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Portland, ME 04101
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# DESIGN MEMO

Date: June 13, 2022

To: Old Belfast Bank LLC
c/o Earl MacKenzie, Manager
PO Box 41, Islesboro, ME 04848

From: Jaime Madore, P.E. and Peter Sherr, P.E., Ransom Consulting, LLC (Ransom)

Cc: Sarah Mazerolle, Ransom

Subject: Design Summary - Proposed Vapor Barrier and Vapor Mitigation System
126 Church Street
Belfast, Waldo County, Maine
Ransom Project 111.06134.306

## INTRODUCTION AND BACKGROUND

On behalf of Old Belfast Bank LLC, Ransom has prepared this basis of design memorandum summarizing the basic design components of the sub-slab vapor mitigation system (VMS) to be installed at the proposed residential development located at 126 Church Street in Belfast, Waldo County, Maine (the "Site" or "Subject Property").

Environmental investigations of the Site have identified volatile organic compound (VOC) impacts to soil and soil vapor including tetrachloroethene (PCE) and trichloroethene (TCE) at the Site in excess of applicable Maine Department of Environmental Protection (MEDEP) Remedial Action Guidelines (RAGs). The Stie has been submitted and accepted to the MEDEP Voluntary Response Action Program (VRAP) and the MEDEP has issued a VRAP No Action Assurance (NAA) Letter on March 11, 2022, for the Site. In addition, on December 29, 2021, the MEDEP issued a Conditional Acknowledgment Letter for Hazardous Waste Generator Closure Certification under the Resource Conservation and Recovery Act (RCRA). As a condition and requirement of the MEDEP's VRAP NAA Letter and RCRA Conditional Acknowledgement Letter, to mitigate potential vapor intrusion of volatile contaminants into the proposed Site building, Old Belfast Bank, LLC will install a sub-slab VMS consisting of a vapor barrier and venting system beneath the new proposed building.

This basis of design memorandum includes a narrative description and summary of the proposed VMS design, along with the following:

1. A VMS layout plan along with proposed vapor monitoring point locations (Figures 1a-d).
2. A detail plan with notes and additional system specifications (Figure 2); and

3. Manufacturer's specifications for STEGO® Wrap rolled membrane Vapor Barrier or approved equals, turbine ventilator chimney cap (Empire Ventilation Equipment Co.), Vapor Pin® sub-slab vapor monitoring/sampling point with Tygon® brand 2375 Ultra Chemical Resistant Tubing; a Spears® 4 -inch polyvinyl chloride (PVC) Butterfly valve, and schedule 40 machine-slotted (0.020-inch) PVC pipe, Quikrete® or approved equal.

The design also includes the layout for vertical pipe penetrations through the floor slab and provisions for internal vertical and horizontal piping runs from foundation penetrations to roof penetrations, as necessary, to provide design flexibility in meeting specified clearances from roof intakes, parapet walls, and/or interior obstructions.

## PROPOSED VAPOR MITIGATION SYSTEMS

Ransom proposes the installation of a "passive" sub-slab vapor mitigation/depressurization system consisting of vapor extraction (VE) piping, washed ¾-inch crushed-stone pipe bedding and venting layer, a vapor monitoring point, and a sub-slab vapor barrier. A site plan showing the general piping layout with VE piping and proposed sub-slab vapor monitoring points is attached as Figure 1a, the proposed locations of riser pipes up through the first and second floors and discharge locations on the roof level of the proposed building are shown on Figures 1b to 1d, and detail plans showing piping and vapor retardant barrier details, notes, and system specifications is attached as Figure 2. The final pipes, roof penetration, and vapor monitoring point locations shall be field determined by the engineer (Ransom), owner, architect, and the selected building contractor/plumber, based on final architectural plans, building layout, and/or field conditions.

Three horizontal sub-slab VE points composed of 4-inch-diameter, slotted (0.020-inch), Schedule 40 PVC pipe (or approved equal) with a threaded cap at one end, shall be spaced beneath the building from north to south, five feet from the front foundation wall. The horizontal sub-slab VE points will be split between two risers that will come up through the foundation in the same location. The first two horizontal sub-slab VE points will be on the west side of the building under the first unit where most of the contaminated is concentrated. The third sub-slab VE point will run at a 45-degree angle parallel with the eastern outside wall of the foundation down the middle of the second unit. See Figure 1a for the proposed sub-slab VE point locations. The top of the horizontal pipes shall be installed approximately 3 inches below the bottom of the proposed floor slab and shall be bedded in approximately 3 inches of washed ¾-inch crushed stone adjacent to, above, and below the pipes. See Figures 2 for sub-slab VE point construction details and notes.

In addition, to encourage sub-slab vapor movement and collection by the VE points, a minimum of 6 inches of washed ¾-inch crushed stone shall also be placed below the vapor barrier and floor slab, across the entire area of the slab.

Solid, 4-inch-diameter Schedule 40 PVC horizontal extraction pipes shall connect to the slotted VE pipes. The horizontal extraction pipes shall run below the slab and vapor retardant barrier and connect, below-grade, to a 4-inch-diameter Schedule 40 PVC header/riser pipe. The sub-slab horizontal piping runs should be sloped a minimum of $^{1}/_{64}$-inch per linear foot towards the slotted VE points to facilitate drainage back into the ground of condensation or precipitation, which may collect within the piping system. It is anticipated that the horizontal sub-slab extraction pipes would be installed after the foundation footings were installed. The VMS piping would be backfilled with crushed stone (as specified above).

To retard vapors from entering the buildings a rolled sub-slab vapor barrier, such as STEGO® Wrap 15 - mil as manufactured by Stego Industries LLC, or approved equal, shall be utilized. STEGO® Wrap, or approved equal, shall be utilized beneath the entire building. The vapor barrier shall have a minimum thickness of 15 mil, shall extend up the interior of perimeter foundation and footing walls a minimum of 3 inches, and shall be sealed to the walls, utility slab penetrations, and footings using STEGOCrawl® Tape, or approved equal, in accordance with the manufacturer's recommendations. Sheets shall overlap a minimum of 6 inches and shall be sealed. Once installed, the vapor barrier membrane should be protected from holes and other damage prior to the installation of the concrete floor slab. Prior to pouring of the concrete floor slab, the vapor barrier shall be inspected, and any holes, tears, or other damage shall be properly patched and/or repaired in accordance with the manufacturer's recommendations. See Figure 2 for sub-slab 15 mil rolled membrane vapor barrier details and notes. Subsequent to the vapor barrier installation activities and at the request of the owner or general contractor, a smoke test could be performed in an effort to determine if any leaks developed during placement of the gas vapor barrier. See Figure 2 for additional sub-slab vapor barrier membrane details and notes.

Once manifolded into the 4-inch-diameter header/riser pipe, the VE header pipe shall extend horizontally below the floor slab and vapor retardant barrier, extend vertically up through the slab, continue as riser pipes up through the interior of the building, and exit/vent through the roof. The exact locations of the floor and roof penetrations may be modified and field-determined by Ransom, owner, architect, and the selected contractor, if necessary. Each riser/vent pipe shall be supported by pipe hangers along the wall and ceiling, as needed. Prior to ceiling and roof penetrations, each 4-inch riser/vent pipe shall be equipped with a 4-inch, ¼-turn PVC butterfly valve for manually isolating (turning on/off) and adjusting the vapor flow. Future access to the butterfly valves will be required; therefore, an access panel should be provided, if the riser/vent pipes are placed within a wall or ceiling cavity; these access panels should be installed during construction of the building, as necessary.

Due to the location of rooftop infrastructure, pipes may need to transition and run horizontally from the location of the foundation penetration to the desired roof penetration location to meet the specified clearances from intakes and parapet walls and avoid conflicts. Clearance distance from other rooftop air intakes shall comply with all applicable local and/or state codes and be no less than ten feet. To facilitate these transitions, the number of additional 90-degree elbows shall be kept to a minimum (i.e., maximum of two, if possible). In addition, horizontal piping runs through ceiling or wall cavities should be sloped a minimum of $^{1}/_{64}$-inch per linear foot away from the roof penetrations to facilitate drainage back into the ground of condensation or precipitation, which may collect within the piping system. The four roof penetrations for the 4-inch-diameter riser/vent pipes conduits shall also be sealed to prevent water leaks, using standard flexible rubber pipe boots or equivalent; these roof penetrations are recommended to be included in the roof warranty. See Figures 2 for header/riser pipe and vertical discharge/vent pipe construction details and notes.

