
THEODORE ROOSEVELT
SENIOR HIGH SCHOOL

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EXPERIENCE ON HISTORIC SITES & BUILDINGS

DLR Group has been involved with additions, remodeling and renovations to numerous public facilities which entail not only ADA compliance, but sensitive additions to existing facilities which respect the physical and emotional legacy of the building and place while acknowledging future uses. We believe each building should be designed with an eye toward the future while representing the diversity of the community it serves.

We have often found this to be true when renovating schools that have served several generations of families: the school embodies the heart and soul of the community, any change is to be approached with sensitivity and respect.

DLR Group projects addressing historic sensitivity:
- LAUSD, Jordan High School Redevelopment
- Beverly Hills USD, Beverly Hills High School Modernization
- Beverly Hills USD, Hawthorne School
- Chaffey JUHSD, Chaffey High School Historical Assessment
- Los Angeles Memorial Coliseum Renovation
- University of Southern California Bovard Administration Building Renovation
- UCLA Kerckhoff Hall Historic and Seismic Renovation
- Pomona College Mason Hall Historic and Seismic Renovation

Saiful Bouquet has successfully worked with public and private clients on a wide range of historic or culturally significant projects. Our office has a collaborative approach to ensure a respectful treatment to preserve the historical significance of each building/site, and to optimize the functional and aesthetic qualities of the project. By strategically pin-pointing the areas of structure requiring seismic strenthening we are able to minimize the impact to existing on-going operations and preserve the building's historic elements. Below is an overview of this experience:
- Macy's on Lake, Pasadena, CA
- University of Southern California, North Science Building
- University of Southern California, Physical Education Building
- City of Los Angeles, Van Nuys City Hall
- 733 Front Street, San Francisco, CA
- University of Southern California, Mudd Hall of Philosophy
- University of Southern California, Webb Tower
- University of California - Riverside, Rouse Building - Culver Center for the Arts

EXECUTIVE SUMMARY

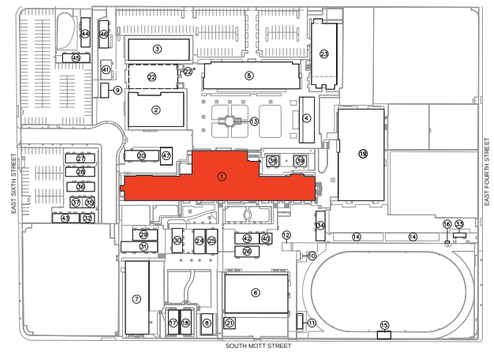
This analysis was prepared at the request of the Los Angeles Unified School District (District), to inform the development of a proposed Comprehensive Modernization project at Roosevelt High School. The analysis studies the opportunities and challenges involved in a possible seismic retrofit of Building 1 (also referred to as Building R) at Roosevelt High School in order to meet the District goal to provide a safe and healthy environment that promotes learning.

The State of California enacted Assembly Bill (AB) 300 in 1999, which required the Department of General Services to survey the State's public school buildings (Kindergarten through grade 12) for earthquake safety and to submit a report of its findings to the Legislature. AB 300 identified 269 of the LAUSD's nearly 13,000 buildings for seismic evaluation. In 2006, after further analysis by District staff, including site visits and field investigations, additional buildings were identified for seismic evaluation based upon AB 300 criteria and the District's higher standards. Building 1 at Roosevelt High School was identified as one of the buildings which required seismic evaluations due to its seismic vulnerability.

Based on the seismic analysis contained in this report, Building 1 would require major seismic retrofits to be in compliance with ASC41-13, Certificate for Non-Compliant DSA Buildings. Many of the existing building structural elements are inadequate to resist seismic forces, cannot be sufficiently strengthened and would be bypassed with the new seismic retrofit work designed to resist the majority of the seismic forces rather than supplement the existing structural system. In order to perform the seismic retrofit work, demolition of the building would be required down to concrete, wood joists and roof framing. The seismic retrofit of Building 1 would require anchoring exterior brick walls to physically connect them to gunite/concrete walls to prevent dislodging under strong ground shaking to prevent falling hazards. Weak and inadequate roof/floor diaphragms and wall anchorages would require replacement along with added structural members and steel hardware because the existing assembly does not have adequate strength and connectivity to deliver forces to the vertical resisting elements. The existing walls do not have enough strength to effectively resist a seismic event and the walls do not have adequate means of delivering the lateral forces to the foundation. New 18 inch thick concrete shear walls bonded to the interior of the existing exterior wall assembly and foundation micro-piles would be required.

The building's existing structural layout would restrict classroom proportions to an elongated and narrow shape. These restricted proportions do not support effective instruction when compared to classrooms that meet District design standards. These elongated classrooms would limit teaching wall visibility and result in reduced acoustical effectiveness due to the increased distance from the instructor to the student and limit flexible seating arrangements. The seismic retrofit work would result in an inefficient utilization of space by only yielding 21 classrooms that meet California Department of Education (CDE) standards from the existing 48 under-sized classrooms. The remaining spaces and rooms would not meet the CDE standard for classrooms and would have to be used as specialized spaces or smaller support spaces. In addition, the required new concrete shear walls for the seismic retrofit would block existing windows and compromise the amount of natural daylighting into the classroom.

At the auditorium, the required seismic retrofit work would have significant impacts to the existing configuration of the space. Demolition of a large portion of the ground floor would be required in order to install new 18 inch thick shear walls onto the new micro-piles and foundations. The work would require the removal and reconfiguration of the existing seats and would trigger Title 24 California Code of Regulations upgrades to seating, aisle widths, circulation and accessible ramps/slopes to meet current accessibility requirements. The existing balcony would require extensive demolition to provide for a new compliant floor to meet the code required load factors and to strengthen the existing diaphragm and improve the horizontal bracing connections at the walls. The existing ceilings in both the auditorium and lobby would have to be demolished down to the rafters and require seismic retrofitting to address the weak and inadequate roof diaphragms and wall anchorages. Due to the extensive seismic retrofit work, the existing stage, rigging and fly loft cannot be preserved and therefore would require demolition and replacement.



AUDITORIUM & CLASSROOM BUILDING
BUILDING: (1)

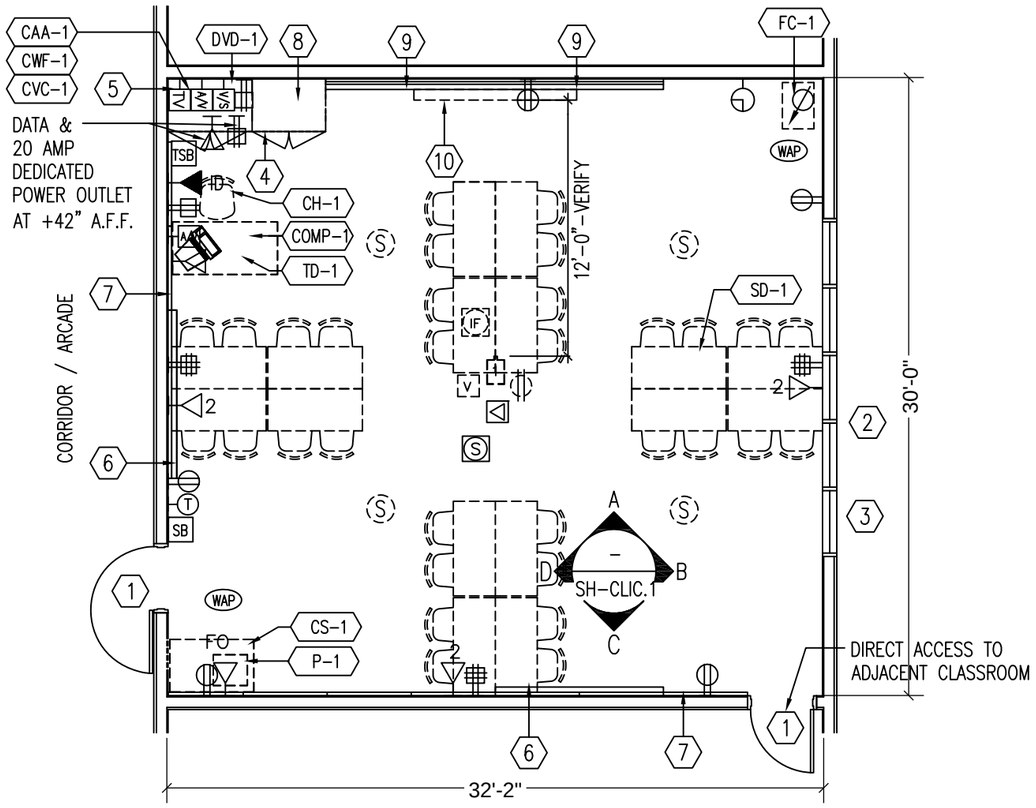
Diagrammatic Plan Changes
All existing interior walls to be removed with existing column structure and staircases to remain. General Classroom dimensions were dictated by the existing column structure with a main corridor running through the middle of the building. There is a total of twenty-one (21) classrooms; breakdown of counts is as follows: four (4) on the First Floor, eight (8) on the Second Floor and nine (9) on the Third Floor. All classrooms are 960 square feet, approximately 23'-10" x 40'-3". Remaining rooms were either dedicated to specialized spaces and/or not adequately sized for classroom instruction. Ed. Specs for General Classrooms are 960 sf with approximate dimensions of 30'-0" x 32'-0" and required ceiling height of 10'-0" A.F.F. Due to existing conditions, required ceiling heights of classrooms will not be met.

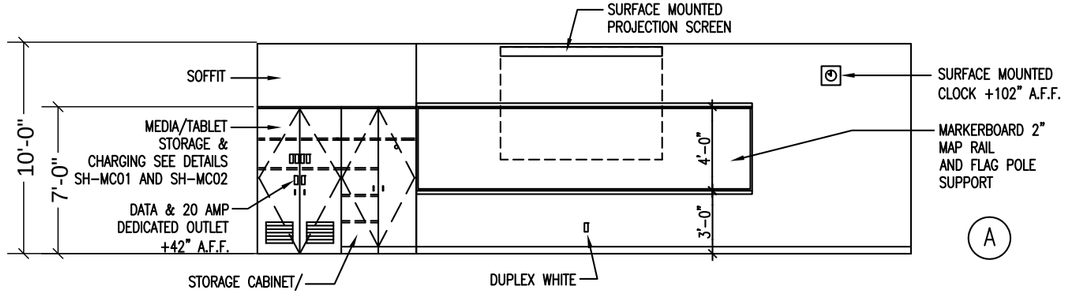
Accessibility Upgrades
Accessible paths of travel to the building will be addressed in the Campus Master Plan. Minor upgrades include new accessible handrails to replace existing non-compliant handrails. A new elevator retrofit that complies with travel distance limits has been added. New restrooms were added to each floor with consideration to accessibility and plumbing fixture count requirements.

Fire/Life/Safety Upgrades
Under the current building code, the "highest" possible classification for the existing structural system would be Type IIIA; however, the building exceeds the current maximum allowable area for Type IIIA construction, both for each floor and for the overall building. The building will require a 2-hour vertical separation to be compliant with the maximum allowable area per current building code. Fire/Life/Safety upgrades include a new fire sprinkler system and fire alarm system replacement.

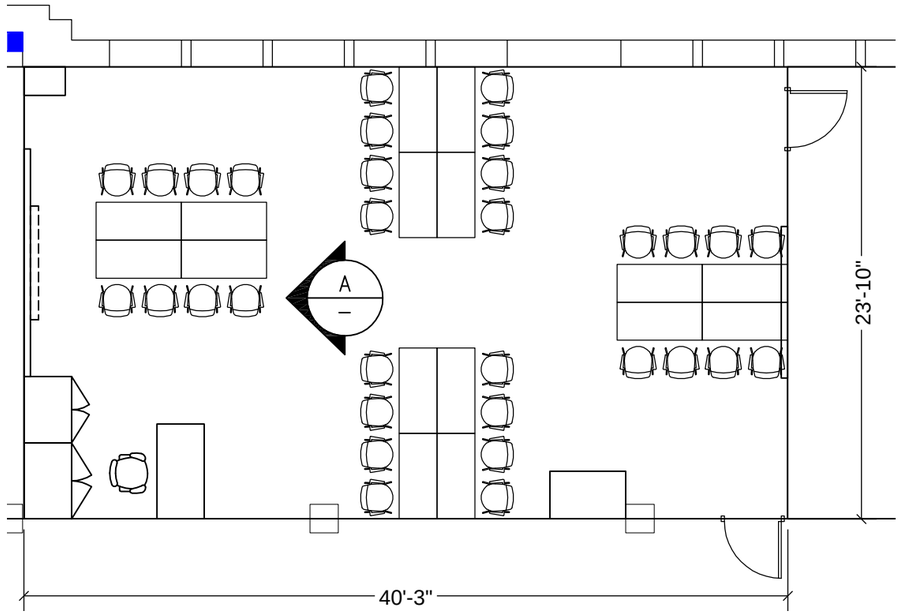
Historical Significance Impact
The 1936 and 1954 seismic strengthening projects removed almost all of the original 1922 extensive exterior design features. The exterior entrance to the lobby and some of the interior of the auditorium are the only remaining traces of the original design. New shear walls and foundations will be located on the interior side of the building to preserve the aesthetic of the exterior elevations. However, access to daylighting in several classrooms will be impacted due to the new shear walls covering up existing windows. Two shear walls are to be added to the interior side of the west perimeter wall of the Auditorium. One of those walls is located where the Balcony occurs.

LAUSD DESIGN GUIDE - EDUCATIONAL SPECIFICATION: GENERAL CLASSROOM (960 SQ. FT.)



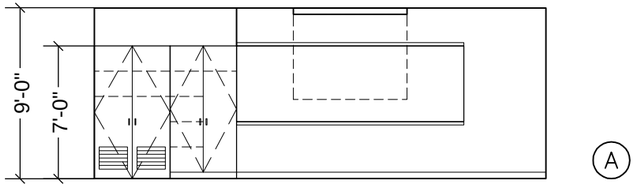


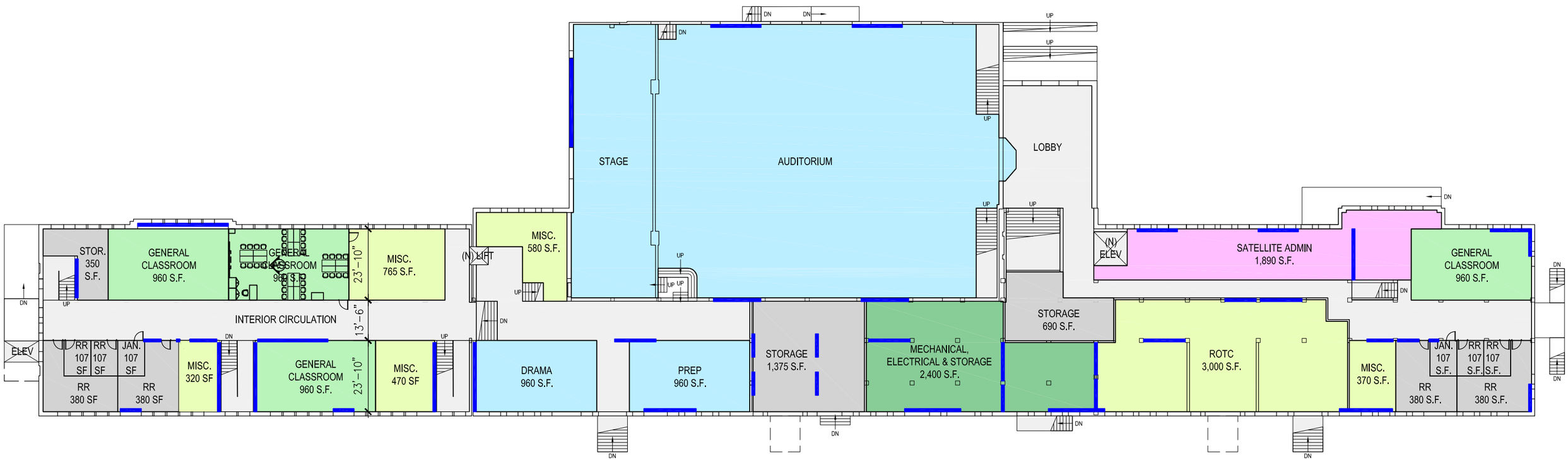
TYPICAL GENERAL CLASSROOM LAYOUT AFTER BUILDING RETROFIT (960 SQ. FT.)



