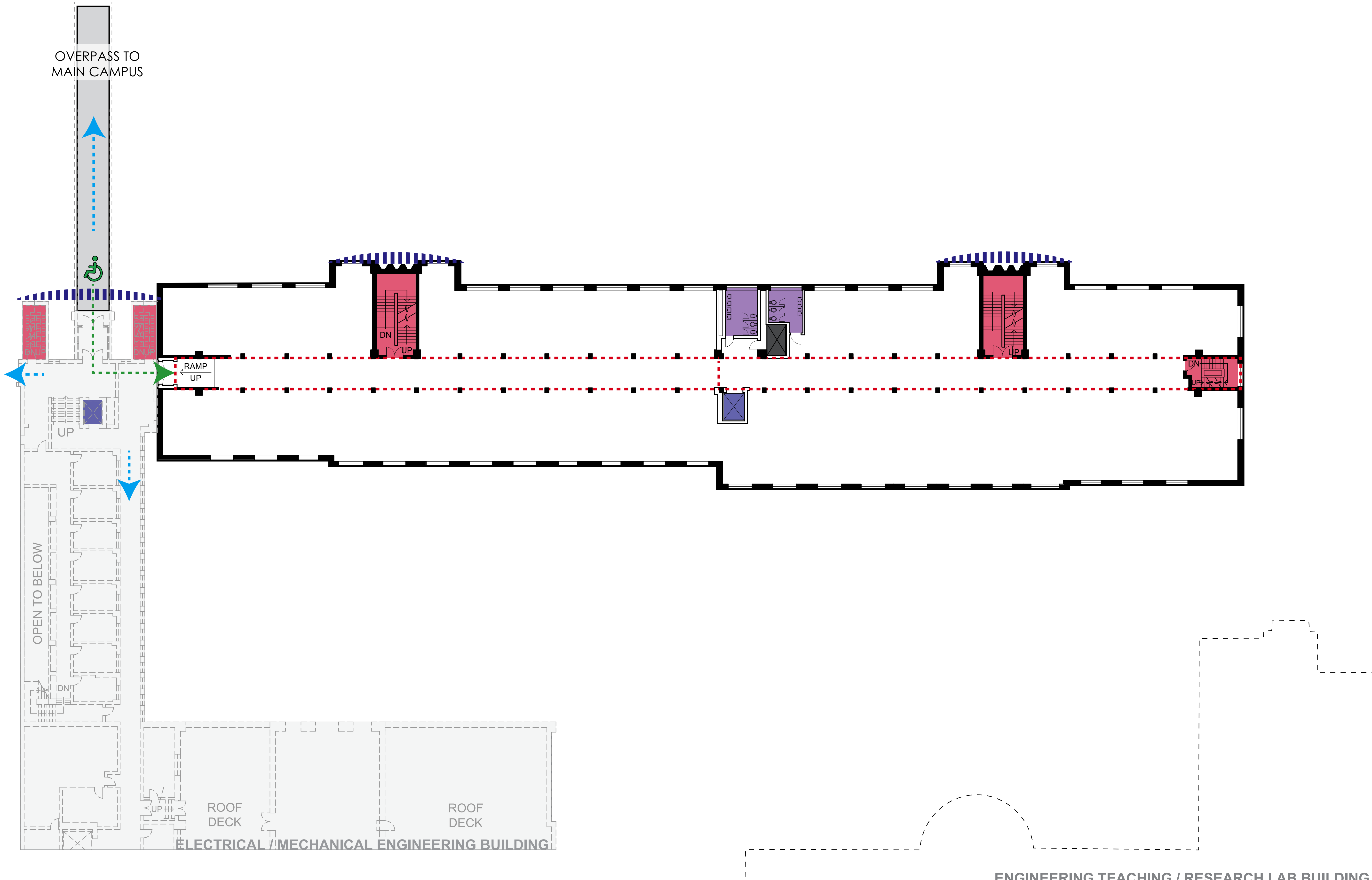
EXISTING

1ST FLOOR

7
SHEET NO.

SABA + BA



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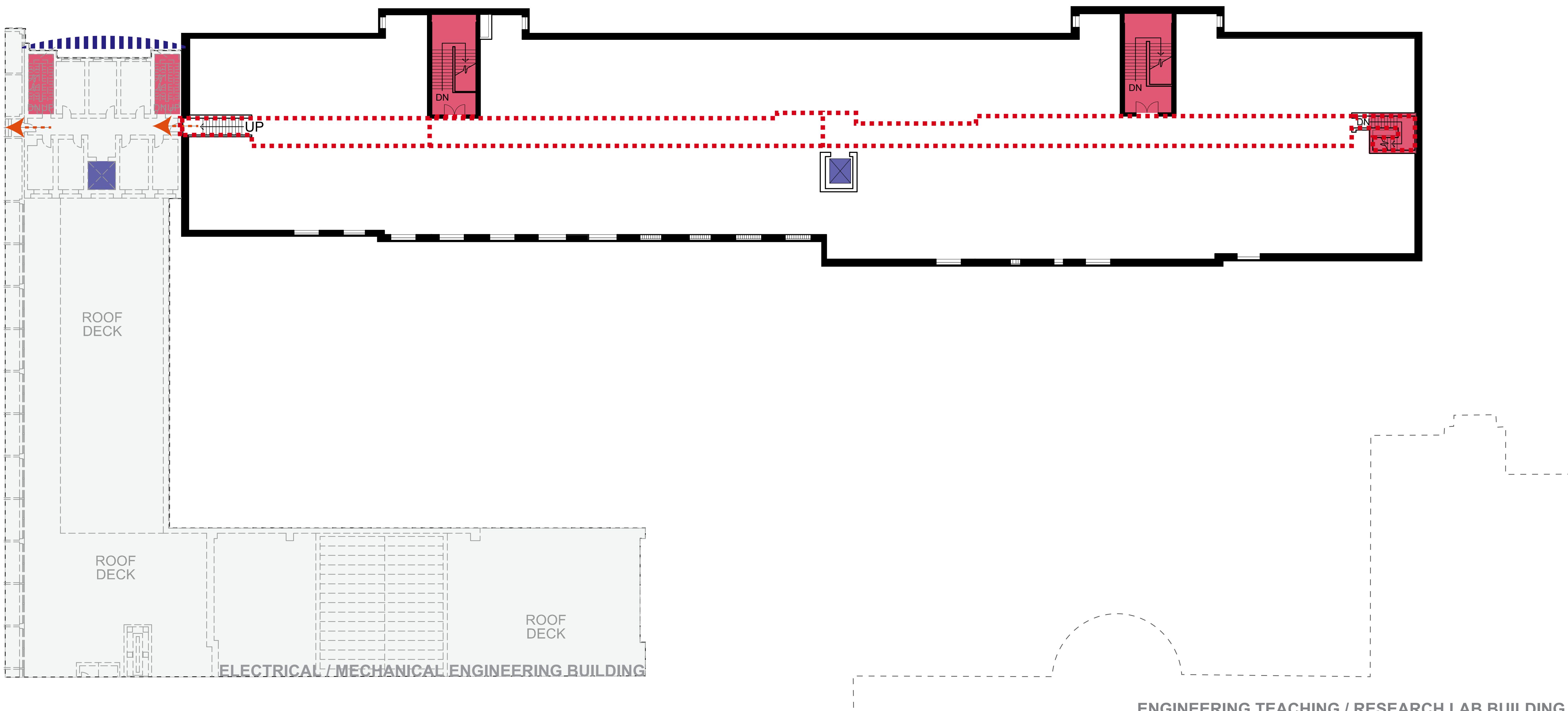
EXISTING
2ND FLOOR

8
SHEET NO.

SABA + BA



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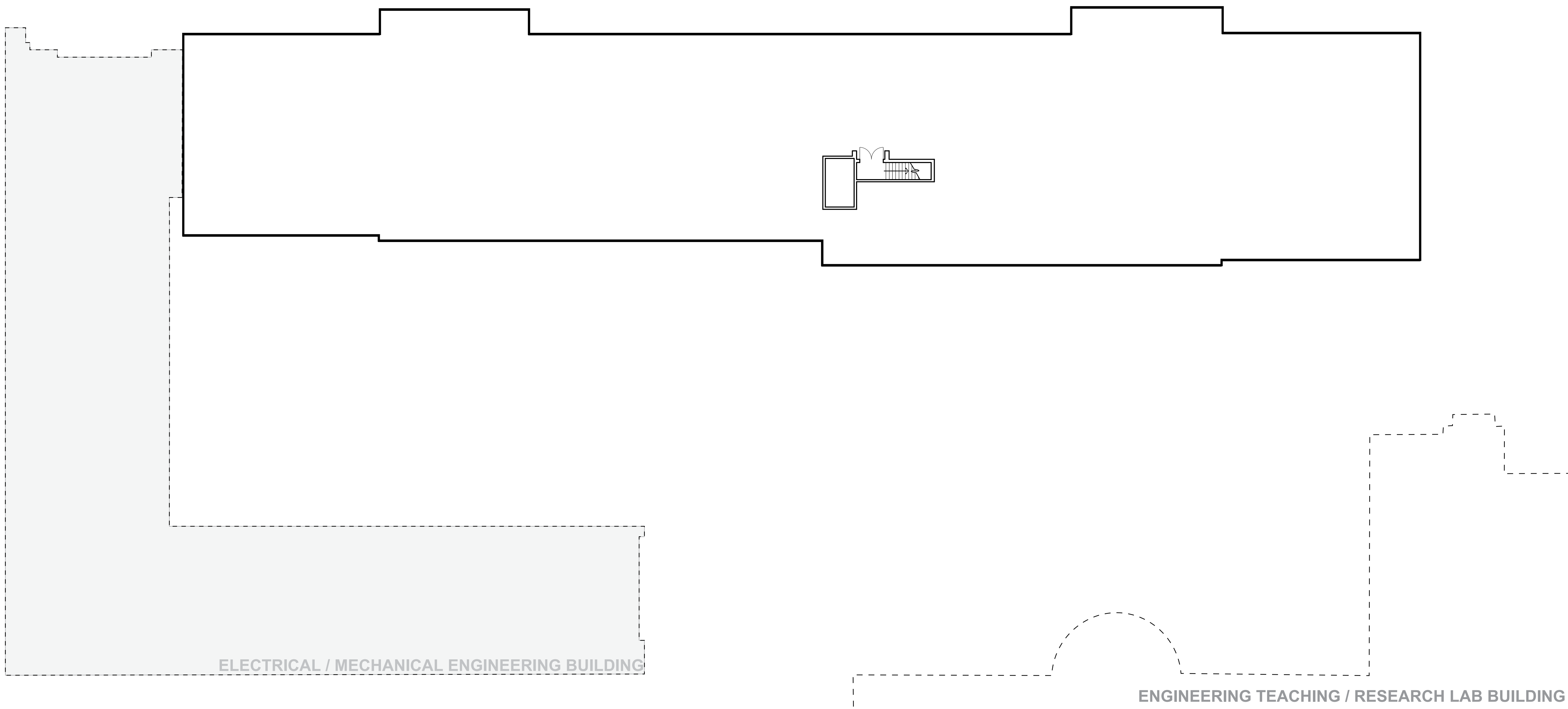
EXISTING

3RD FLOOR

9
SHEET NO.

SABA + BA



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GROSS SQUARE FEET
282
BLDG. TOTAL: 90,023 S.F.

NORTH

SCALE: 1" =30'
0 5 10 20 30

EXISTING
ROOF PLAN

10
SHEET NO.

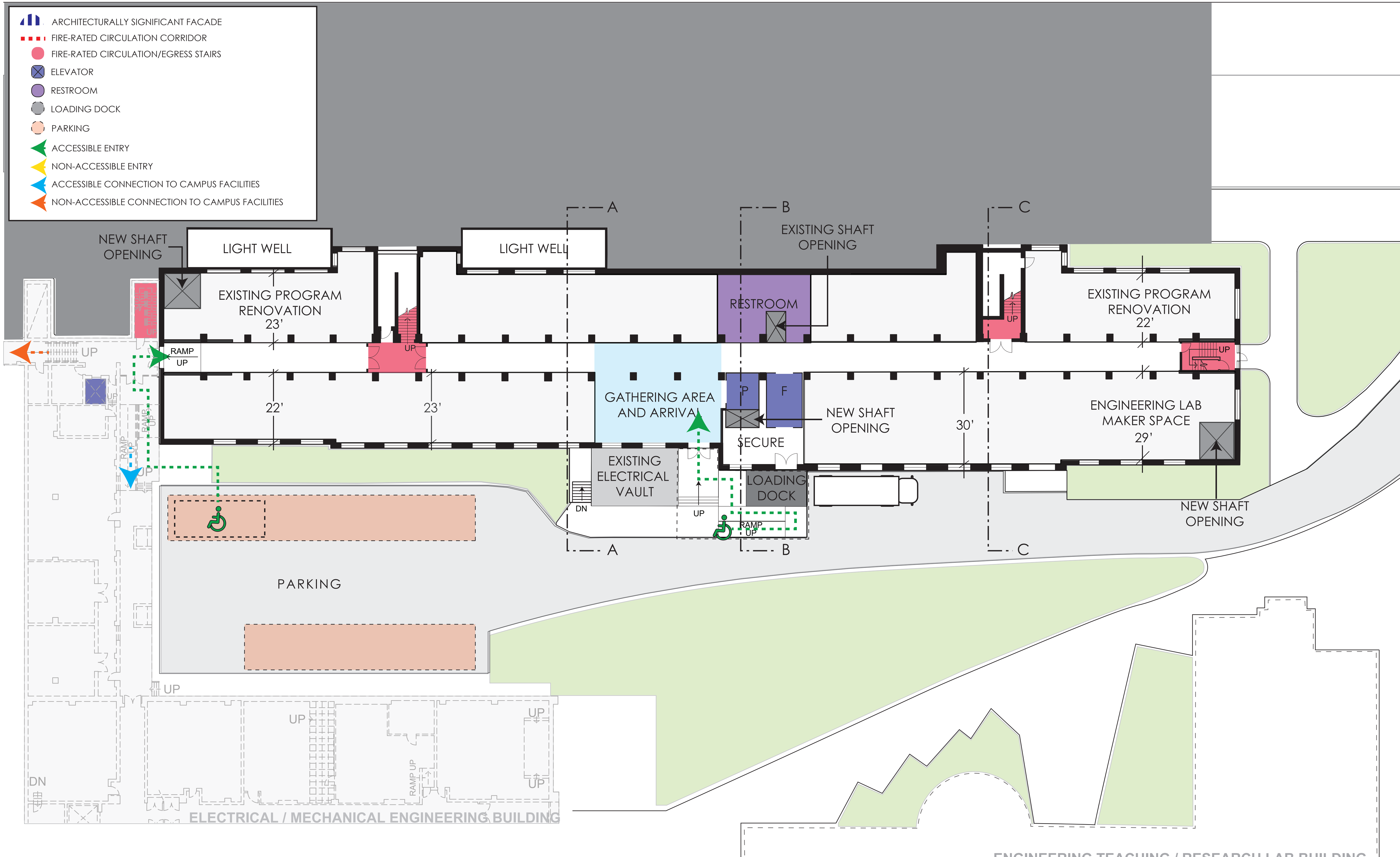
SABA + BA

SECTION 2

OPTION A: EXISTING BLDG. W/ UPGRADES

Option A is a baseline option that only includes upgrading the existing building and does not include adding additional floors. This option would provide upgrades to the existing building to address some of the challenges described in the existing conditions, and includes baseline scope of work that would be included in each of the design options in this report.

- Existing connections to adjacent building to remain.
- The addition of fire sprinklers allows for free planning for circulation through the floor plus more transparent or open connections between the hallway and the program spaces.
- New shaft openings are shown at opposite ends of the building for distribution, at solid walls. The structural system allows penetrations at any typical column bay.
- Restrooms are upgraded as necessary to meet code, but consideration to be given to maintaining existing architecturally significant elements such as terrazzo floor and tile walls.
- Illustrative programming is shown for options that would work within the existing floor structural bay depths and the new floor proposed columns layouts.