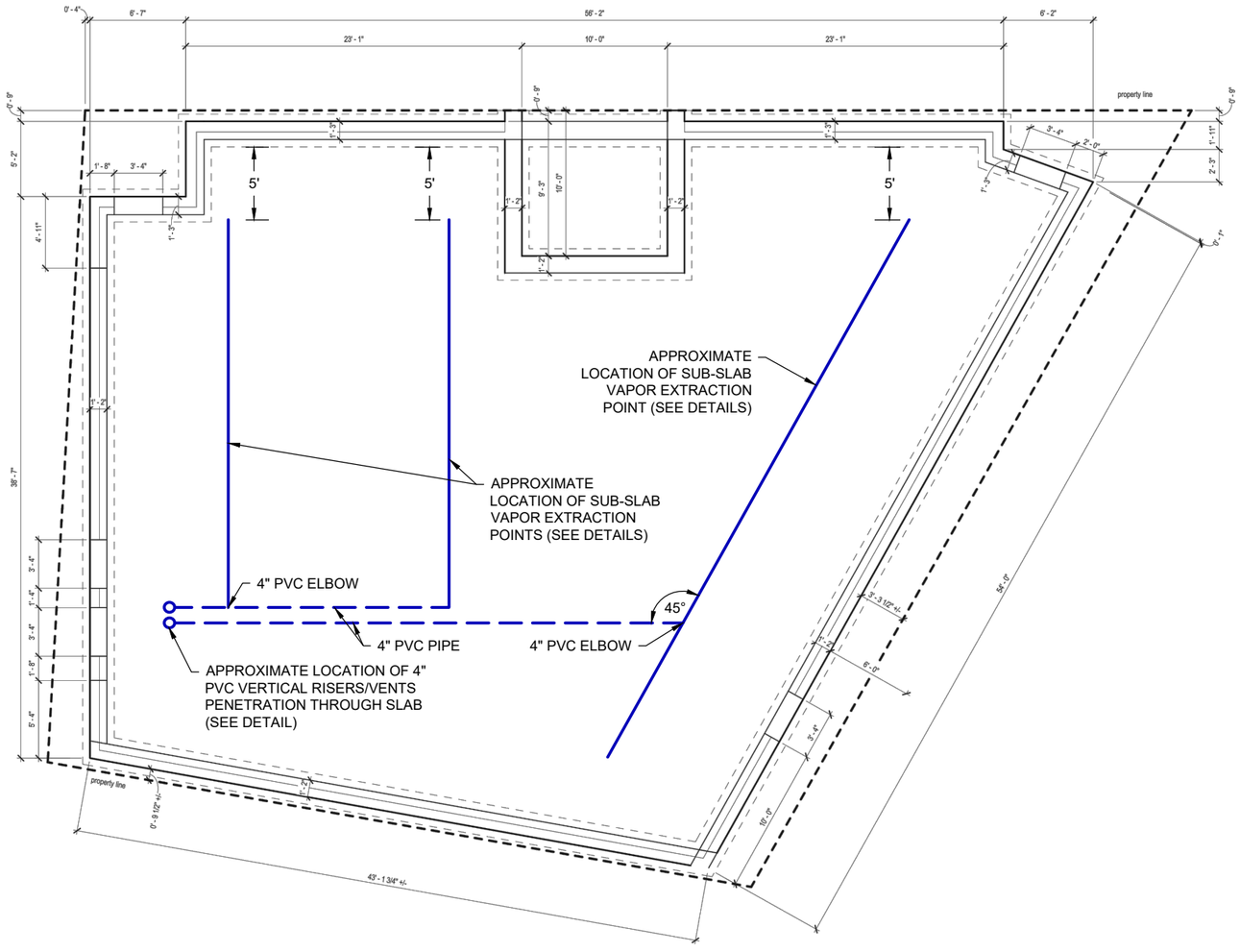
The end of each riser/vent pipe must be a minimum of 18 to 24-inches above the roof and be fitted with a 4-inch diameter stainless-steel turbine ventilator chimney cap (Empire Ventilation Equipment Co. or approved equal); see attached reference sheet.

In addition, two 2-inch-diameter electrical conduits shall be installed adjacent to the 4-inch-diameter riser/ vent pipes to facilitate potential future retrofit of the VMS to an "active" system, if necessary and as determined by the engineer (Ransom), MEDEP, and/or regulatory requirements. An active system would utilize roof-mounted suction fan(s) to mechanically enhance vacuum (negative) pressures and remove impacted air from below the floor slab. One electrical conduit will be for future power supply line(s) and one will be for future low-voltage controls and/or sample tubing. These conduits, as well as any

associated future electrical work, should be installed and coordinated by a licensed electrician, in accordance with applicable codes and standards. The roof penetrations for the two 2-inch-diameter electrical conduits shall also be sealed to prevent water leaks, using standard flexible rubber pipe boots or equivalent; these penetrations are recommended to be included in the roof and warranty.

## MONITORING POINTS

Two sub-slab vapor monitoring point, such as Vapor Pin® or approved equal, shall be installed in the approximate location indicated on Figure 1a, for the purpose of assessing and determining future sub-slab vapor contaminant concentrations and differential pressures, if required. The final location of the vapor monitoring point shall be determined in the field by Ransom, owner, architect, and the selected contractor, based on the final merchandise floor plans, architectural plans, and/or building layout plans. Each vapor monitoring point shall consist of a ¼-inch diameter, stainless steel probe, with 3 inches of slotted screen at the bottom of the probe, installed to a depth of 6 inches below the building slab and vapor barrier. If requested, these probes can be provided to the Contractor by the Engineer (Ransom). This request should be completed at least one week in advance of the proposed work. These probes shall also be housed in 4-inch-diameter flush-mounted road boxes/hand-holes (provided and installed by the Contractor), which will provide future access to the sampling points. The flexible tubing material will be Tygon® brand 2375 Ultra Chemical Resistant Tubing (or equivalent). These probes shall be equipped with an air-tight, removable cap. The annulus space between the road box and the probe, as well as the area between the road box and the slab, shall be sealed with a non-shrink grout, Quikrete® or approved equal.




## LEGEND

- 0.020" SLOTTED 4" PVC PIPING
- 4" PVC PIPING
- 4" PVC RISER/VENT

## NOTES

1. 4" DIAMETER VERTICAL RISERS/VENTS SHOULD BE LOCATED IN UTILITY ROOM AND PROPERLY LABELED.
2. PLAN BASED ON AH ARCHITECTURAL FOUNDATION PLAN. 1ST AND 2ND FLOOR FRAMING PLAN.
3. SOME FEATURES ARE APPROXIMATE IN LOCATION AND SCALE.

0 5 10 20

SCALE in FEET
1"=10'

RANSOM Consulting, LLC

PREPARED FOR:

OLD BELFAST BANK LLC
C/O EARL MACKENZIE, MANAGER
PO BOX 41 ISLESBORO, ME 04848

SITE:

FORMER EM-BEE CLEANERS
126 CHURCH STREET
BELFAST, MAINE

# *SUB-SLAB VAPOR MITIGATION SYSTEM LAYOUT FOUNDATION PLAN*

PROJECT: 111.06134.306

FIGURE: 1a

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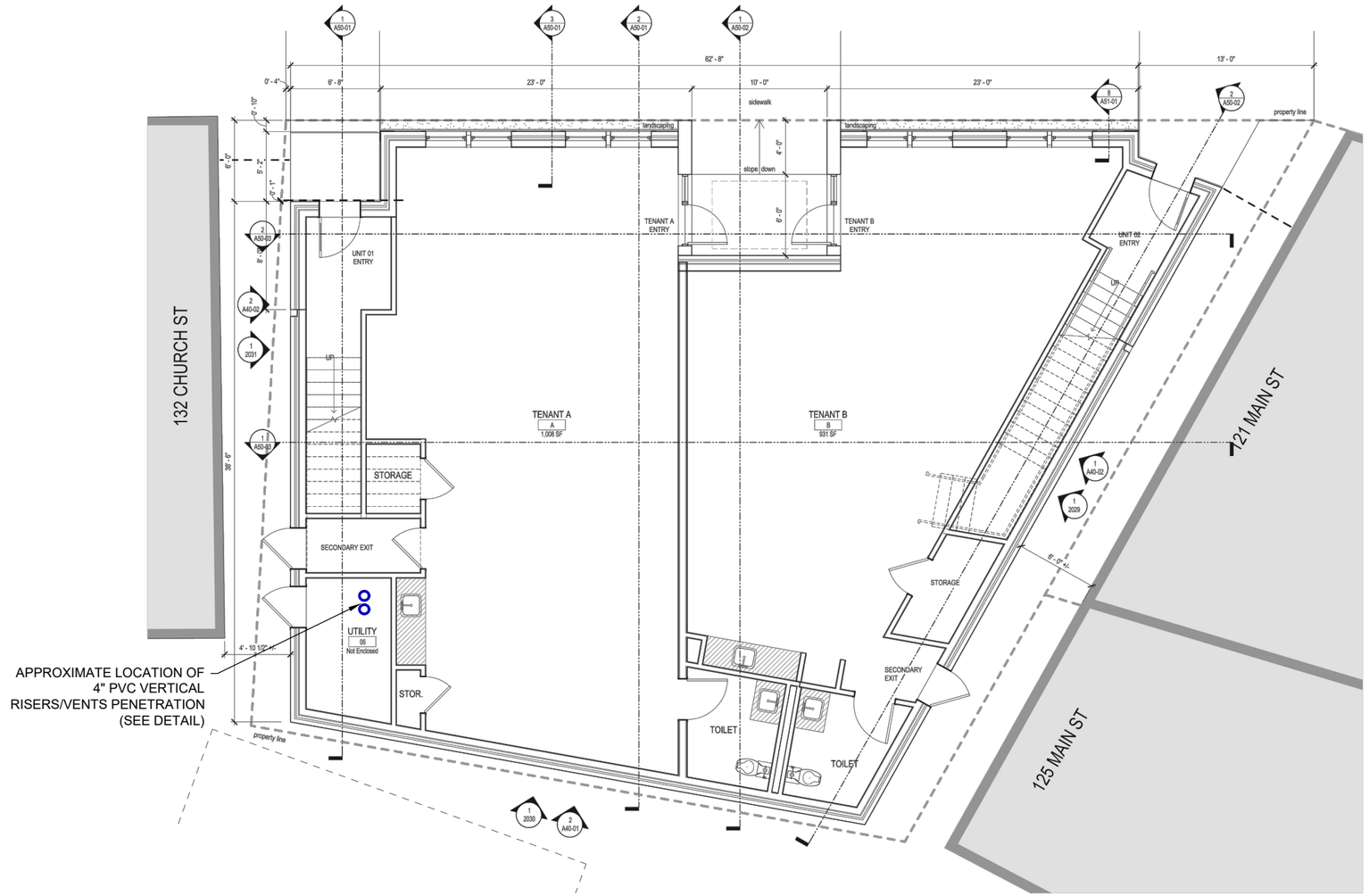


