

MEMORANDUM

To:	Rob Hood	From:	Mike F. Coenen, P.E.
Company:	Oregon Department of Environmental Quality	Date:	December 15, 2023
Address:	700 NE Multnomah Street, Suite 600 Portland, OR 97232		
cc:	Heidi Nelson, Oregon Department of Environmental Quality Mike Romero, Oregon Department of Environmental Quality Rob Ries, Alamo Manhattan Donnie Reece, Alamo Manhattan Scott Cray, Alamo Manhattan Bradley Olmstead, Alamo Manhattan		
Project No.:	AlamoMan-6-06-03		
RE:	Response to Comments – Vapor Intrusion Mitigation System Design AM Blocks – Block 44 Southeast of Future Intersection of South River Parkway and South Abernethy Street Portland, Oregon DEQ ECSI File No. 6210		

INTRODUCTION

On behalf of AM/DRI Block 44, LLC, NV5 is pleased to submit this memorandum providing response to comments and revised vapor intrusion mitigation system (VIMS) design drawings for the AM Blocks – Block 44 project southeast of the future intersection of South River Parkway and South Abernethy Street in Portland, Oregon.

The Oregon Department of Environmental Quality (DEQ) provided comments to the VIMS design drawings in its letter dated May 18, 2023. Comments requiring revisions to the drawings were incorporated in the VIMS design drawings attached to this memorandum. Comments that warranted a written response are provided below. For completeness and clarity, each of DEQ's comments are stated below, followed by our response.

MEMORANDUM

GENERAL COMMENTS

DEQ COMMENT

Please provide a schedule for installation. DEQ requests a 3-day notification be provided for vent piping and liner application, and prior to pouring the slab to allow time for a site inspection of the installation.

RESPONSE

Construction is postponed until 2024. NV5 will update DEQ with a more definitive date when a schedule is available. DEQ will be notified at least three days before the installation of vent piping and liner application and before concrete slab is poured.

DEQ COMMENT

Please show and discuss how the vapor barrier will be completed around any elevator shaft(s) in the building, if any are constructed.

RESPONSE

The low-permeable membrane will be installed under the residential units only. Elevators are not located near the residential units. Therefore, low-permeable membranes under the elevators are not part of the VIMS design.

SHEET-SPECIFIC COMMENTS

DEQ COMMENT

Sheet H0.00 – General Note 3 and 4. The system is designed for radon and is also robust enough (60-mil liner with vent piping) for VOCs and DEQ concurs with the approach to the mitigation system; however, DEQ will require a submittal to review the actual liner material selected to meet the spec listed in the plan. In addition to the Engineer's approval, as noted on this Sheet, please note that any changes to the material would also require additional DEQ review for approval.

RESPONSE

Notes 3 and 4 on Sheet H0.00 have been updated to reflect that DEQ review and approval will be needed for the selected low-permeable membrane. When the specific product for the low-permeable membrane is selected, a submittal of the proposed low-permeable membrane will be provided to DEQ for review and approval.

DEQ COMMENT

Sheet H3.01N/H3.01S - In general, the vent piping is currently just a linear pipe that is run through the center, and in some areas of the building and appears to achieve coverage below the entire slab

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area for the residential units. What is the assumed distance of influence of the vent piping? Please verify that additional laterals are not necessary to achieve venting coverage across the entire area of the slab.

RESPONSE

NV5 designed the sub-slab venting system based on the 2019 State of Oregon Structural Specialty Code (SOSSC) Section 1812, Radon Control Methods – Group R-2 and R-3 Occupancies, specifically Section 1812.2.5, Passive Subslab Depressurization System (Basement or Slab-On-Grade), and Section 1812.2.6, Subslab Soil Exhaust System Ducts (SSESD). Section 1812.2.5 requires sub-slab exhaust systems to comply with Section 1812.2.6. Section 1812.2.6 requires one SSESD (i.e., vent riser) for every 2,000 square feet of building sub-slab area. The number of vent risers meets this requirement. Calculations are shown on Sheets H3.01N and H3.01S. SOSSC 1812 does not require sub-slab vent piping.

However, the VIMS design includes sub-slab vent piping connected to the vent risers that allows increased sub-slab coverage for the vent risers and redundancy in the design. Additionally, NV5 based our VIMS design using the requirements in the Los Angeles Department of Building and Safety (LADBS) Methane Hazard Mitigation Standard Plan. We recognize these requirements may not be applicable in Oregon. However, they provide a sufficient basis for design and have been used to design several methane mitigation systems in Oregon under DEQ oversight.

Methane hazards are significantly greater than vapor intrusion hazards posed by volatile organic compounds (VOCs). Considering these risks, it is our opinion that the conservative nature of the LADBS methane standards is protective when used for VIMS designs. According to the LADBS methane standards, sub-slab vent pipe spacing for a 3-inch-diameter vent riser can be up to 75 feet. As discussed with DEQ, the VIMS is only needed under the residential units of the building. The widths of the residential units range between approximately 28 to 35 feet. Based on this, the single sub-slab vent pipe provides more than sufficient coverage under the LADBS methane standard. Considering the VIMS design meets the requirements of SOSSC 1812 and LADBS methane standards, the vent spacing as designed is sufficient and additional laterals are not warranted.