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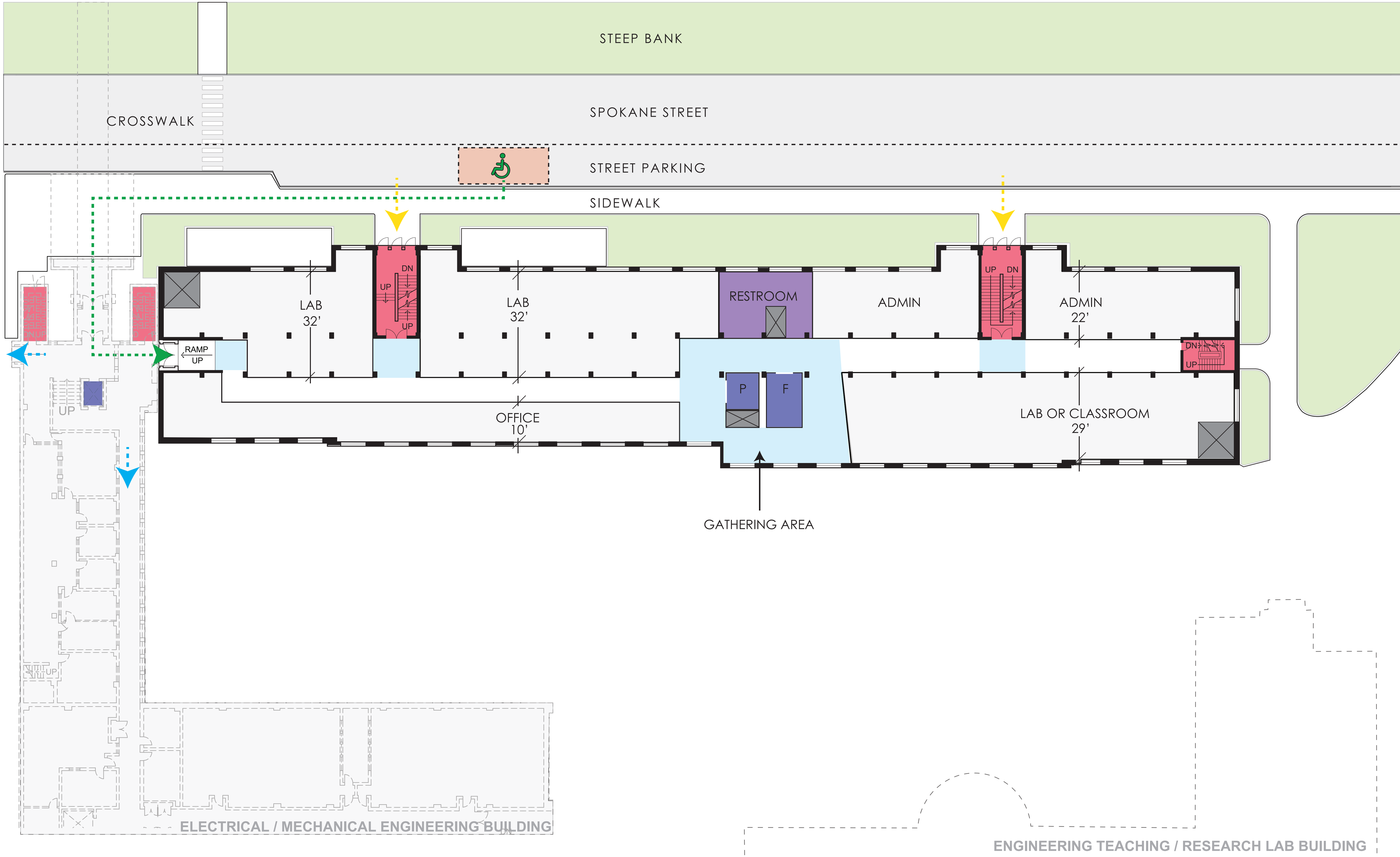
OPTION A
GROUND FLOOR

SABA + BA



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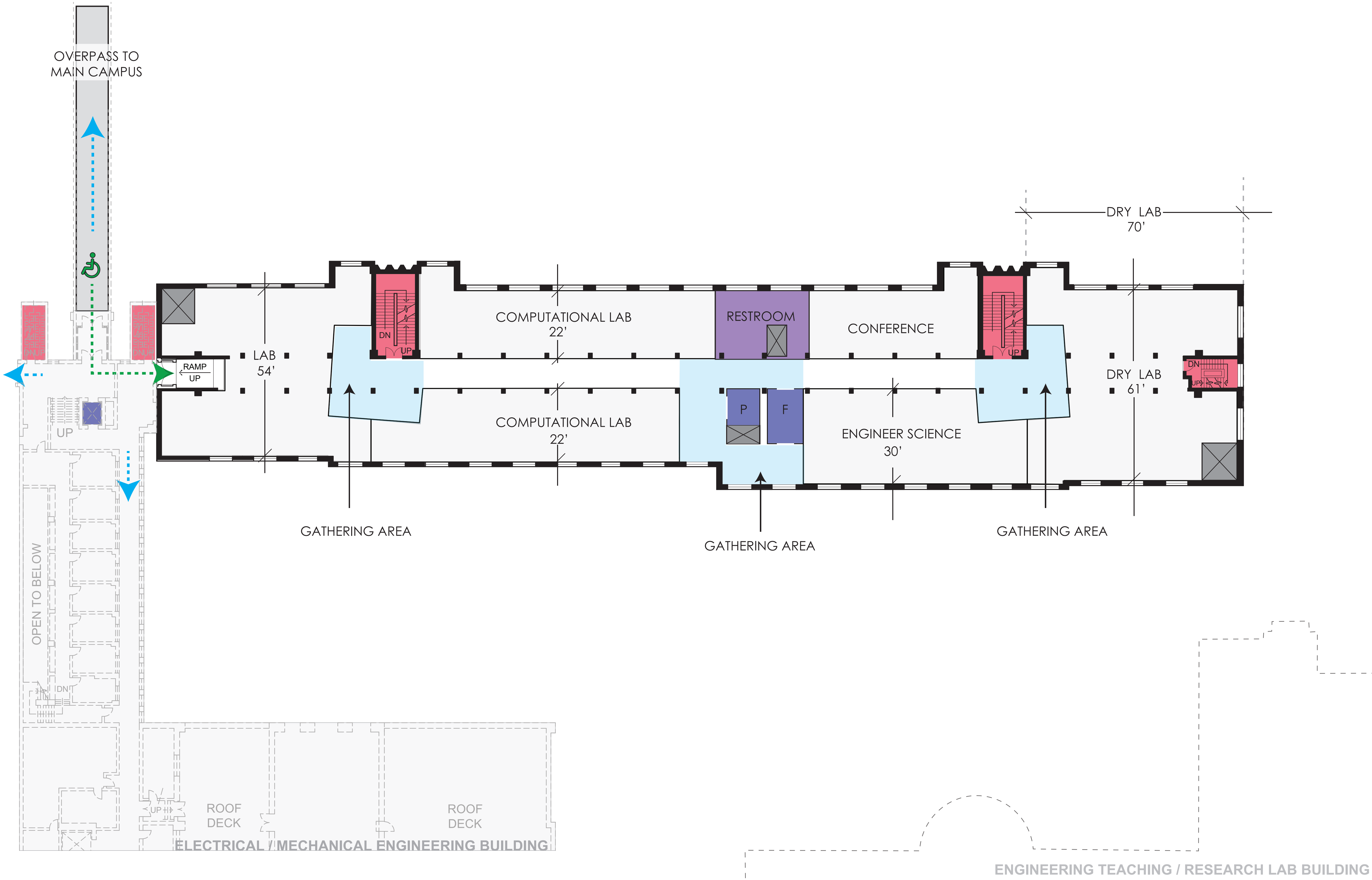
OPTION A

1ST FLOOR

13
SHEET NO.

SABA + BA



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SCALE: 1" =30'

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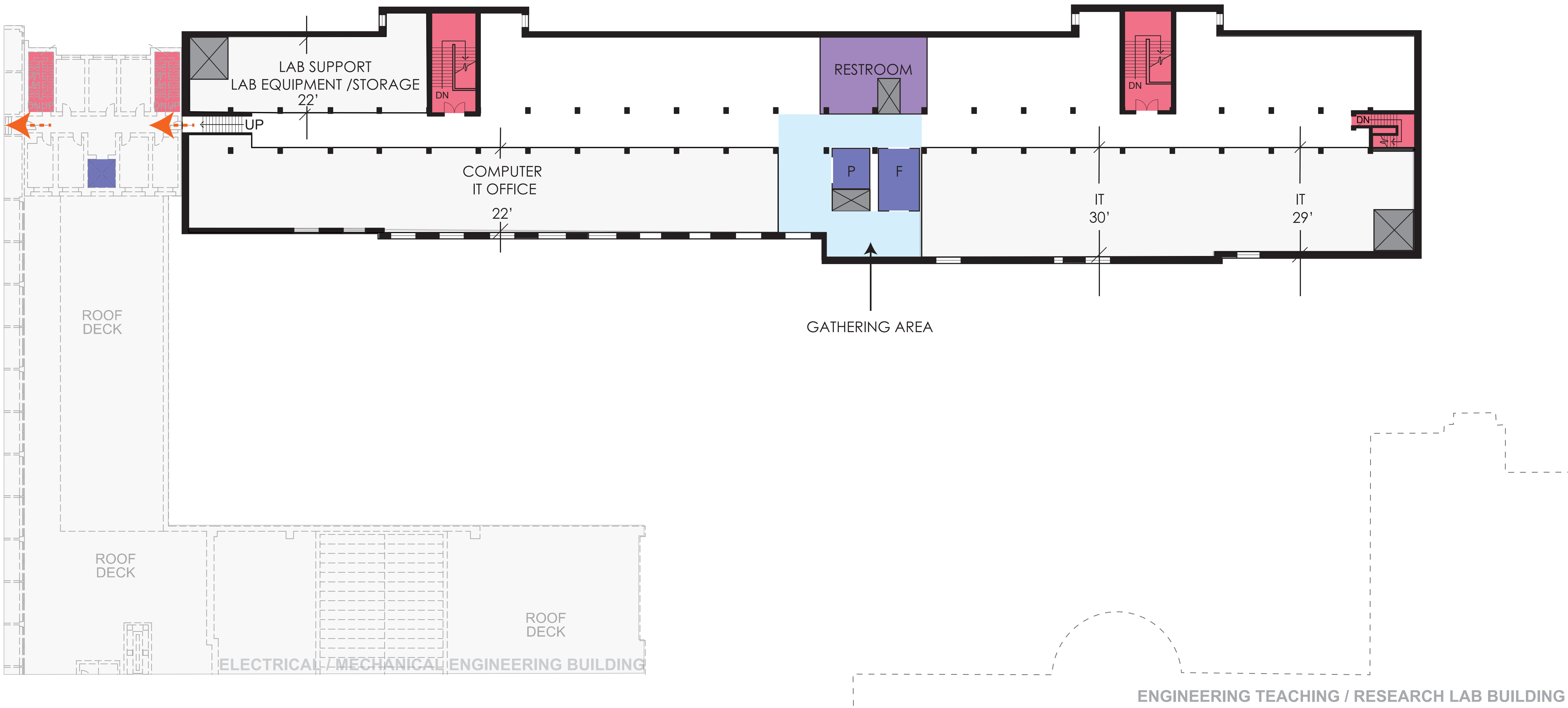
OPTION A

2ND FLOOR

SABA + BA



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NORTH

SCALE: 1" =30'
0 5 10 20 30

OPTION A

3RD FLOOR

15
SHEET NO.

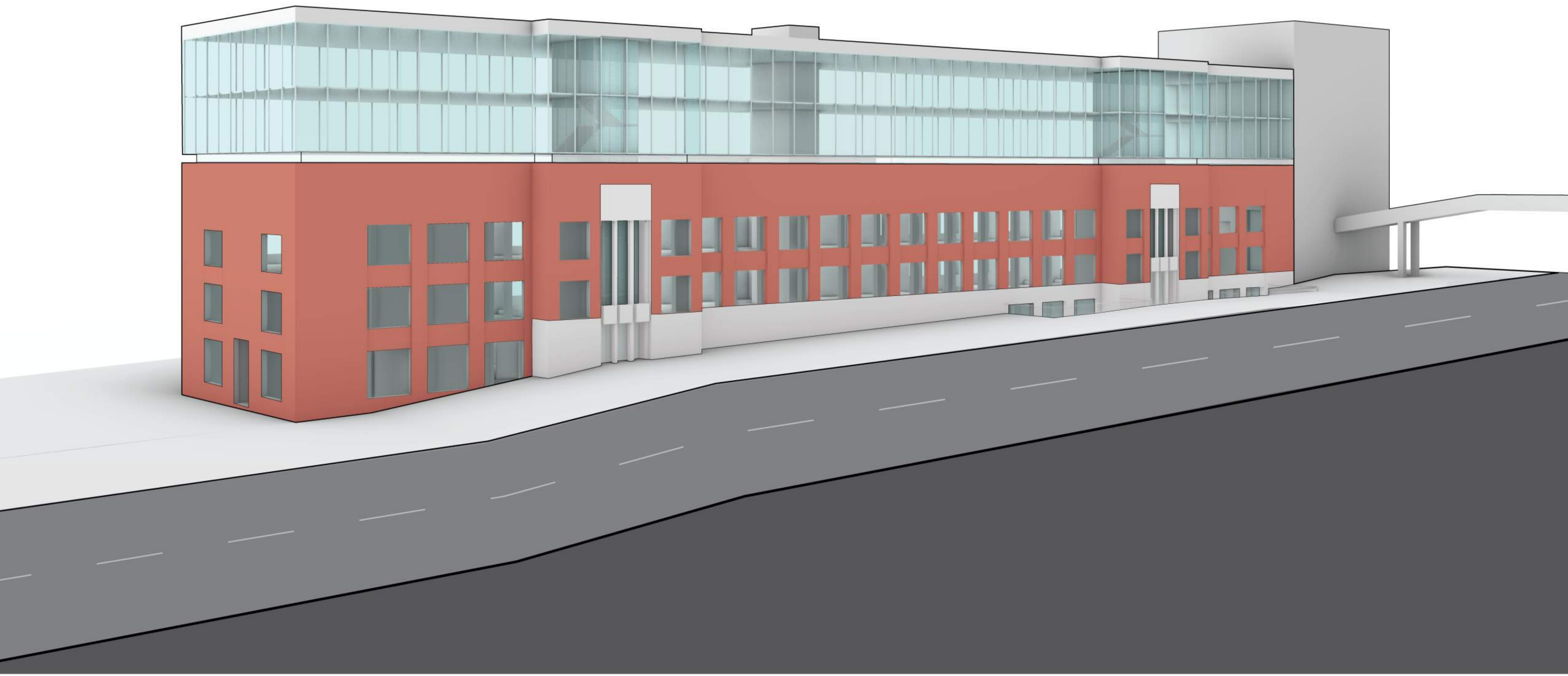
SABA + BA

SECTION 3

OPTION B: UPGRADES WITH ADDITIONAL FLOORS

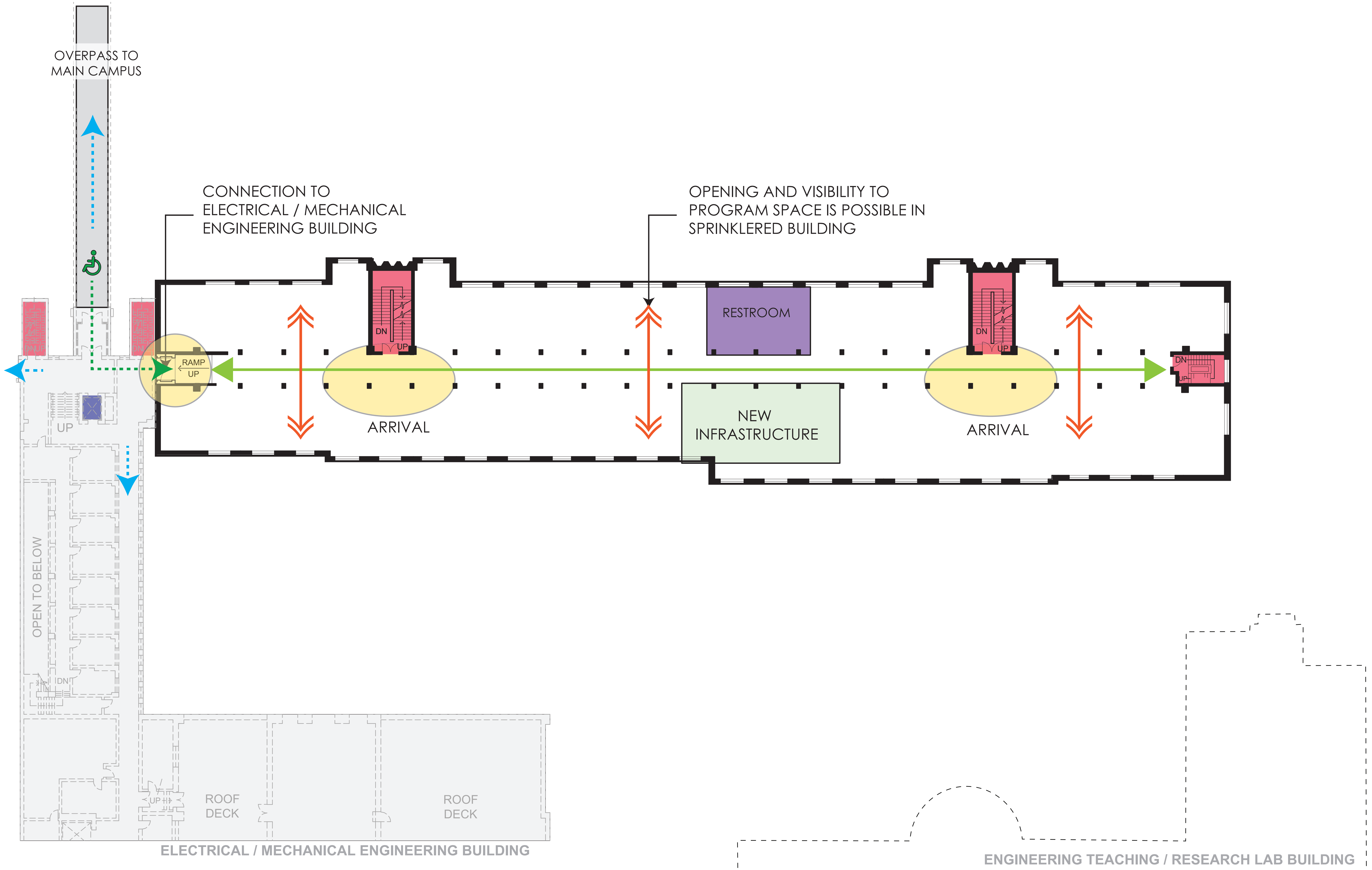
Option B adds two additional floors and a re-built interstitial level 3. An additional entry is proposed on the West side of the building. This would be a more prominent entry that includes an accessible route at the rear of the building. Arrival would be an expansive entry experience with a gathering area opportunity centrally located in the building floor plate. This scenario also includes a new loading dock with secure staging area. It shows a new passenger elevator and a new larger scale freight elevator. This option also includes the existing conditions upgrades described in the previous section.

- Existing connections to adjacent building to remain.
- The addition of fire sprinklers allows for free planning for circulation through the floor plus more transparent or open connections between the hallway and the program spaces.
- New shaft openings are shown at opposite ends of the building for distribution, at solid walls. The structural system allows penetrations at any typical column bay.
- Restrooms are upgraded as necessary to meet code, but consideration to be given to maintaining existing architecturally significant elements such as terrazzo floor and tile walls.
- Illustrative programming is shown for options that would work within the existing floor structural bay depths and the new floor proposed columns layouts.
- There are two approaches proposed for addressing the column placing on the new floors. See page 39 for diagrams.



OPTION B

PERSPECTIVE



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BLDG. TOTAL: 90,023 S.F.