Negative Limitations to Typical General Classroom Layout After Building Retrofit:

- Existing column structure limits classroom dimensions on either side of the corridor to approx. 23'-10"W x 40'-3"L. This results in increased distance from instructor to students.
- Limited teaching wall visibility and sight lines due to the elongated and narrow room dimensions.
- Limited utilization and flexibility for active learning seating arrangements.
- Acoustics and listening conditions will be also impacted due to the elongated room dimension. Students seated towards the back of the classroom will not have equal accessibility to speech communication.
- Some classrooms will have compromised access to daylighting due to the new proposed shear walls

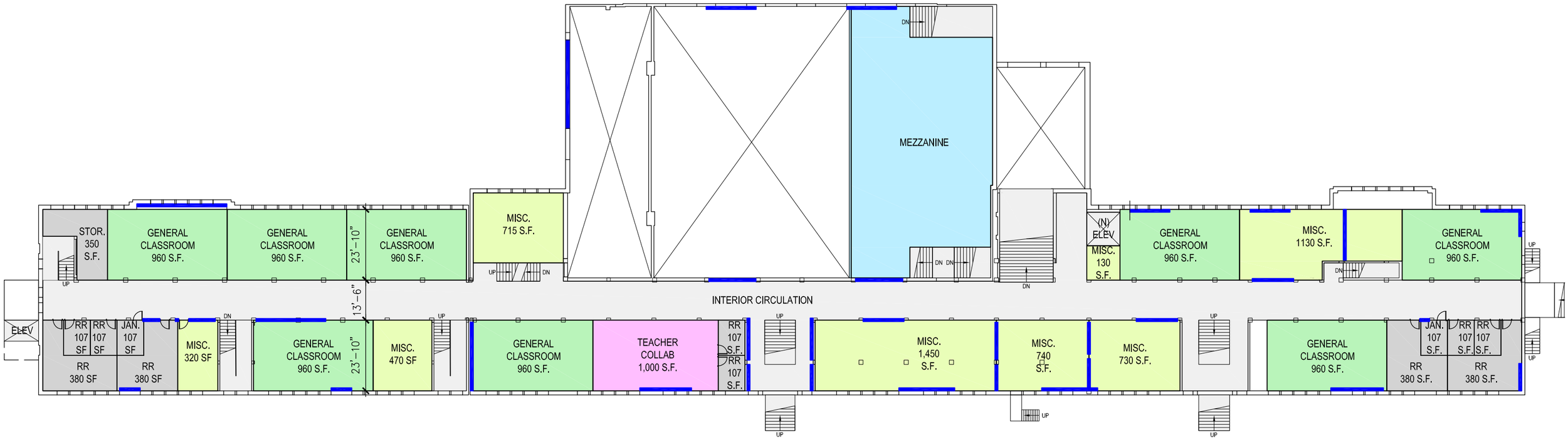




LEGEND	FIRST FLOOR PROGRAM SUMMARY
NEW SHEAR WALL	
ADMINSTRATIVE OFFICES	4.3%
GENERAL CLASSROOM	8.7%
FACILITIES & OPERATIONS	5.4%
INTERIOR CIRCULATION	24.8%
MISC.	12.5%
PERFORMING ARTS	33.9%
SUPPORT SERVICES	10.4%

FIRST FLOOR

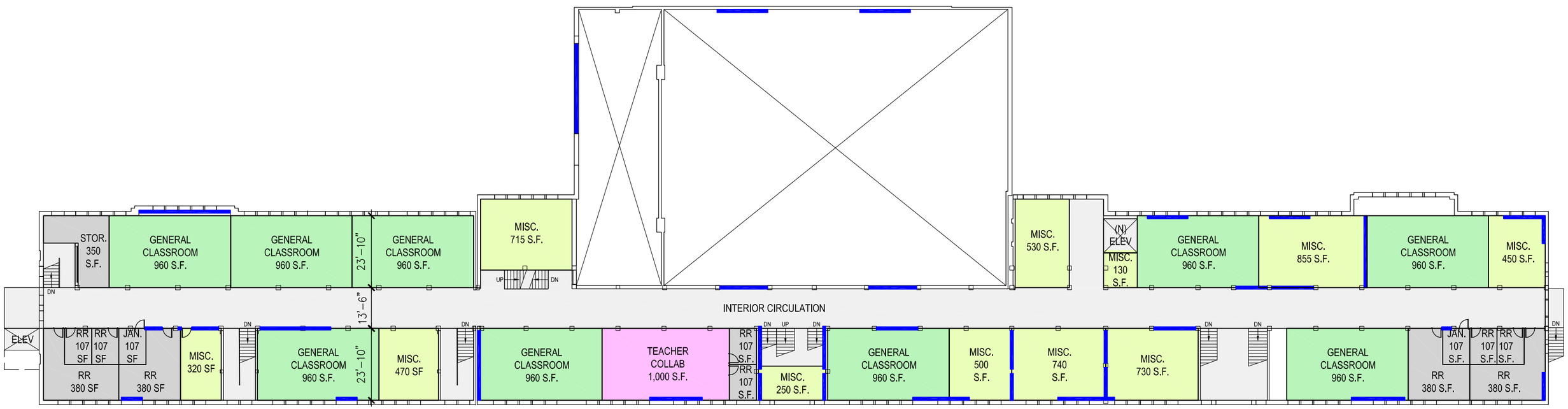
1/32" = 1'-0"



LEGEND	SECOND FLOOR PROGRAM SUMMARY
NEW SHEAR WALL	
ADMINSTRATIVE OFFICES	2.2%
GENERAL CLASSROOM	17.5%
FACILITIES & OPERATIONS	0.0%
INTERIOR CIRCULATION	27.6%
MISC.	12.6%
PERFORMING ARTS	33.9%
SUPPORT SERVICES	6.2%

SECOND FLOOR

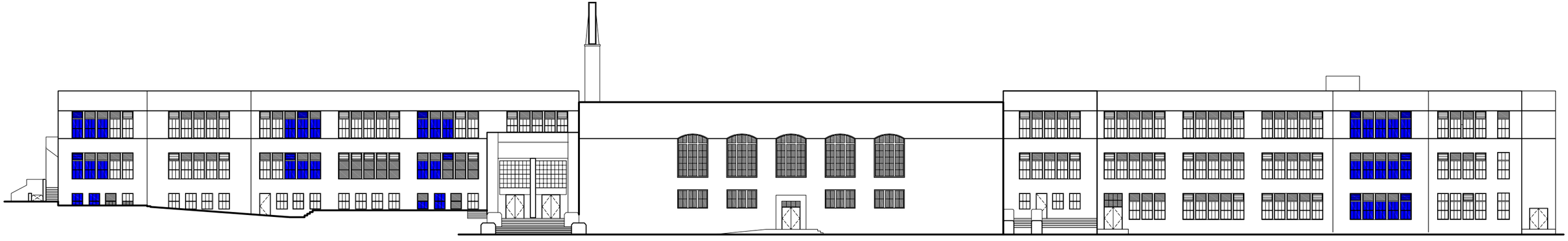
1/32" = 1'-0"



LEGEND	THIRD FLOOR PROGRAM SUMMARY
NEW SHEAR WALL	
ADMINSTRATIVE OFFICES	2.2%
GENERAL CLASSROOM	19.6%
FACILITIES & OPERATIONS	0.0%
INTERIOR CIRCULATION	25.2%
MISC.	12.9%
PERFORMING ARTS	33.9%
SUPPORT SERVICES	6.2%

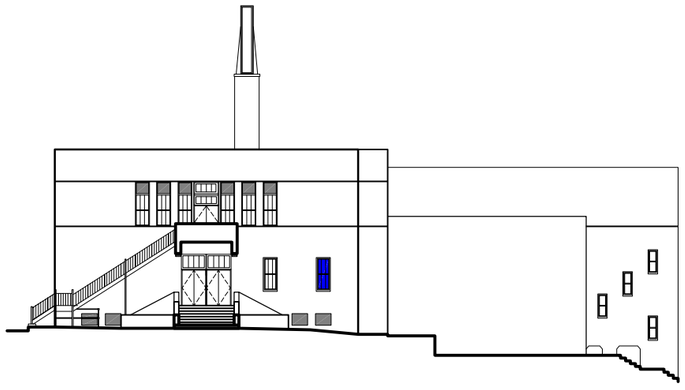
THIRD FLOOR

1/32" = 1'-0"

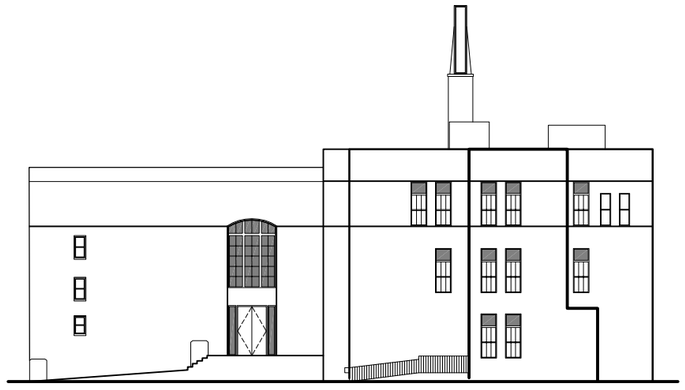


WEST ELEVATION

EAST ELEVATION



NORTH ELEVATION



SOUTH ELEVATION

EXISTING WINDOWS CURRENTLY BLOCKED

EXISTING WINDOWS TO BE BLOCKED BY NEW PROPOSED SHEAR WALLS

EXTERIOR ELEVATIONS

1/32" = 1'-0"

RHS BUILDING R: AUDITORIUM & CLASSROOM
PROPOSED MANDATORY SEISMIC UPGRADE NARRATIVE

PRELIMINARY STRUCTURAL EVALUATION NARRATIVE FOR MANDATORY SEISMIC UPGRADE

In December 2015, *DLR* and *SBI* issued an evaluation report for many of the existing camps buildings at the Roosevelt High School. The report, *ASCE 41-13 Tier 2 Deficiency-Based Evaluation and Retrofit*, summarized the team's findings of the Tier 2 evaluation on three existing campus buildings, Building 1 (Auditorium and Classroom), Building 6 (Industrial Arts) and Building 19 (Gymnasium). The evaluation criterion was based on a 250-year earthquake event. The findings concluded that the buildings are candidates for voluntary seismic upgrade based on the discovered deficiencies.

Since the issuance of the noted report, LAUSD has requested that *SBI* provide a professional opinion as to the structural requirements for implementing a mandatory seismic upgrade on Building 1 (R), that would be in conformance with Part 10 of the 2016CAC. A scope of work was developed that utilizes the prior knowledge and expands on the previous evaluation to determine a conceptual seismic upgrade scheme that is based on the criteria of a mandatory seismic upgrade as defined by DSA and contained in Part 10 of 2016CAC. The seismic upgrade scheme would also incorporate the required renovation and modifications to the existing structure as determined by *DLR*.

Based on the findings from the 2015 study, it was determined that many of the buildings' existing lateral resisting element did not meet the Tier 2, life-safety criteria contained in ASCE41-13 and stipulated by LAUSD. Building on this knowledge, a conceptual seismic strengthening scheme was developed considering that a *mandatory seismic upgrade* would need to take into account the enhanced performance objective of ASCE41-13 and CBC2016, which generally yields higher design forces, limitations on material strengths, detailing requirements on select elements and further defined load path and mechanism behaviors. Also noting that the 2015 study utilized a lower earthquake event (250-year) than that of the required design earthquake of CBC2016 (475-year), thus yielding higher seismic forces. It is important to also note that many of the existing building structural elements are inadequate to effectively contribute to the seismic resisting systems, and as a result they are being bypassed and not relied upon with the majority of the proposed upgrade work resisting 100% of the seismic forces rather than supplementing the existing systems.

As noted earlier above, the following improvements made herein are considering the *mandatory* seismic upgrade rather than *voluntary*. It is important to note the difference between *voluntary* versus *mandatory*. According to 2016CAC, *voluntary* modifications are acceptable to DSA as long as they do **not** adversely affect the structure and create a new unsafe condition (reduce lateral elements or increase the seismic mass – make building worse) when the cost exceeds $25,000, but not 50% of the replacement value (if costs exceed 50% the replacement value, then retrofit to "current code" is required). Therefore, mandated seismic upgrades, for a building will be required to be strengthened to meet minimum seismic design performance levels in accordance with Part 10 of 2016CBC – construed as "current code".

The following summarizes the findings of the study based on the aforementioned approach. Included are retrofit scope work items with supporting sketches that can be used for cost estimating. This current effort utilized our extensive knowledge of evaluating and retrofitting similar buildings as well as the knowledge gained from our previous studies. A geotechnical report specific to the proposed retrofit work scope was not available for reference; therefore, estimation of foundations was not feasible at this time.

Findings with Recommendations:

1. Exterior Brick Anchorage: The existing exterior brick walls were original to the building and later reinforced with gunite/concrete. There does not appear to be a physical connection of the masonry units to the gunite/concrete walls, the units may become dislodged under strong ground shaking that would be deemed a non-structural, falling hazard by DSA.

   Recommendation: It is recommended that the masonry units be anchored to gunite/concrete walls/piers with masonry veneer type anchorage at mortar joints from the exterior. This would entail the removal and replacement of mortar joints.

2. Inadequate In-Plane Shear Resistance: The existing gunite/concrete shear walls do not have enough strength to effectively resist the anticipated seismic forces and maintain vertical carrying capabilities within proper deformation limitations.

   Recommendation: Install new concrete shear walls along with new foundations.

3. Wall Anchorage System: Inadequate out-of-plane wall resistance at wood roof/floor to masonry/concrete walls.

   Recommendation: Install out-of-plane wall anchorage system with installation of steel hardware from walls to floor/roof levels plus strengthening of floor and ceiling framing elements as needed.

4. Weak and Inadequate Roof/Floor Diaphragms: The existing wood sheathing does not have adequate strength to deliver forces to the vertical resisting elements – in conjunction with wall anchorage forces in item #3.

   Recommendation: Remove and replace 2nd floor and roof sheathing along with strengthening of framing elements, as needed. Provide diaphragm chord and shear transfer elements.

5. Incomplete/Inadequate Lateral Load Path (Delivery) at Floor/Roof Diaphragms to Shear Walls. The horizontal diaphragm connectivity to the vertical shear walls is lacking. In addition, the chord reinforcing at diaphragm boundaries is insufficient.

   Recommendation: Provide proper connectivity of horizontal to vertical lateral bracing elements via use of new shear transfer connections, drags, chords, in conjunction with above items.

6. Lack of Dowels from Shear Walls to Foundations: The existing shear walls do not have adequate dowels to deliver lateral forces to the footings.

   Recommendation: Install new shear walls and foundations as noted above to bypass use of existing system elements.

7. Incomplete/Disconnected Vertical Load Path at Roof to Shear Walls: The roof diaphragm ratio exceeds the maximum allowed and should be reduced by cross shear walls that can be naturally connected to the existing interior shear walls.

   Recommendation: Provide complete load path to connect roof diaphragms to tops of existing shear walls with wood framed cripple walls sheathed with plywood along with proper hardware. At existing cripple walls, provide plywood sheathing and hardware.

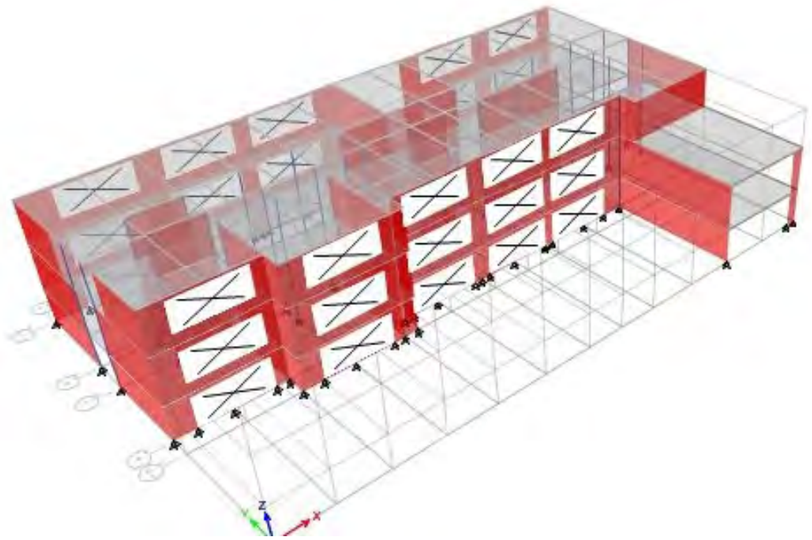
Additional Non-Structural Code Upgrade Requirements:

With any mandatory Code upgrade to an existing building, all the systems are to be upgraded to be compliant with “current Code”. This relates to non-structural systems and elements such as MEP anchorage, support and bracing, ceiling framing and bracing, partition walls, etc.

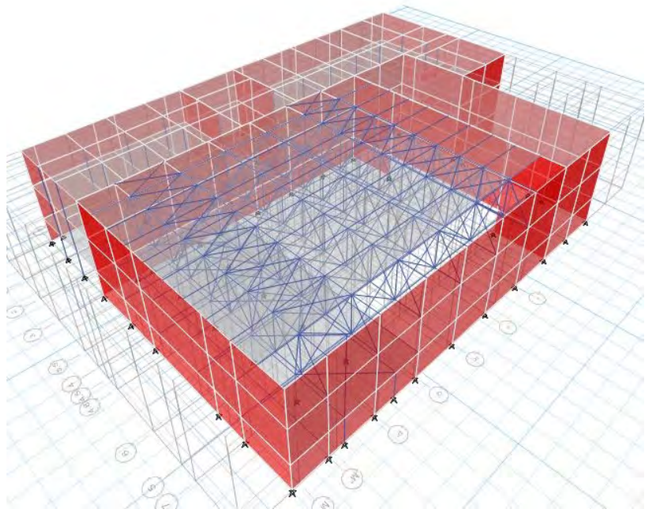
As part of the proposed renovation work, the majority of the interior systems will be removed and replaced with updated items designed and installed in conformance with current Code. This is true for all the ceiling systems as they are non-compliant and would be required to be replaced in order to perform the structural work. This is also true of the existing auditorium ceiling system as the ceiling is not considered compliant with current Code and the retrofit work to be done on the roof framing will impact the ceiling.

IMAGES OF COMPUTER MODELING

As part of the 2015 study, 3-D linear dynamic computer modeling was performed of the buildings' structural lateral resisting elements. Seismic forces generated in the lateral elements were used to check against the element capacities to determine adequacy.