## LEGEND

- 4" PVC RISER/VENT

## NOTES

1. 4" DIAMETER VERTICAL RISERS/VENTS SHOULD BE LOCATED IN UTILITY ROOM AND PROPERLY LABELED.
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SCALE in FEET
1"=10'

RANSOM Consulting, LLC

| PREPARED FOR: | SITE: |
|---|---|
| OLD BELFAST BANK LLC<br>C/O EARL MACKENZIE, MANAGER<br>PO BOX 41 ISLESBORO, ME 04848 | FORMER EM-BEE CLEANERS<br>126 CHURCH STREET<br>BELFAST, MAINE |

*SUB-SLAB VAPOR MITIGATION SYSTEM LAYOUT LEVEL 1 PLAN*

PROJECT: 111.06134.306

FIGURE: 1b

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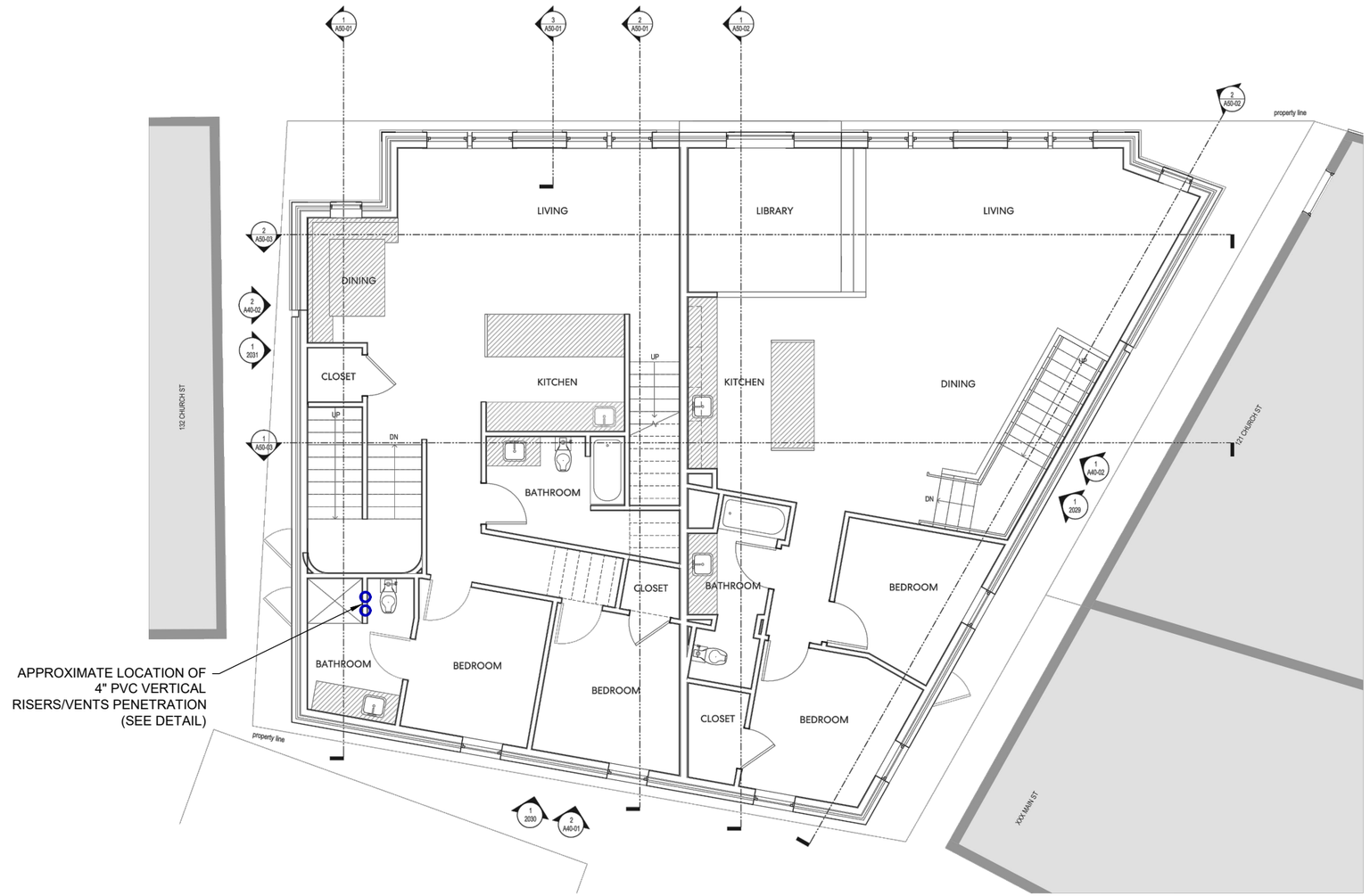


## LEGEND

- 4" PVC RISER/VENT

## NOTES

1. 4" DIAMETER VERTICAL RISERS/VENTS SHOULD BE LOCATED IN UTILITY ROOM AND PROPERLY LABELED.
2. PLAN BASED ON AH ARCHITECTURAL FOUNDATION PLAN. 1ST AND 2ND FLOOR FRAMING PLAN.
3. SOME FEATURES ARE APPROXIMATE IN LOCATION AND SCALE.

0 5 10 20

SCALE in FEET
1"=10'

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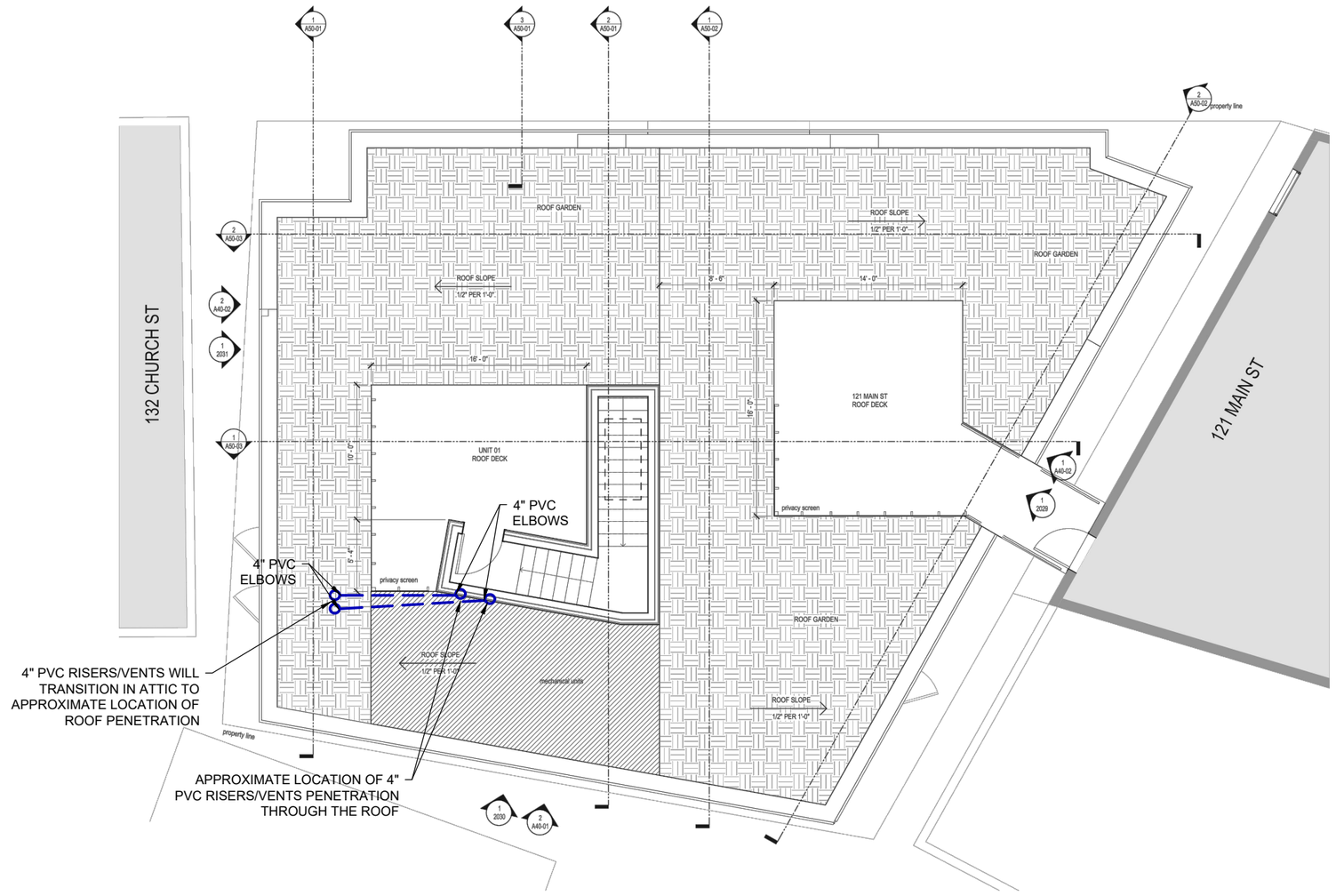
*SUB-SLAB VAPOR MITIGATION SYSTEM LAYOUT LEVEL 2 PLAN*