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SCALE: 1" =30'

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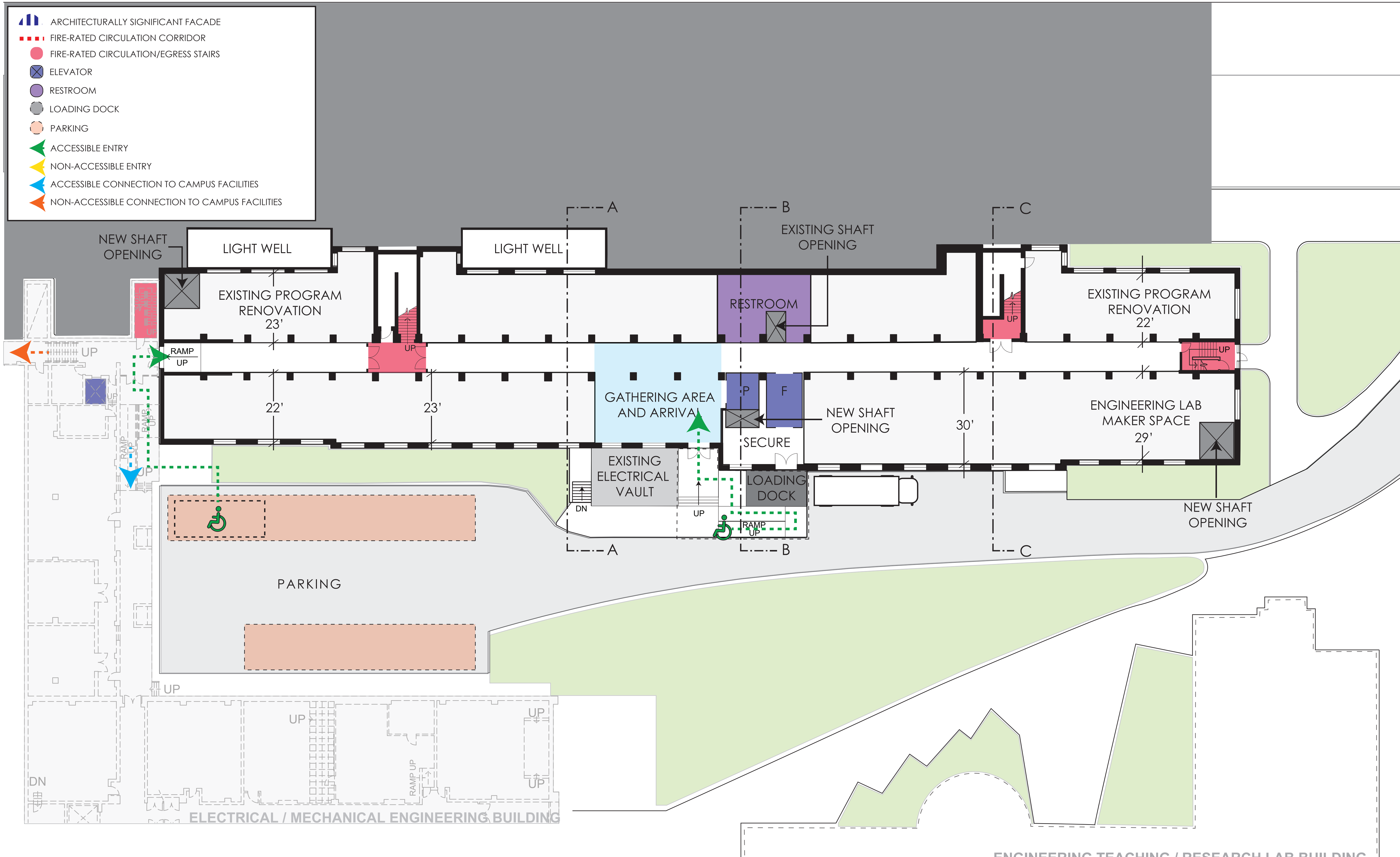
OPTION B

ARCHITECTURAL OPPORTUNITIES

18

SHEET NO.

SABA + BA



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BLDG. TOTAL: 90,023 S.F.

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SCALE: 1" =30'
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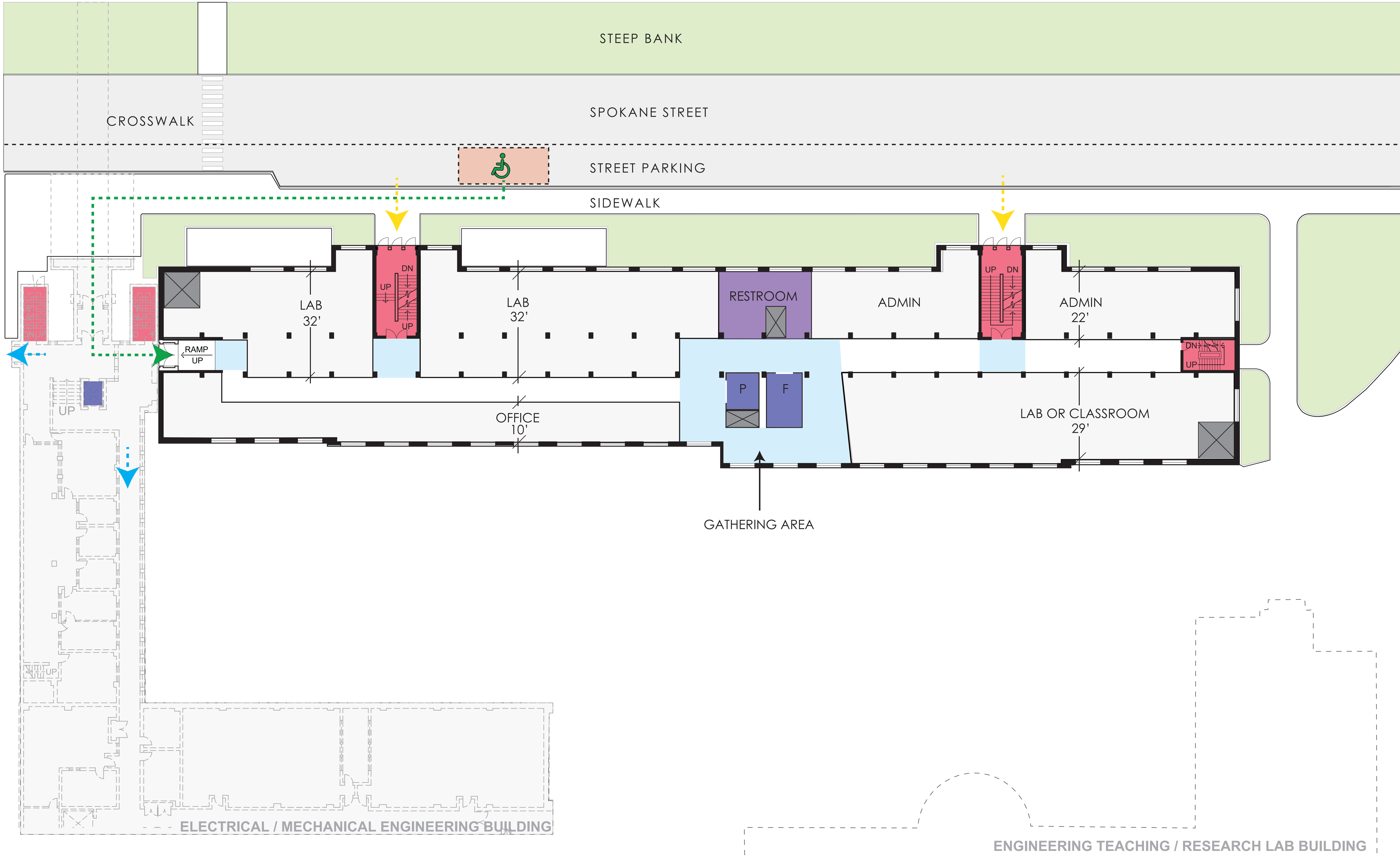
OPTION B
GROUND FLOOR

19
SHEET NO.

SABA + BA



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BLDG. TOTAL: 90,023 S.F.

NORTH

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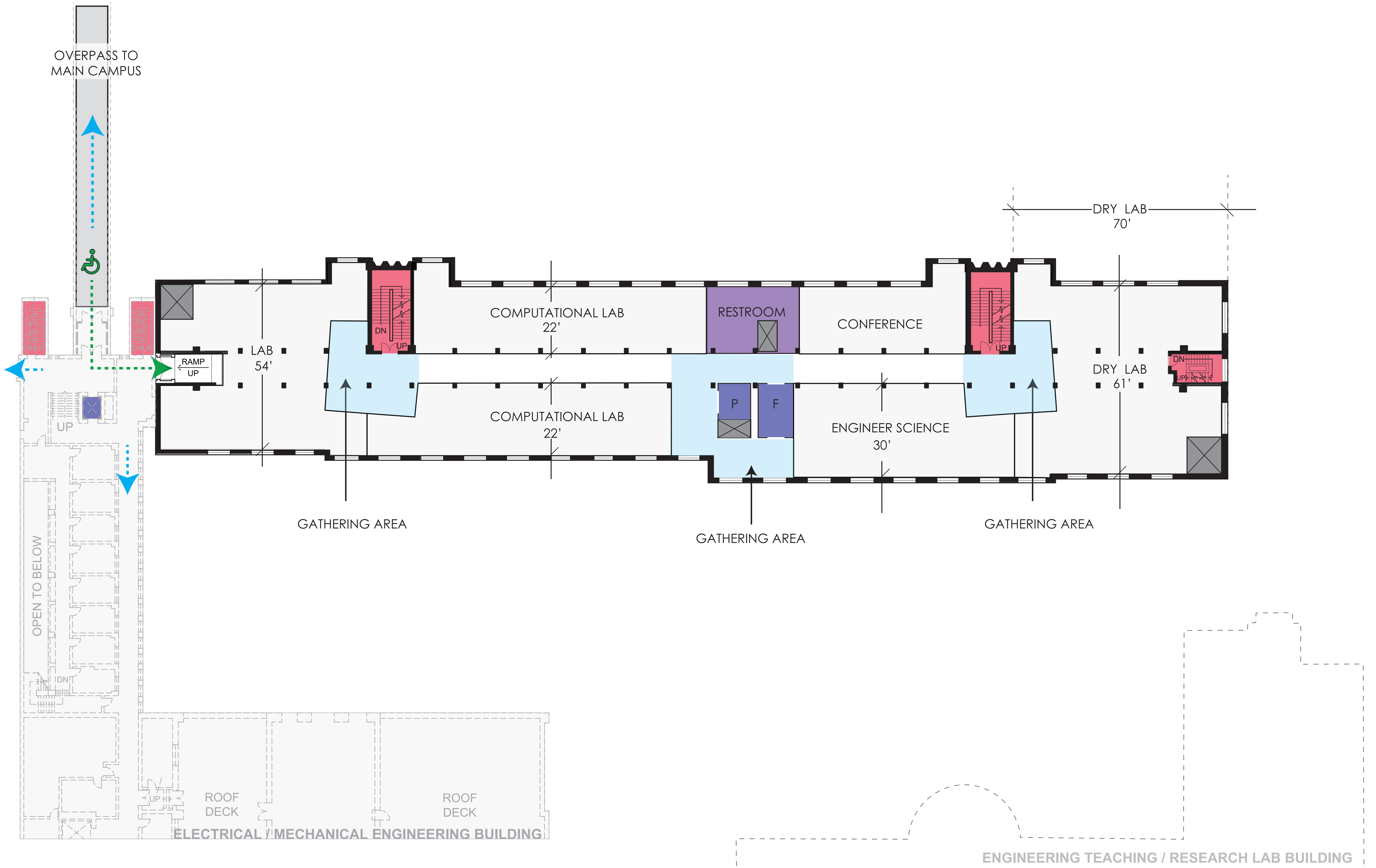
OPTION B

1ST FLOOR

SABA + BA



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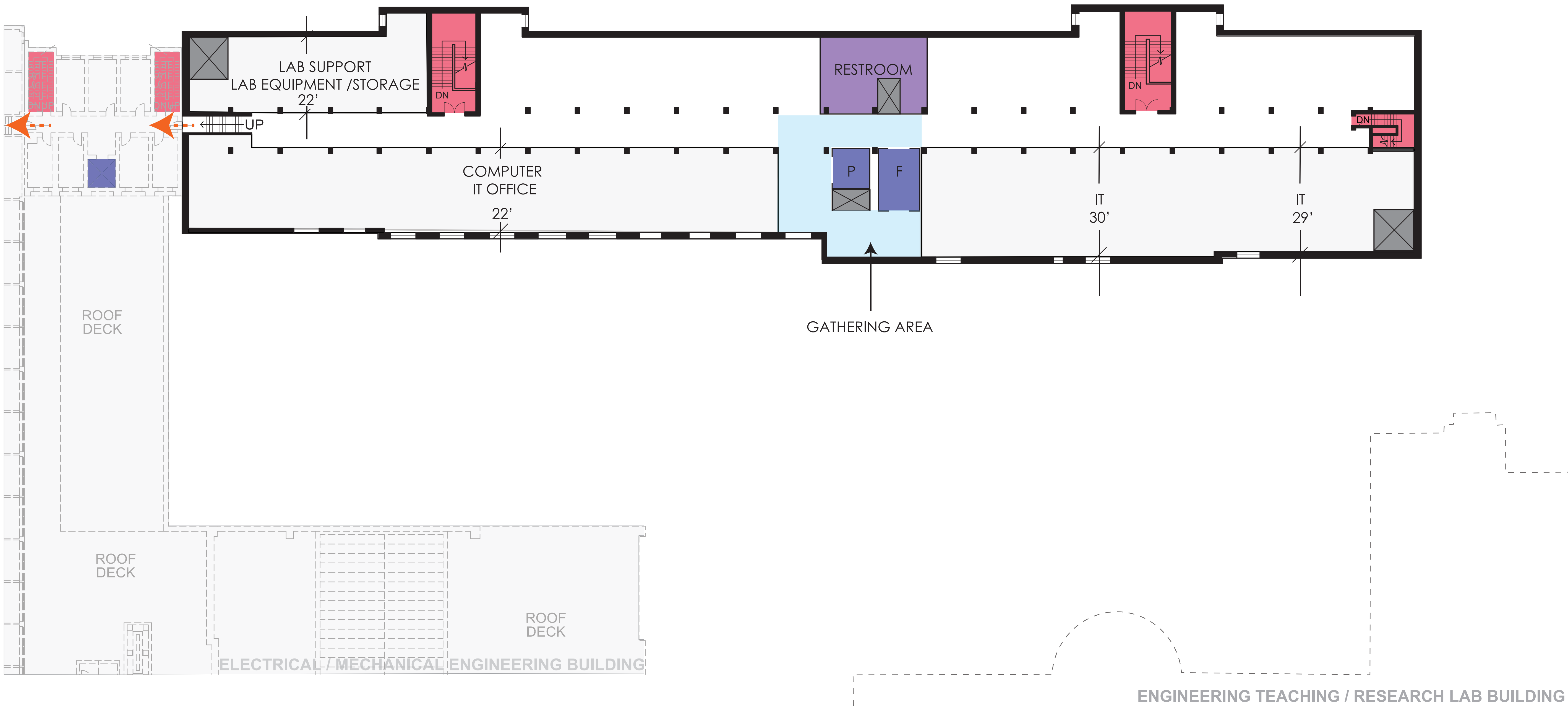
OPTION B

2^{ND} FLOOR

SABA + BA



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BLDG. TOTAL: 90,023 S.F.

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SCALE: 1" =30'

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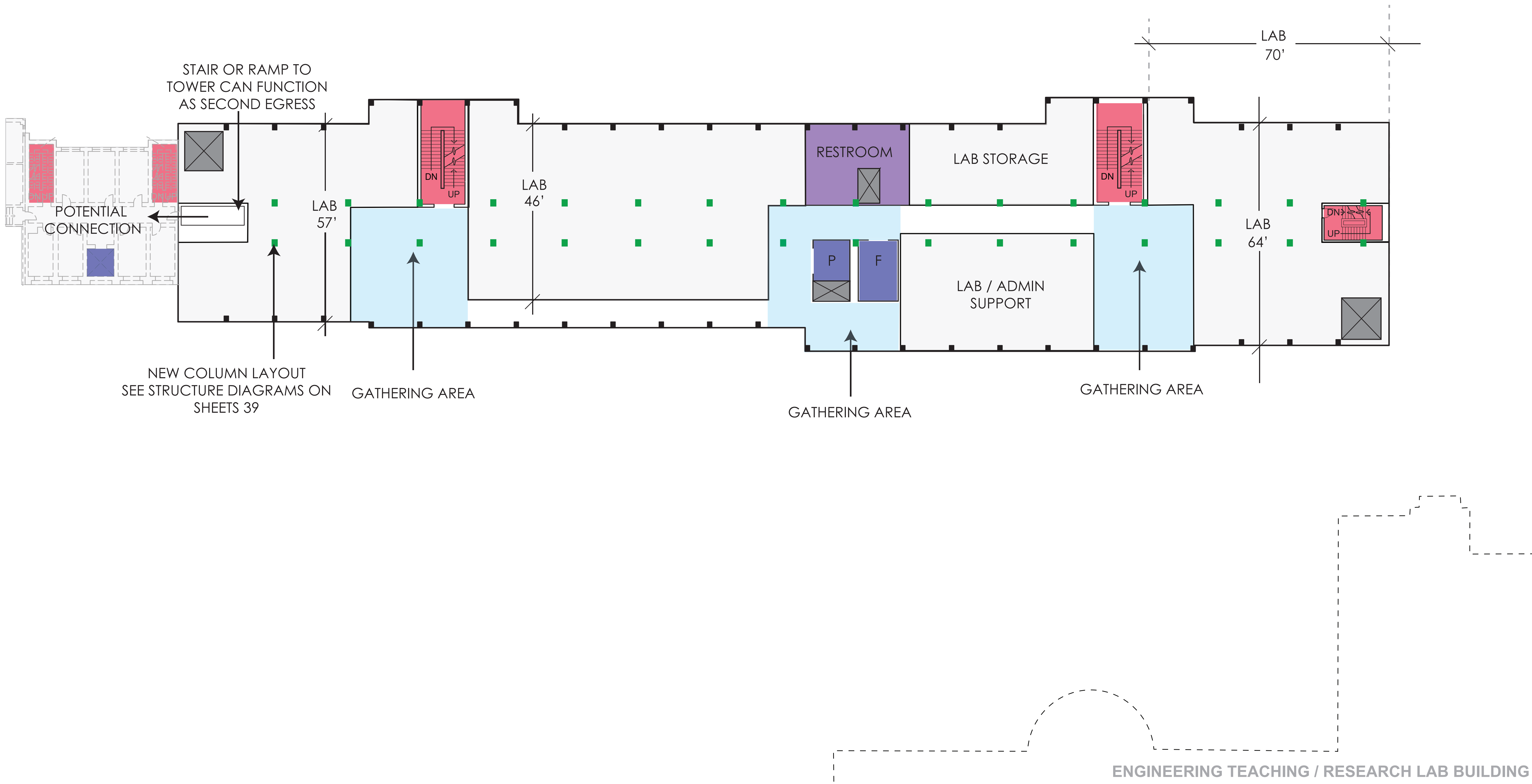
OPTION B

3RD FLOOR

SABA + BA



ENGINEERING TEACHING / RESEARCH LAB BUILDING

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BLDG. TOTAL: 90,023 S.F.