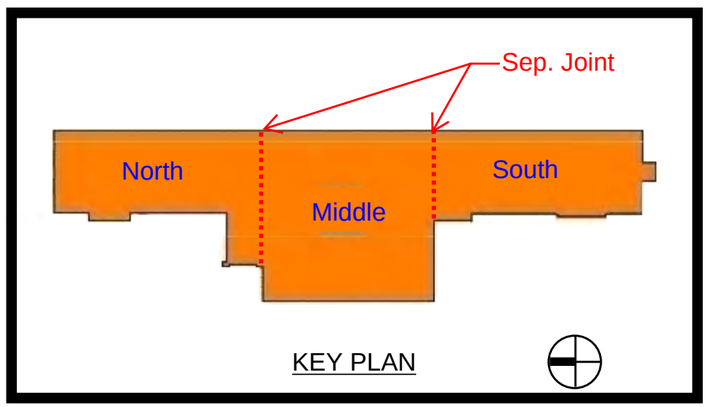


3D-Dynamic Computer Model – North



3D-Dynamic Computer Model – Middle

3D-Dynamic Computer Model – South



RHS BUILDING R – AUDITORIUM & CLASSROOM
PROPOSED STRUCTURAL SCOPE OF WORK
MANDATORY SEISMIC UPGRADE

The following scope items are for the structural work, only. Any and all non-structural work items that would be required for installation/implementation of structural items are to also be considered.

Prepare cost estimate based on the following scope of work and in addition carry a 25% design contingency of the construction costs.

A geotechnical report was not provide for pile or micro-pile design capacities, thus size of foundations cannot be determined at this stage. Assume 8" diameter micro-piles embedded 50ft into certified/competent soil.

General - Where Applicable:

- Tie/anchor **all** existing exterior brick/tile walls to existing concrete/gunite walls using veneer type anchor screw ties or epoxy dowels (remove mortar and set anchors).

NORTH END:

Key Note	Scope Description	Ref. Sketch
Basement/Foundation Level:		
1	Tie/anchor all existing exterior brick/tile walls to existing concrete/gunite walls using veneer type anchor screw ties or epoxy dowels (remove mortar and set anchors). – Apply to full height of all building exterior.	SK-1 SK-A SK-D
2	Enlarge existing foundations at new shotcrete walls (drill and epoxy dowels). Remove and replace existing slab-on-grade for foundation work.	
7	Anchor base of all exterior wall piers with steel angles epoxy bolted to wall and slab/stem wall.	
14	New 18" thick reinforced concrete shear walls with CIDH or micro-pile foundations. Remove existing brick exterior at walls. Drill and epoxy dowel to existing gunite/concrete walls.	
First & Second Floor Level:		
3	Install out-of-plane wall anchor system at brick/concrete walls comprised of bolted holdowns (or steel plates screwed to joists), epoxy anchor bolts, straps, blocking, etc. Develop anchor system into floor framing.	SK-2 SK-B SK-C
4	Remove and replace existing floor sheathing with new plywood (top & bottom), fully blocked. Strengthen (sister) existing joists with new wood members at panel edges. *Allow for repair/replacement of 30% existing wood framing members.*	
9	Provide diaphragm shear transfer connections at brick/concrete walls with new steel angle bolted to wall with expansion/epoxy bolts and epoxy bolts to slab. Install continuous steel angle with epoxy anchor bolts to act as diaphragm chord reinforcing and drag/collector to new shear walls.	
11	New drag/collector element (steel or concrete), bolted to shear walls.	
15	New 18" thick reinforced concrete shear walls. Remove existing brick exterior at walls – see Key Note #14. Provide new steel drag collectors along existing wall with epoxy anchors.	
Second Floor Ceiling Level:		
3	Install out-of-plane wall anchor system at brick/concrete walls comprised of bolted holdowns (or steel plates screwed to joists), epoxy anchor bolts, straps, blocking, etc. Develop anchor system into floor framing.	SK-3 SK-B SK-C
11	New drag/collector element (steel or concrete), bolted to shear walls.	
15	New 18" thick reinforced concrete shear walls. Remove existing brick exterior at walls – see Key Note #14.	
16	Remove and reconstruct existing ceiling joist framing with new wood frame diaphragm consisting of wood joists and plywood sheathing, fully blocked. *Allow for repair/replacement of 30% existing wood framing members.*	
17	Provide ceiling diaphragm shear transfer connections at brick/concrete walls with new wood blocking/ledger bolted to wall with expansion/epoxy bolts. Install continuous steel angle with epoxy anchor bolts to act as diaphragm chord reinforcing and drag/collector to new shear walls.	
Roof Level:		
3	Install out-of-plane wall anchor system at brick/concrete walls comprised of bolted holdowns (or steel plates screwed to joists), epoxy anchor bolts, straps, blocking, etc. Develop anchor system into floor framing.	SK-3 SK-B SK-C
4	Remove and replace existing roof sheathing with new plywood, fully blocked. Strengthen (sister) existing joists with new wood members at panel edges. *Allow for repair/replacement of 30% existing wood framing members.*	
9	Provide diaphragm shear transfer connections at brick/concrete walls with new steel angle bolted to wall with expansion/epoxy bolts and epoxy bolts to slab. Install continuous steel angle with epoxy anchor bolts to act as diaphragm chord reinforcing and drag/collector to new shear walls.	
18	Create new wood stud cripple walls sheathed with plywood at tops of existing concrete walls. Connect to concrete walls and to roof sheathing.	
Interior/Exterior Walls:		
2	Enlarge existing foundations at new shotcrete walls (drill and epoxy dowels). Remove and replace existing slab-on-grade for foundation work.	SK-4 SK-5 SK-D
14	New 18" thick reinforced concrete shear walls with CIDH or micro-pile foundations. Remove existing brick exterior at walls. Drill and epoxy dowel to existing gunite/concrete walls.	

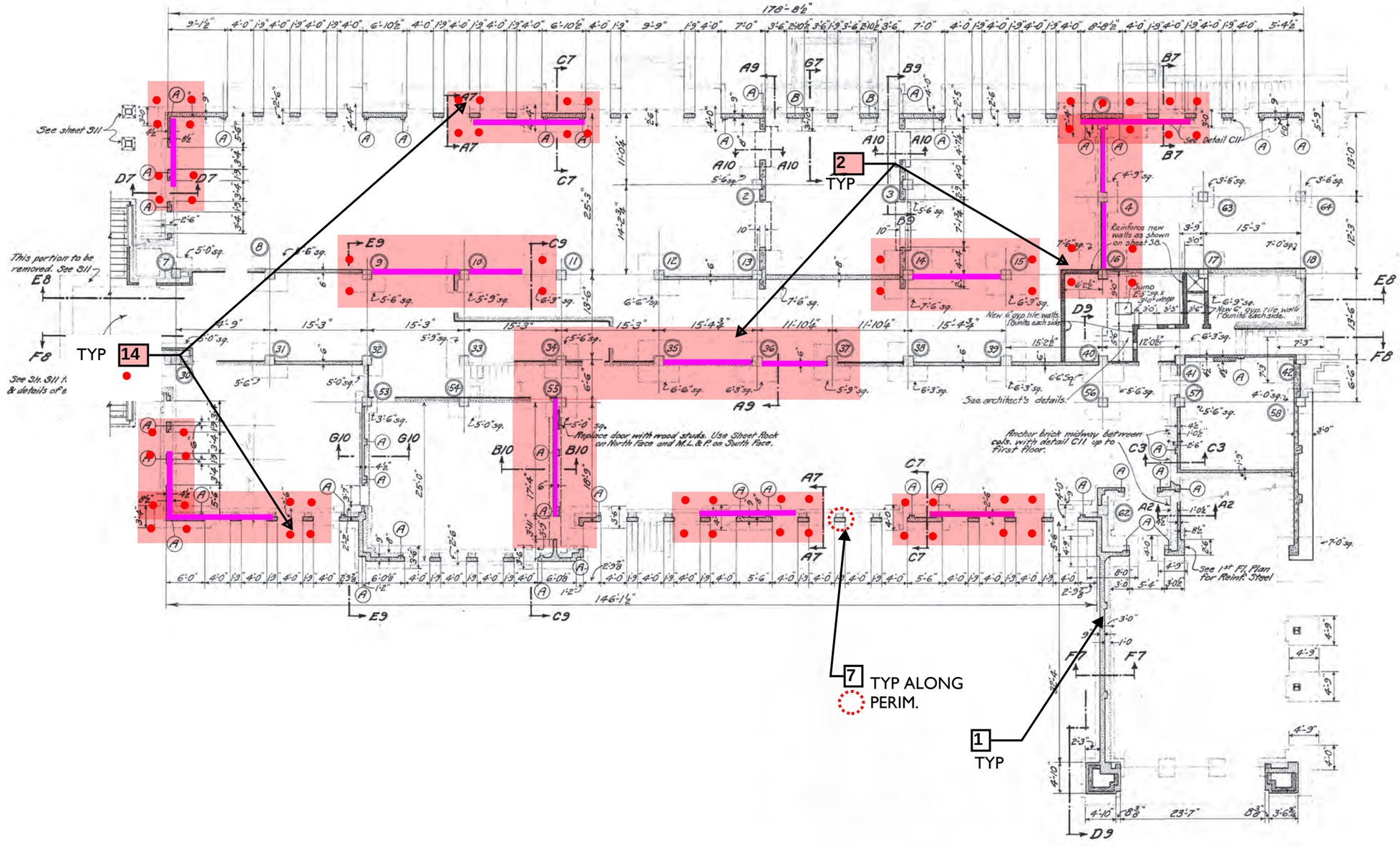
MIDDLE (Auditorium / Classroom):

Key Note	Scope Description	Ref. Sketch
Basement/Foundation Level:		
1	Tie/anchor all existing exterior brick/tile walls to existing concrete/gunite walls using veneer type anchor screw ties or epoxy dowels (remove mortar and set anchors). – Apply to full height of all building exterior.	SK-6 SK-A SK-D
2	Enlarge existing foundations at new shotcrete walls (drill and epoxy dowels). Remove and replace existing slab-on-grade for foundation work.	
7	Anchor base of all exterior wall piers with steel angles epoxy bolted to wall and slab/stem wall.	
8	Wrap (2 layers) existing brick wall with Fiber Reinforced Polymer (FRP) for full height of wall.	
14	New 12" thick reinforced concrete shear walls with CIDH or micro-pile foundations. Remove existing brick exterior at walls. Drill and epoxy dowel to existing gunite/concrete walls.	
First / Balcony Floor Level:		
3	Install out-of-plane wall anchor system at brick/concrete walls comprised of bolted holdowns (or steel plates screwed to joists), epoxy anchor bolts, straps, blocking, etc. Develop anchor system into floor framing.	SK-7 SK-A SK-B SK-C
4	Strengthen existing balcony diaphragm **Option 1:** Remove and replace with new plywood (top & bottom), fully blocked. Strengthen (sister) existing joists with new wood members at panel edges (top & bottom). *Allow for repair/replacement of 30% existing wood framing members.* **Option 2:** Install new horizontal steel bracing	
5	Remove and replace existing floor sheathing with new plywood, fully blocked. Strengthen (sister) existing joists with new wood members at panel edges. *Allow for repair/replacement of 30% existing wood framing members.*	
6	Strengthen horizontal bracing connection at tapered girder and wall locations	
8	Wrap (2 layers) existing brick wall with Fiber Reinforced Polymer (FRP) for full height of wall.	
9	Provide diaphragm shear transfer connections at brick/concrete walls with new steel angle bolted to wall with expansion/epoxy bolts and epoxy bolts to slab. Install continuous steel angle with epoxy anchor bolts to act as diaphragm chord reinforcing and drag/collector to new shear walls.	
11	New drag/collector element (steel or concrete), bolted to shear walls.	
15	New 18" thick reinforced concrete shear walls. Remove existing brick exterior at walls – see Key Note #14	

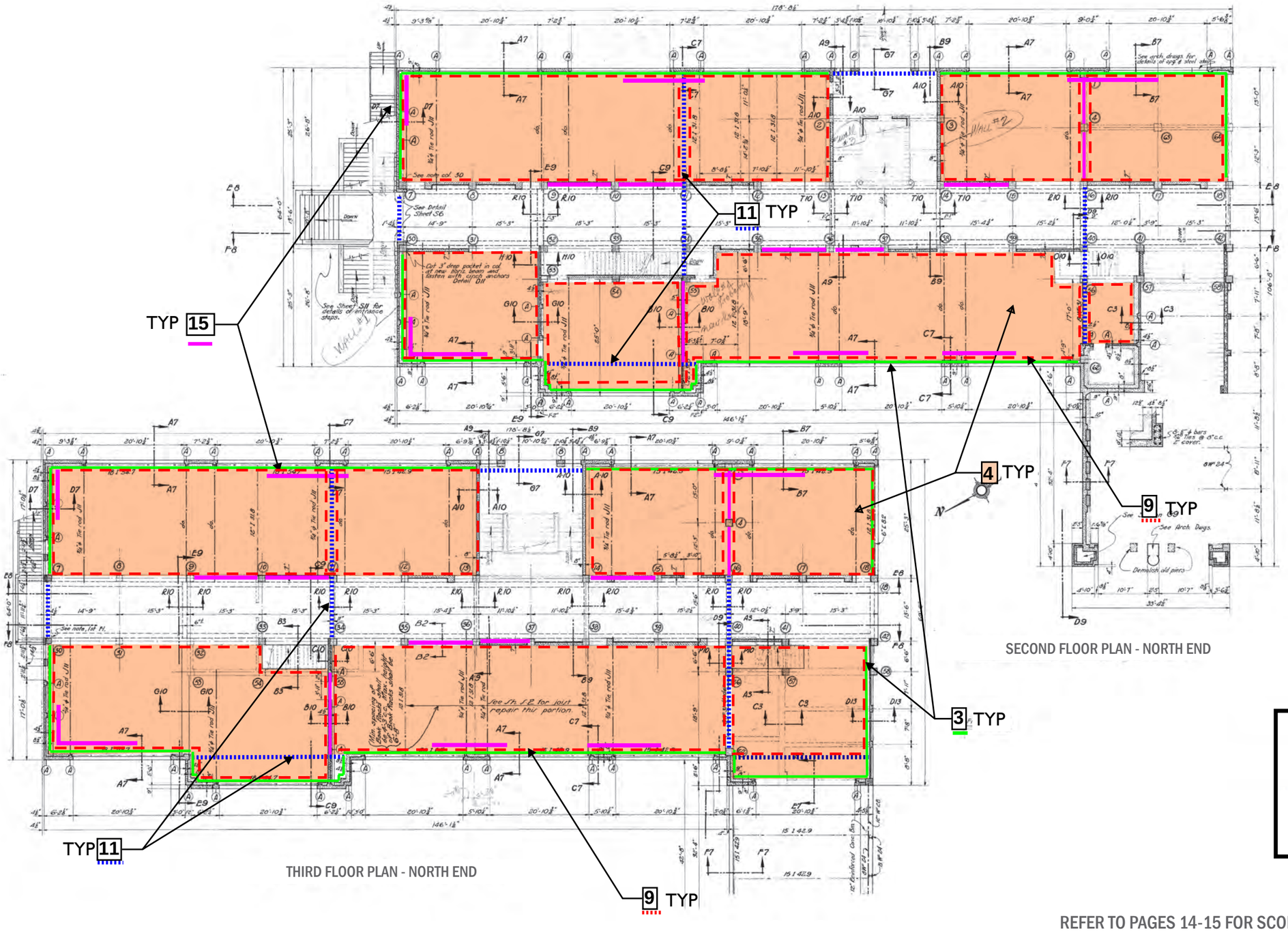
Second Floor / Balcony Level:		
3	Install out-of-plane wall anchor system at brick/concrete walls comprised of bolted holdowns (or steel plates screwed to joists), epoxy anchor bolts, straps, blocking, etc. Develop anchor system into floor framing.	SK-8 SK-A SK-B SK-C
4	See note #4 – **First / Balcony Floor Level**	
5	Remove and replace existing floor sheathing with new plywood (top & bottom), fully blocked. Strengthen (sister) existing joists with new wood members at panel edges. *Allow for repair/replacement of 30% existing wood framing members.*	
8	Wrap (2 layers) existing brick wall with Fiber Reinforced Polymer (FRP) for full height of wall.	
9	Provide diaphragm shear transfer connections at brick/concrete walls with new steel angle bolted to wall with expansion/epoxy bolts and epoxy bolts to slab. Install continuous steel angle with epoxy anchor bolts to act as diaphragm chord reinforcing and drag/collector to new shear walls.	
11	New drag/collector element (steel or concrete), bolted to shear walls.	
15	New 18" thick reinforced concrete shear walls. Remove existing brick exterior at walls – see Key Note #14	
16	Remove and reconstruct existing ceiling joist framing with new wood frame diaphragm consisting of wood joists and plywood sheathing, fully blocked.	
17	Provide ceiling diaphragm shear transfer connections at brick/concrete walls with new wood blocking/ledger bolted to wall with expansion/epoxy bolts. Install continuous steel angle with epoxy anchor bolts to act as diaphragm chord reinforcing and drag/collector to new shear walls.	
Roof Level:		
3	Install out-of-plane wall anchor system at brick/concrete walls comprised of bolted holdowns (or steel plates screwed to joists), epoxy anchor bolts, straps, blocking, etc. Develop anchor system into roof framing.	SK-9 SK-10 SK-B SK-C
4	Remove and replace existing roof sheathing with new plywood (top & bottom), fully blocked. Strengthen (sister) existing joists with new wood members at panel edges (top & bottom). *Allow for repair/replacement of 30% existing wood framing members.*	
9	Provide diaphragm shear transfer connections at brick/concrete walls with new steel angle bolted to wall with expansion/epoxy bolts and epoxy bolts to slab. Install continuous steel angle with epoxy anchor bolts to act as diaphragm chord reinforcing and drag/collector to new shear walls.	
11	New drag/collector element (steel or concrete), bolted to shear walls.	
15	New 18" thick reinforced concrete shear walls. Remove existing brick exterior at walls – see Key Note #14	
18	Create new wood stud cripple walls sheathed with plywood at tops of existing concrete walls. Connect to concrete walls and to roof sheathing.	
Exterior Walls:		
14	New 18" thick reinforced concrete shear walls with CIDH or micro-pile foundations. Remove existing brick exterior at walls. Drill and epoxy dowel to existing gunite/concrete walls.	SK-11

SOUTH END:

Key Note	Scope Description	Ref. Sketch
Basement / Foundation Level:		
1	Tie/anchor all existing exterior brick/tile walls to existing concrete/gunite walls using veneer type anchor screw ties or epoxy dowels (remove mortar and set anchors). – Apply to full height of <u>all</u> building exterior.	SK-12 SK-A SK-D
2	Enlarge existing foundations at new shotcrete walls (drill and epoxy dowels). Remove and replace existing slab-on-grade for foundation work.	
7	Anchor base of all exterior wall piers with steel angles epoxy bolted to wall and slab/stem wall.	
8	Wrap (2 layers) existing brick wall with Fiber Reinforced Polymer (FRP) for full height of wall.	
9	Remove existing tile/gunite walls and install new 18" thick reinforced concrete shear walls with enlarged foundations.	
14	New 18" thick reinforced concrete shear walls with CIDH or micro-pile foundations. Remove existing brick exterior at walls. Drill and epoxy dowel to existing gunite/concrete walls.	
First Floor / Second Floor Level:		
3	Install out-of-plane wall anchor system at brick/concrete walls comprised of bolted holdowns (or steel plates screwed to joists), epoxy anchor bolts, straps, blocking, etc. Develop anchor system into floor framing.	SK-12 SK-A SK-B SK-C
4	Remove and replace existing floor sheathing with new plywood (top), fully blocked. Strengthen (sister) existing joists with new wood members at panel edges. *Allow for repair/replacement of 30% existing wood framing members.*	
8	Wrap (2 layers) existing brick wall with Fiber Reinforced Polymer (FRP) for full height of wall.	
9	Provide diaphragm shear transfer connections at brick/concrete walls with new steel angle bolted to wall with expansion/epoxy bolts and epoxy bolts to slab. Install continuous steel angle with epoxy anchor bolts to act as diaphragm chord reinforcing and drag/collector to new shear walls.	
11	New drag/collector element (steel or concrete), bolted to shear walls.	
15	New 18" thick reinforced concrete shear walls. Remove existing brick exterior at walls. Drill and epoxy dowel to existing gunite/concrete walls.	
Third Floor / Roof Level:		
3	Install out-of-plane wall anchor system at brick/concrete walls comprised of bolted holdowns (or steel plates screwed to joists), epoxy anchor bolts, straps, blocking, etc. Develop anchor system into floor framing.	SK-13 SK-B SK-C
4	Remove and replace existing floor sheathing with new plywood (top & bottom), fully blocked. Strengthen (sister) existing joists with new wood members at panel edges. *Allow for repair/replacement of 30% existing wood framing members.*	
5	Remove and replace existing floor sheathing with new plywood (top), fully blocked. Strengthen (sister) existing joists with new wood members at panel edges. *Allow for repair/replacement of 30% existing wood framing members.*	
6	Strengthen horizontal bracing connection at tapered girder and wall locations	
9	Provide diaphragm shear transfer connections at brick/concrete walls with new steel angle bolted to wall with expansion/epoxy bolts and epoxy bolts to slab. Install continuous steel angle with epoxy anchor bolts to act as diaphragm chord reinforcing and drag/collector to new shear walls.	
11	New drag/collector element (steel or concrete), bolted to shear walls.	
15	New 18" thick reinforced concrete shear walls. Remove existing brick exterior at walls. Drill and epoxy dowel to existing gunite/concrete walls.	
16	Remove and reconstruct existing ceiling joist framing with new wood frame diaphragm consisting of wood joists and plywood sheathing, fully blocked.	
17	Provide ceiling diaphragm shear transfer connections at brick/concrete walls with new wood blocking/ledger bolted to wall with expansion/epoxy bolts.	
Exterior Walls:		
2	See keynote #2 - **Foundation / First Floor Level**	SK-14 & SK-15
8	See keynote #8 - **Foundation / First Floor Level**	
14	See keynote #14 - **Foundation / First Floor Level**	

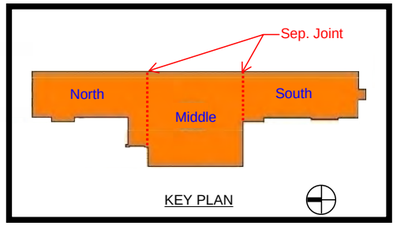


REFER TO PAGES 14-15 FOR SCOPE DESCRIPTION LIST OF KEY NOTES

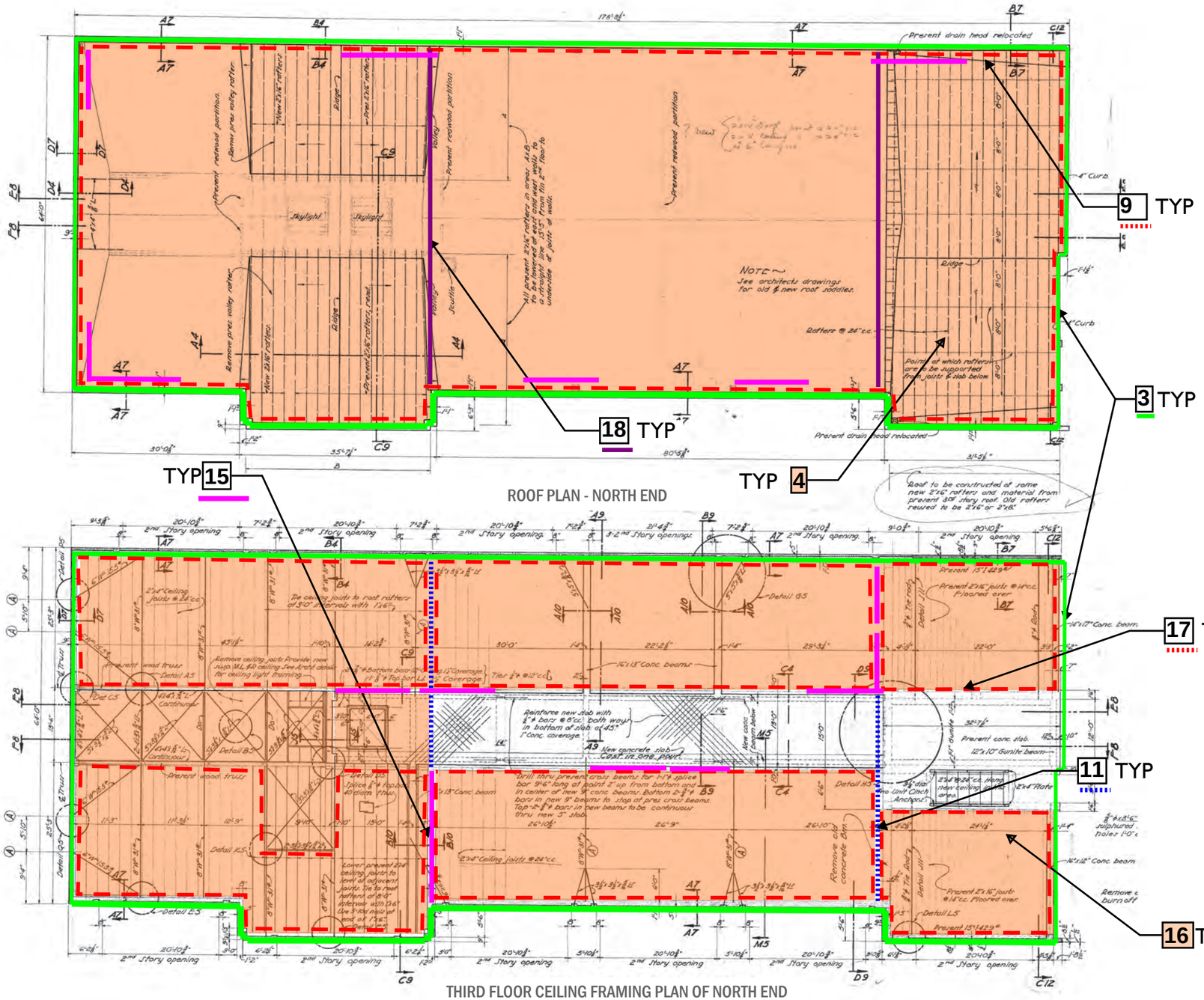


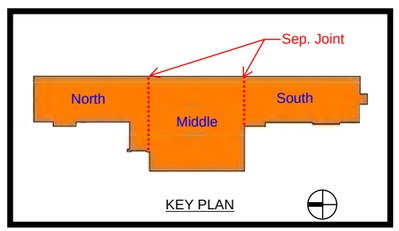
THIRD FLOOR PLAN - NORTH END

SECOND FLOOR PLAN - NORTH END

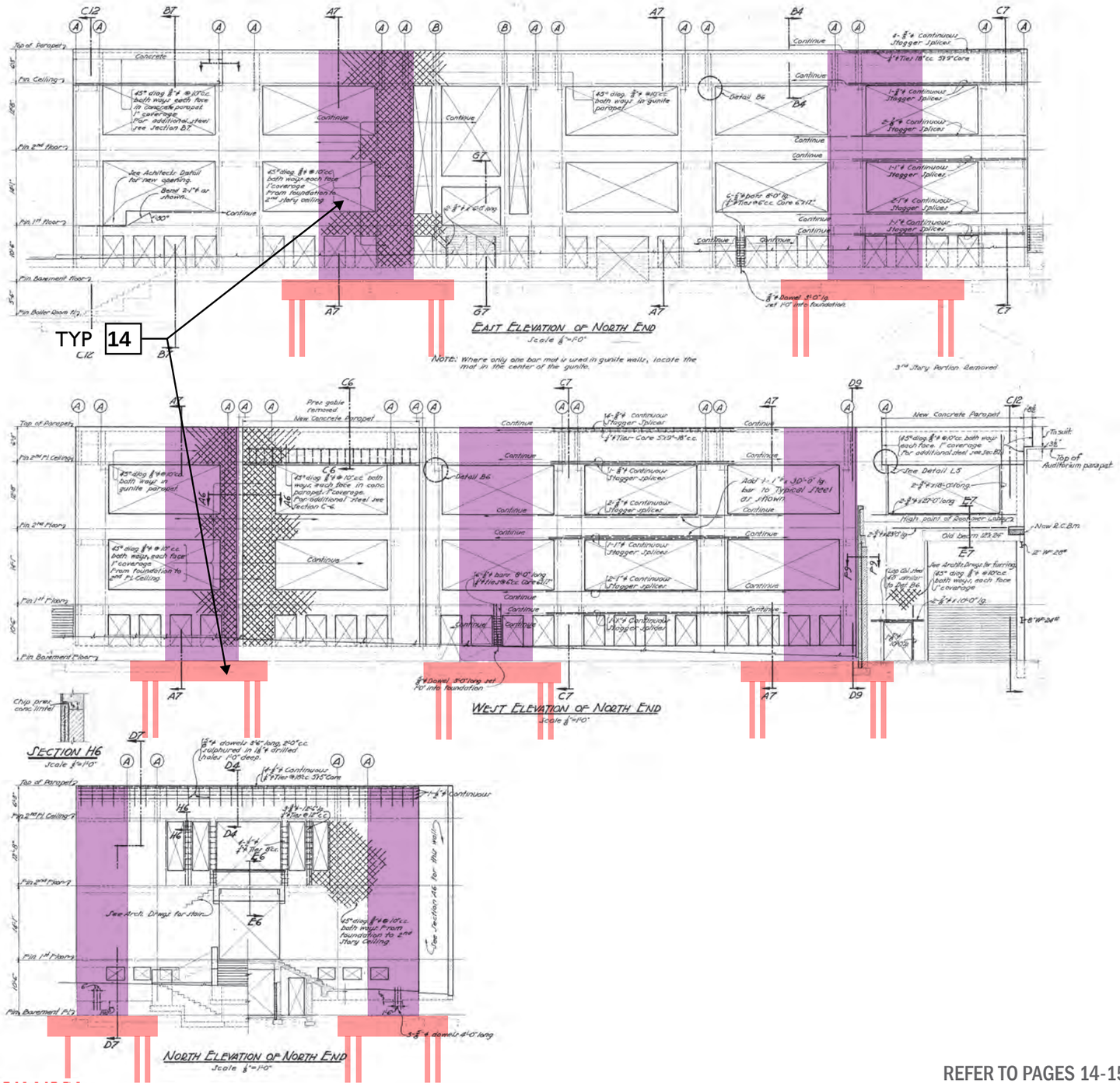


REFER TO PAGES 14-15 FOR SCOPE DESCRIPTION LIST OF KEY NOTES

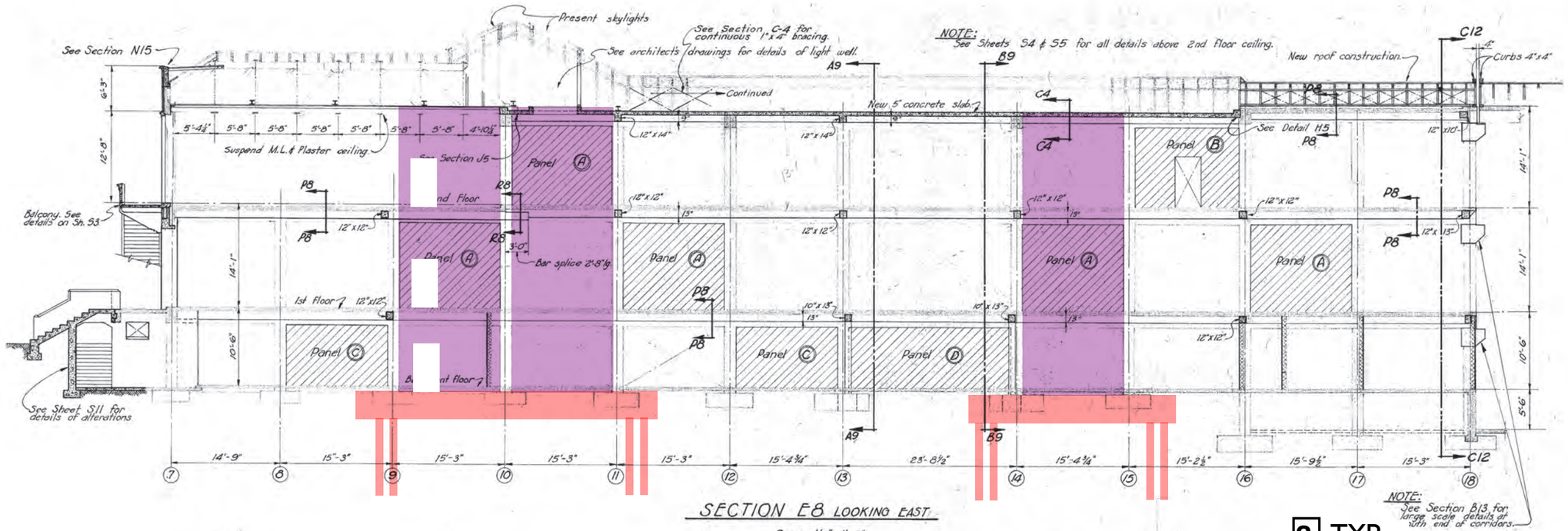




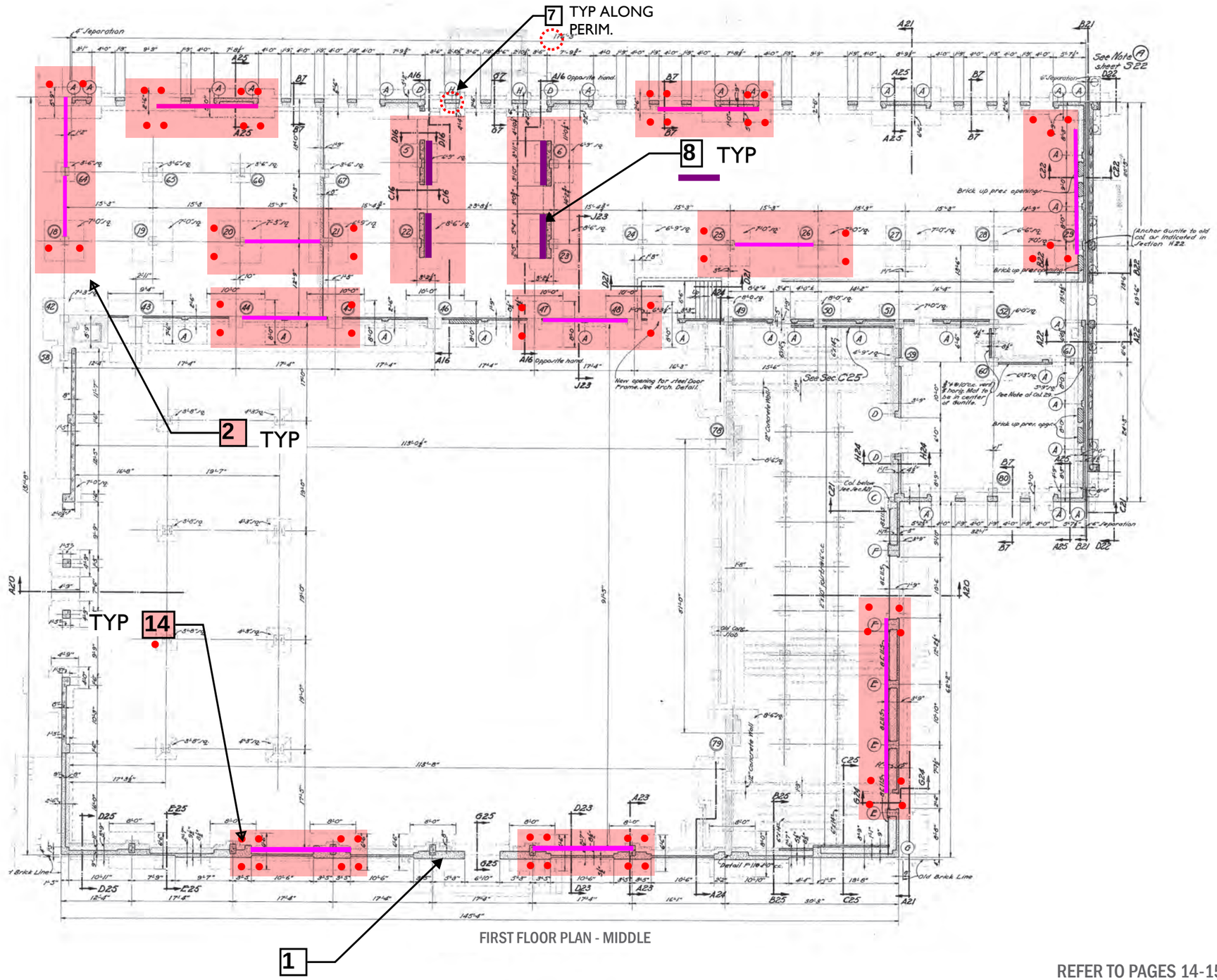
REFER TO PAGES 14-15 FOR SCOPE DESCRIPTION LIST OF KEY NOTES