DEQ COMMENT

Sheet H3.05N/H3.05S – Please provide a distinct label for each of the vent risers. (Sheet H3.05N). The vent pipe located in the SE corner is stubbed up in an area that is labeled “Outdoor Amenity”. Note 1 on Sheet H5.01 accurately indicates vent risers shall not terminate within 10 feet of vent intakes or windows; however, this vent appears to daylight in an open use area. Please provide comment, and/or relocate the vent riser. Please also check the riser located in the NE that appears to terminate in an area with the same hatch as the southern outdoor amenity.

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RESPONSE

Distinct labels were added to Sheets H3.05N and H3.05S. Vent risers were relocated to maintain clearances. Also note that the three 3-inch-diameter vent risers from the residential units on the north side of the building and the three 3-inch-diameter vent risers from the residential units on the east side of the building will be combined into two 6-inch-diameter vent risers after daylighting from the sub-slab. The cross-sectional area of the 6-inch-diameter vent riser (approximately 28 square inches) is greater than the combined cross-sectional area of the three 3-inch-diameter vent risers (approximately 21 square inches). Therefore, flow parameters through the vent risers will be maintained.

DEQ COMMENT

Sheet H5.01 –

1. Please add a note to this sheet that indicates any changes to membrane liner/vent piping are subject to DEQ review for approval.
2. Detail 6. The termination for the vent riser needs to include a vented cover to prevent rainfall from entering these lines.

RESPONSE

1. A note was added to Detail 1, Sheet H5.01.
2. Detail 6 was modified to show a “candy cane” termination configuration to help prevent rainfall from entering the lines.

Please contact Mike Coenen at (503) 726-3143 or mike.coenen@NV5.com if you have questions or comments regarding this submittal.

MFC:sn

Attachment

One copy submitted

Document ID: AlamoMan-6-06-03-121523-envm.docx

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ATTACHMENT

AM BLOCKS - BLOCK 44

SOUTHEAST OF FUTURE INTERSECTION OF SOUTH RIVER PARKWAY AND SOUTH ABERNETHY STREET,
PORTLAND, OREGON

VAPOR INTRUSION/RADON MITIGATION SYSTEM

SHEET INDEX DRAWING NUMBER

DRAWING NUMBER	SHEET TITLE
H0.00	VICINITY MAP, GENERAL NOTES, AND SHEET INDEX
H2.01N	LOW-PERMEABLE MEMBRANE - NORTH
H2.01S	LOW-PERMEABLE MEMBRANE - SOUTH
H3.01N	SUB-SLAB VENTING - NORTH
H3.01S	SUB-SLAB VENTING - SOUTH
H3.05N	LEVEL 5 - NORTH VAPOR INTRUSION/RADON SYSTEM ROOF PLAN
H3.05S	LEVEL 5 - SOUTH VAPOR INTRUSION/RADON SYSTEM ROOF PLAN
H5.01	DETAILS

EXPLANATION:

REFERENCE NUMBER OF DRAWING WHERE DETAIL IS SHOWN/TAKEN

DETAIL NUMBER OR SECTION LETTER



GENERAL NOTES

- ALL WORK SHALL COMPLY WITH CURRENT AND APPLICABLE BUILDING CODES, PARTICULARLY 2019 SSSC CHAPTER 18, SECTION 1812.
- VAPOR INTRUSION/RADON MITIGATION SYSTEM ELEMENTS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS' INSTRUCTIONS.
- LOW-PERMEABLE MEMBRANE SHALL BE A MINIMUM 60-MIL-THICK HIGH DENSITY POLYETHYLENE FLEXIBLE SHEETING, 60-MIL-THICK SPRAY-APPLIED MEMBRANE, OR DEQ/ENGINEER-APPROVED EQUIVALENT. LOW-PERMEABLE MEMBRANE SHALL BE PLACED ON TOP OF GRAVEL BLANKET BEFORE THE CONCRETE SLAB IS PLACED. THE LOW-PERMEABLE MEMBRANE SHALL COVER THE ENTIRE FLOOR AREA OF THE RESIDENTIAL OCCUPANCIES AND SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS' INSTRUCTIONS. PUNCTURES AND TEARS SHALL BE REPAIRED PRIOR TO COVERING.
- LIQUID BOOT GCOVENT OR DEQ/ENGINEER-APPROVED EQUIVALENT SHALL BE CONNECTED TO VERTICAL VENTILATION RISER. THE VERTICAL VENTILATION RISER SHALL BE 3 INCHES IN DIAMETER, SCHEDULE 40 PVC DRAIN/WASTE/VENT (DWV) PIPE. VENTILATION RISER PIPE SHALL BE PROTECTED WITH NAIL-GUARDED STUDS WHERE APPLICABLE.
- ANY CHANGES TO THE SELECTED LOW-PERMEABLE MEMBRANE, SUB-SLAB VENT PIPE, OR VENT RISER MATERIALS ARE SUBJECT TO ADDITIONAL DEQ REVIEW PRIOR TO APPROVAL.
- VENTILATION RISERS SHALL BE CLEARLY MARKED TO INDICATE THAT THE PIPE MAY CONTAIN VOLATILE ORGANIC VAPORS OR RADON GAS. PIPES SHALL BE MARKED 6 INCHES BELOW THEIR TERMINATION POINTS AND AT 5-FOOT INTERVALS ALONG THE REMAINDER OF THE VENTILATION RISERS. THIS INCLUDES SECTIONS ENCASED WITHIN THE WALLS OR OTHER ENCLOSURES. THE IDENTIFIER SHOULD INCLUDE THE WORDS "VOLATILE ORGANIC VAPOR/RADON REDUCTION SYSTEM HAZARDOUS GAS VENT PIPE." THE PLACARD SIGN SHALL BE 3 INCHES HIGH BY 4 INCHES WIDE WITH 1/4-INCH-HIGH BLACK LETTERS ON WHITE BACKGROUND AND BE PLASTIC WITH ADHESIVE BACKING, UNLESS OTHERWISE SPECIFIED BY ENGINEER.
- VENT RISERS WITH HORIZONTAL RUNS SHALL NOT BE TRAPPED AND SHALL HAVE A SLOPE OF NOT LESS THAN 1 PERCENT TO ALLOW DRAINAGE DOWNWARD TO THE GROUND BENEATH THE SLAB.
- ALL UNDERGROUND ELECTRICAL, PLUMBING, AND SIMILAR CONDUITS PENETRATING THE LOW-PERMEABLE MEMBRANE SHALL BE SEALED WITH A BOOT AS SHOWN ON DETAIL 2, SHEET H5.01.
- SUB-SLAB VENT THAT PASSES THROUGH A FOOTING OR GRADE BEAM SHALL BE PROVIDED WITH A SLEEVE AS SHOWN ON DETAIL 7, SHEET H5.01 AND STRUCTURAL DRAWINGS.
- CONTROL JOINTS, ISOLATION JOINTS, CONSTRUCTION JOINTS, AND ANY OTHER JOINT IN CONCRETE SLABS OR BETWEEN SLABS AND FOUNDATION WALLS SHALL BE SEALED WITH A CAULK OR SEALANT. GAPS AND JOINTS SHALL BE CLEARED OF LOOSE MATERIAL AND FILLED WITH POLYURETHANE CAULK OR OTHER ELASTOMERIC SEALANT APPLIED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
- ALL SHOWER OR TUB BOXES MUST BE SET ABOVE THE LOW-PERMEABLE MEMBRANE. IF NECESSARY, OVER-EXCAVATE SOIL BENEATH BOXES TO PROVIDE NECESSARY CLEARANCE FOR THE LOW-PERMEABLE MEMBRANE.
- CONTRACTOR SHALL VERIFY EXACT LOCATION AND TYPE OF CONSTRUCTION AT EACH VENT RISER. RISERS MUST AVOID WINDOWS AND MUST NOT BE INSTALLED WHERE STRUCTURAL MEMBERS PROHIBIT. HORIZONTAL RUNS, SLOPING, AND ANCHORING SHALL COMPLY WITH APPLICABLE CODES.
- SUMP PITS OPEN TO SOIL OR SERVING AS A TERMINATION POINT FOR SUB-SLAB OR EXTERIOR DRAIN LOOPS SHALL BE COVERED WITH A GASKETED OR OTHERWISE SEALED LID. SUMPS USED AS THE SUCTION POINT IN A SUB-SLAB DEPRESSURIZATION SYSTEM SHALL HAVE A LID DESIGNED TO ACCOMMODATE THE VENT PIPE. SUMPS USED AS A FLOOR DRAIN SHALL HAVE A LID EQUIPPED WITH A TRAPPED INLET.
- CONCRETE FORMING, PLACEMENT, AND FINISHING SHALL BE CONDUCTED SO AS TO MAINTAIN THE INTEGRITY OF THE LOW-PERMEABLE MEMBRANE. INTERNAL FORM STAKING SHALL BE COMPOSED OF STEEL AND SHALL BE BELOW THE SURFACE OF THE FINISHED CONCRETE. REPAIR SLAB AS NECESSARY WITH NON-SHRINK GROUT. UNDER NO CIRCUMSTANCES SHALL THE LOW-PERMEABLE MEMBRANE BE PENETRATED WITH FINISHING APPARATUS DURING CONCRETE PLACEMENT. IF THE LOW-PERMEABLE MEMBRANE IS DAMAGED, CONTRACTOR'S WORK SHALL DISCONTINUE UNTIL THE APPROPRIATE REPAIRS TO THE LOW-PERMEABLE MEMBRANE ARE MADE. REINFORCING STEEL, PIPING, FORMS, ETC. SHALL NOT BE SUPPORTED DIRECTLY ON THE LOW-PERMEABLE MEMBRANE AND EQUIPMENT SHALL NOT BE DRIVEN OVER THE LOW-PERMEABLE MEMBRANE.
- A QUALIFIED PROFESSIONAL KNOWLEDGEABLE IN THE INSTALLATION OF VAPOR INTRUSION/RADON MITIGATION SYSTEMS SHALL BE PRESENT DURING CONSTRUCTION AND TESTING OF THE LOW-PERMEABLE MEMBRANE AND VENTING SYSTEM FOR THIS PROJECT. THE QUALIFIED PROFESSIONAL SHALL OBSERVE AND DOCUMENT THE DESIGN ELEMENTS AS DESCRIBED HEREIN WERE INSTALLED IN ACCORDANCE WITH THE DRAWINGS AND SPECIFICATIONS.
- COPIES OF THIS PLAN SET SHALL BE DISTRIBUTED TO AND RECEIVED BY CONCRETE, ELECTRIC, PLUMBING, AND MECHANICAL CONTRACTORS AT A MINIMUM.