PROJECT: 111.06134.306

FIGURE: 1c




## LEGEND

- 4" PVC PIPING
- 4" PVC RISER/VENT

## NOTES

1. 4" DIAMETER VERTICAL RISERS/VENTS SHOULD BE LOCATED IN UTILITY ROOM AND PROPERLY LABELED.
2. PLAN BASED ON AH ARCHITECTURAL FOUNDATION PLAN. 1ST AND 2ND FLOOR FRAMING PLAN.
3. SOME FEATURES ARE APPROXIMATE IN LOCATION AND SCALE.

0 5 10 20

SCALE in FEET
1"=10'

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*SUB-SLAB VAPOR MITIGATION SYSTEM LAYOUT ROOF PLAN*

PROJECT: 111.06134.306

FIGURE: 1d

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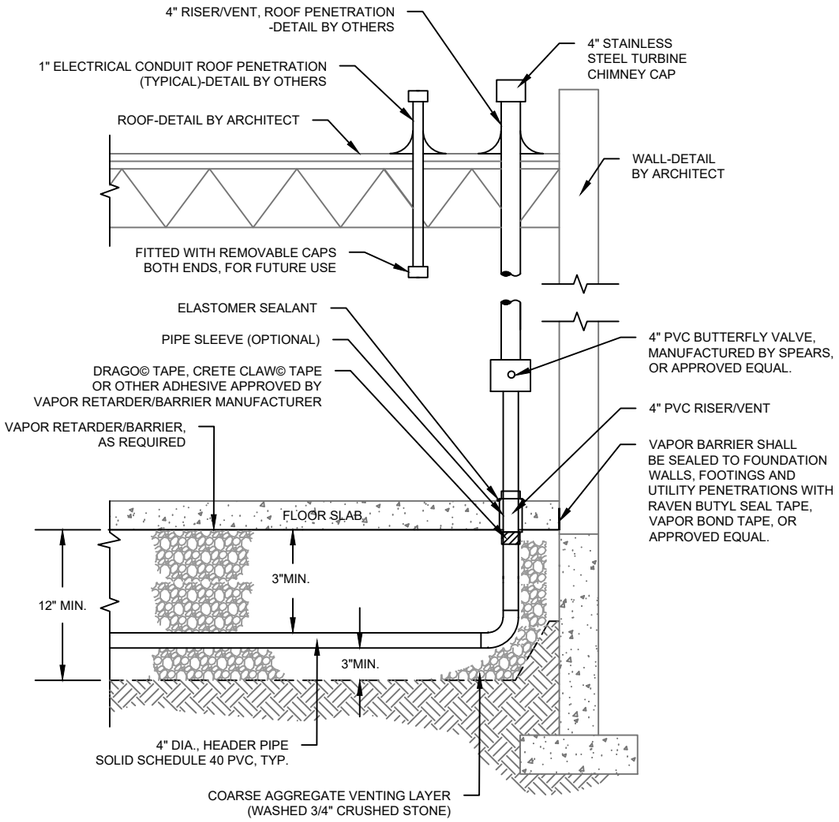
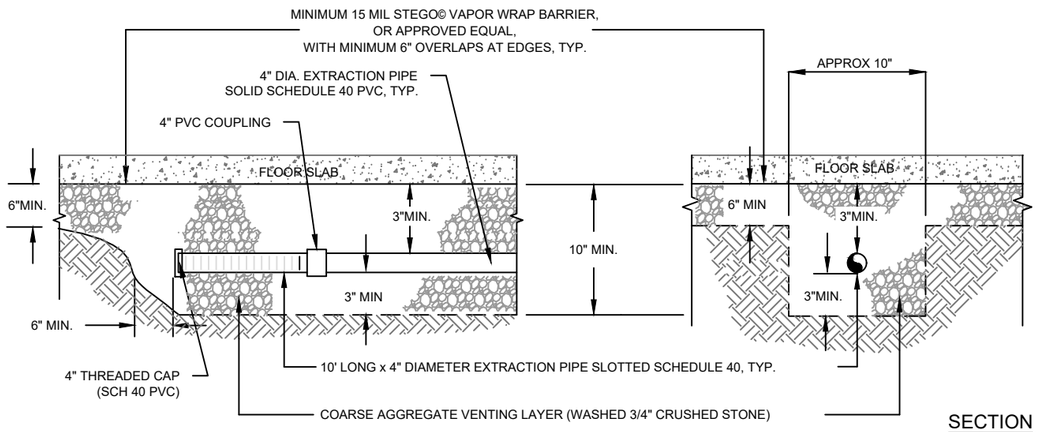



## SUB-SLAB VENTING SYSTEM VERTICAL DISCHARGE STACK

NOT TO SCALE

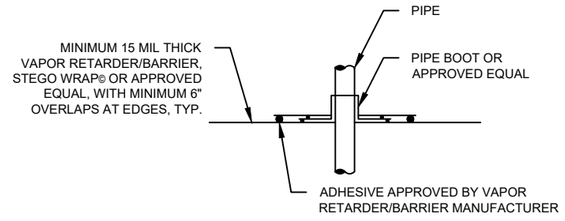



## SUB-SLAB VAPOR EXTRACTION (VE) POINT

NOT TO SCALE

# NOTES

1. BUILDING SLAB SHALL BE UNDERLAIN BY A VENTING LAYER CONSISTING OF 4" MINIMUM OF 3/4" WASHED, CRUSHED STONE.
2. PIPING SHALL BE INSTALLED AS SHOWN, UNLESS OTHERWISE REQUIRED BY BUILDING CODE. PIPE SHALL BE SOUND AND CLEAN BEFORE LAYING.
3. PIPING SHALL BE RELOCATED, AS NECESSARY, TO AVOID FOUNDATIONS AND MINIMIZE INTERFERENCE WITH OTHER UTILITIES. THE FINAL PIPE, ROOF PENETRATION, AND VAPOR MONITORING POINT LOCATIONS MAY BE FIELD–DETERMINED BY THE ENGINEER, DEVELOPER/OWNER, ARCHITECT, AND CONTRACTOR BASED ON FINAL FLOOR PLANS, ARCHITECTURAL PLANS, BUILDING LAYOUT, AND/OR FIELD CONDITIONS.
4. HORIZONTAL SUB–SLAB PIPING SHALL BE SLOPED MINIMUM 1/64–INCH PER LINEAR FOOT TOWARDS THE SUB–SLAB VAPOR EXTRACTION (VE) POINT TO FACILITATE DRAINAGE OF CONDENSATION OR PRECIPITATION WHICH MAY COLLECT WITHIN THE SYSTEM.
5. THE HORIZONTAL SUB–SLAB VE POINTS SHALL BE COMPOSED OF 10–FOOT–LONG SECTIONS OF 4–INCH–DIAMETER, MACHINE–SLOTTED (0.020–INCH), SCHEDULE 40 PVC PIPE WITH A THREADED CAP AT ONE END. 4" ELBOWS WILL BE USED WITH PVC CEMENT AT TURNS.
6. FLOOR SLAB PENETRATION LOCATION IS APPROXIMATE AND SHALL BE DETERMINED BY THE MECHANICAL ENGINEER AND/OR ARCHITECT.
7. VAPOR RETARDER SHALL CONSIST OF A 15–MIL STEGO® WRAP VAPOR BARRIER OR APPROVED EQUAL. VAPOR RETARDER SHALL BE PLACED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. ADJOINING SHEETS SHALL OVERLAP MINIMUM OF 6" AT ALL EDGES. SEAMS BETWEEN ADJOINING SHEETS TO BE SEALED WITH STEGO CRAWL® TAPE, OR APPROVED EQUAL. VAPOR RETARDER SHALL EXTEND UP EXTERIOR FOUNDATION WALLS A MINIMUM OF 3" AND BE SEALED TO WALL, SLAB PENETRATIONS, AND COLUMNS WITH STEGO CRAWL® TAPE, OR APPROVED EQUAL.
8. ALL HOLES OR OPENINGS THROUGH THE VAPOR RETARDER MUST BE EFFECTIVELY SEALED. SEAL AROUND SEWER PIPES, SUPPORT COLUMNS OR ANY OTHER PENETRATIONS WITH DRAGO® TAPE, CRETE CLAW®/TAPE, OR APPROVED EQUAL TO CREATE A MONOLITHIC MEMBRANE BETWEEN THE SURFACE OF THE SLAB AND MOISTURE AND/OR SOIL VAPORS.
9. ONCE INSTALLED, THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO PROTECT THE VAPOR RETARDER FROM HOLES, TEARS, AND OTHER DAMAGE PRIOR TO INSTALLATION OF THE CONCRETE FLOOR SLAB. ANY HOLES, TEARS OR OTHER DAMAGE SHALL BE PROPERLY PATCHED AND/OR REPAIRED PRIOR TO SLAB INSTALLATION.