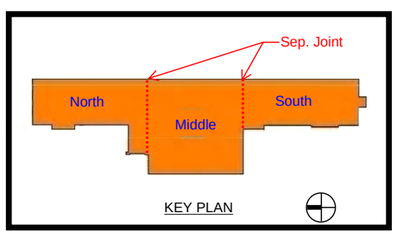
REFER TO PAGES 14-15 FOR SCOPE DESCRIPTION LIST OF KEY NOTES



REFER TO PAGES 14-15 FOR SCOPE DESCRIPTION LIST OF KEY NOTES



FIRST FLOOR PLAN - MIDDLE



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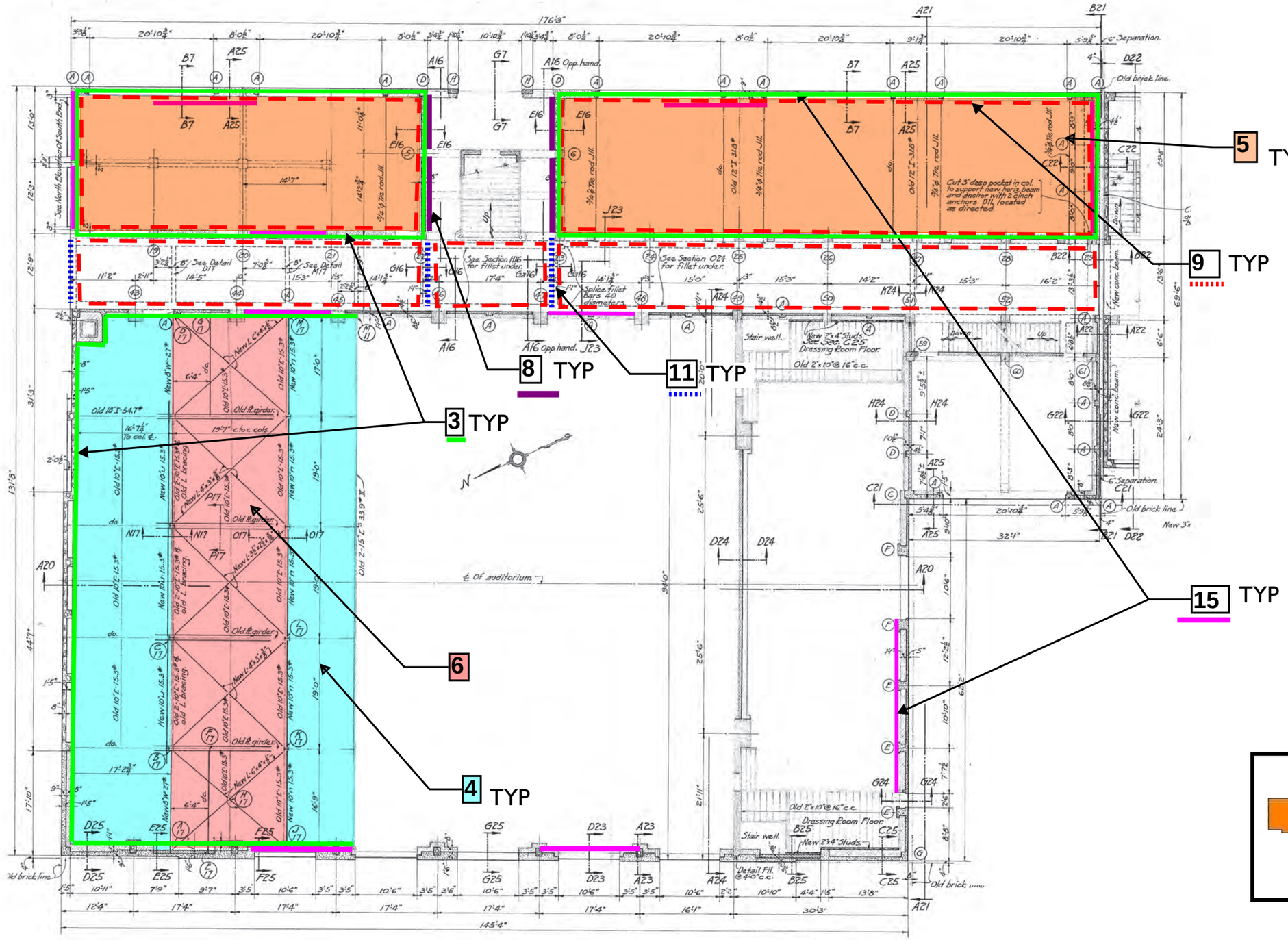
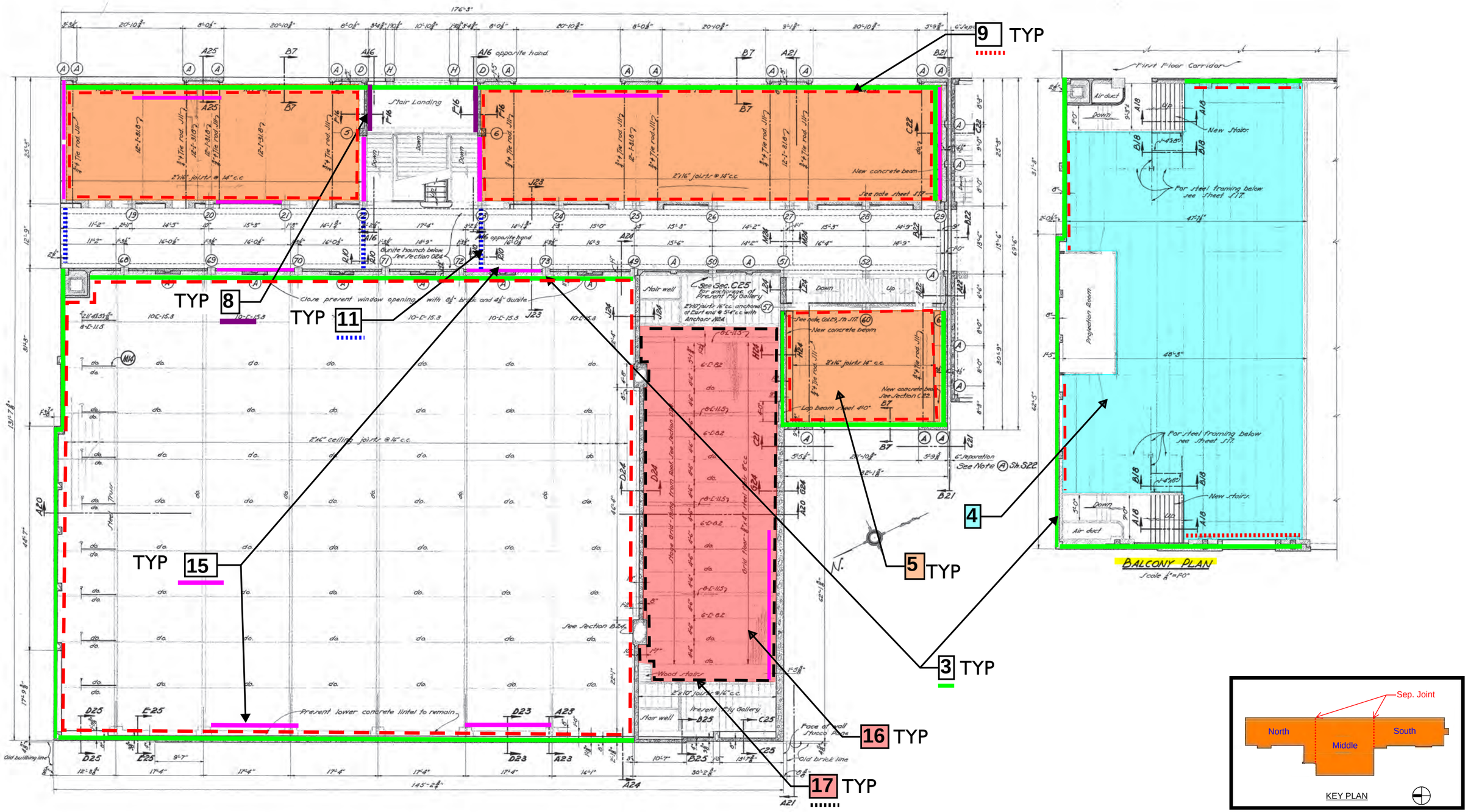
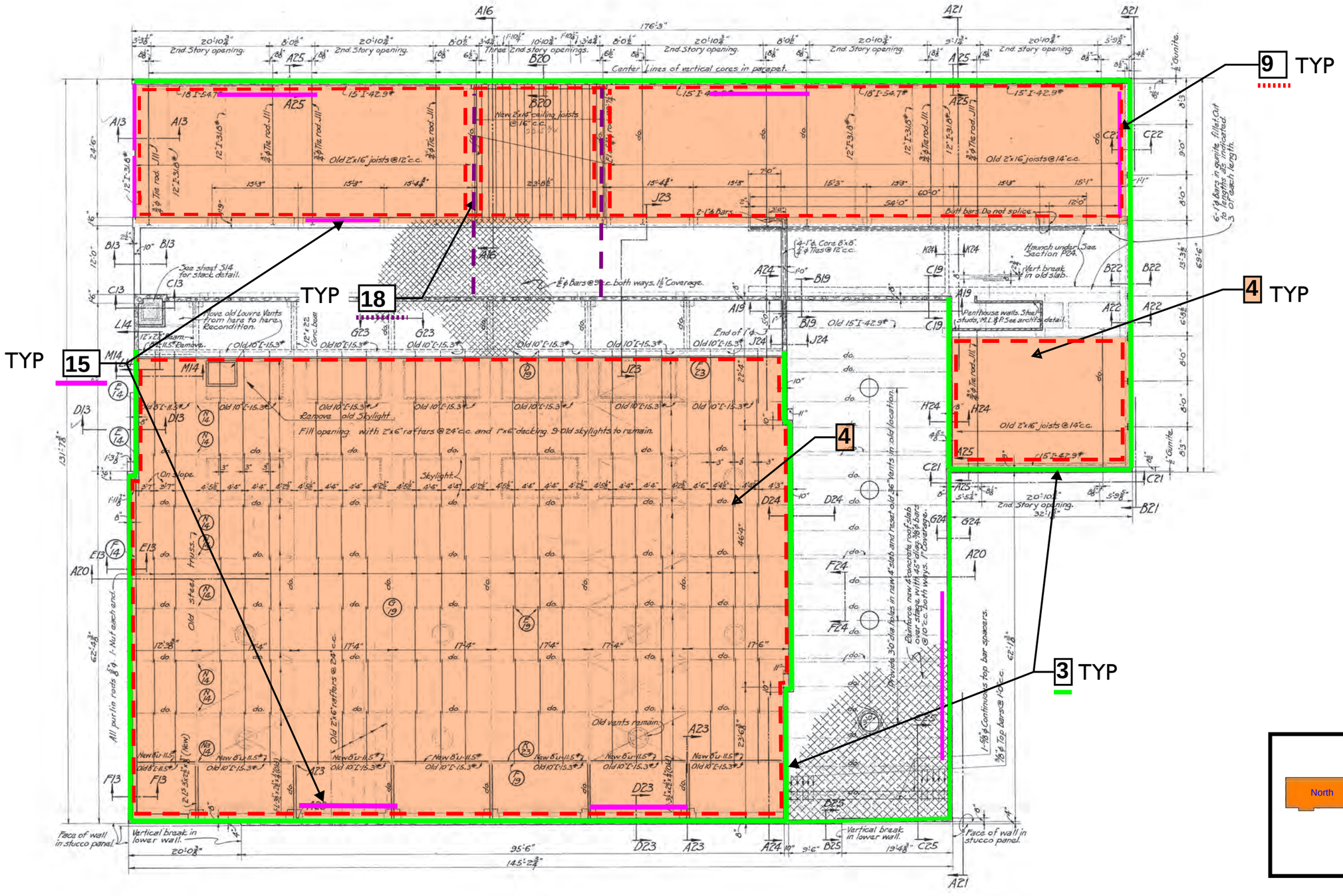


REFER TO PAGES 14-15 FOR SCOPE DESCRIPTION LIST OF KEY NOTES



REFER TO PAGES 14-15 FOR SCOPE DESCRIPTION LIST OF KEY NOTES



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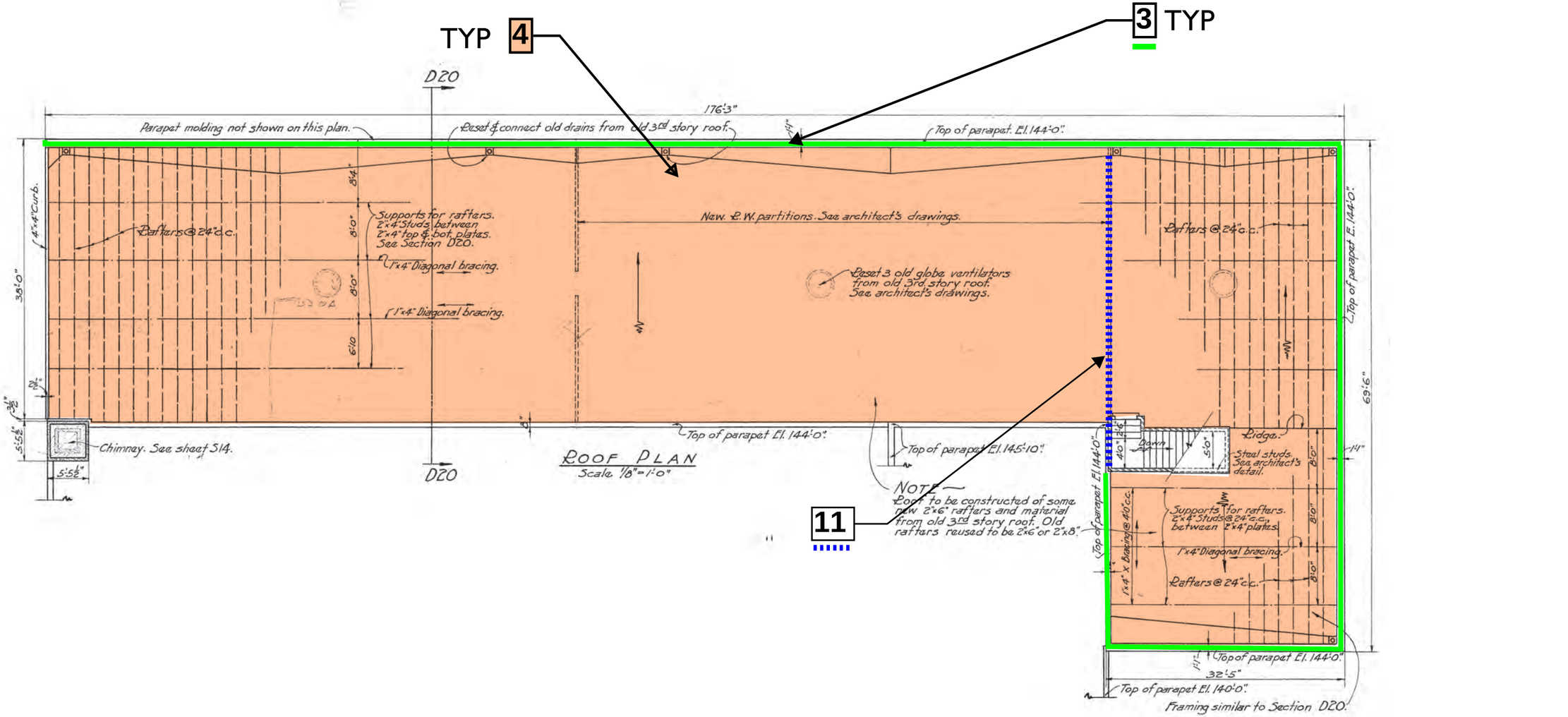