AM BLOCKS - BLOCK 44

39XX S RIVER PKWY

PORTLAND, OR 97239

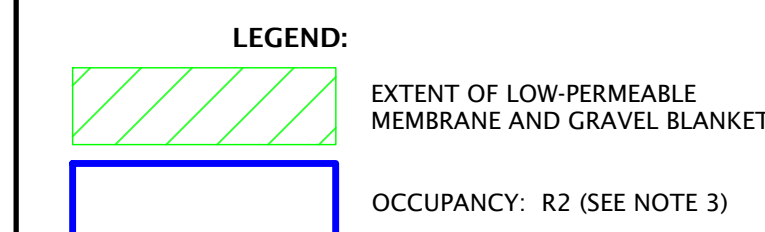
AM/D/B BLOCK 44, LLC
3012 FARMGROVE STREET, SUITE 100
DALLAS, TEXAS 75201

DRAWING ISSUE / REVISION
DESCRIPTION DATE
DEQ COMMENT SET 12/08/2023



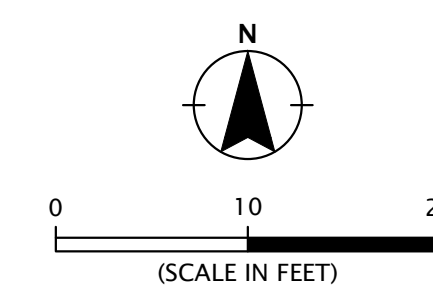
VICINITY MAP,
GENERAL NOTES,
AND SHEET INDEX

H0.00



NOTES

1. THE LOW-PERMEABLE MEMBRANE SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
2. THE GRAVEL BLANKET SHALL BE A MINIMUM OF 4 INCHES THICK EVENLY PLACED UNDER THE ENTIRE FLOOR SLAB OF THE RESIDENTIAL OCCUPANCIES. STRUCTURES ARE NOT TO INTRODUCE ANY FINE MATERIAL. IF MATERIAL WITH EXCESSIVE FINES AND COMPACTION OF AGGREGATE IS REQUIRED FOR FOUNDATION OR OTHER CODE CONSIDERATIONS, A GEOTECHNICAL FABRIC OR AN ADDITIONAL REINFORCED VAPOR RETARDER MAY BE PLACED BENEATH THE AGGREGATE.
3. OCCUPANCY GROUP R2 LOCATIONS SHOWN. REMAINDER OF LEVEL 1 COMPLETES CODE REQUIREMENTS FOR GROUP R2, R3, R4, R5, R6, R7, R8, R9, R10, R11, R12, R13, R14, R15, R16, R17, R18, R19, R20, R21, R22, R23, R24, R25, R26, R27, R28, R29, R30, R31, R32, R33, R34, R35, R36, R37, R38, R39, R40, R41, R42, R43, R44, R45, R46, R47, R48, R49, R50, R51, R52. REFERENCE ARCHITECTURAL SHEET A0.21 FOR OCCUPANCY GROUPS



AM BLOCKS - BLOCK 44
39XX S RIVER PKWY
PORTLAND, OR 97239AM/DR BLOCK 44, LLC
3012 FARMOUNT STREET, SUITE 100
DALLAS, TEXAS 75201DRAWING ISSUE / REVISION:
DESCRIPTION DATE
DEG COMMENT SET 12/08/2023LOW-PERMEABLE
MEMBRANE -
SOUTH