## VAPOR BARRIER PENETRATIONS

NOT TO SCALE BUILDINGS B1, B2, B3, B6, B8, B10, B14
AS SHOWN ON FIGURE 2

10. ALL SLAB JOINTS, INCLUDING BUT NOT LIMITED TO: FLOOR/WALL JOINTS, POUR AND CONTROL SAW JOINTS, CRACKS AND SLAB PENETRATIONS SHALL BE SEALED WITH AN ELASTOMERIC JOINT SEALANT.
11. PROVIDE PIPE SUPPORTS CONSTRUCTED OF TYPE 304 STAINLESS STEEL WITH TYPE 316 STAINLESS STEEL FASTENERS, NUTS, WASHERS AND BOLTS WITH APPROVED ANCHORING SYSTEM FOR WALL AND CLAMP FOR PIPE.
12. VERTICAL RUNS OF PIPE SHALL BE SUPPORTED INDEPENDENTLY OF THE CONNECTED HORIZONTAL PIPE RUNS. VERTICAL RUNS SHALL BE SUPPORTED AT EACH FLOOR AND AT INTERVALS NOT GREATER THAN 10' BY APPROVED PIPE COLLARS, CLAMPS, BRACKETS OR WALL RESTS. PIPE SUPPORTS SHALL BE LOCATED WITHIN 4" OF EACH SIDE OF ALL FITTINGS.
13. THE 4–INCH–DIAMETER RISER/VENT PIPES WILL BE EQUIPPED WITH A 4–INCH, ¼–TURN PVC BUTTERFLY VALVES FOR MANUALLY ISOLATING (TURNING ON/OFF) AND ADJUSTING THE VAPOR FLOW. FUTURE ACCESS TO THE BUTTERFLY VALVES MAY BE REQUIRED; THEREFORE, AN ACCESS PANEL SHOULD BE PROVIDED IF THE RISER/VENT PIPES ARE PLACED WITHIN A WALL OR CEILING CAVITY.
14. PIPING WITHIN THE OCCUPIED BUILDING SPACE SHALL BE LABELED AT A MAXIMUM SPACING OF 10'; THE LABEL SHALL READ "SUBSLAB VENT SYSTEM".
15. DUE TO THE LOCATION OF ROOFTOP UNITS, PIPES MAY NEED TO TRANSITION AND EXTEND HORIZONTALLY AT A FIELD–DETERMINED LOCATION FROM THE LOCATION OF THE FOUNDATION PENETRATION TO THE DESIRED ROOF PENETRATION LOCATION TO MEET THE SPECIFIED CLEARANCES FROM INTAKES. TO FACILITATE THESE TRANSITIONS, THE NUMBER OF ADDITIONAL 90–DEGREE ELBOWS SHALL BE KEPT TO A MINIMUM. HORIZONTAL PIPING RUNS THROUGH CEILING OR WALL CAVITIES SHOULD BE SLOPED A MINIMUM OF 1/64–INCH PER LINEAR FOOT AWAY FROM THE ROOF PENETRATIONS TO FACILITATE DRAINAGE OF CONDENSATION OR PRECIPITATION BACK INTO THE GROUND.
16. VENT STACKS SHALL EXTEND FROM THE ROOF AND TERMINATE 18"–24" ABOVE THE SURFACE OF THE ROOF. VENT STACKS SHALL BE LOCATED IN COMPLIANCE WITH ANY APPLICABLE LOCAL ORDINANCES DICTATING MINIMUM DISTANCE FROM WINDOWS OR AIR INTAKES AND NO LESS THAN OF 10' FROM WINDOWS OR INTAKES ASSOCIATED WITH THE HEATING, VENTILATION AND AIR CONDITIONING SYSTEM.
17. AT ROOF EXIT, A PERMANENT LABEL SHALL BE ATTACHED TO VENT STACK READING "SUBSLAB VENT SYSTEM, DO NOT PLACE AIR INTAKE WITHIN 10 FEET". DISTANCE MAY BE INCREASED OR DECREASED TO COMPLY WITH LOCAL CODE.
18. CHIMNEY CAP SHALL BE 4" STAINLESS STEEL TURBINE VENTILATOR (EMPIRE VENTILATION EQUIPMENTS CO., OR APPROVED EQUAL).
19. SUB–SLAB VAPOR MONITORING POINTS (VAPOR PIN OR APPROVED EQUAL) SHALL BE INSTALLED. THE FINAL LOCATIONS OF THE VAPOR MONITORING POINTS MAY BE FIELD DETERMINED. THE VAPOR MONITORING POINTS SHALL CONSIST OF A 1/4–INCH–DIAMETER, STAINLESS STEEL VERTICAL PROBE WITH 3 TO 6 INCHES OF SLOTTED SCREEN AT THE BOTTOM OF THE PROBE, INSTALLED TO A DEPTH OF 3 TO 6 INCHES BELOW THE BUILDING SLAB AND VAPOR BARRIER. THESE PROBES SHALL ALSO BE HOUSED IN 4–INCH–DIAMETER FLUSH–MOUNTED ROAD BOXES/HAND–HOLES, WHICH WILL PROVIDE FUTURE ACCESS TO THE SAMPLING POINTS. THE FLEXIBLE TUBING MATERIAL WILL BE TygonA® BRAND 2375 ULTRA CHEMICAL RESISTANT TUBING (OR EQUIVALENT). THESE PROBES SHALL BE EQUIPPED WITH AN AIR–TIGHT, REMOVABLE CAP. THE ANNULUS SPACE BETWEEN THE ROAD BOX AND THE PROBE, AS WELL AS THE AREA BETWEEN THE ROAD BOX AND THE SLAB, SHALL BE SEALED WITH A NON–SHRINK GROUT.
20. THE SUB–SLAB VENTILATION SYSTEM SHALL BE A "PASSIVE" SYSTEM; HOWEVER, IF IN THE FUTURE, THE OWNER WISHES TO RETROFIT THE SYSTEM TO AN 'ACTIVE' SYSTEM, ROOF–MOUNTED SUCTION BLOWER(S) MAY BE INSTALLED TO MECHANICALLY ENHANCE VACUUM (NEGATIVE) PRESSURES AND REMOVE IMPACTED AIR FROM BELOW THE FLOOR SLAB. UPON INSTALLATION OF A FAN, DETERMINATION OF RADIUS OF INFLUENCE MAY BE NECESSARY TO CONFIRM VACUUM PRESSURES AND VAPOR CONTAMINANT CONCENTRATIONS BENEATH THE SLAB. VACUUM PRESSURES WILL BE DETERMINED USING VAPOR MONITORING POINTS. IF NECESSARY, A LARGER FAN MAY BE INSTALLED. THE CONTRACTOR SHALL COORDINATE FAN INSTALLATION WITH THE ELECTRICAL CONTRACTOR. (IF NEEDED).
21. FOUR SPARE ELECTRICAL CONDUITS SHALL BE INSTALLED WITH THE 6" RISER/VENT PIPES TO FACILITATE POTENTIAL FUTURE RETROFIT OF VAPOR MITIGATION SYSTEM TO AN "ACTIVE" SYSTEM. TWO CONDUITS SHALL BE 1" DIA. CONDUIT FOR FUTURE POWER LINES; AND THE OTHER TWO SHALL BE 1" DIA. CONDUIT FOR FUTURE LOW–VOLTAGE CONTROLS OR SAMPLE TUBING. ALL CONDUIT, WIRING AND ELECTRICAL WORK SHALL BE PERFORMED BY A LICENSED ELECTRICIAN AND IN ACCORDANCE WITH STATE AND LOCAL APPLICABLE CODES AND STANDARDS. ALL ROOF PENETRATIONS SHALL BE SEALED TO PREVENT WATER LEAKS, USING STANDARD FLEXIBLE RUBBER PIPE BOOTS OR EQUIVALENT.