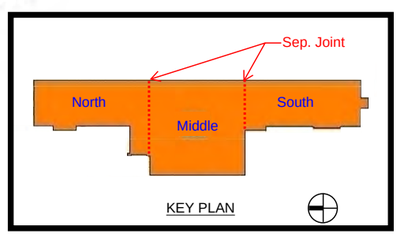

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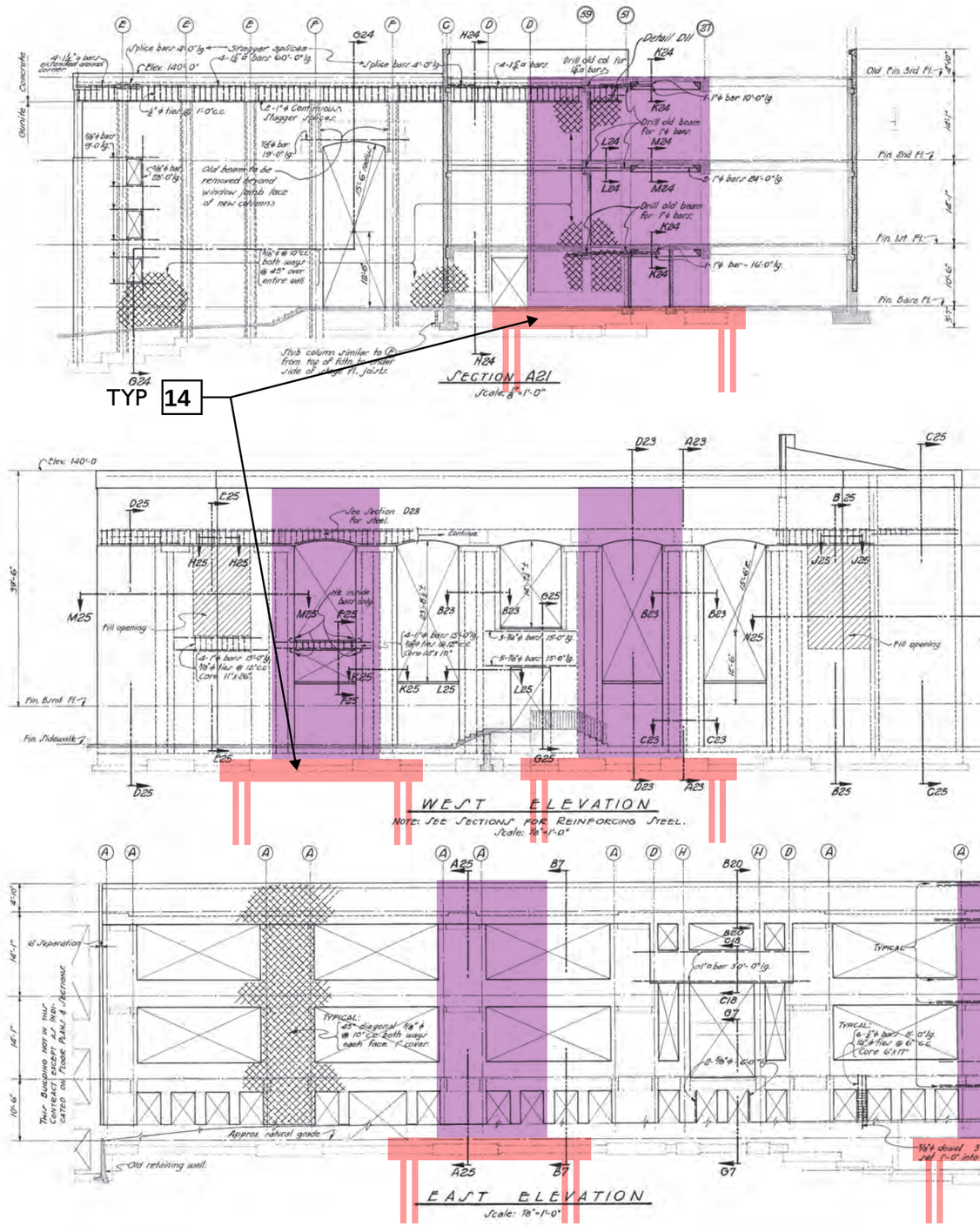
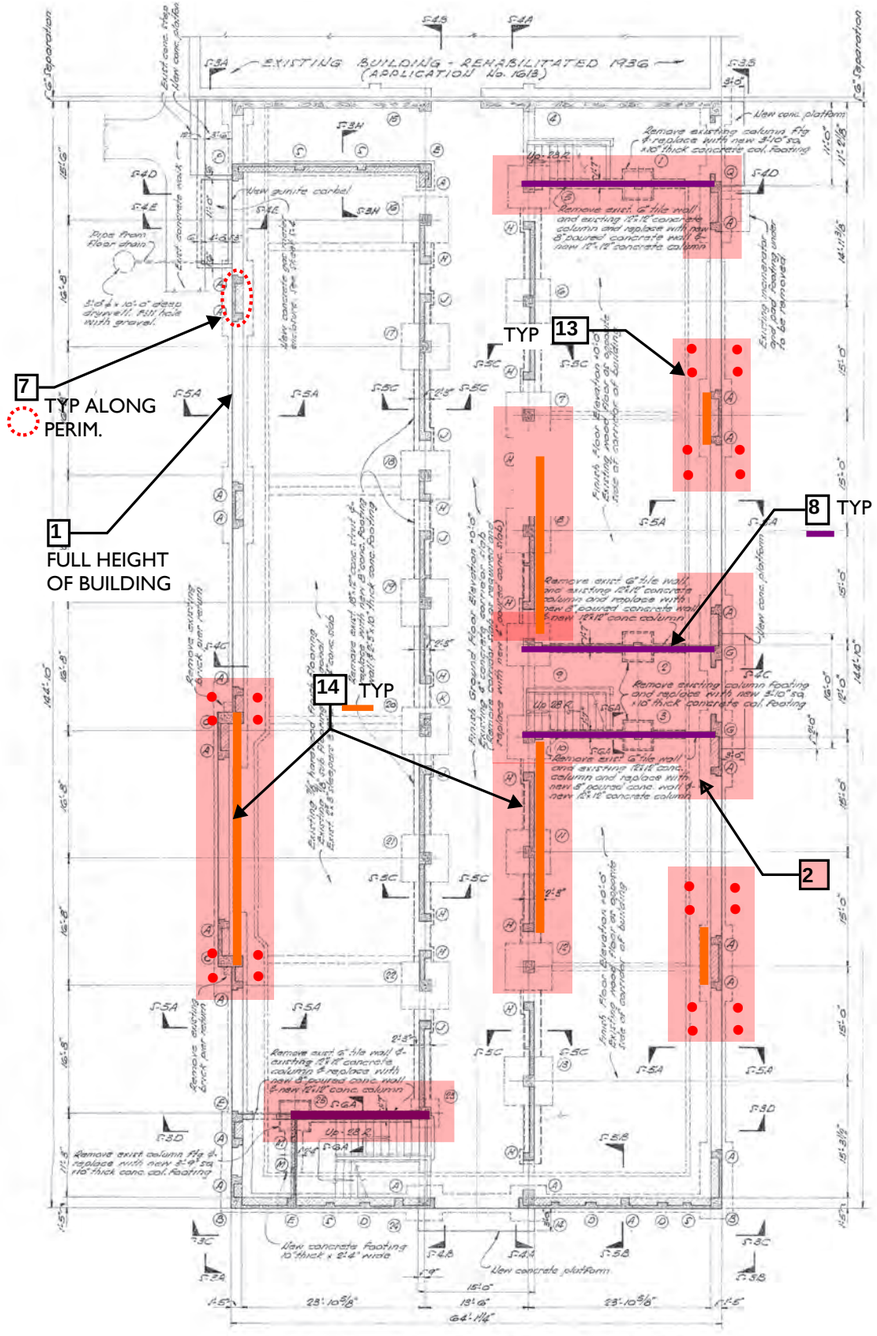
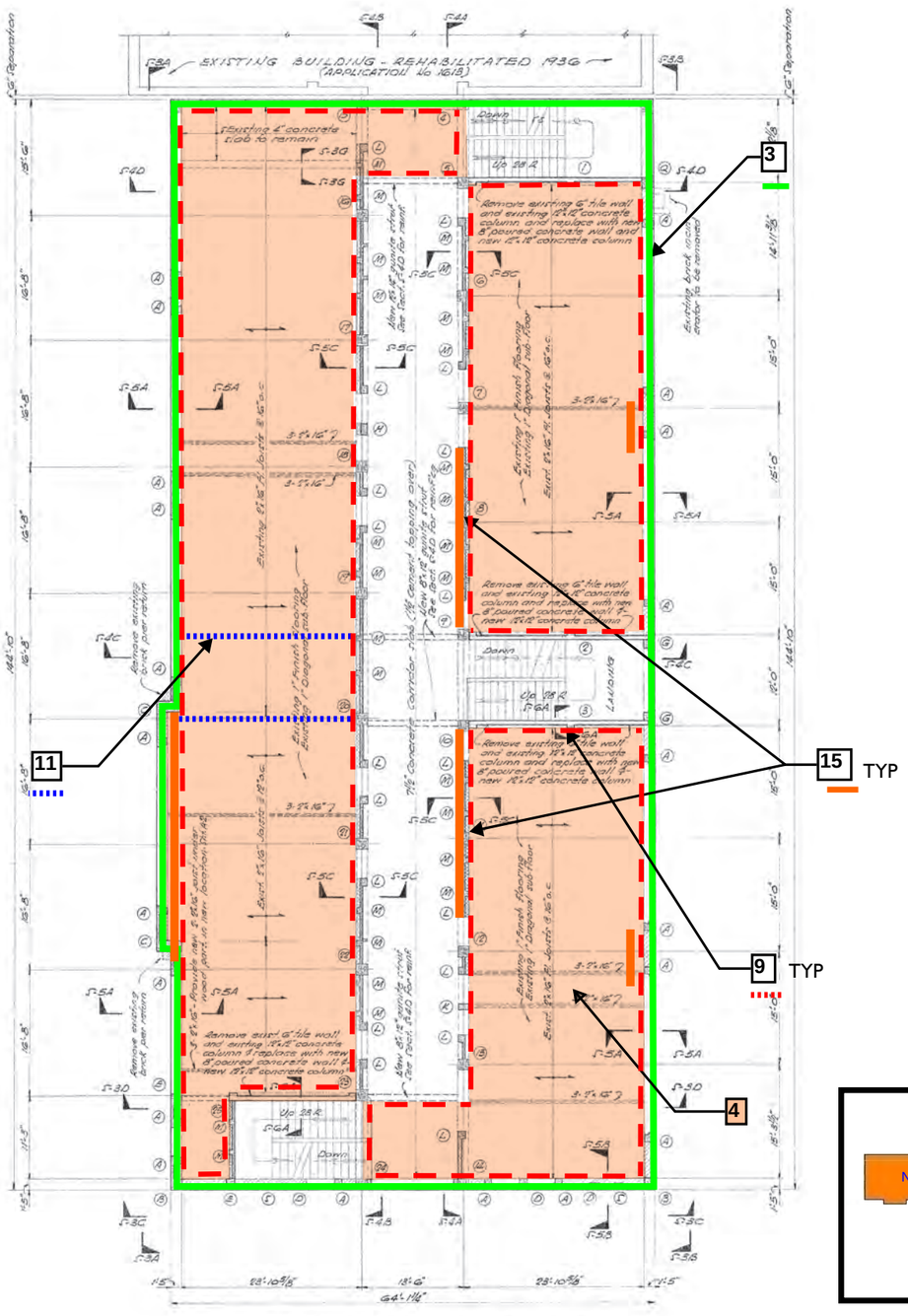


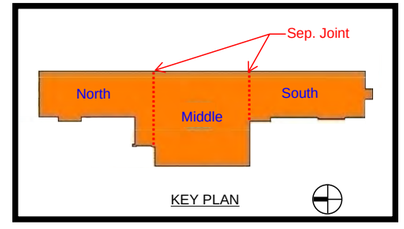
REFER TO PAGES 14-15 FOR SCOPE DESCRIPTION LIST OF KEY NOTES



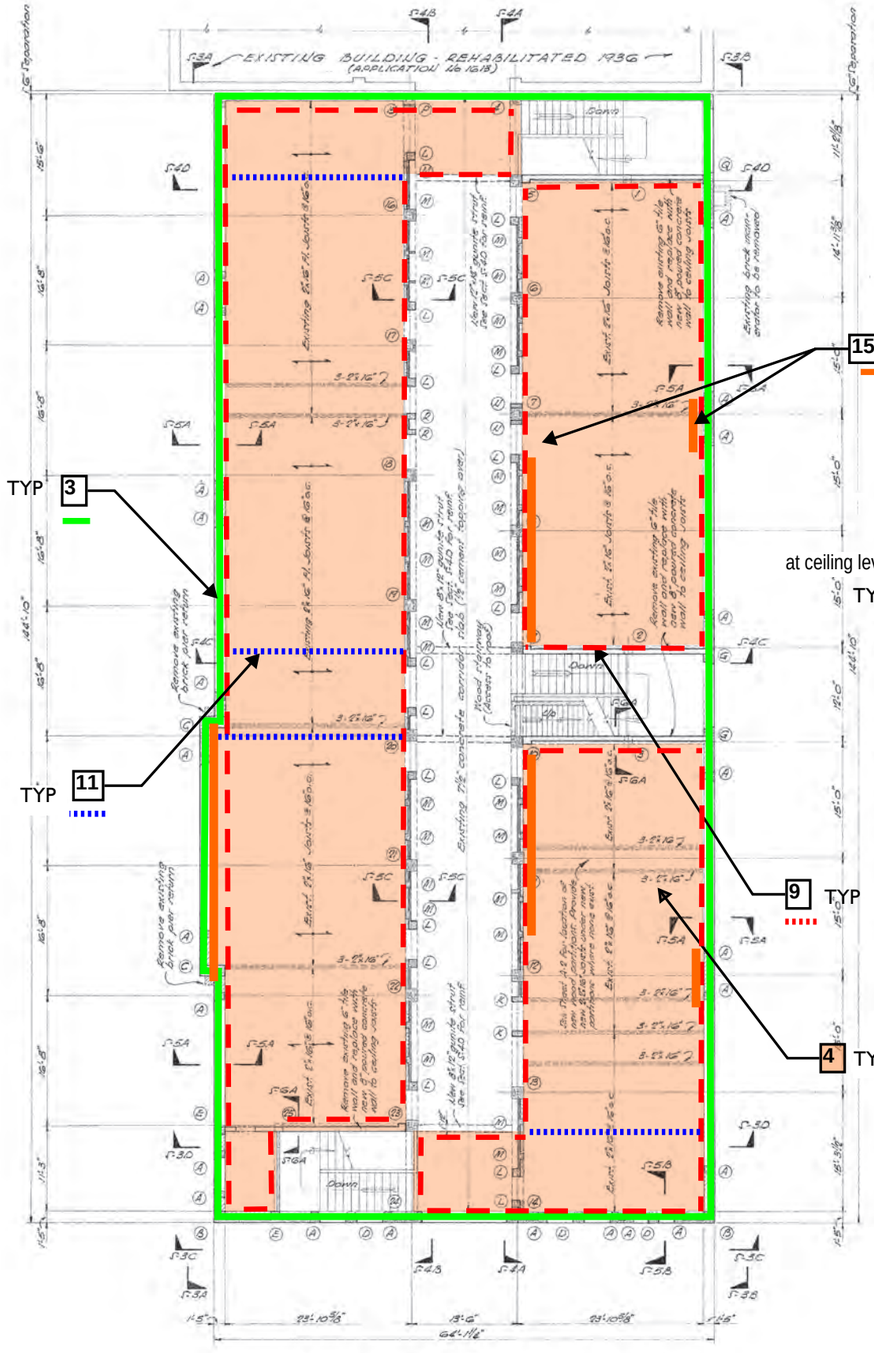
FIRST FLOOR & FOOTING PLAN



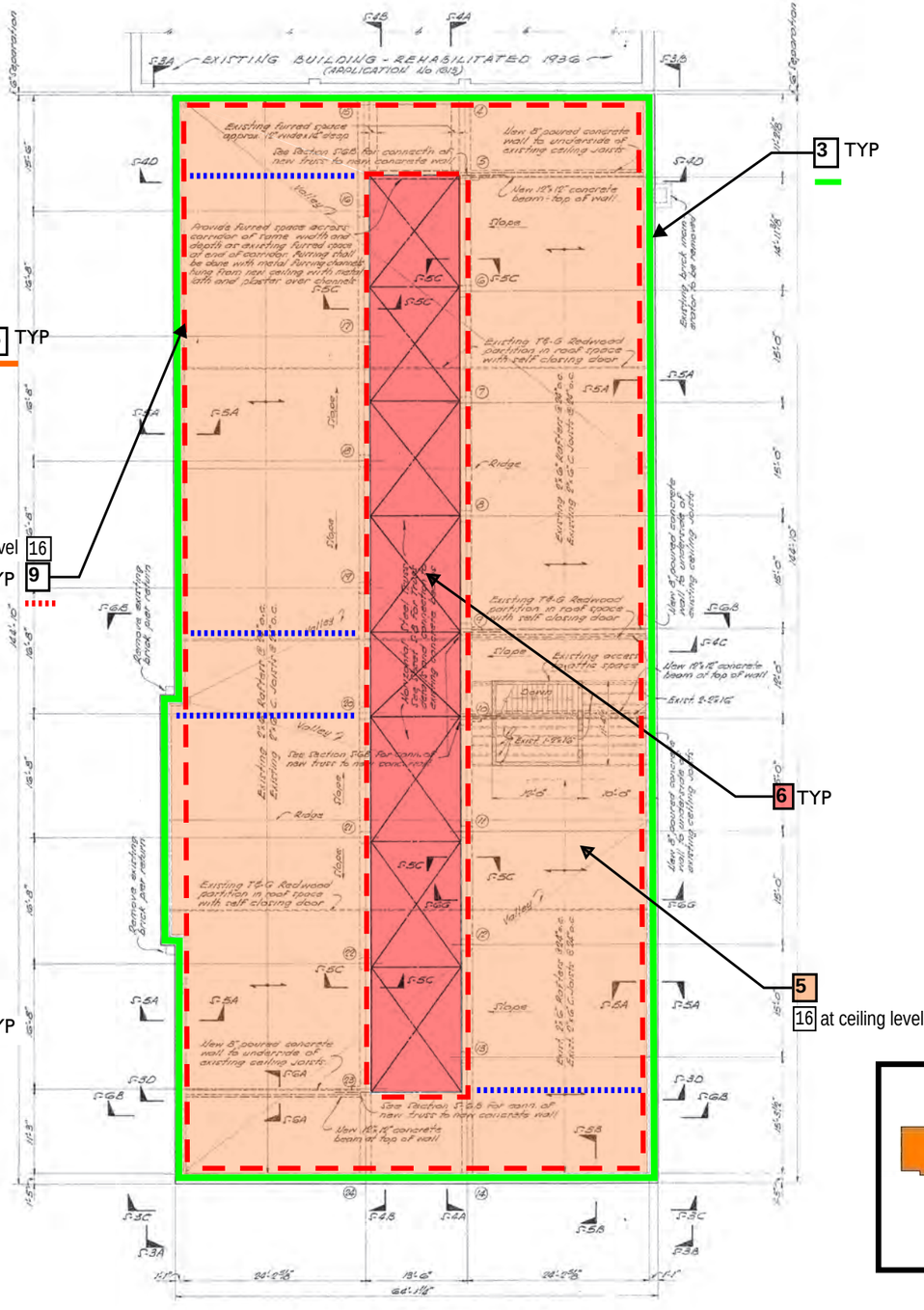
SECOND FLOOR FRAMING PLAN



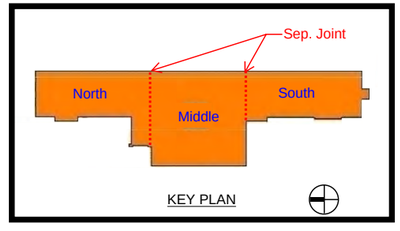
REFER TO PAGES 14-15 FOR SCOPE DESCRIPTION LIST OF KEY NOTES