H2.01S

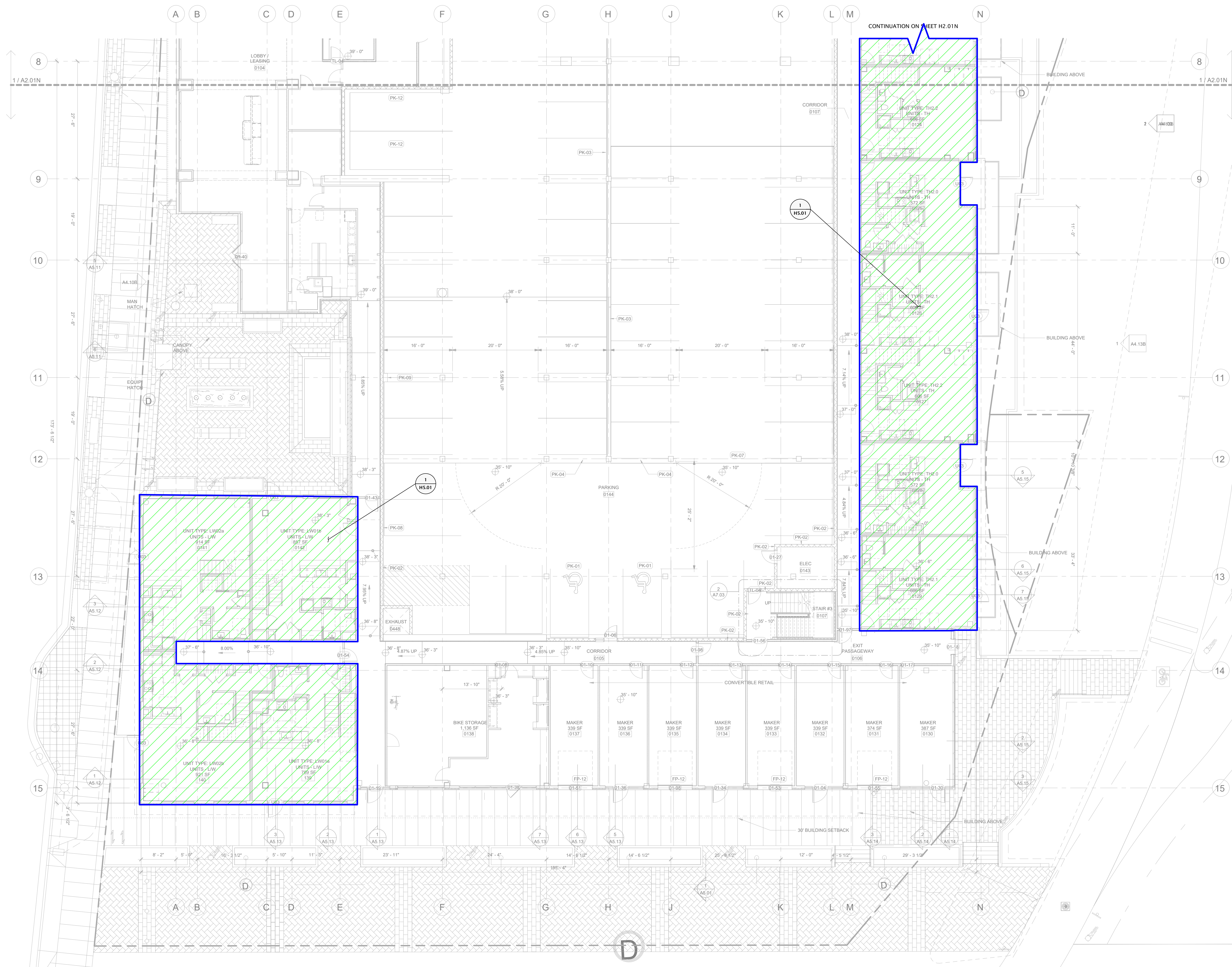
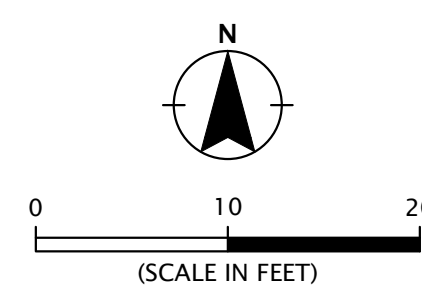
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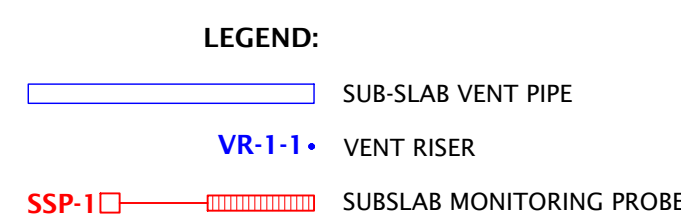
EXTENT OF LOW-PERMEABLE MEMBRANE AND GRAVEL BLANKET

OCCUPANCY: R2 (SEE NOTE 3)

NOTES

1. THE LOW-PERMEABLE MEMBRANE SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
2. THE GRAVEL BLANKET SHALL BE A MINIMUM OF 4 INCHES THICK EVENLY PLACED UNDER THE ENTIRE FLOOR SLAB OF THE RESIDENTIAL OCCUPANCIES, TAKING CARE NOT TO INTRODUCE ANY FINE MATERIAL. IF MATERIAL WITH EXCESSIVE FINES AND COMPACTION OF AGGREGATE IS REQUIRED FOR STRUCTURAL OR OTHER CODE CONSIDERATIONS, A GEOTEXTILE FABRIC OR AN ADDITIONAL REINFORCED VAPOR RETARDER MAY BE PLACED BENEATH THE AGGREGATE.
3. OCCUPANCY GROUP R2 LOCATIONS SHOWN. REMAINDER OF LEVEL 1 COMPRISES OCCUPANCY GROUPS B, M, AND S2. REFERENCE ARCHITECTURAL SHEET A0.21 FOR OCCUPANCY GROUPS.