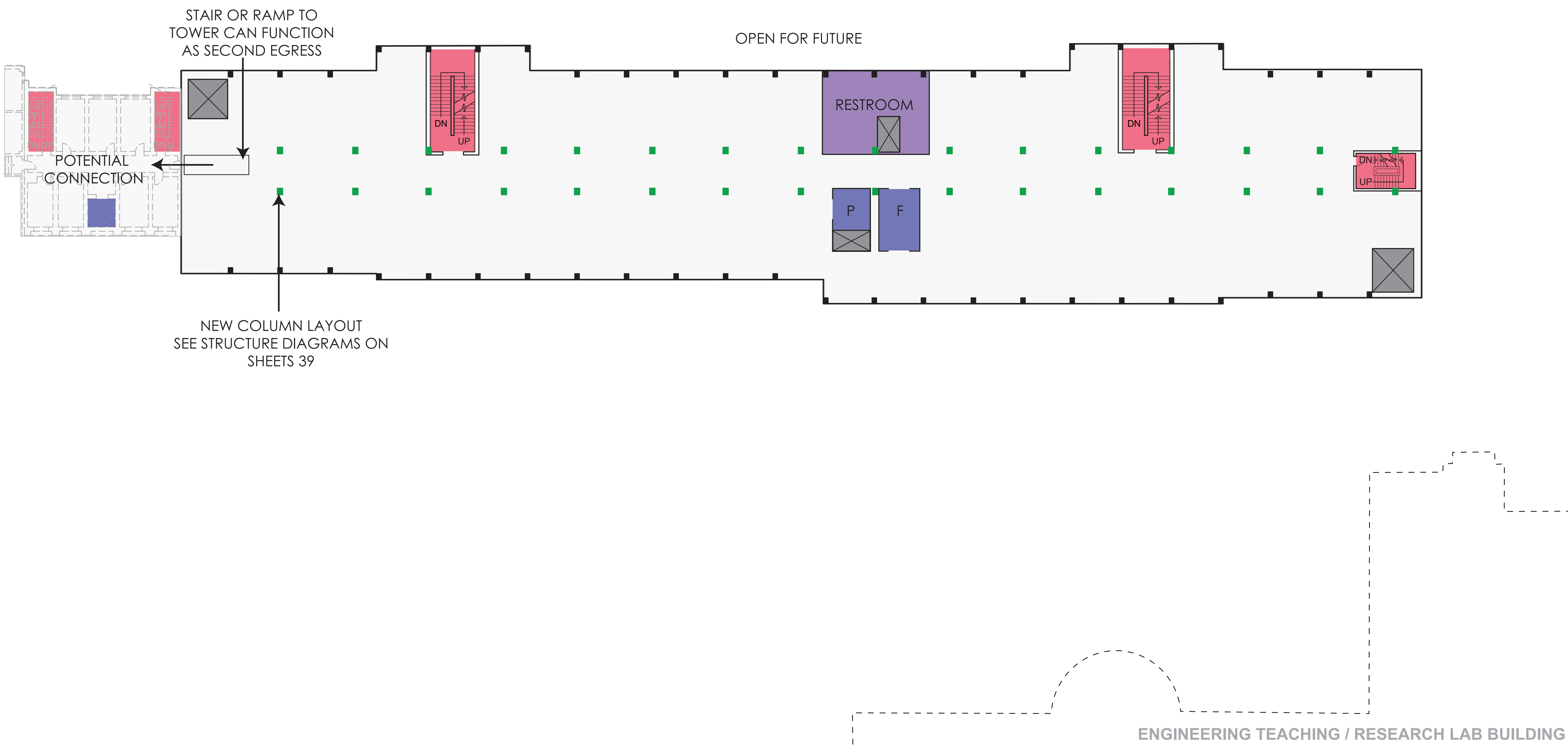
NORTH

SCALE: 1" =30'
0 5 10 20 30

OPTION B

4TH FLOOR

SABA + BA



ENGINEERING TEACHING / RESEARCH LAB BUILDING

Voiland College of Engineering & Architecture, Washington State University	21,952 BLDG. TOTAL: 90,023 S.F.	NORTH	SCALE: 1" =30' 0 5 10 20 30	OPTION B 5TH FLOOR	24 SHEET NO.	SABA + BA

SECTION 4

OPTION C : UPGRADES WITH ADDITIONAL FLOORS W/ VERTICAL CIRCULATION TOWER

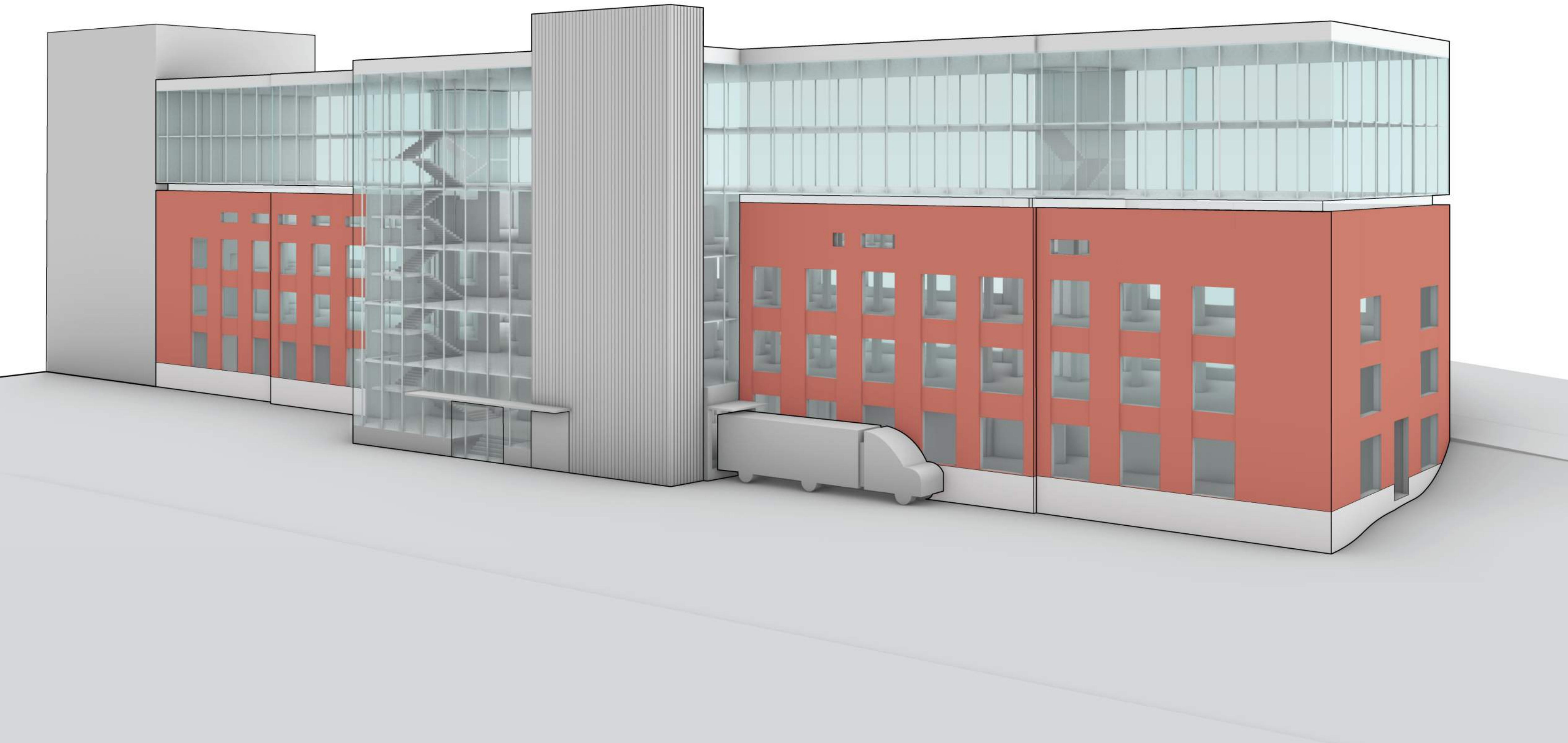
Option C adds the same two additional floors and re-built interstitial level 3, plus a full building height circulation addition on the West side of the building. This would also be a more prominent entry inclusive of an accessible route.

This option provides a brand-new architectural element with a grander entry, open communicating stair, visual connection with all of the floors for more dynamic circulation and activates the plaza adjacent to the West side of the building. This relates Dana Hall back to the Engineering Teaching Research Lab building. It offers an important architectural expression with a front-facing experience at the plaza side, which includes a campus pedestrian thoroughfare, providing an additional link to campus and the new construction planned SE of the building. This architectural component allows it to be a public facing expression rather than just a service side of the building. This provides a complementary response to the engineering lab building to the West.

The significant new infrastructure includes a new elevator and stair incorporated cleanly into the new addition as well as limited structural upgrades. It is all bundled into a nice new architectural move, allowing the existing building to be available for other program functions, for maximizing the existing floor plan and maximizing the space available for other programs. This would require site improvements to connect the Dana Hall building to the plaza, pedestrian thoroughfare, and Engineering Teaching Research Lab building.

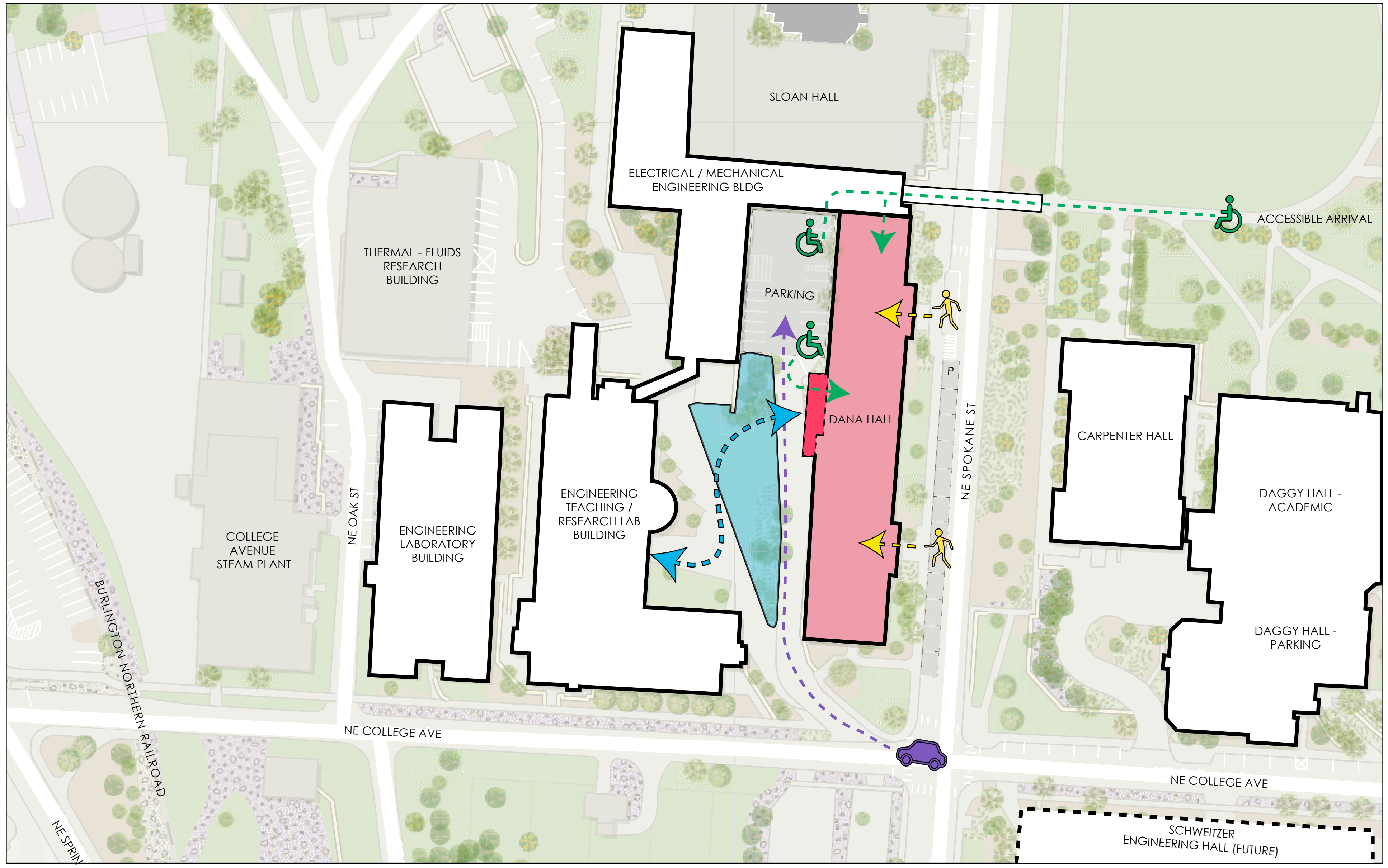
The following highlights from Option B also apply to this option, as well as the existing conditions upgrades from Option A:

- Existing connections to adjacent building to remain.
- The addition of fire sprinklers allows for free planning for circulation through the floor plus more transparent or open connections between the hallway and the program spaces.
- New shaft openings are shown at opposite ends of the building for distribution, at solid walls. The structural system allows penetrations at any typical column bay.
- Restrooms are upgraded as necessary to meet code, but consideration to be given to maintaining existing architecturally significant elements such as terrazzo floor and tile walls.