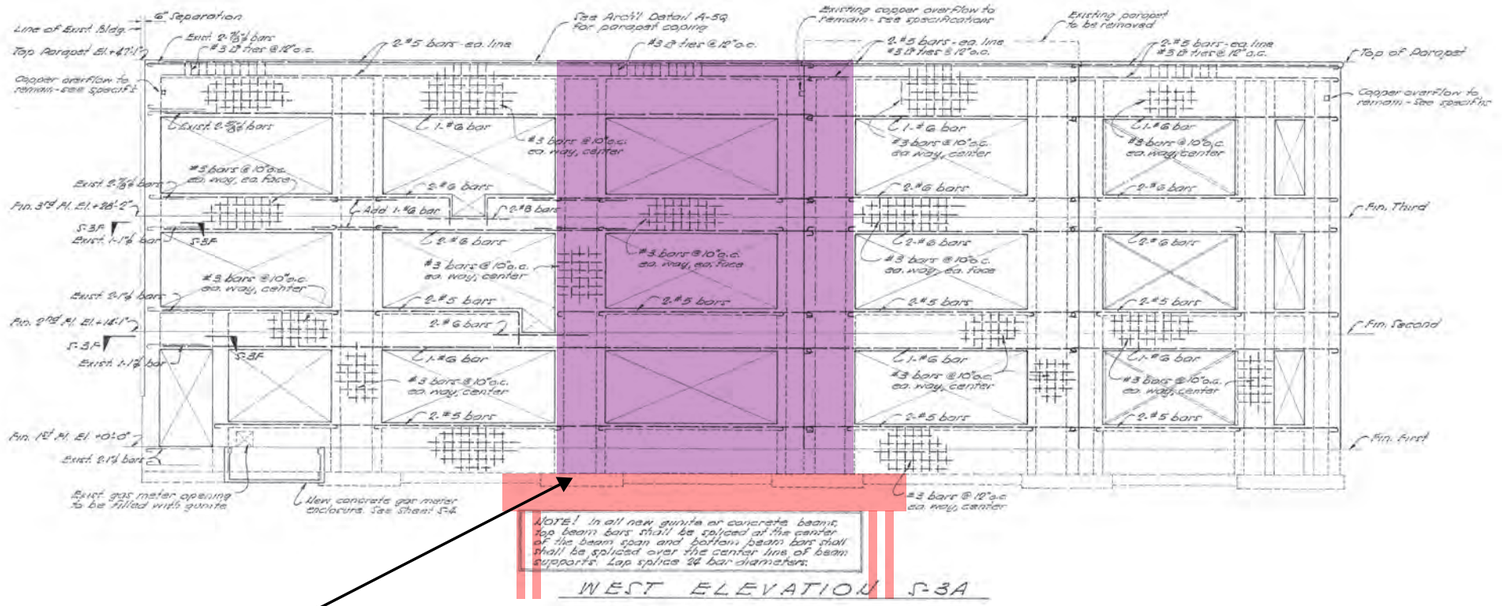
THIRD FLOOR FRAMING PLAN



ROOF FRAMING PLAN



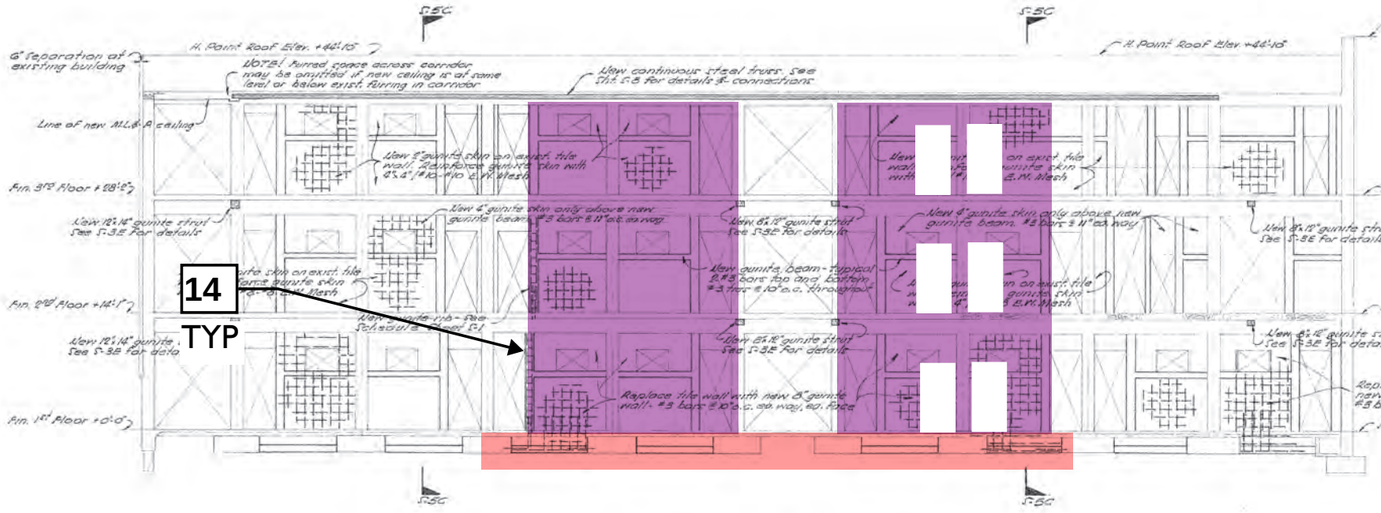
REFER TO PAGE XX FOR SCOPE DESCRIPTION LIST OF KEY NOTES


WEST ELEVATION S-3A
NOTE: In all new gunite or concrete beams, top beam bars shall be spliced at the center of the beam span and bottom beam bar shall be spliced over the center line of beam supports. Lap splice 24 bar diameters.
EAST ELEVATION S-3B
SECTION S-3C
DETAIL S-3E
DETAIL S-3F

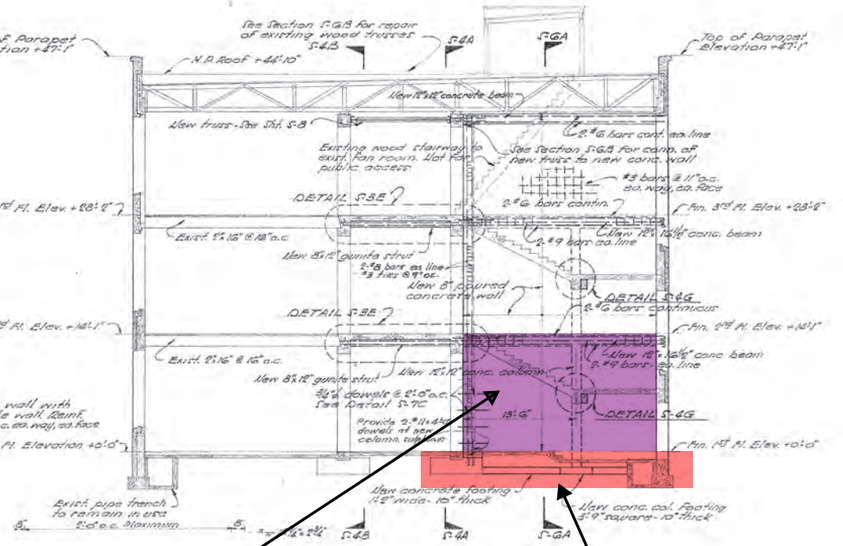
14 TYP

8 TYP

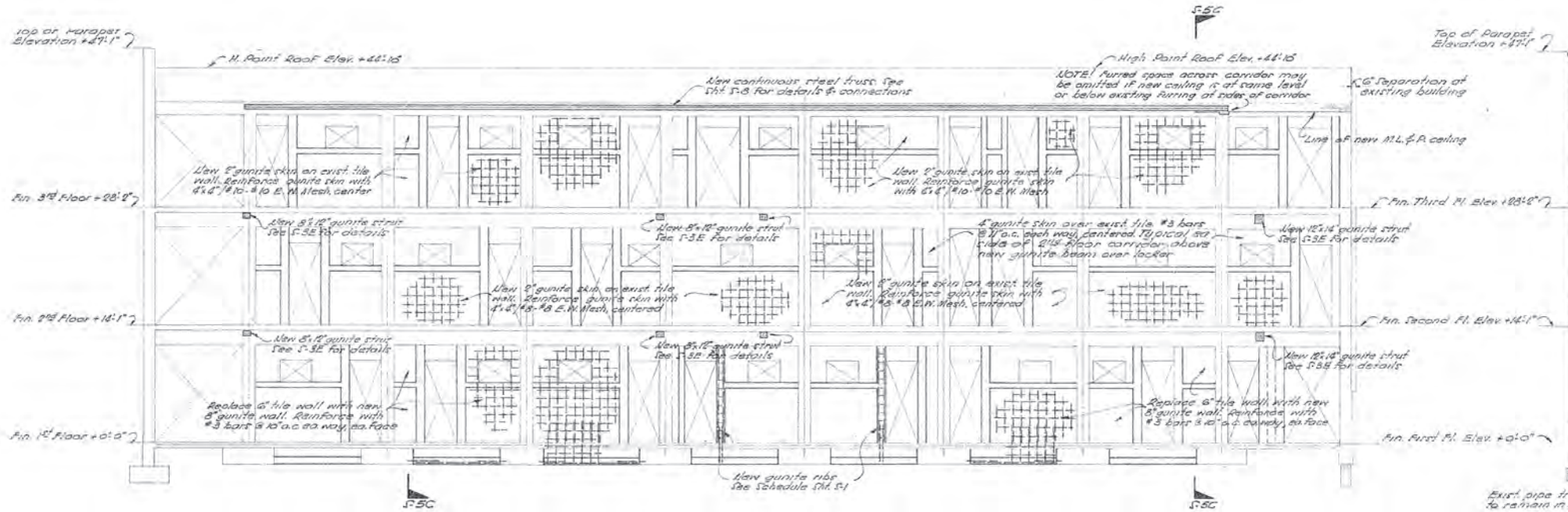
2



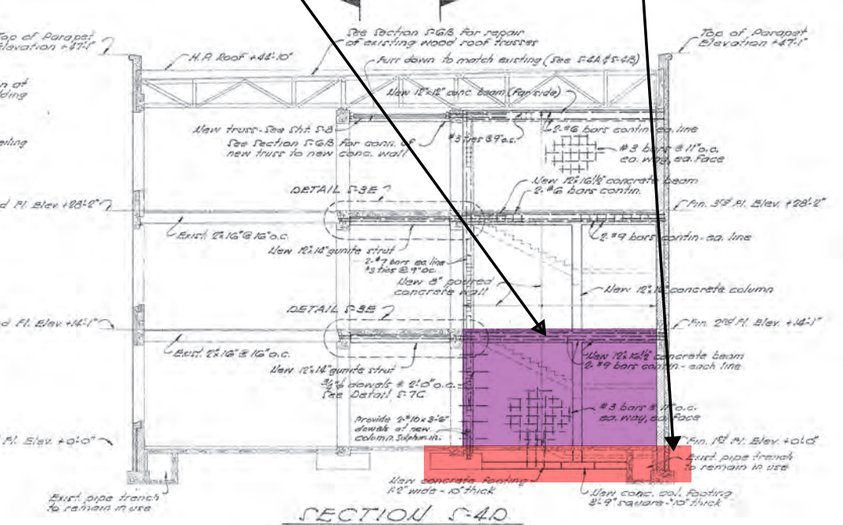
EAST CORRIDOR ELEVATION S-4A



SECTION S-4C



WEST CORRIDOR ELEVATION S-4B



SECTION S-4D

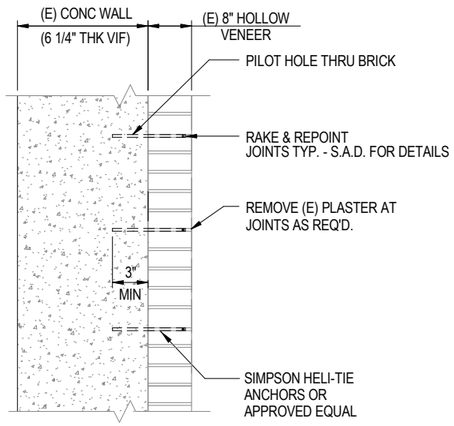
REFER TO PAGE XX FOR SCOPE DESCRIPTION LIST OF KEY NOTES

ANCHOR SPECIFICATIONS

Helical restoration anchors shall be 3/8 inch (9 mm) in diameter by 8 inches in length and manufactured of Type 304 stainless steel, such as Heli-Tie helical wall ties, as manufactured by the Simpson Strong-Tie Company (Model No. HELI37800A). Pre-drilled holes required to permit helical anchor installation shall be drilled using a rotary hammer drill set in rotation plus hammer mode and with 7/32 inch diameter carbide drill bits conforming to ANSI Standard B212.15, unless otherwise permitted or directed, in writing, by the Design Professional in responsible charge of the project. Heli-Ties shall be driven into pre-drilled holes using Heli-Tie fastener installation tool (Model No. HELITOOL37A) placed in a rotary hammer drill set in rotation plus hammer mode.

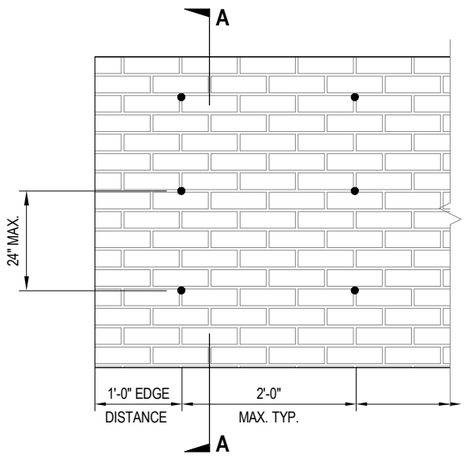
IN- SITU TESTING

1. UNDER THE SUPERVISION OF THE IOR, THE FOLLOWING ANCHOR TESTING IS TO BE PERFORMED, DOCUMENTED AND SUBMTITED TO DSA FOR ACCEPTANCE PRIOR TO THE INSTALLATION OF THE ANCHORS ON THE BUILDINGS.
2. A REPRESENTATIVE FROM THE ANCHOR MANUFACTURE IS TO OBSERVE THE INSTALLATION AND TESTING PROCEDURE.
3. CONTRACTOR TO PREPARE MOCK-UP TESTING AT PORTION OF EXISTING BUILDING WALL ACCEPTABLE BY THE STRUCTURAL ENGINEER AND ARCHITECT.
4. IN-SITU TESTING TO BE PERFORMED ON WALL ANCHORS TO REPRESENT PROPOSED INSTALLATION USING A MIMUM OF 8FTx8FT WALL.
5. INSTALL FOUR (4) ANCHORS IN A SQUARE PATTERN AS INDICATED IN THE BELOW ELEVATION. INSTALL ANCHORS PER MANUFACTURE RECOMMENDATIONS.
6. ANCHORS TO BE TENSION TESTED USING SIMPSON TESNSION TESTER MODEL HELITEST37A. ANCHORS TO BE TENSION TESTED TO A LOAD OF 410LBS. WITH A MAXIMUM DISPLACEMENT OF 0.157".
7. ACCEPTANCE CRTIERIA: NO FAILURE IN ANCHOR OR SUBSTRATE (CONCRETE).
8. IOR TO DOCUMENT AND REPORT FINDINGS OF TESTING TO DSA.



NOTE: PILOT HOLE DEPTH SHOULD BE GREATER THAN ANCHOR LENGTH BY 1" MIN.