- ## NOTES
1. BUILDING LOCATED IN A MODERATE RADON RISK ZONE ACCORDING TO THE OREGON HEALTH AUTHORITY. AVERAGE RADON CONCENTRATION IN THE AREA IS 1.5-3 PICOCURI PER LITER, WHICH IS LESS THAN THE U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA) RECOMMENDED CONCENTRATION FOR RADON MITIGATION OF 4.0 PICOCURI PER LITER. THE RADON SYSTEM WAS INSTALLED TO MEET THE REQUIREMENTS OF 50 USC 1812 AND WILL OPERATE AS A PASSIVE SYSTEM, UNLESS RADON TESTING INDICATES THE SYSTEM MUST BE ACTIVATED.
 2. 3-INCH DIAMETER VENT RISERS VR-1 THROUGH VR-1.3 AND VR-2.1 THROUGH VR-2.3 SHALL BE ROUTED TO SINGLE 6-INCH DIAMETER VENT RISERS TERMINATING AT LOCATIONS SHOWN ON SHEETS HS-100 AND HS-055. COORDINATE VENT RISER ROUTING WITH ARCHITECT.

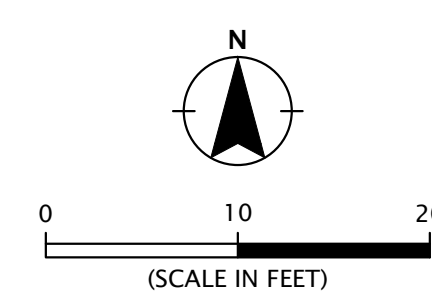
VENT RISER CALCULATION:

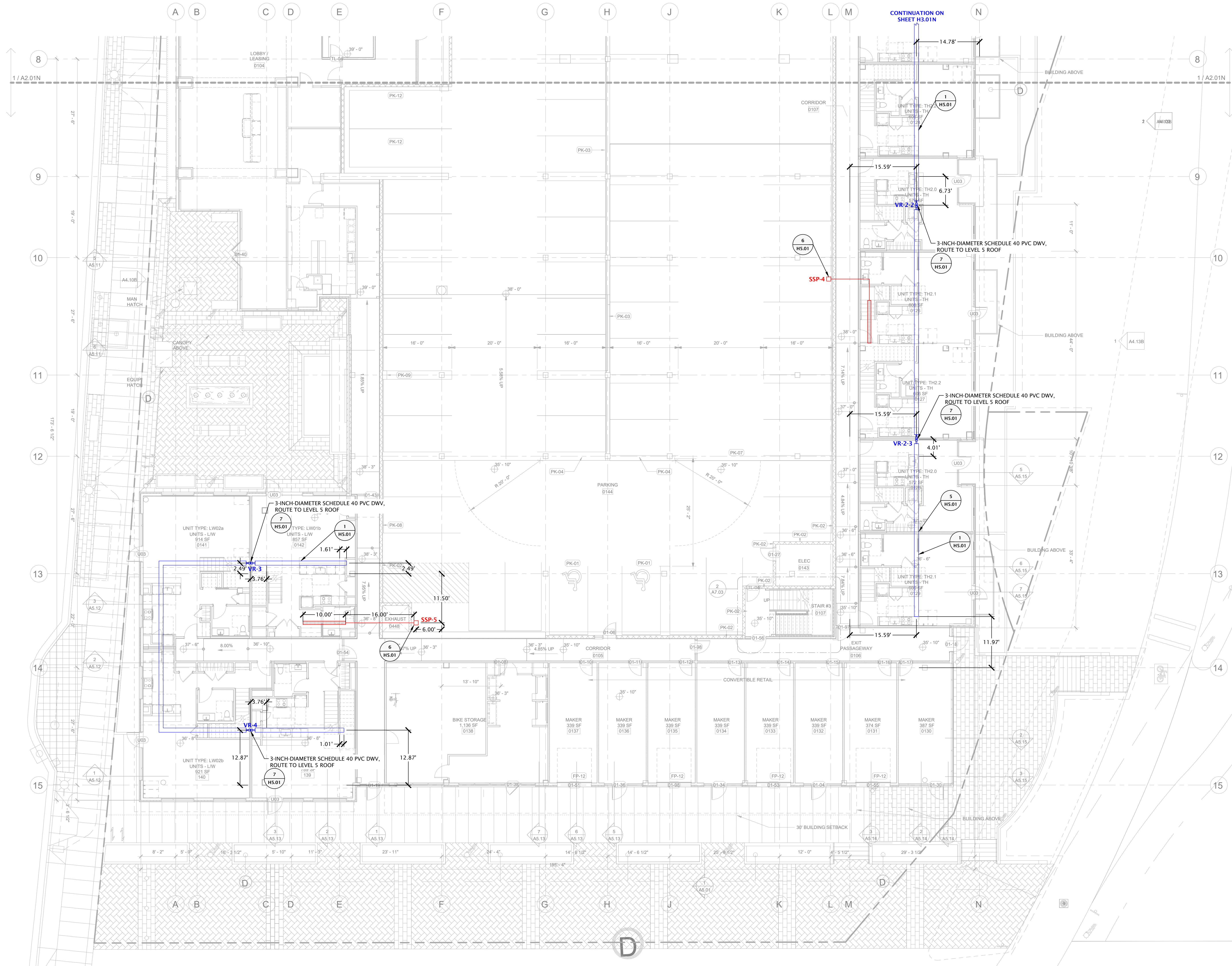
SOSSC 1812.2.6 REQUIRES 1 VENT RISER PER 2,000 SQUARE FEET (SF) OF BUILDING SUB-SLAB WITH R2 OCCUPANCY.