OPTION C

PERSPECTIVE



- INACCESSIBLE ENTRY
- ACCESSIBLE ENTRY
- VEHICLE ACCESS
- ACCESSIBLE CONNECTION
- PLAZA DEVELOPMENT

Voiland College of Engineering & Architecture
Washington State University

NORTH

1:2,000

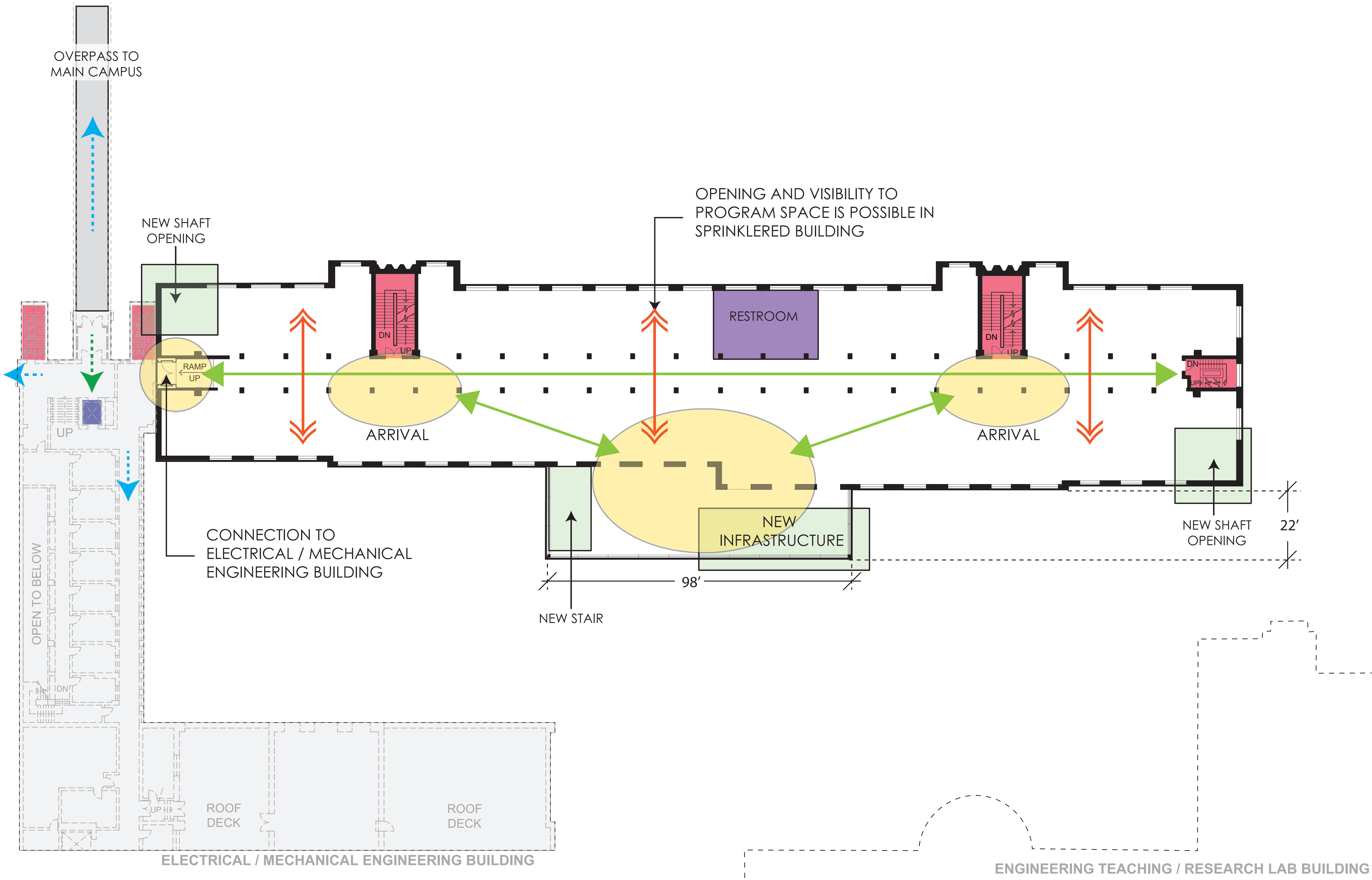
0 0.01 0.02 0.04 mi
0 0.02 0.04 0.07 km

Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA,

OPTION C

SITE PLAN

SABA + BA



Voiland College of Engineering & Architecture
Washington State University

24,520

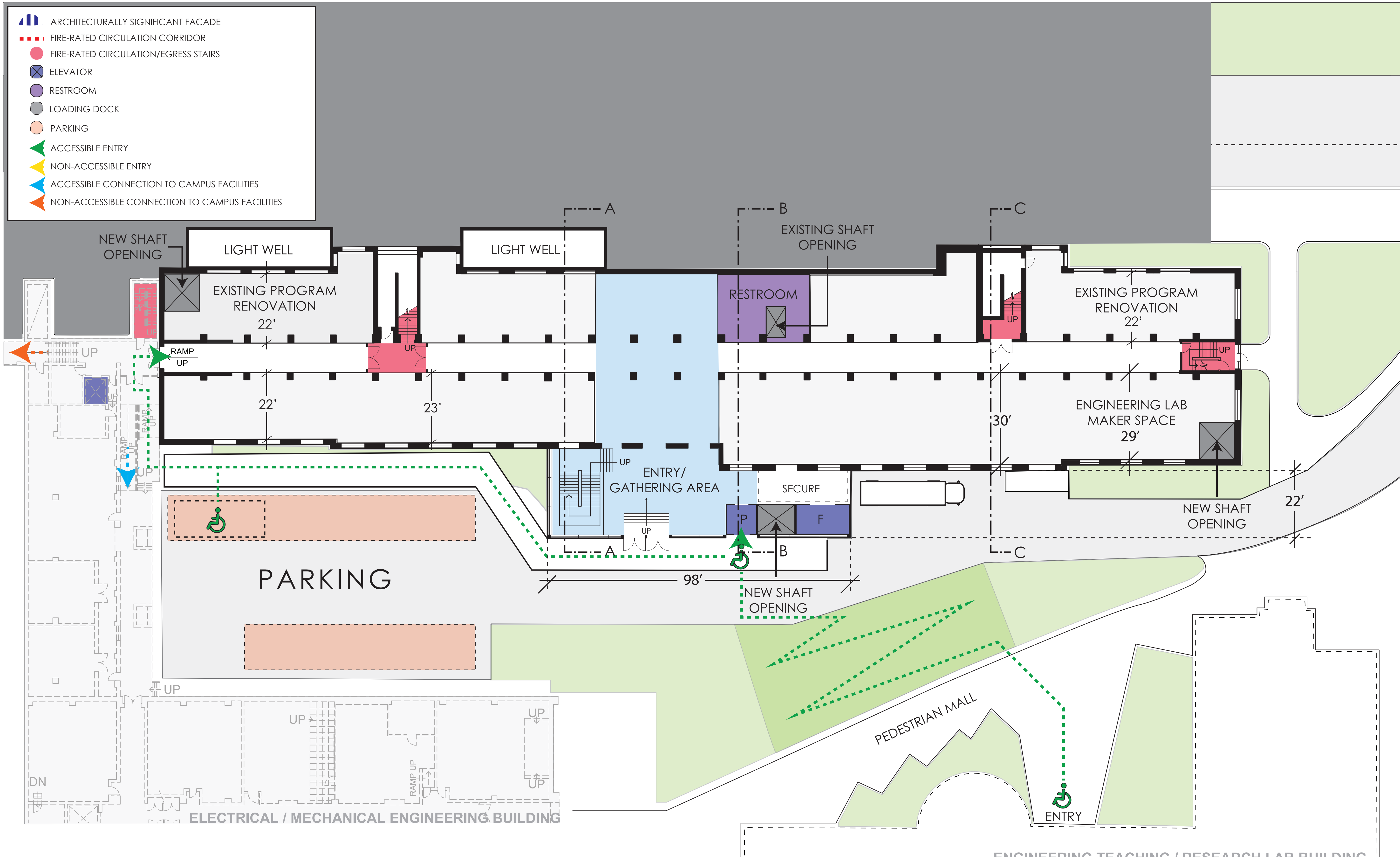
BLDG. TOTAL: 147,120 S.F.

NORTH

SCALE: 1" =30'
0 5 10 20 30

OPTION C
ARCHITECTURAL OPPORTUNITIES

SABA + BA



Voiland College of Engineering & Architecture
Washington State University

24,520

BLDG. TOTAL: 147,120 S.F.

NORTH

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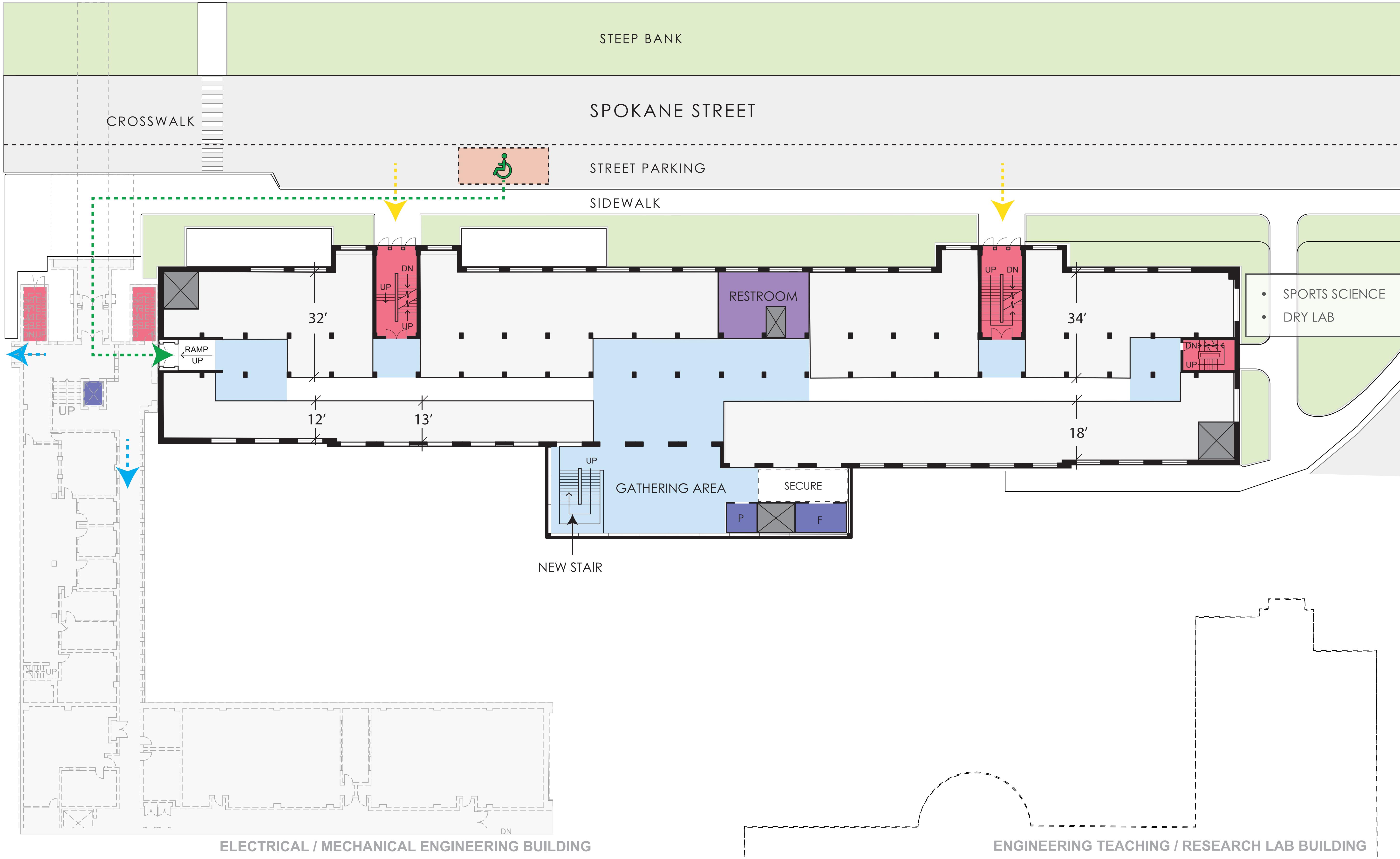
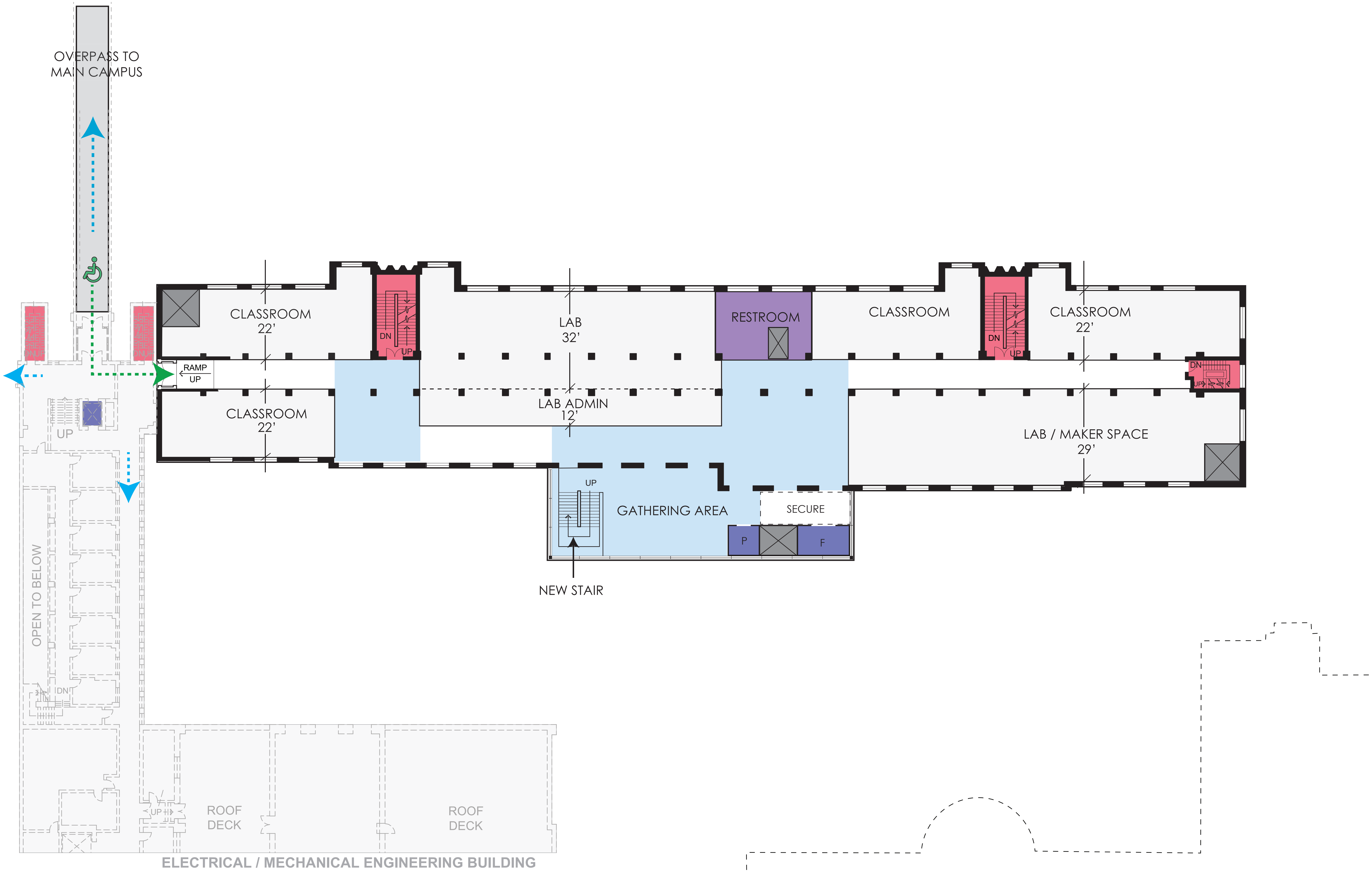
OPTION C

GROUND FLOOR

SABA + BA



Voiland College of Engineering & Architecture, Washington State University	24,520 BLDG. TOTAL: 147,120 S.F.	NORTH	SCALE: 1" =30' 0 5 10 20 30	OPTION C 1ST FLOOR	30 SHEET NO.	SABA + BA



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WASHINGTON STATE UNIVERSITY

24,520

BLDG. TOTAL: 147,120 S.F.

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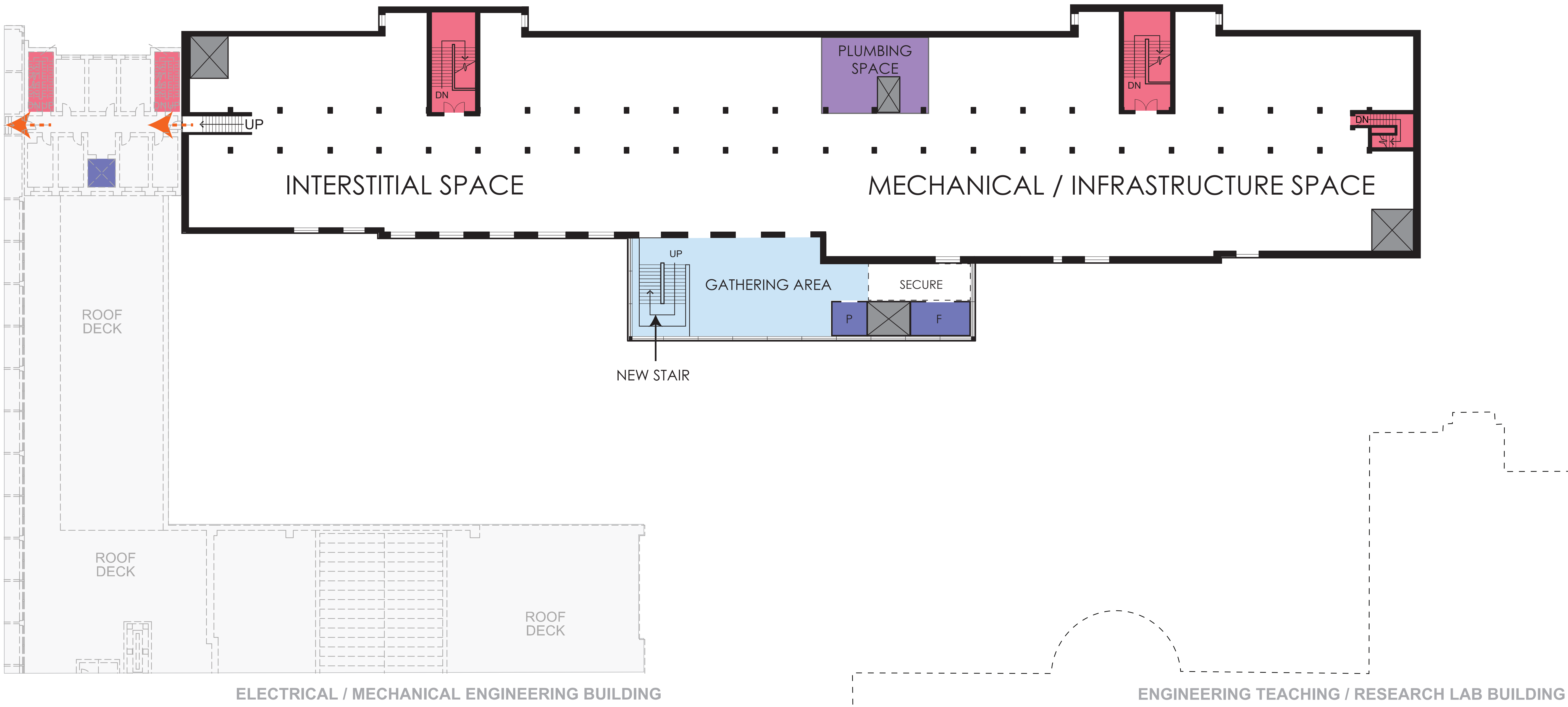
OPTION C

2ND FLOOR

SABA + BA



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BLDG. TOTAL: 147,120 S.F.

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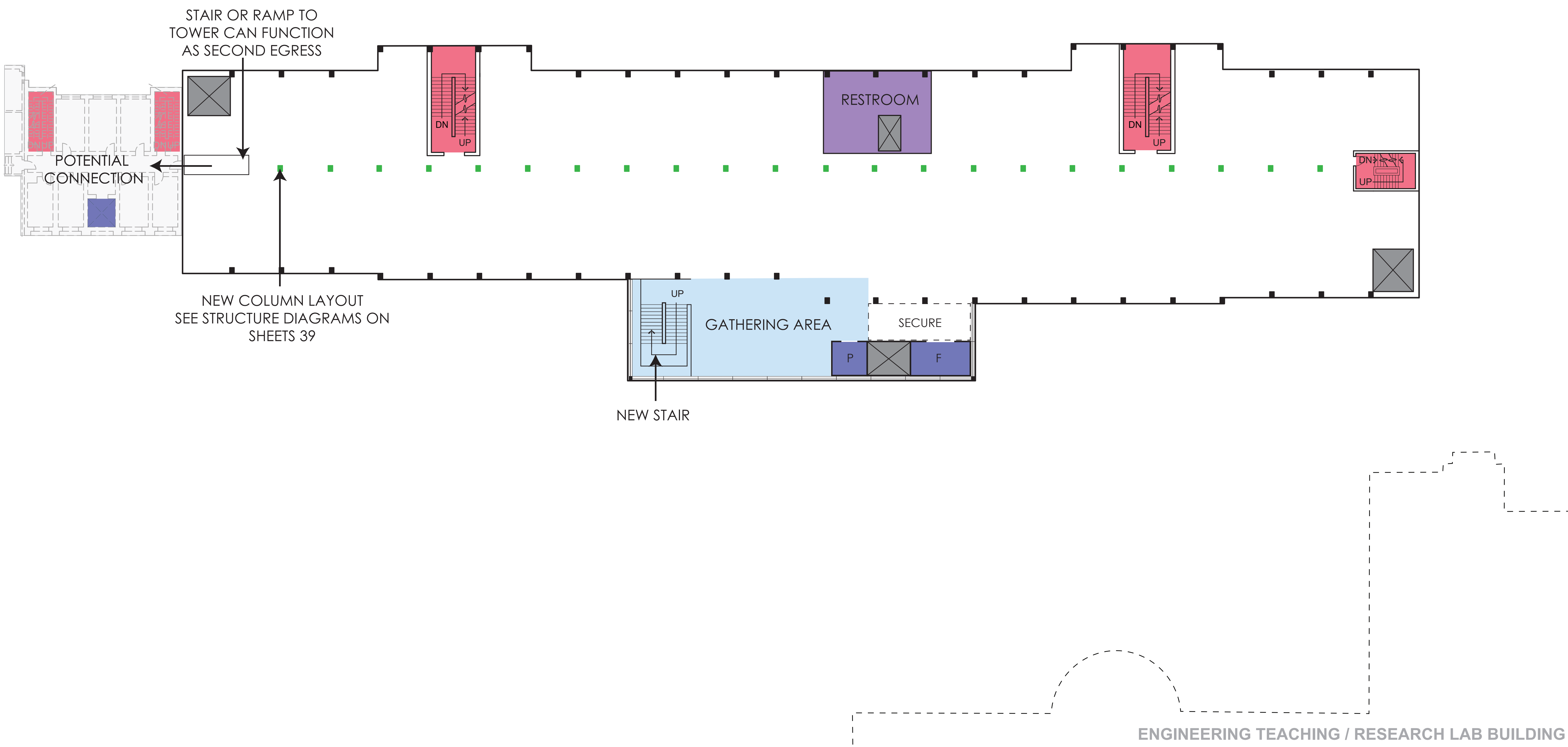
OPTION C
3RD FLOOR