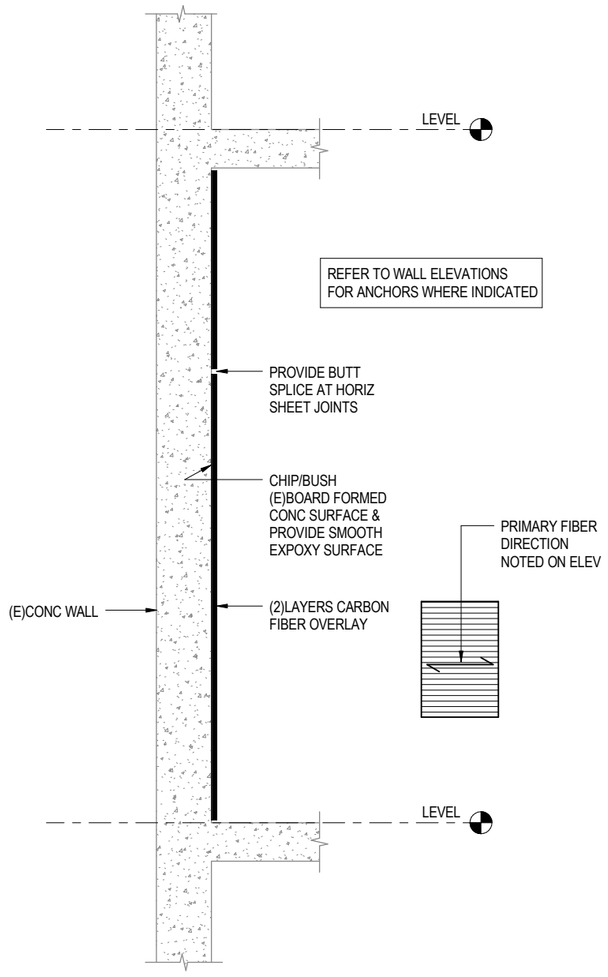
SECTION A-A



ELEVATION

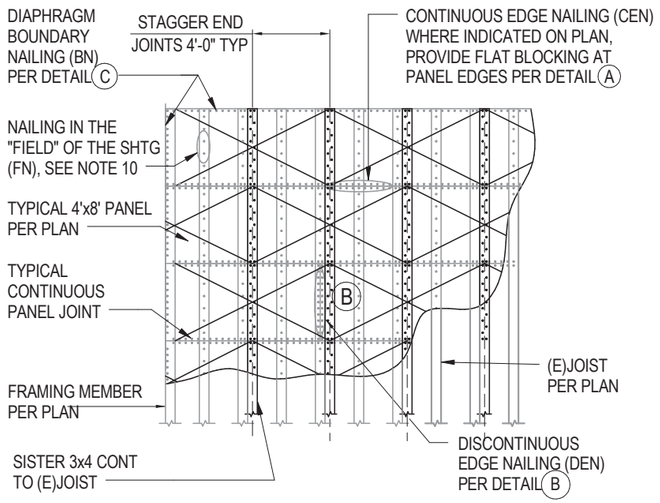
TYPICAL ANCHOR DETAIL OF (E) BRICK TILE WALLS

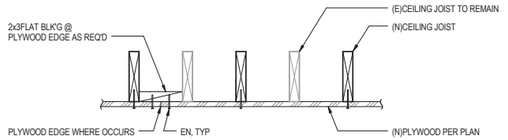
SCALE: NTS



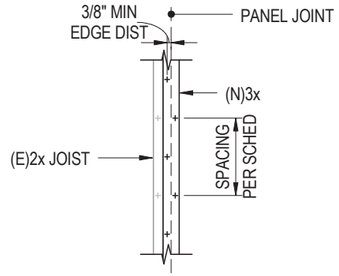
TYPICAL FIBER WRAP WALL SECTION

SCALE: NTS

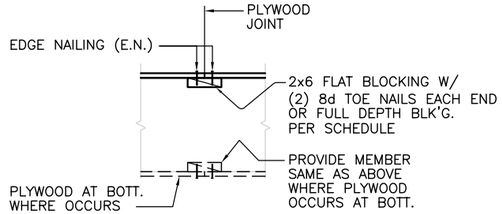




TYPICAL (N)CEILING JOIST AT (E)CEILING JOIST DETAIL

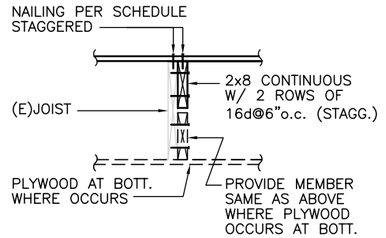


PLAN VIEW

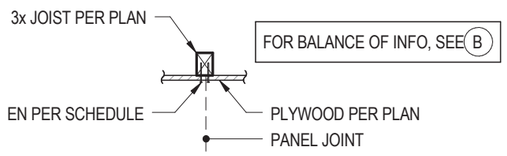


SECTION

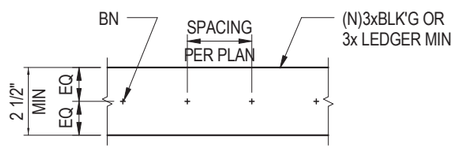
AT ADJOINING PANEL EDGES (B)



BLOCKED DIAPHRAGM (A)



AT ADJOINING PANEL EDGES (D)



AT BOUNDARY EDGE (C)

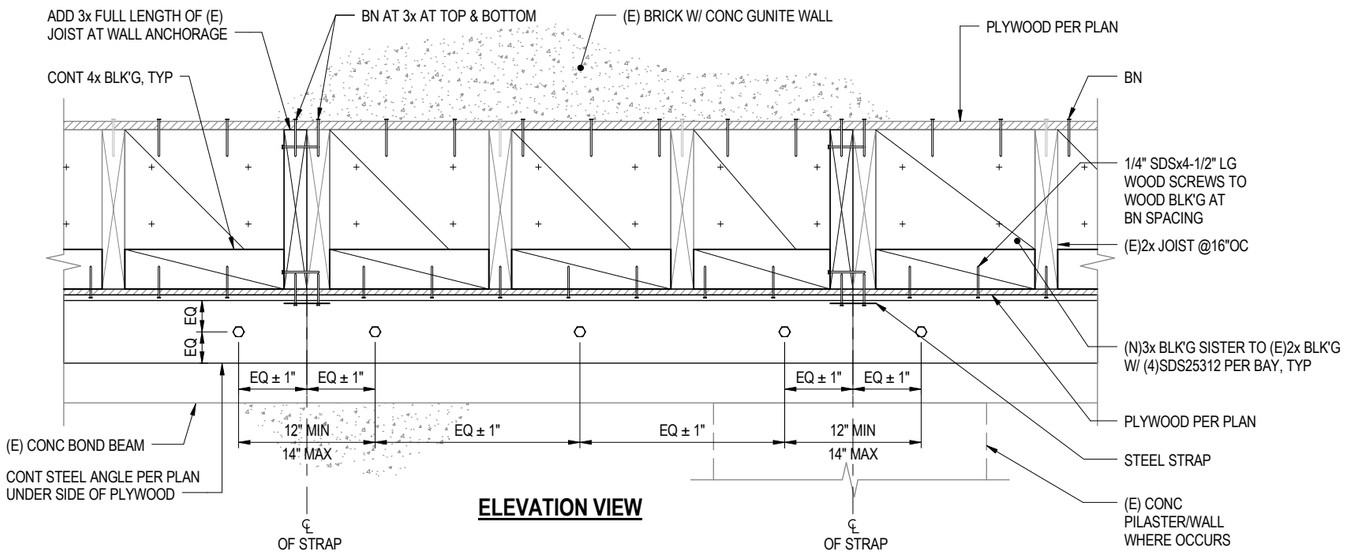
WOOD STRUCTURAL PANEL (WSP)

1. RUN LONG DIMENSION OF WSP PERPENDICULAR TO FRAMING MEMBERS.
2. NAILING SIZE AND SPACING AS NOTED ON PLAN.
3. NAILS SHALL HAVE A MINIMUM 3/8" EDGE DISTANCE.
4. LAY OUT JOISTS IN A 4 FOOT MODULE TO COINCIDE WITH WSP PATTERN.
5. USE FULLY BLOCK ALL PANEL EDGES PER DETAIL (A).
6. USE BOUNDARY NAILING AT FRAME & DRAG BEAMS.
7. PROVIDE EDGE NAILING TO INTERIOR BRACING SUPPORT.
8. WSP SHALL BE GRADE PER NIST PS1-07 AND SHALL BE INTERIOR TYPE SHEATHING C-D GRADE (STRUCT. I) WITH EXTERIOR GLUE.
9. EACH SHEET SHALL HAVE A MINIMUM AREA OF 8 SQUARE FEET WITH A
10. MINIMUM DIMENSION OF 2 FEET. PROVIDE FN AT (N)3x AT SISTERED JOIST
11. WHERE (E)2x OCCURS ONLY, (N)FN SHALL BE 3" CLEAR FROM (E) NAILING.
12. FASTENER PENETRATION IN FRAMING OR BLOCKING SHALL BE 1-1/2" MIN.

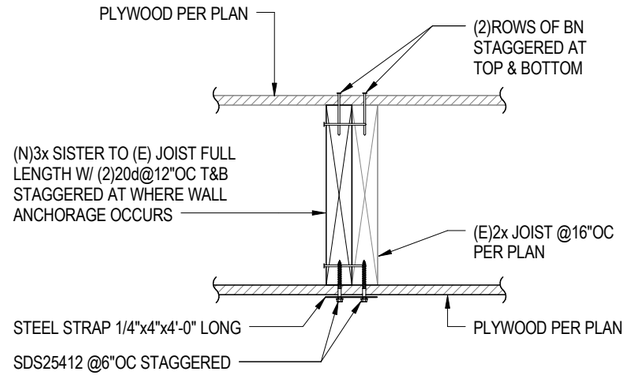
PLYWOOD DIAPHRAGM SCHEDULE

MARK (SEE KEY PLAN)	SHEAR CAPACITY (LB/FT)	WOOD PANEL THICKNESS	MIN NOMINAL WIDTH OF FRAMING MEMBER AT ADJOINING PANEL EDGES AND BOUNDARIES	LINES OF FASTENERS	NAILING (10d COMMON NAILS UNO)			REMARKS
					BN	EN	FN	
(1)	2624	15/32"	3x	1	2	3	12	REMOVE & REPLACE (E)FLOOR SHEATHING W/ (N)PLYWOOD T&B
(2)	1312	15/32"	3x	1	2	3	12	UNDERSIDE FLOOR CEILING JOIST
-								
-								

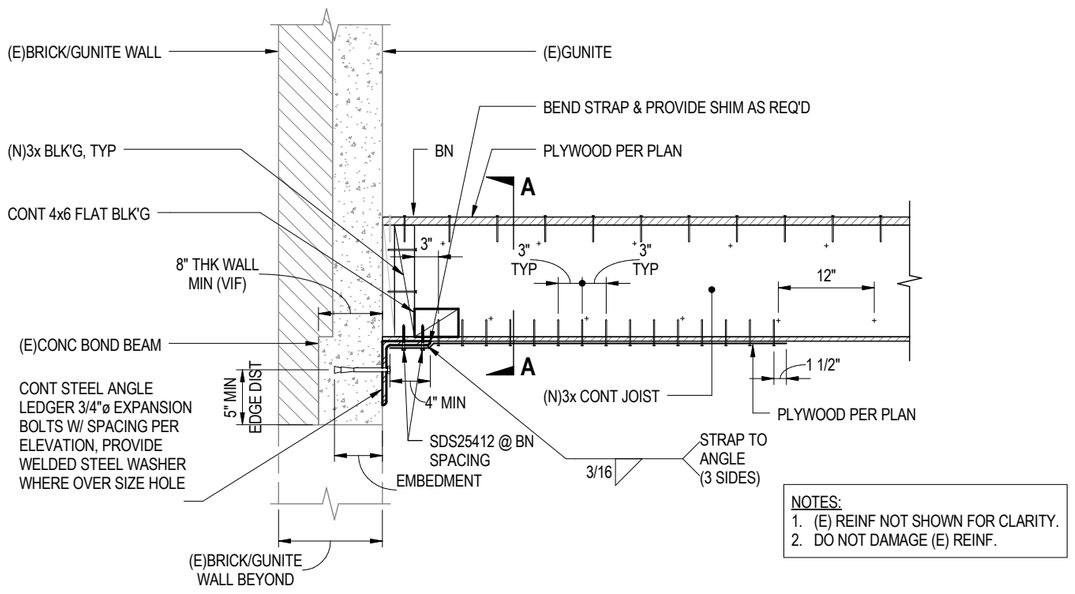
TYPICAL PLYWOOD DIAPHRAGM CONSTRUCTION DETAILS



ELEVATION VIEW

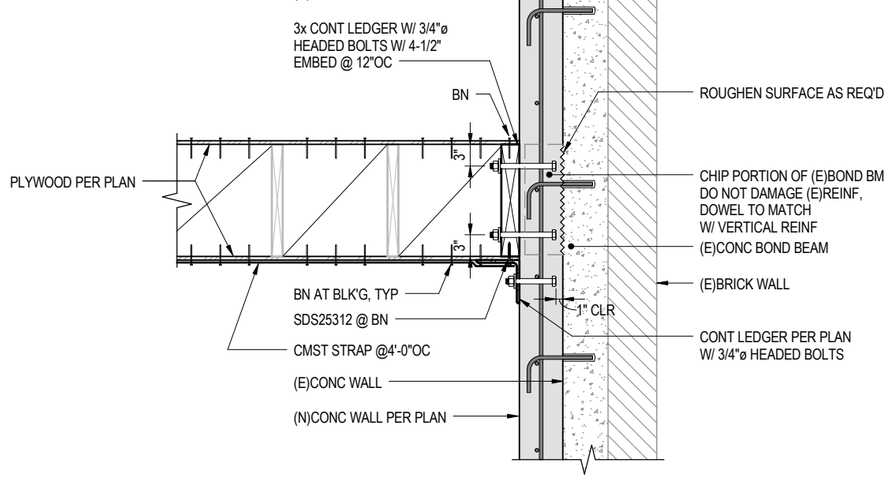


SECTION A-A

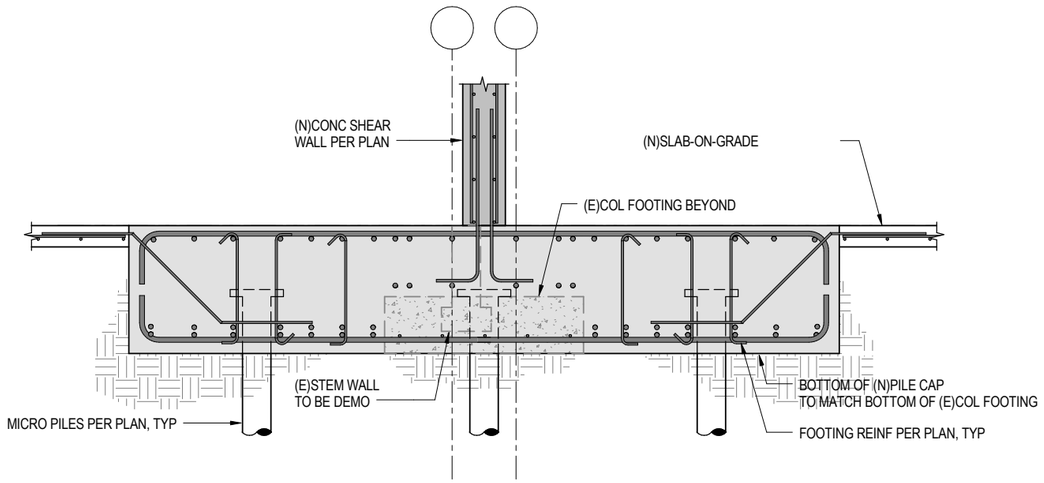


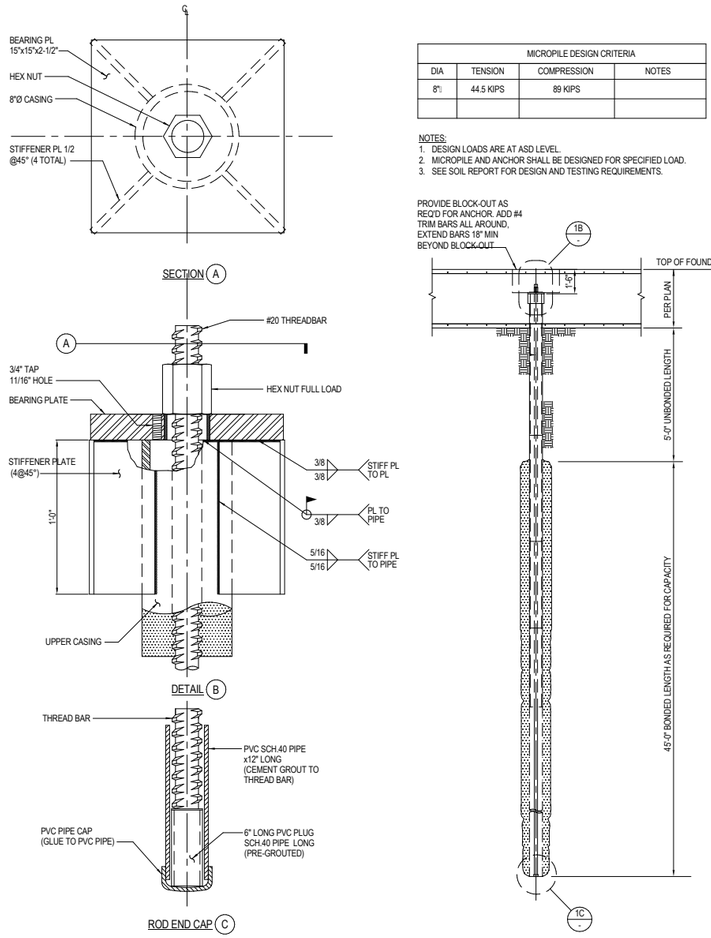
NOTES:
1. (E) REINF NOT SHOWN FOR CLARITY.
2. DO NOT DAMAGE (E) REINF.

JOIST PERPENDICULAR TO WALL ANCHORAGE RETROFIT DETAIL



JOIST PARALLEL TO WALL ANCHORAGE RETROFIT DETAIL





MICROPILE DESIGN CRITERIA			
DIA	TENSION	COMPRESSION	NOTES
8"	44.5 KIPS	89 KIPS	

NOTES:
1. DESIGN LOADS ARE AT ASD LEVEL.
2. MICROPILE AND ANCHOR SHALL BE DESIGNED FOR SPECIFIED LOAD.
3. SEE SOIL REPORT FOR DESIGN AND TESTING REQUIREMENTS.

TYPICAL ENLARGED FOUNDATION WITH MICRO-PILE

SCALE: NTS


DANGER


NO TOUCH