AREA OF BUILDING SUB-SLAB WITH R2 OCCUPANCY

AREA OF BUILDING SUB-SLAB WITH R2 OCCUPANCY
UNITS 0114 TO 0120
TOTAL AREA = 5,137 SF/2,000 SF PER VENT RISER = 2.6
NUMBER OF VENT RISERS PROVIDED: 3

UNITS 0121 TO 0129
TOTAL AREA = 5,318 SF/2,000 SF PER VENT RISER = 2.7
NUMBER OF VENT RISERS PROVIDED: 3

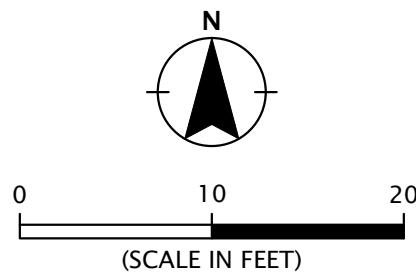


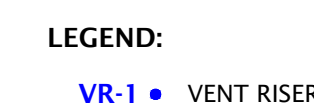


LEGEND:
SUB-SLAB VENT PIPE
VR-2-2 - VENT RISER
SSP-4 - SUBSLAB MONITORING PROBE

- NOTES
- BUILDING LOCATED IN A MODERATE RADON RISK ZONE ACCORDING TO THE OREGON HEALTH AUTHORITY. AVERAGE RADON CONCENTRATION IN THE AREA IS 1.9 PICOCURIES PER LITER, WHICH IS LESS THAN THE EPA RECOMMENDED CONCENTRATION FOR RADON MITIGATION OF 4.0 PICOCURIES PER LITER. THE RADON SYSTEM WAS INSTALLED TO MEET THE REQUIREMENTS OF 50SSC 181.2 AND WILL OPERATE AS A PASSIVE SYSTEM, UNLESS RADON TESTING INDICATES THE SYSTEM MUST BE ACTIVATED.
 - 3-INCH-DIAMETER VENT RISERS VR-1-1 THROUGH VR-1-3 AND VR-2-1 THROUGH VR-2-3 SHALL BE ROUTED TO SINGLE 6-INCH-DIAMETER VENT RISERS TERMINATING AT LOCATIONS SHOWN ON SHEETS H3.05N AND H3.05S. COORDINATE VENT RISER ROUTING WITH ARCHITECT.

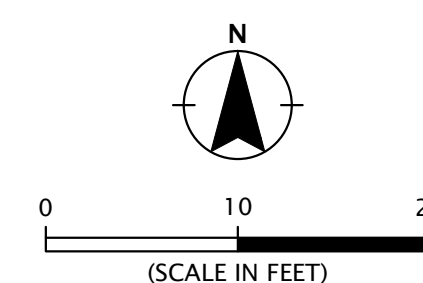
VENT RISER CALCULATION:
OSSC 181.2.2.6 REQUIRES 1 VENT RISER PER 2,000 SF OF BUILDING SUB-SLAB WITH R2 OCCUPANCY
AREA OF BUILDING SUB-SLAB WITH R2 OCCUPANCY
UNITS 01-21 TO 01-29
TOTAL AREA = 5,318 SF/2,000 SF PER VENT RISER = 2.7
NUMBER OF VENT RISERS PROVIDED: 3
UNITS 01-30 TO 01-42
TOTAL AREA = 3,481 SF/2,000 SF PER VENT RISER = 1.7
NUMBER OF VENT RISERS PROVIDED: 2