RANSOM Consulting, LLC

PREPARED FOR:

OLD BELFAST BANK LLC
C/O EARL MACKENZIE, MANAGER
PO BOX 41 ISLESBORO, ME 04848

SITE:

FORMER EM–BEE CLEANERS
126 CHURCH STREET
BELFAST, MAINE

*SUB–SLAB VAPOR MITIGATION SYSTEM LAYOUT ROOF PLAN*

PROJECT: 111.06134.306

FIGURE: 2

X:\Ransom_NewEngland\Maine\Belfast_ME\Em-Bee_Cleaners\Drawings\0322_EBC_BELFAST-ME_VMSD.dwg: F2_Details April 25, 2022

**MANUFACTURERS SPECIFICATIONS**

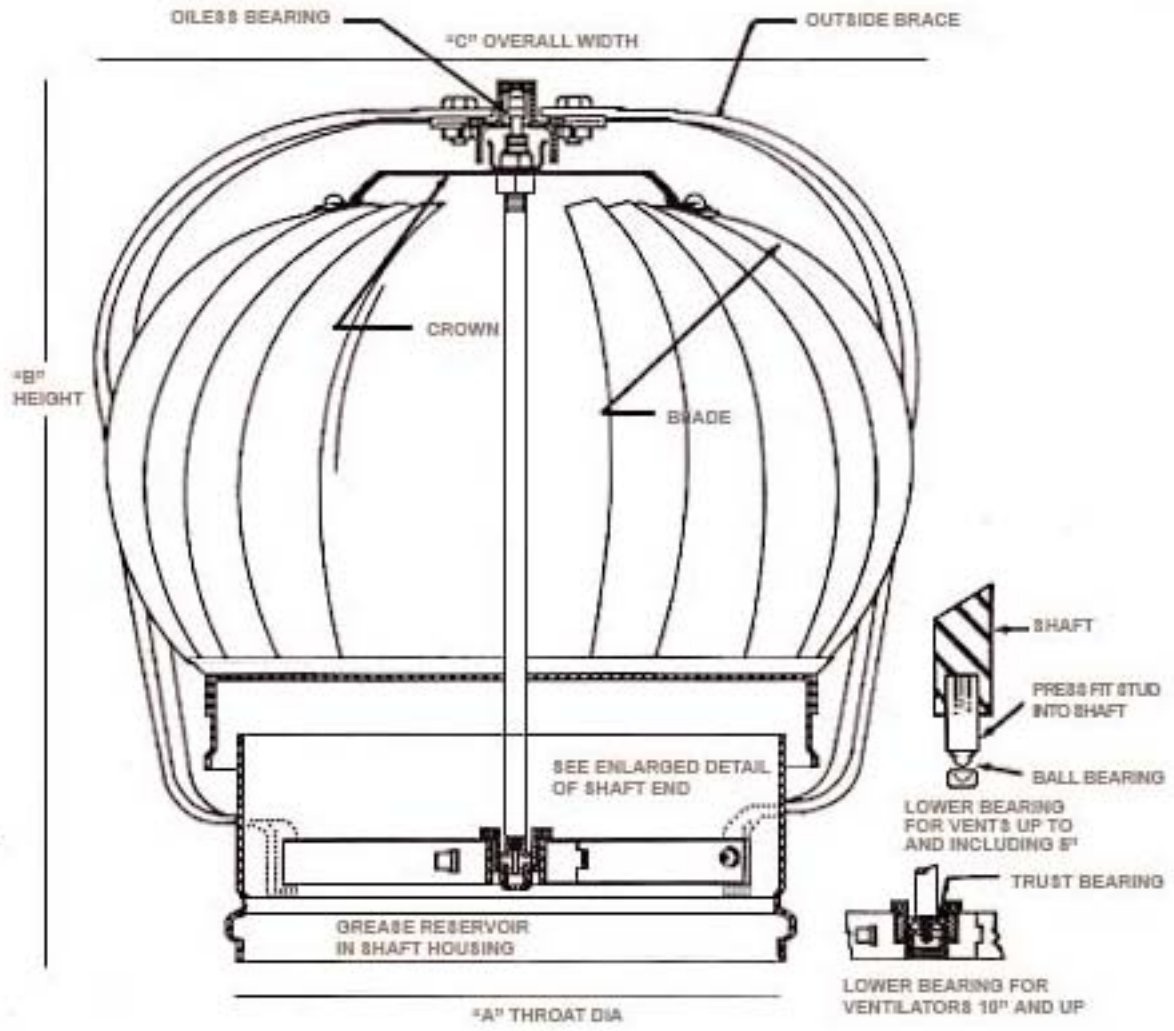
Design Summary, Vapor Barrier, and Vapor Mitigation System
126 Church Street
Belfast, Waldo County, Maine

RANSOM
Project 111.06134.306

EMPIRE
VENTILATION EQUIPMENT CO., INC.

TOP OF THE LINE VENTILATORS
FOR BOTTOM LINE RESULTS

# TURBINE VENTILATORS




## CONSTRUCTION SPECIFICATIONS

| "A" THROAT SIZE | GUAGE | | | NO. OF BRACES | BRACE MATERIAL |
|---|---|---|---|---|---|
| | CROWN GALV. | BLADE GALV. | THROAT GALV. | | |
| 4 | 24 | 28 | 26 | 3 | ALUMINUM |
| 6 | 24 | 28 | 26 | 3 | ALUMINUM |
| 8 | 24 | 28 | 26 | 3 | ALUMINUM |
| 10 | 24 | 28 | 26 | 3 | ALUMINUM |
| 12 | 24 | 28 | 24 | 3 | ALUMINUM |
| 14 | 22 | 26 | 24 | 3 | ALUMINUM |
| 16 | 22 | 26 | 24 | 3 | STEEL |
| 18 | 22 | 26 | 24 | 4 | STEEL |
| 20 | 20 | 26 | 24 | 4 | STEEL |
| 24 | 20 | 26 | 22 | 4 | STEEL |

## DIMENSIONAL AND PERFORMACE DATA

| "A" THROAT SIZE | "B" HEIGHT | "C" OVERALL WIDTH | EXHAUSTED CAPACITY* | APPROX. SHIPPING WEIGHT |
|---|---|---|---|---|
| 4 | 12 | 10 1/4 | 125 | 5 |
| 6 | 14 1/2 | 12 3/4 | 147 | 7 |
| 8 | 15 | 14 1/4 | 255 | 8 |
| 10 | 16 1/4 | 16 1/4 | 425 | 11 |
| 12 | 17 | 19 | 631 | 13 |
| 14 | 19 3/4 | 22 3/4 | 700 | 21 |
| 16 | 21 3/4 | 25 1/2 | 950 | 31 |
| 18 | 24 | 29 | 1200 | 38 |
| 20 | 25 1/4 | 31 5/8 | 1700 | 46 |
| 24 | 28 1/4 | 35 3/4 | 2350 | 58 |

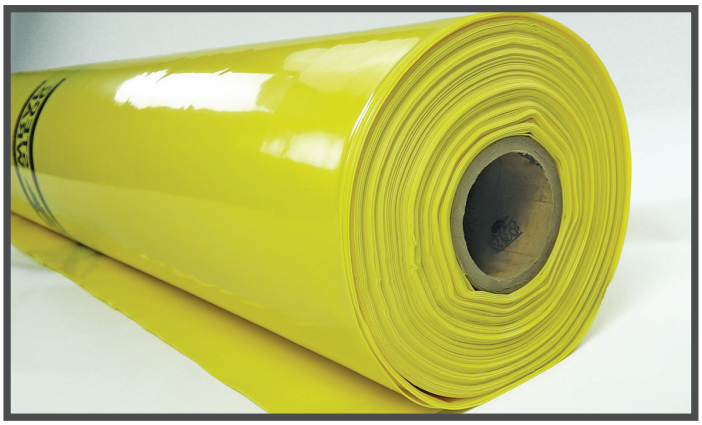
*4 MPH WIND CFM

# STEGO® WRAP 15-MIL VAPOR BARRIER

A STEGO INDUSTRIES, LLC INNOVATION | VAPOR RETARDERS 07 26 00, 03 30 00 | VERSION: FEB 18, 2020

## 1. PRODUCT NAME

**STEGO WRAP 15-MIL VAPOR BARRIER**



## 2. MANUFACTURER

Stego Industries, LLC
216 Avenida Fabricante, Suite 101
San Clemente, CA 92672
Sales, Technical Assistance
Ph: (877) 464-7834
contact@stegoindustries.com
www.stegoindustries.com

## 3. PRODUCT DESCRIPTION

USES: Stego Wrap 15-Mil Vapor Barrier is used as a below-slab vapor barrier.

COMPOSITION: Stego Wrap 15-Mil Vapor Barrier is a multi-layer plastic extrusion manufactured with only high grade prime, virgin, polyolefin resins.

ENVIRONMENTAL FACTORS: Stego Wrap 15-Mil Vapor Barrier can be used in systems for the control of soil gases (radon, methane), soil poisons (oil by-products) and sulfates.