SABA + BA



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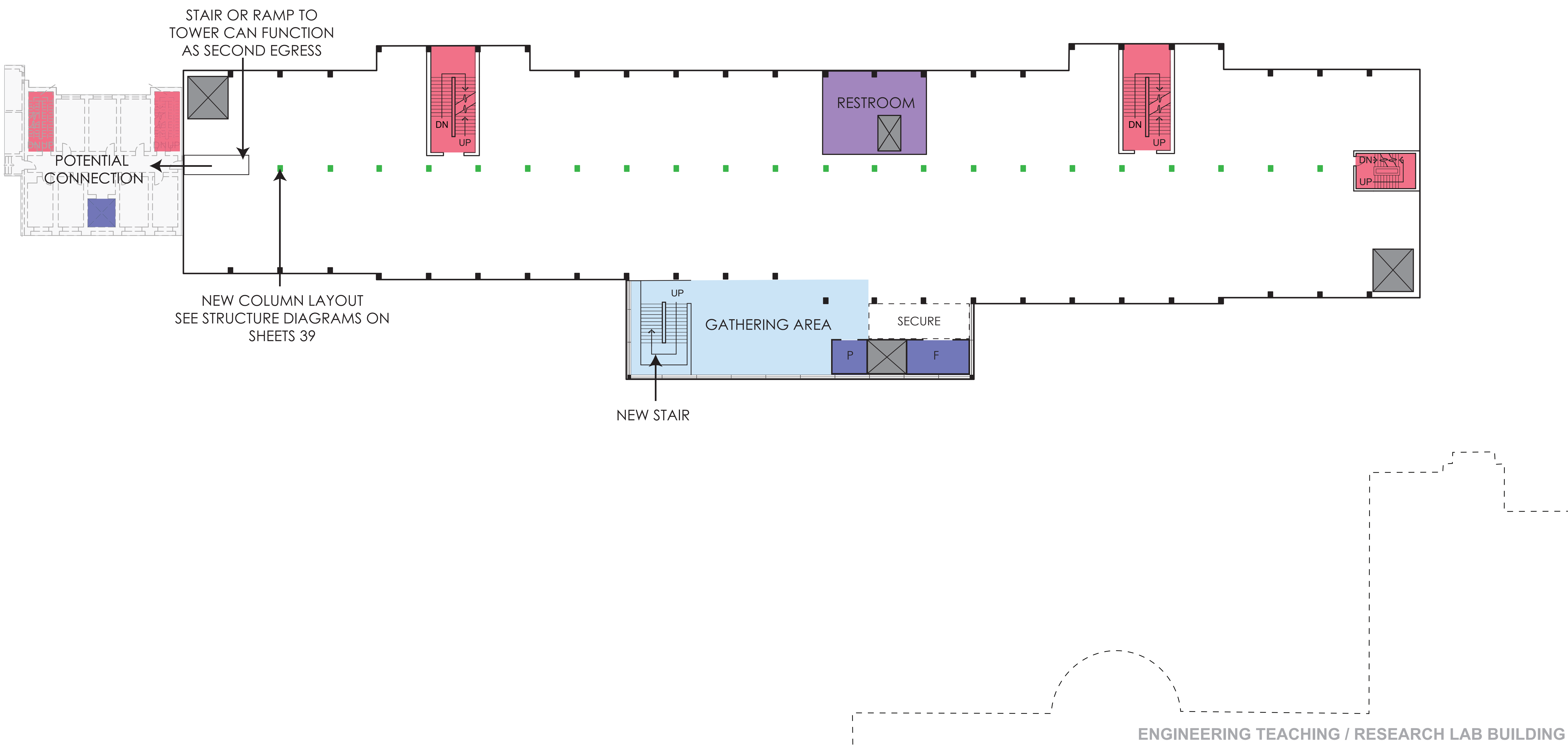
OPTION C

4TH FLOOR

SABA + BA



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BLDG. TOTAL: 147,120 S.F.

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SCALE: 1" =30'

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OPTION C

5TH FLOOR

34
SHEET NO.

SABA + BA

SECTION 5
STRUCTURAL

Building Structural System Summary (provided by CPL)

Dana Hall is a reinforced concrete building designed and constructed in the mid 1940s. The building is comprised of three stories. The floor systems are concrete pan joist slabs spanning to concrete beams. The roof structure is comprised of heavy timber. Concrete columns and pilasters provide the vertical support and are spaced at roughly 28'x14' o.c.. The building foundations are bearing directly on existing bedrock (basalt). The existing building was designed for Heavy loading with live loads ranging between 200 to 250 psf.

The existing lateral system for the building in the east-west direction is primarily concrete shear walls located near the stair wells. In the north-south long direction, existing concrete frames at the perimeter provide the main lateral resistance. The building has an existing 2" joint located roughly at the mid point of the building. This joint effectively creates a northern and southern half. Foundations at the joint are shared.

IEBC (International Existing Building Code)

Washington State University and Pullman are currently governed by the 2018 International Building Code (IBC). The 2021 IBC will go into effect in the upcoming year, currently planned for March 2024. Both codes reference the IEBC. For structure, a substantial alteration is only required if 30% of structural systems are altered. This is a rare occurrence; however, any element that is modified by more than 5% of its original design value must be upgraded to new code standards. For example, if new loads are added to a column and those loads are greater than 5% of the column's original design value, the column would need to be designed under new code standards. In short, alterations and additions could be done that do not require a substantial alteration or large lateral system upgrade, but local upgrades would be needed at all locations where significant load is added. This would most likely be the case for a large interior and mechanical upgrade.

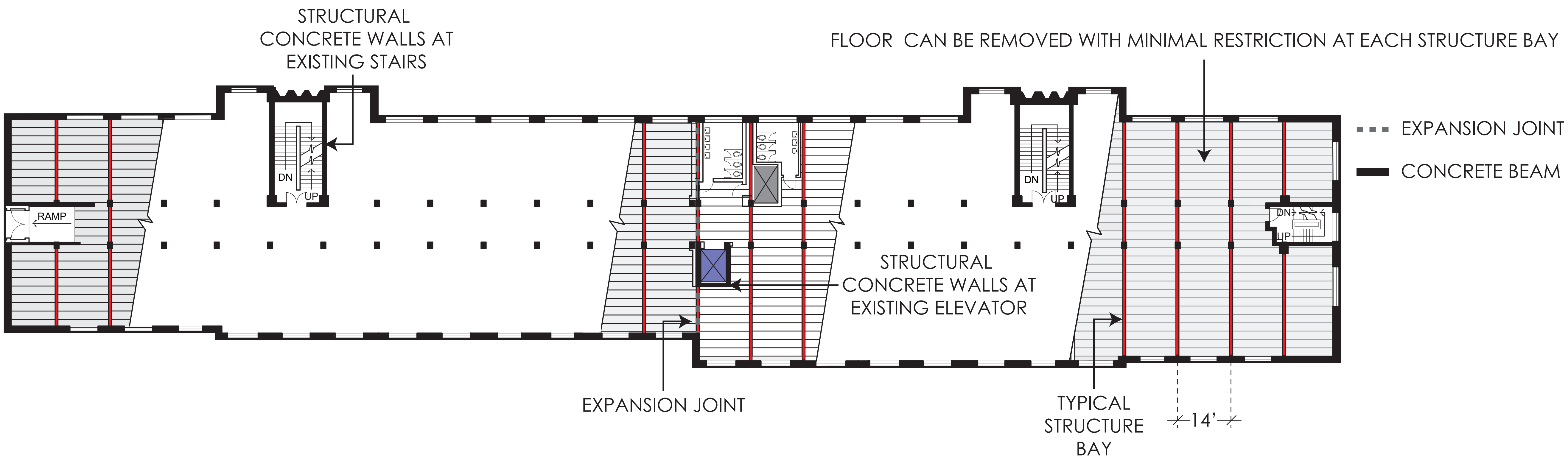
The joint provides flexibility for modifying the structure. Alterations and additions could be limited to one half of the building thereby eliminating the need for major renovations to the other half. This fact could be utilized particularly if changes were more desirable in one section of the building than the other.

Vertical Expansion Options

A cursory study on the existing system was conducted to evaluate the feasibility of additional floors. As noted above, the existing building was designed for very high live loads, ranging from 200 to 250 psf. Live loads in this range are typically reserved for heavy manufacturing areas and/or areas subject to loading from traffic. If the use of the building is limited to lighter loading, such as classrooms, office, and/or limited assembly, the reserve capacity in the columns and foundations could be used to support additional floor space. Our quick study found that up to two additional floors could be added to the existing building without the need for substantial modifications to the foundations or columns. For these new levels, we assumed floor assemblies comprised of Composite Steel or Mass Timber—systems that are lighter than the original concrete floor structure.

Vertical expansion, transfer conditions

A quick study also revealed that the new floor structures could be supported by bays slightly larger than the existing columns. This would require a transfer beam system to distribute the loads evenly to the supporting structure below. The concept would be to limit the load increases below the 2nd floor to 5% of the original load. Local strengthening would be required for concrete columns and the existing perimeter/pilaster system with new elements such as fiber wrap and or supplemental vertical strength.



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21,952

BLDG. TOTAL: 90,023 S.F.

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SCALE: 1" =30'

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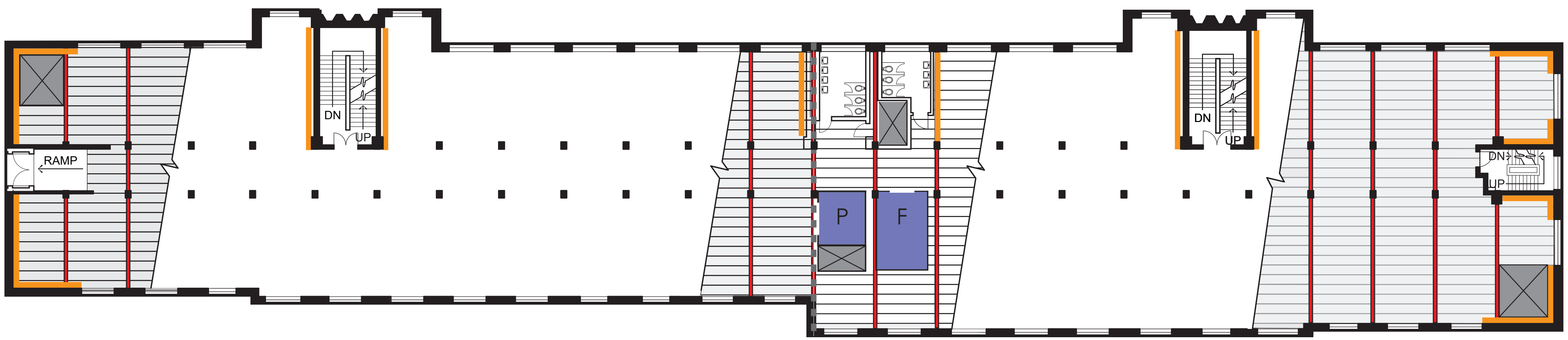
EXISTING CONDITION SIMILAR TO OPTION A

TYPICAL FLOOR

SABA + BA



EXPANSION JOINT
POTENTIAL LOCATIONS FOR SHOTCRETE
CONCRETE BEAM

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SCALE: 1" =30'

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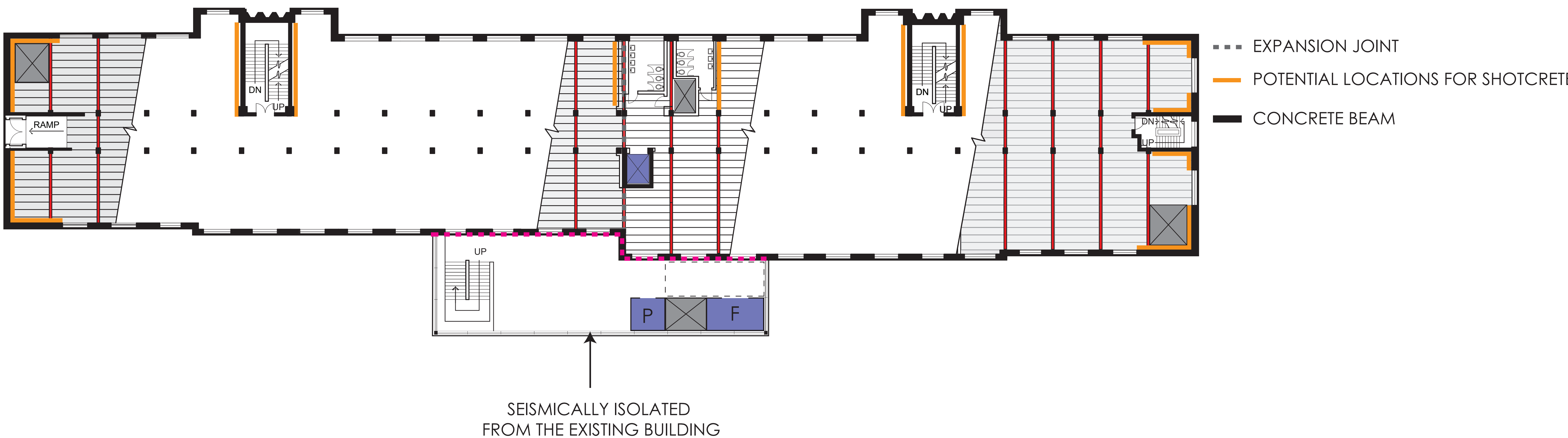
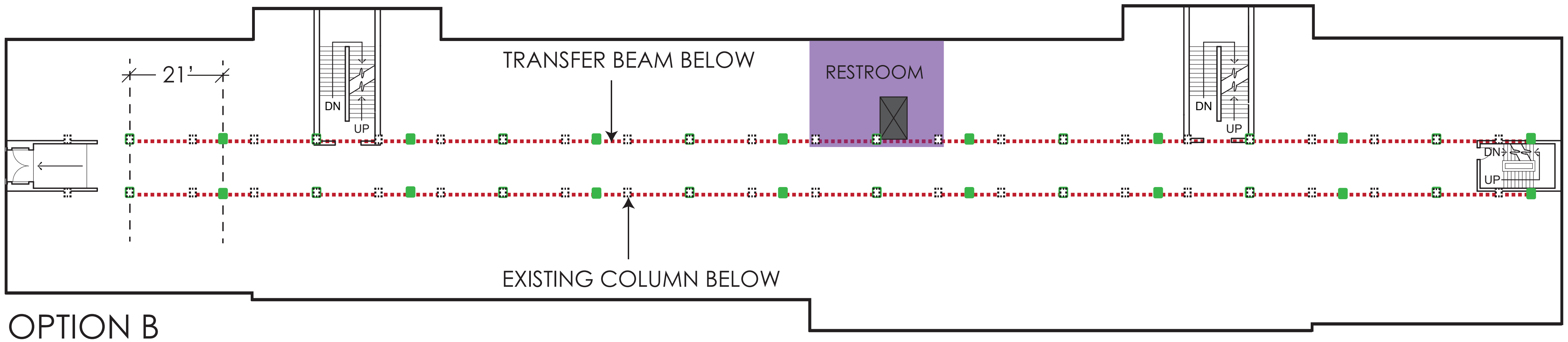
OPTION B

TYPICAL FLOOR

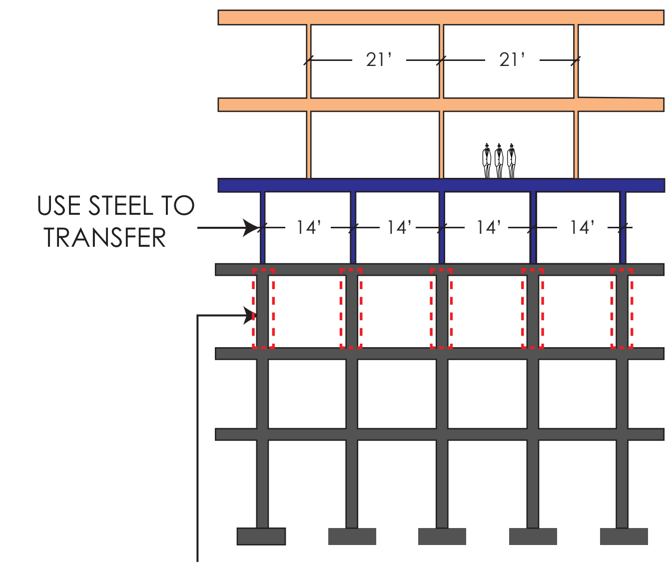
SABA + BA



RAMP
DN
UP
DN
UP
DN
UP
UP
P
F
EXPANSION JOINT
POTENTIAL LOCATIONS FOR SHOTCRETE
CONCRETE BEAM
SEISMICALLY ISOLATED
FROM THE EXISTING BUILDING



OPTION B

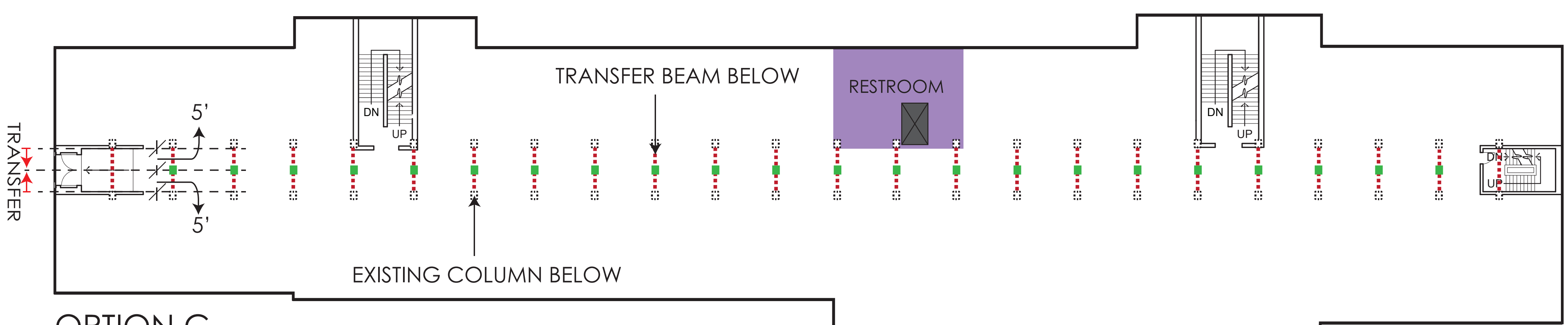


LIMITS IMPACT TO UPPER COLUMN STRENGTHENING ONLY. MOST LIKELY A FIBER WRAP OR LOCATION STRENGTHENING TO BE CONFIRMED WITH FINAL CONFIGURATION AND COLUMN LOCATIONS