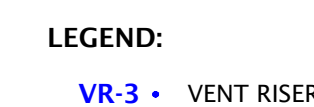




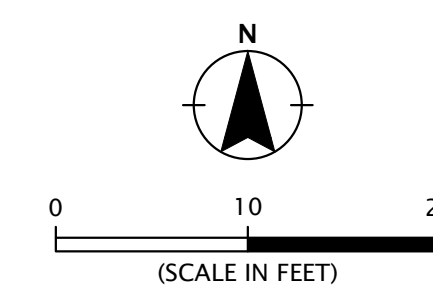
NOTES

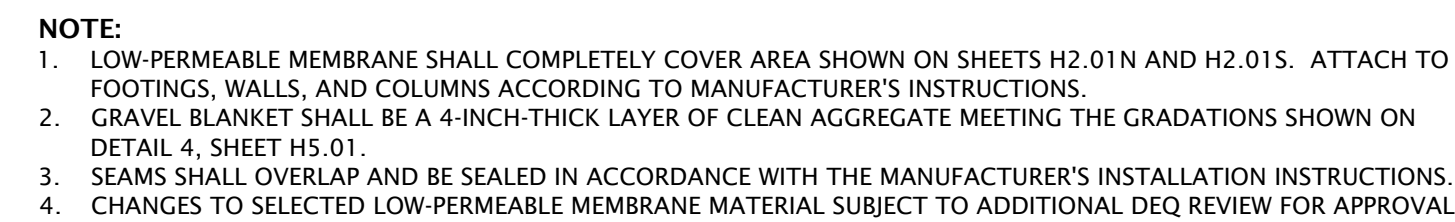
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2. 3-INCH-DIAMETER VENT RISERS VR-1 THROUGH VR-13 AND VR-2 THROUGH VR-23 SHALL BE ROUTED TO SINGLE 6-INCH-DIAMETER VENT RISERS TERMINATING AT LOCATIONS SHOWN ON SHEETS H3.05N AND H3.05S. COORDINATE VENT RISER ROUTING WITH ARCHITECT.





1. BUILDING LOCATED IN A MODERATE RADON RISK ZONE ACCORDING TO THE OREGON HEALTH AUTHORITY. AVERAGE RADON CONCENTRATION IN THE AREA IS 1.9 PICOCURIES PER LITER, WHICH IS LESS THAN THE EPA-RECOMMENDED CONCENTRATION FOR RADON MITIGATION OF 4.0 PICOCURIES PER LITER. THE RADON SYSTEM WAS INSTALLED TO MEET THE REQUIREMENTS OF SOSC 1812 AND WILL OPERATE AS A PASSIVE SYSTEM, UNLESS RADON TESTING INDICATES THE SYSTEM MUST BE ACTIVATED.
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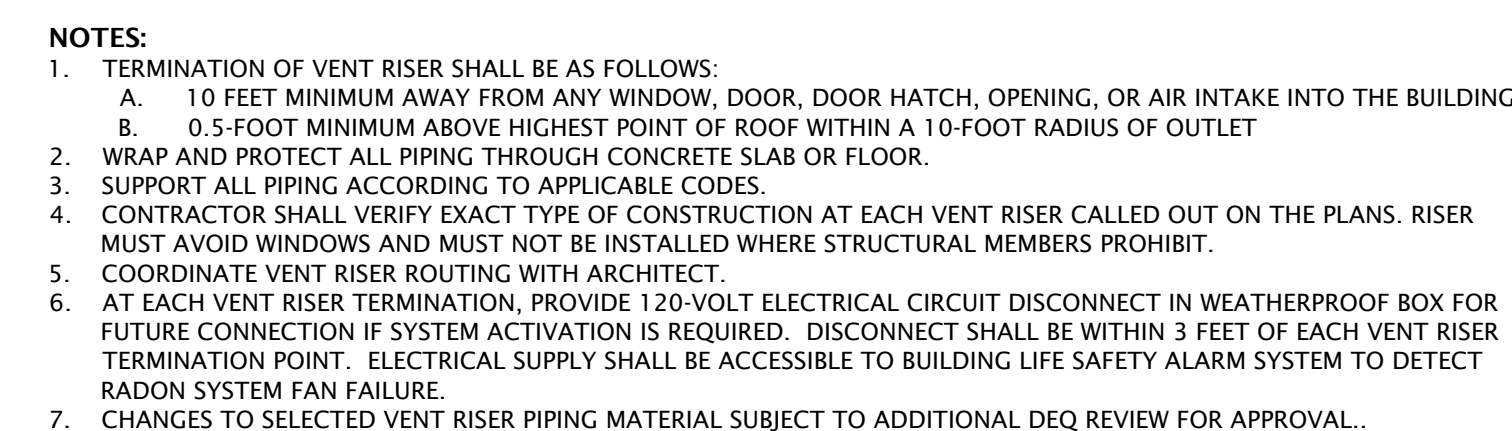


1 TYPICAL LOW-PERMEABLE MEMBRANE AND VENT PIPE DETAIL
H5.01 NOT TO SCALE

4 SPECIFICATIONS FOR GRAVEL BLANKET
H5.01 NOT TO SCALE



5 TYPICAL STEP IN SLAB-ON-GRADE DETAILS
H5.01 NOT TO SCALE



7 TYPICAL VERTICAL VENT RISER
H5.01 NOT TO SCALE