## 4. TECHNICAL DATA

### TABLE 1: PHYSICAL PROPERTIES OF STEGO WRAP 15-MIL VAPOR BARRIER

| PROPERTY | TEST | RESULTS |
|---|---|---|
| Under Slab Vapor Retarders | ASTM E1745 Class A, B & C– Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs | Exceeds Class A, B & C |
| Water Vapor Permeance | ASTM F1249 – Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor | 0.0086 perms |
| Permeance After Conditioning (ASTM E1745 Sections 7.1.2 - 7.1.5) | ASTM E154 Section 8, F1249 – Permeance after wetting, drying, and soaking<br>ASTM E154 Section 11, F1249 – Permeance after heat conditioning<br>ASTM E154 Section 12, F1249 – Permeance after low temperature conditioning<br>ASTM E154 Section 13, F1249 – Permeance after soil organism exposure | 0.0098 perms<br>0.0091 perms<br>0.0097 perms<br>0.0095 perms |
| Methane Transmission Rate | ASTM D1434 – Standard Test Method for Determining Gas Permeability Characteristics of Plastic Film and Sheeting | 192.8 GTR* (mL(STP)/$m^2$*day) |
| Radon Diffusion Coefficient | K124/02/95 | 8.8 x $10^{-12}$ $m^2$/second |
| Puncture Resistance | ASTM D1709 – Test Method for Impact Resistance of Plastic Film by Free-Falling Dart Method | 2,266 grams |
| Tensile Strength | ASTM D882 – Test Method for Tensile Properties of Thin Plastic Sheeting | 70.6 lbf/in |
| Thickness | | 15 mil |
| Roll Dimensions | width x length:<br>area: | 14' x 140'<br>1,960 $ft^2$ |
| Roll Weight | | 140 lb |

Note: perm unit = grains/($ft^2$*hr*in-Hg)
*GTR = Gas Transmission Rate

*Continued...*
Note – legal notice on page 2.

# STEGO® WRAP 15-MIL VAPOR BARRIER

A STEGO INDUSTRIES, LLC INNOVATION | VAPOR RETARDERS 07 26 00, 03 30 00 | VERSION: FEB 18, 2020

## 5. INSTALLATION

UNDER SLAB: Unroll Stego Wrap 15-Mil Vapor Barrier over an aggregate, sand or tamped earth base. Overlap all seams a minimum of 6 inches and tape using Stego® Tape or Stego® Crete Claw® Tape. All penetrations must be sealed using a combination of Stego Wrap and Stego Accessories.

For additional information, please refer to Stego's complete installation instructions.

## 6. AVAILABILITY & COST

Stego Wrap 15-Mil Vapor Barrier is available through our network of building supply distributors. For current cost information, contact your local Stego distributor or Stego Industries' Sales Representative.

## 7. WARRANTY

Stego Industries, LLC believes to the best of its knowledge, that specifications and recommendations herein are accurate and reliable. However, since site conditions are not within its control, Stego Industries does not guarantee results from the use of the information provided herein. Stego Industries, LLC does offer a limited warranty on Stego Wrap. Please see www.stegoindustries.com/legal.

## 8. MAINTENANCE

None required.

## 9. TECHNICAL SERVICES

Technical advice, custom CAD drawings, and additional information can be obtained by contacting Stego Industries or by visiting the website.

**Email:** contact@stegoindustries.com
**Contact Number:** (877) 464-7834
**Website:** www.stegoindustries.com

## 10. FILING SYSTEMS

- www.stegoindustries.com

# STEGOCRAWL® TAPE

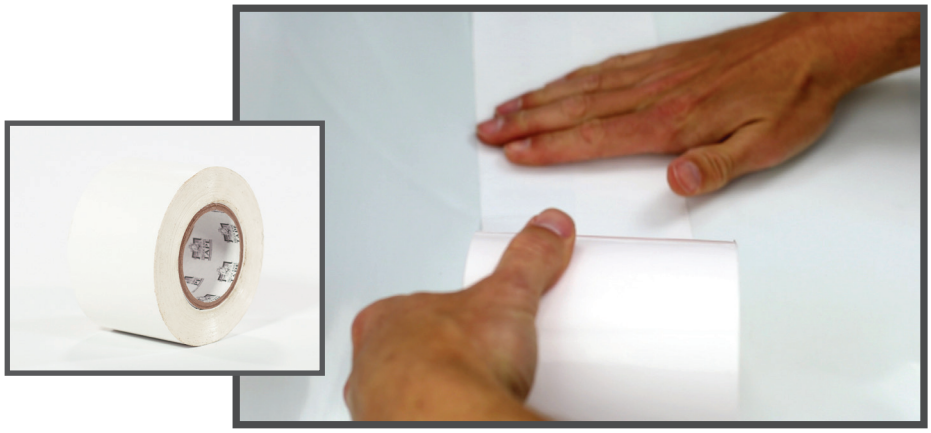
A STEGO INDUSTRIES, LLC INNOVATION | VAPOR RETARDERS 07 26 00 | VERSION: MAY 26, 2021

## 1. PRODUCT NAME

**STEGOCRAWL TAPE**

## 2. MANUFACTURER

Stego® Industries, LLC
216 Avenida Fabricante, Suite 101
San Clemente, CA 92672
Sales, Technical Assistance
Ph: (877) 464-7834
contact@stegoindustries.com
**stegoindustries.com**



## 3. PRODUCT DESCRIPTION

USES: StegoCrawl Tape is a low permeance tape designed for protective sealing, seaming, and patching applications where a highly conformable material is required. StegoCrawl Tape is engineered to bond to StegoCrawl® Wrap.

COMPOSITION: StegoCrawl Tape is composed of polyethylene film and an acrylic, pressure-sensitive adhesive.

**FEATURES AND BENEFITS:**

- **Roll Size: 3.75" x 180'**
- **Extremely low permeance**
- **Great long-term adhesion**
- **8 mils thick – superb durability**
- **White color complements the white StegoCrawl encapsulation system**
- **Low VOC Emissions - Certified Clean Air GOLD**
- **Made in the USA with US and Global materials**

## 4. TECHNICAL DATA

APPLICABLE STANDARDS:
Pressure Sensitive Tape Council (PSTC)

- PSTC 101 – International Standard for Peel Adhesion of Pressure Sensitive Tape
- PSTC 16 - International Standard for Loop Tack

**TABLE 1: PHYSICAL PROPERTIES OF STEGOCRAWL TAPE**

| PROPERTY | TEST METHOD | RESULTS |
|---|---|---|
| Total Thickness | | 8 mil |
| Permeance | | 0.03 perms |
| Ultimate Tensile Strength | ASTM D882 | 28 lb/in width |
| Elongation (at break) MD | ASTM D882 | 995% |
| 180° Peel Adhesion | PSTC 101 20 min dwell ss | 115 oz/in width |
| | PSTC 101 20 min on HDPE | 102 oz/in width |
| Adhesion Loop Tack | PSTC 16 | 90 oz/in width |
| Ultraviolet Resistance | | Excellent |

Note: perm unit = grains/(ft²*hr*in-Hg)

*Continued...*
Note – legal notice on page 2.

# STEGOCRAWL® TAPE



## 5. INSTALLATION

SEAMS: Overlap seams a minimum of six inches and seal with StegoCrawl Tape. Some codes require a minimum of a twelve inch overlap. Check appropriate codes prior to installation. Make sure the area of adhesion is free from dust, dirt, moisture and frost to allow maximum adhesion of the pressure-sensitive tape.

SEALING AROUND PIPES: Install StegoCrawl Wrap around pipe, minimizing the void space. Seal around base of pipe with StegoCrawl Tape.

StegoCrawl Tape should be installed above 40°F. In temperatures below 40°F, take extra care to remove moisture or frost from the area of adhesion.

For additional information, please refer to StegoCrawl's complete installation instructions.

## 6. AVAILABILITY & COST

For cost and availability of StegoCrawl Tape, please contact your local Stego Industries' Sales Representative.

## 7. WARRANTY

Stego Industries, LLC believes to the best of its knowledge, that specifications and recommendations herein are accurate and reliable. However, since site conditions are not within its control, Stego Industries does not guarantee results from the use of the information provided herein. Stego Industries, LLC does offer a limited warranty on StegoCrawl Wrap. Please see **stegoindustries.com/legal**

## 8. MAINTENANCE

Periodically check to ensure seams are secure and damage is repaired using StegoCrawl Accessories.

## 9. TECHNICAL SERVICES

Technical advice, custom CAD drawings, and additional information can be obtained by contacting Stego Industries or by visiting the website.