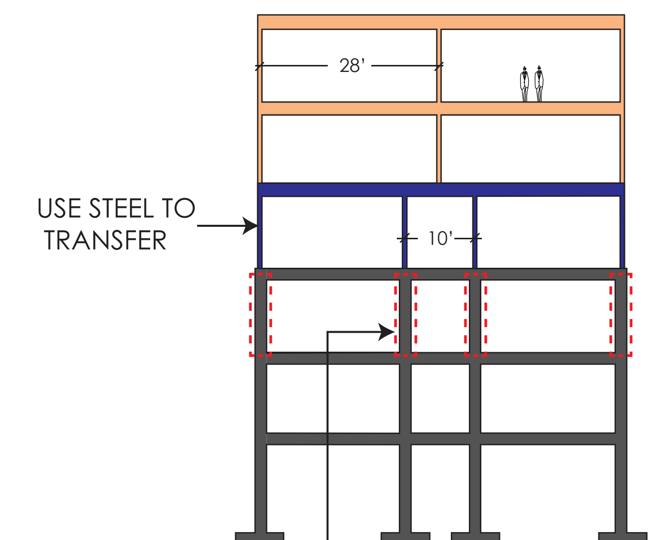
NEW COLUMN LOCATION

EXISTING COLUMN BELOW

TRANSFER BEAM BELOW



OPTION C

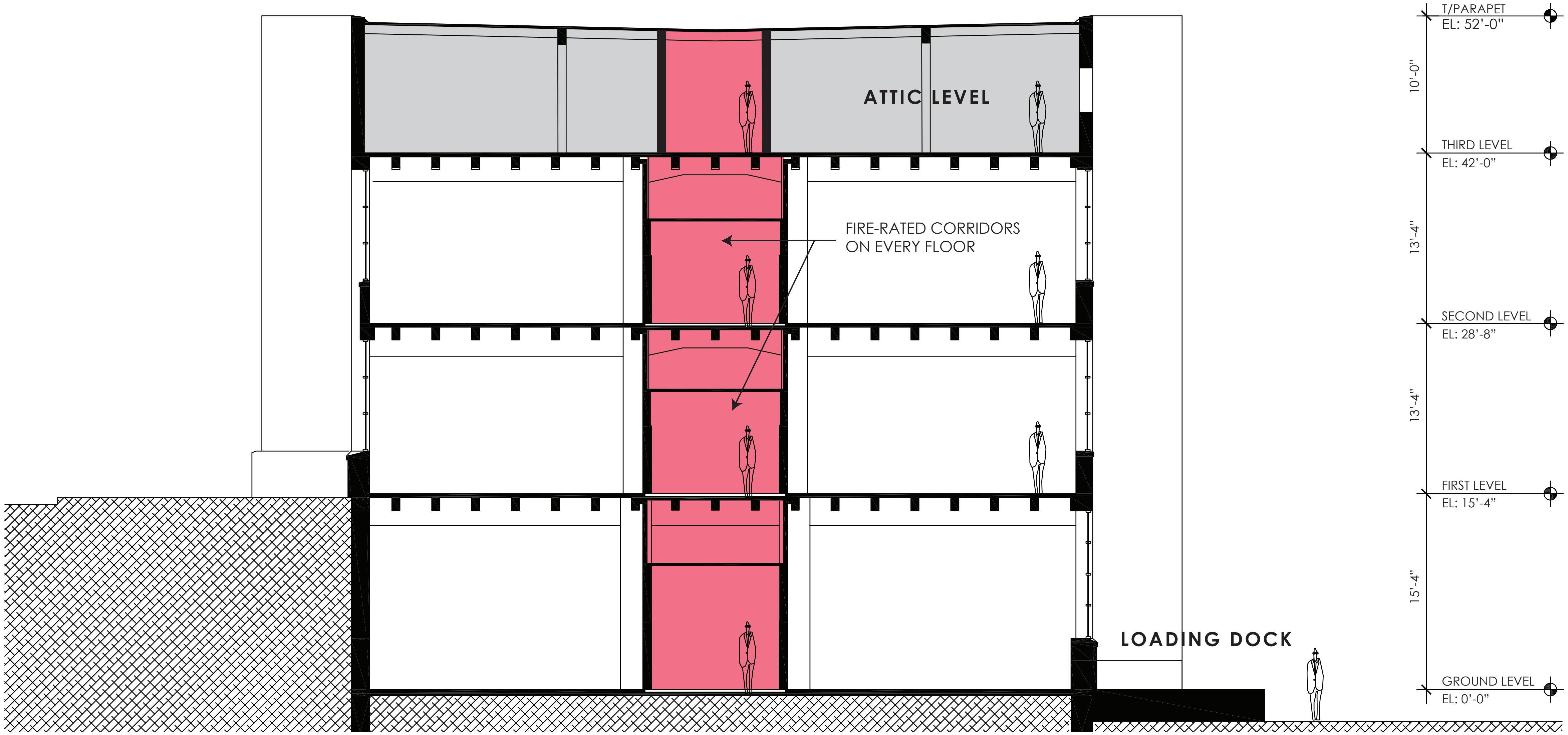


LIMITS IMPACT TO UPPER COLUMN STRENGTHENING ONLY. MOST LIKELY A FIBER WRAP OR LOCATION STRENGTHENING TO BE CONFIRMED WITH FINAL CONFIGURATION AND COLUMN LOCATIONS

SECTION 6
BUILDING SECTIONS

The building sections on the following pages demonstrate vertical information for each of the options described previously. Included in the section diagrams are the following:

- Information about the existing conditions upgrades, comparing the as-is condition with the new upgraded condition, particularly related to the main corridors on each floor.
- Demolition scope information to demonstrate the extents needed for the different options.
- Visual clarification related to the structural upgrades for the different options.
- Circulation diagrams related to the different options, including vertical components.



Voiland College of Engineering & Architecture
Washington State University

SCALE: 1" =10'

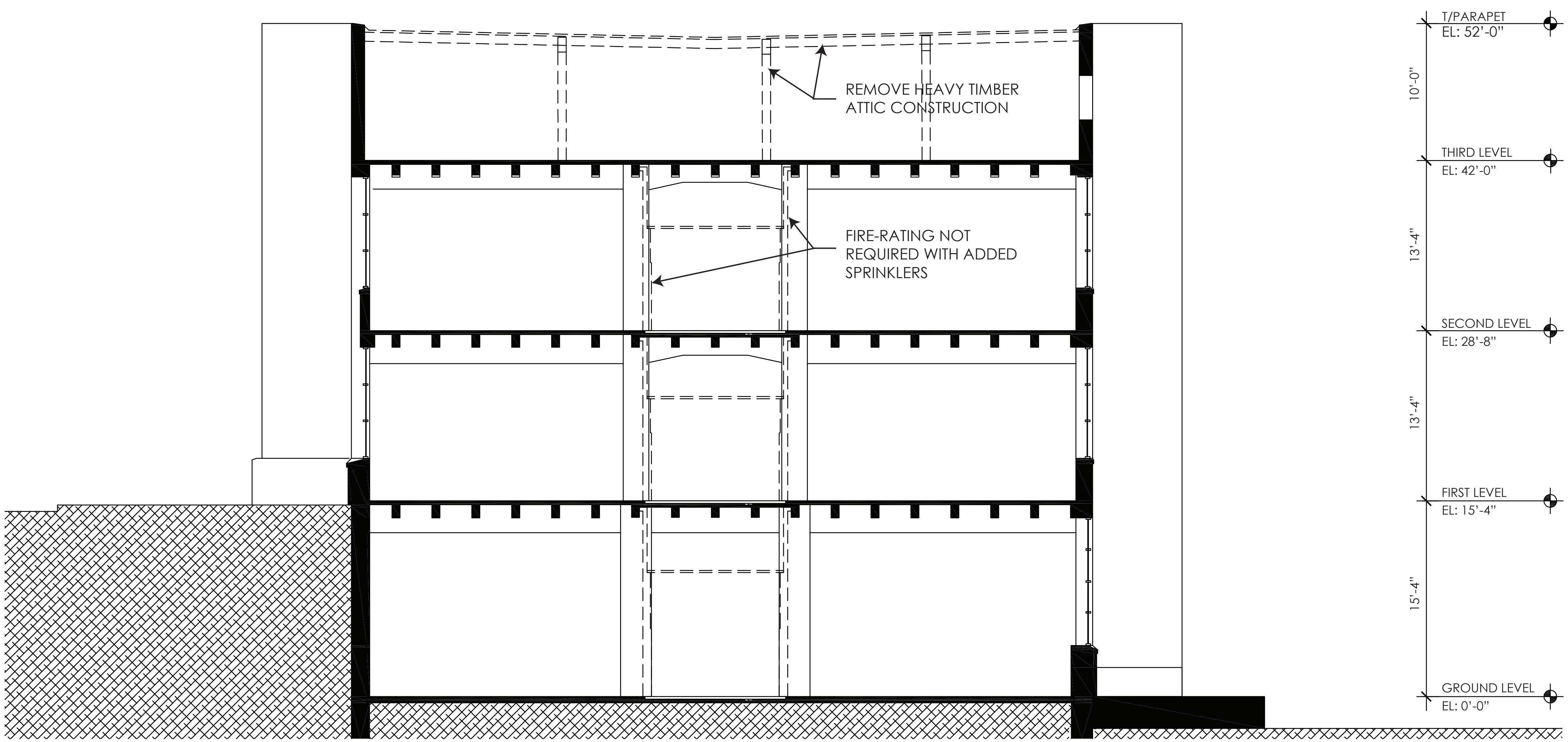
0 1.25 2.5 5 10

EXISTING CONDITION

SECTION A

41
SHEET NO.

SABA + BA



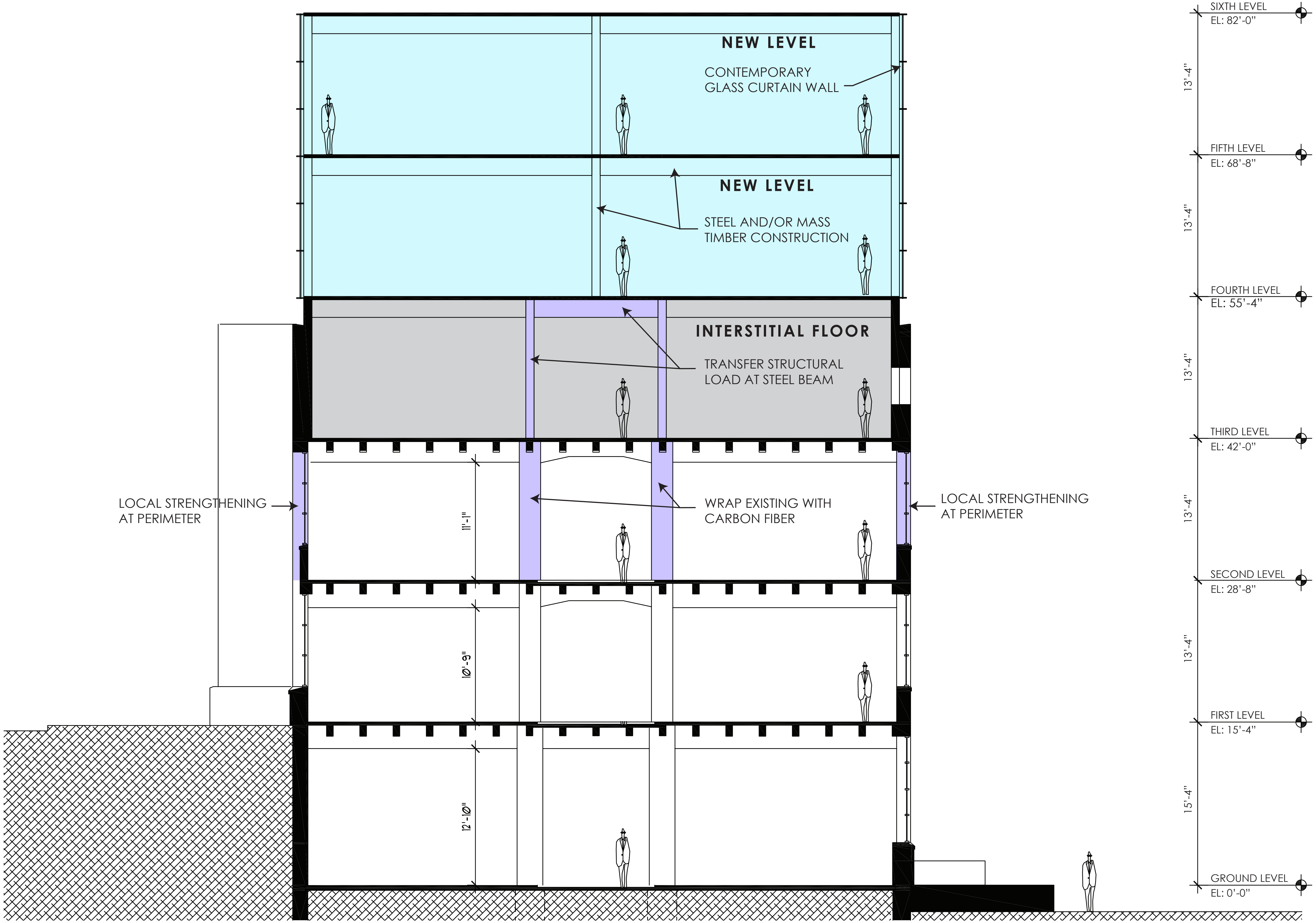
Voiland College of Engineering & Architecture
Washington State University

SCALE: 1" =10'
0 1.25 2.5 5 10

OPTION B & C

DEMOLITION TOP - SECTION A

SABA + BA



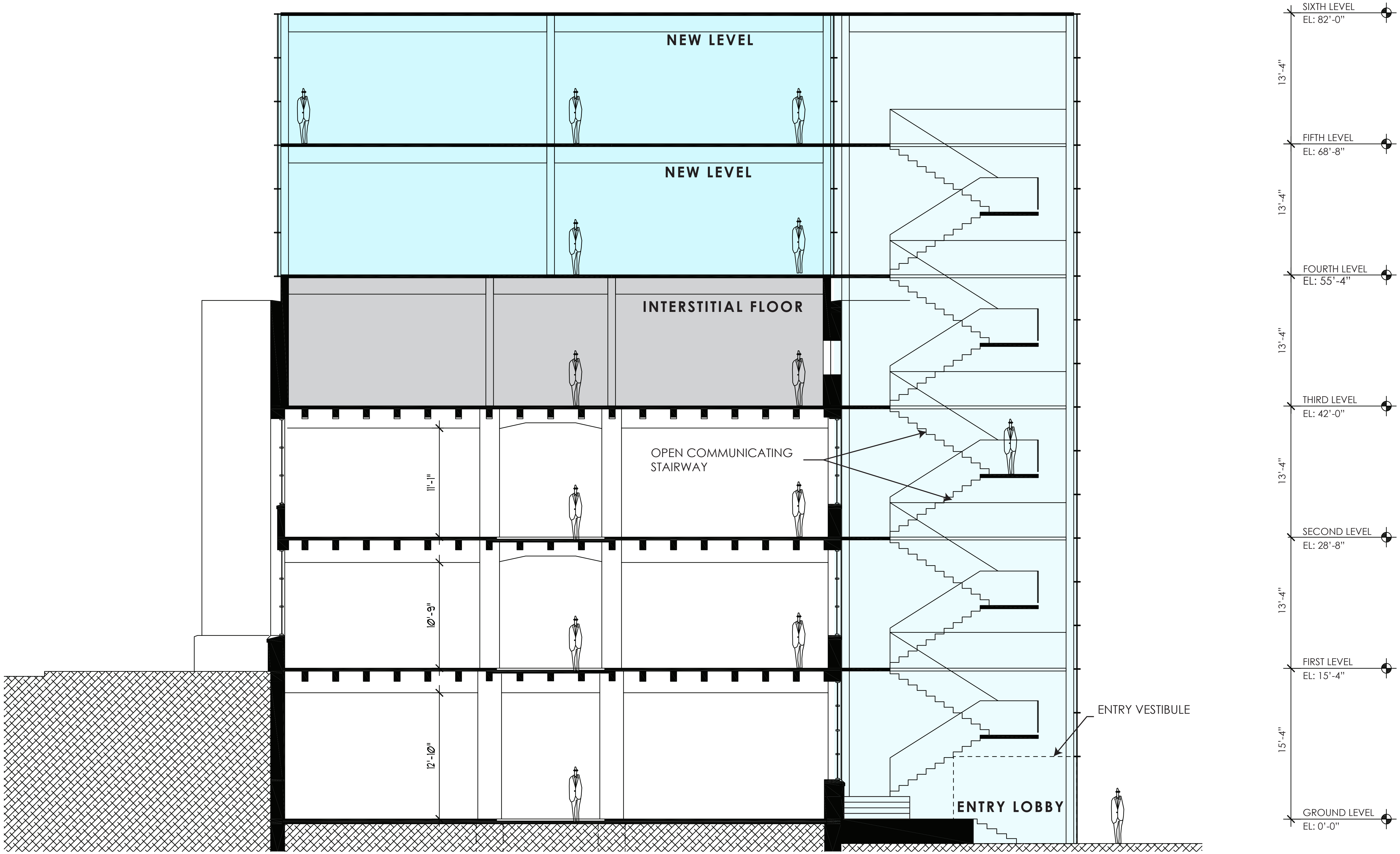
Voiland College of Engineering & Architecture
WASHINGTON STATE UNIVERSITY

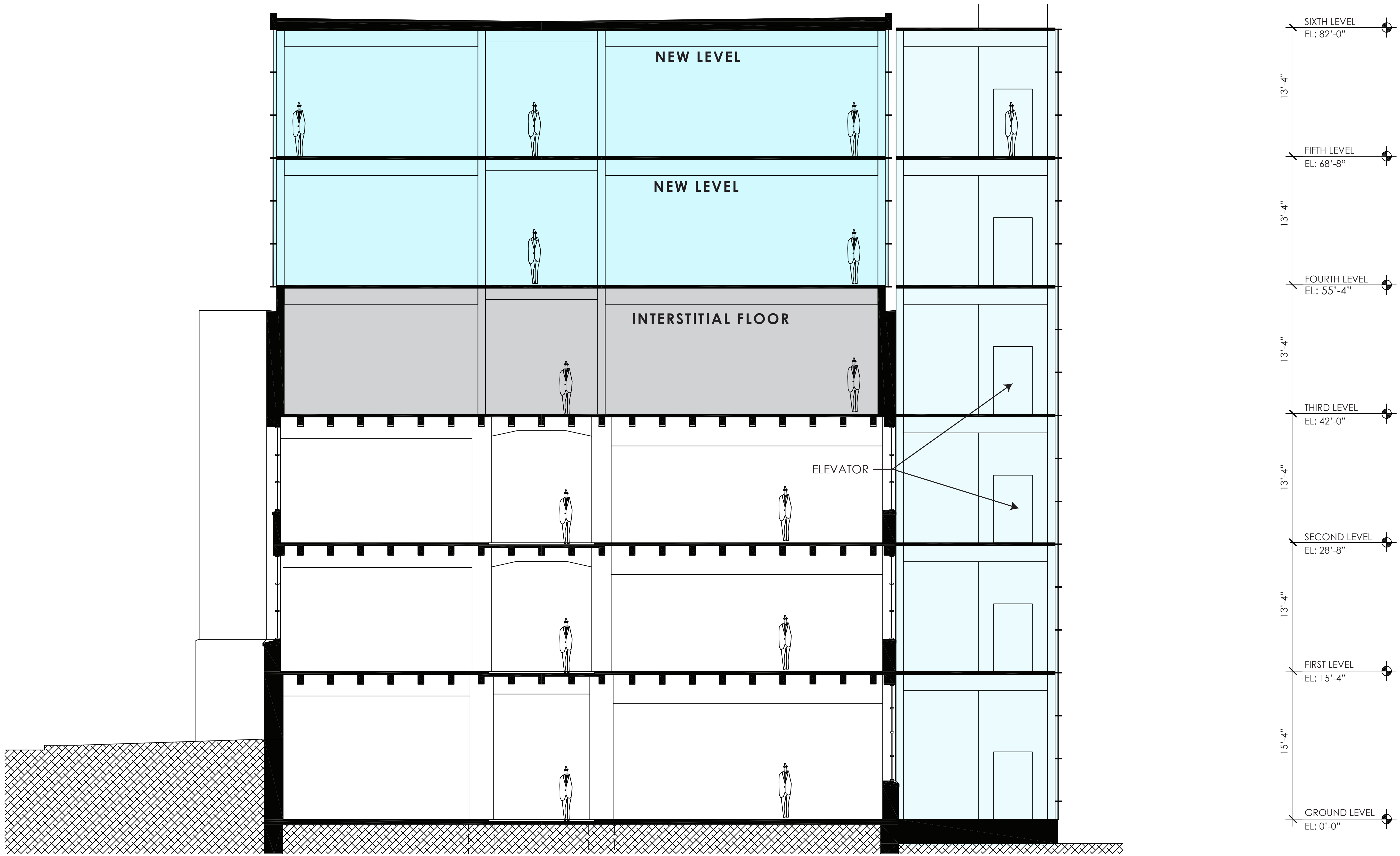
SCALE: 1" =10'
0 1.25 2.5 5 10

OPTION B & C

ADDITION TOP - SECTION A

SABA + BA


NEW LEVEL
NEW LEVEL
INTERSTITIAL FLOOR
OPEN COMMUNICATING STAIRWAY
ENTRY VESTIBULE
ENTRY LOBBY
11'-1"
10'-9"
12'-10"
SIXTH LEVEL
EL: 82'-0"
13'-4"
FIFTH LEVEL
EL: 68'-8"
13'-4"
FOURTH LEVEL
EL: 55'-4"
13'-4"
THIRD LEVEL
EL: 42'-0"
13'-4"
SECOND LEVEL
EL: 28'-8"
13'-4"
FIRST LEVEL
EL: 15'-4"
15'-4"
GROUND LEVEL
EL: 0'-0"



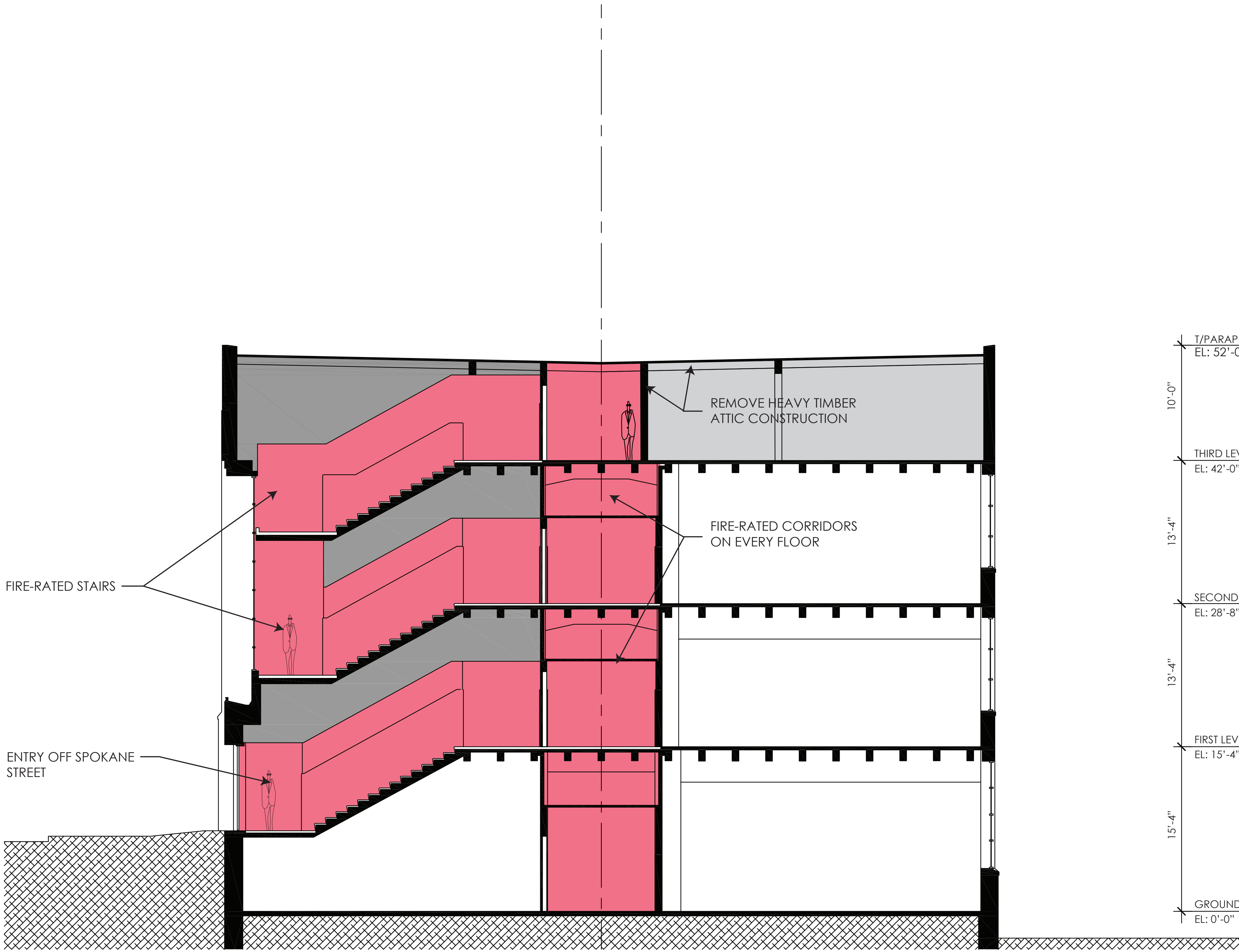
Voiland College of Engineering & Architecture
WASHINGTON STATE UNIVERSITY

SCALE: 1" =10'
0 1.25 2.5 5 10

OPTION C

ADDITION EAST AND TOP - SECTION B

SABA + BA



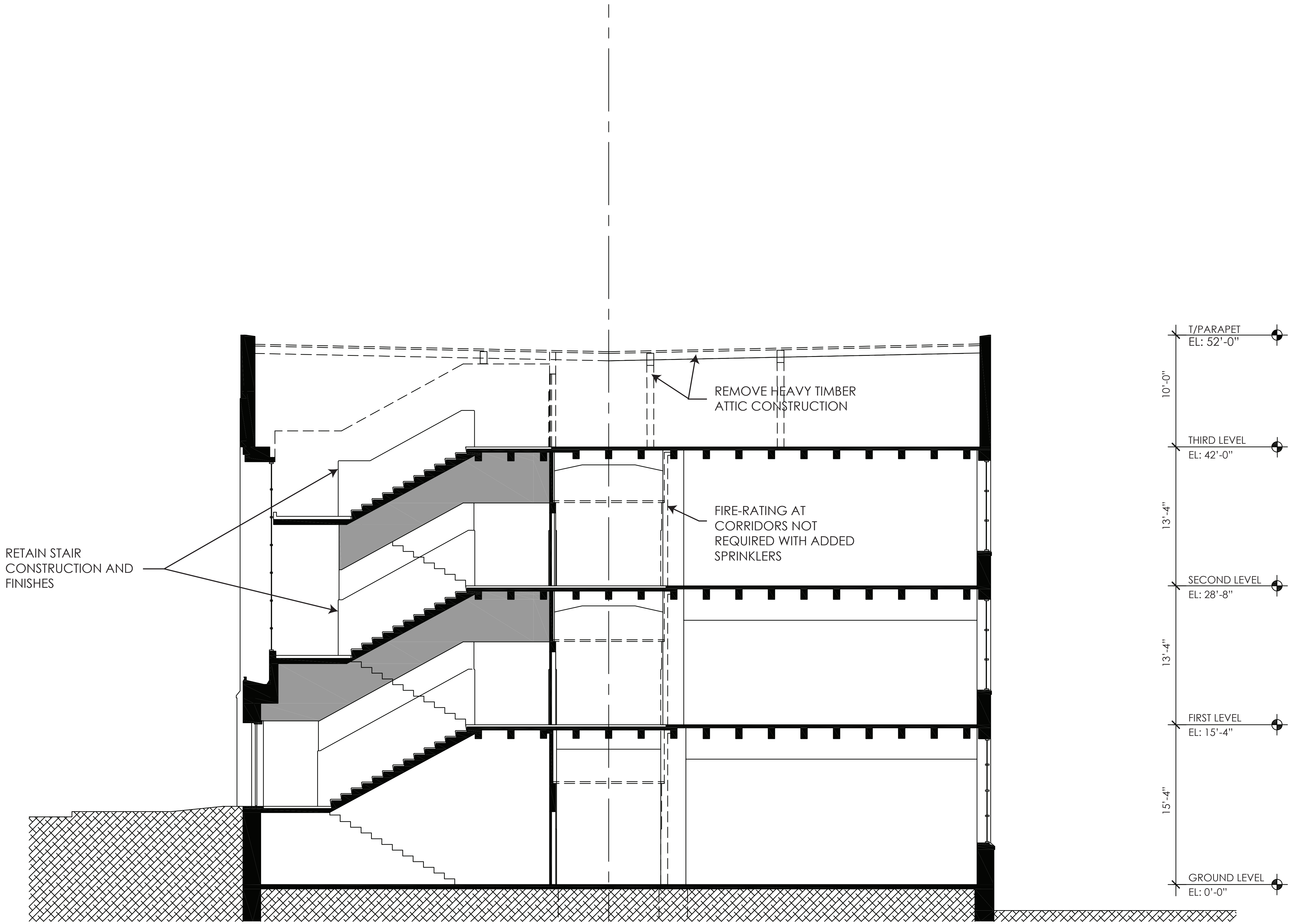
Voiland College of Engineering & Architecture
WASHINGTON STATE UNIVERSITY

SCALE: 1" =10'
0 1.25 2.5 5 10

EXISTING CONDITION

EXISTING SECTION C

SABA + BA



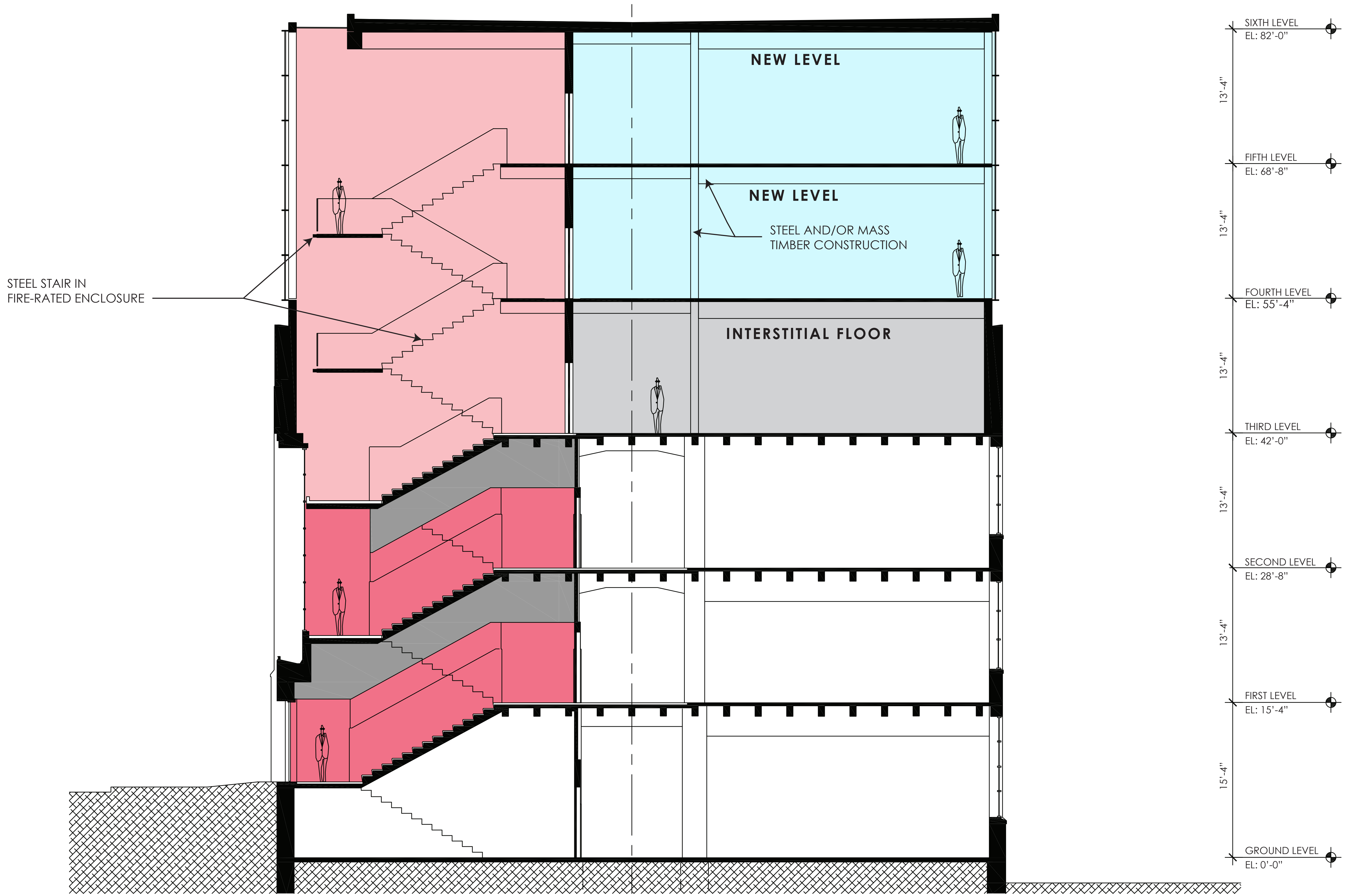
Voiland College of Engineering & Architecture
WASHINGTON STATE UNIVERSITY

SCALE: 1" =10'
0 1.25 2.5 5 10

OPTION B & C
DEMOLITION - SECTION C

47
SHEET NO.

SABA + BA



Voiland College of Engineering & Architecture
WASHINGTON STATE UNIVERSITY

SCALE: 1" =10'
0 1.25 2.5 5 10

OPTION B & C

ADDITION TOP - SECTION C

48
SHEET NO.

SABA + BA

SECTION 7
COST SUMMARY

The following pages include information provided by the cost estimate consultant, TBD Consultants, attention Martin Connor.

Cost estimates are provided for each of the different options, with alternates noted where applicable.

Option A Shell Core	88,624	sf	232.44	$20,599,746
New elevators				
Upgrade stairs				
New Fire sprinklers				
Demo existing ceilings				
MEP Core replacement				
Re-roof				
Replace Restrooms				
Utilities / Off site Improvements	1	ls		1,000,000
Total Of Above	88,624	sf	243.72	$21,599,746
Add TI	66,468	sf	450.00	$29,910,600
Total Option A March 2024	88,624	sf	581.22	51,510,346
Add Escalation	12%			6,181,241
Total Option A March 2027	**88,624**	**sf**	**650.97**	**57,691,587**
Alternate - Upgrade Cladding				5,337,665

Option B Shell Core	132,936	sf	402.44	$53,498,967
Added two floors				
Seismic upgrade				
New elevators with two additional stops				
Utilities / Off site Improvements	1	ls		1,000,000
Total Of Above	132,936	sf	409.96	$54,498,967
TI Costs				
Ground Floor	21,643	sf	450.00	$9,739,350
Lab	54,710	sf	500.00	$27,355,103
Office / Classroom	24,750	sf	400.00	$9,899,918
Shelled	28,752	sf	20.00	$575,040
Total Option B March 2024	132,936	sf	767.80	102,068,377
Add Escalation	12%			12,248,205
Total Option B March 2027	**132,936**	**sf**	**859.94**	**114,316,582**
Alternate - Upgrade Cladding				5,337,665

Option C	148,446	sf	446.22	66,239,973
Addition at west side with Open communicating stair (smoke curtain and deluge sprinklers				
Addition contains following eleements that are accounted for above but located in this area				
1. Passenger and freight elevators				
2. Social gathering area				
3. Secure freight receiving area				
4. Mechanical shaft				
Utilities / Off site Improvements	1	ls		1,000,000
Total Of Above	148,446	sf	452.96	$67,239,973
TI Costs				
Ground Floor	21,643	sf	450.00	$9,739,350
Lab	54,710	sf	500.00	$27,355,103
Office / Classroom	24,750	sf	400.00	$9,899,918
Shelled	28,752	sf	20.00	$575,040
Total Option C March 2024	148,446	sf	773.41	114,809,384
Add Escalation	12%			13,777,126
Total Option C March 2027	**148,446**	**sf**	**866.22**	**128,586,510**
Alternate - Upgrade Cladding				5,337,665


SABA + BA