**Email:** contact@stegoindustries.com
**Contact Number:** (877) 464-7834
**Website:** **stegoindustries.com**

## 10. FILING SYSTEMS: stegoindustries.com

# Spears® Technical Information

10-Oct-13 01:28:05 PM

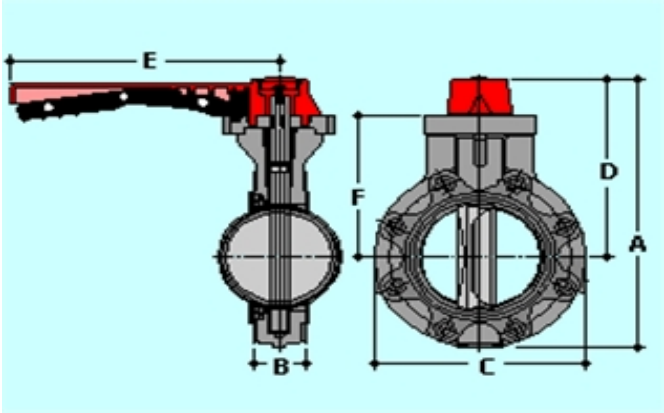
**Part No:** 721311-060 **Valves** **Butterfly Valve**

**Desc:** 6 PVC BUTTERFLY VALVE BUNA W/HANDLE

**List Price:** 538.78 **Part Code:** 250

**Weight(lbs):** 12.776 **Weight(kg):** 5.795 **Weight(gm):** 5795

**Size:** 6" **Color:** GREY **Material:** PVC




**Handle** Lever Handle
**O-Ring** Buna-N
**Design** Standard

**A** = 16-13/32 **B** = 2- 3/4 **C** = 11 **D** = 10- 7/8 **E** = 13-15/16 **F** = 8- 5/8

**No of Bolts** = 8 **Bolt Circle Dia.** = 9- 1/2 **Bolt Size** = 3/4

## Injection Molded Dimension References:

G = (LAYING LENGTH) intersection of center lines to bottom of socket/thread; 90° elbows, tees, crosses; ± 1/32 inch.

H = Intersection of center lines to face of fitting; 90° elbows tees, crosses; ± 1/32 inch.

J = Intersection of center lines to bottom of socket/thread; 45° elbows; ± 1/32 inch

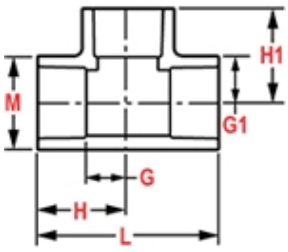
L = Overall length of fittings; ± 1/16 inch.

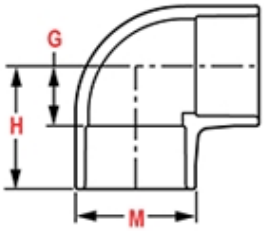
M = Outside diameter of socket/thread hub; ± 1/16 inch.

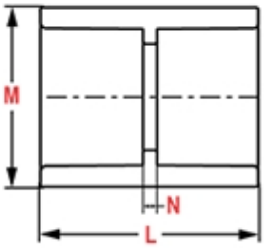
N = Socket bottom to socket bottom; couplings; ± 1/16 inch.

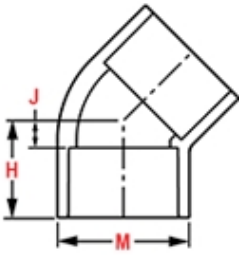
W = Height of cap; ± 1/16 inch

## Typical Molded Dimension References



CertainTeed

# Slotted PVC Well Casing

## Certa-Lok™ & Solvent-Weld

HIGH PERFORMANCE

Superior flow performance

Corrosion resistant

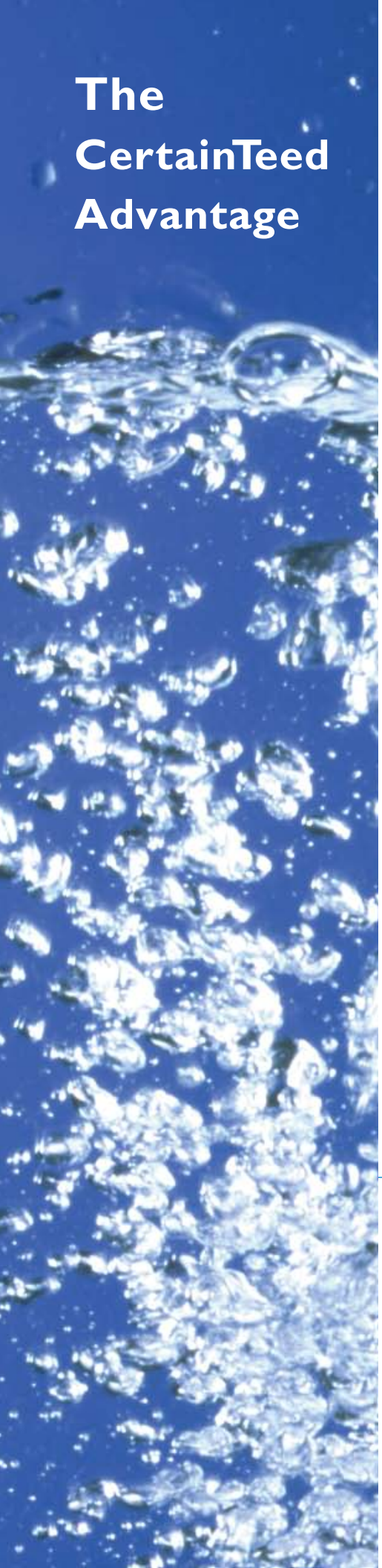
Large selection of slot configurations

Choice of joining systems

CertainTeed

*Quality made certain. Satisfaction guaranteed.*

# The CertainTeed Advantage

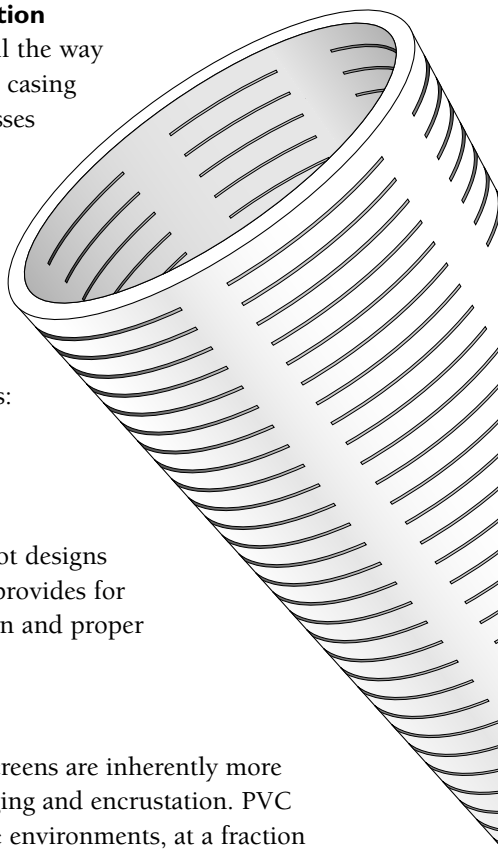


CertainTeed – the name that contractors have come to associate with the industry's broadest line of high-quality PVC well products – is also the industry leader in high performance slotted well casing. Using new manufacturing technology, slotted casing can now be produced with open areas and efficiencies that rival those of other screens, often at a fraction of the cost. Combine PVC screens with PVC well casing for the ultimate corrosion-resistant, low-maintenance water well!

### A Size and Joining System for Every Application

Slotted casing can be produced in sizes from 2" all the way up to the largest commercially available PVC well casing product (17.4" O.D.), in a variety of wall thicknesses and strengths to suit virtually all applications:

- Domestic
- Irrigation
- Municipal
- Aquifer Storage and Recovery
- Environmental



CertainTeed also offers a choice of joining systems: traditional solvent-weld or the contractor-proven, all-weather Certa-Lok™ mechanical joint.

### Slot Width Selection

A wide selection of precision-machined factory slot designs (.010"-.125") with closely spaced inlet openings provides for uniform development over the length of the screen and proper stabilization of the gravel pack.

### Long Life

Well rehabilitation costs are minimized, as PVC screens are inherently more resistant than conventional steel products to clogging and encrustation. PVC also outperforms stainless steel in highly corrosive environments, at a fraction of the cost. All screens are manufactured from PVC casing that is listed by NSF International as safe for use with potable water.

### Single Source for All Your Well Product Needs

No more unloading, local-machining, and repackaging required. With CertainTeed, the industry's best slotted casing is shipped ready to use – no field fabrication required – along with your other PVC well product needs, including solid casing, drop pipe for submersible pumps, and a variety of fittings.

# Underdrain Pipe

Slotted PVC casing is also ideal for use as underdrain pipe. Applications include, but are not limited to:

- Leachate collection systems for solid waste landfills
- Drainage and dewatering applications
- Mining heap leach projects

PVC underdrain pipe is supplied with precision-machined slots, which provide greater intake capacity and continuous, clog-resistant drainage of fluids, as compared to standard round-hole perforated pipe. Slotted underdrain reduces entrance velocity into the pipe, thereby reducing the possibility that solids will be carried into the system. Slot rows can generally be positioned symmetrically or asymmetrically around the pipe circumference, depending upon the application. Outside diameters are generally the same for PVC and non-corrugated polyethylene (HDPE) pipe. However, the HDPE pipe must be extruded with a thicker wall (and therefore a reduced cross-sectional flow area) to obtain a comparable stiffness rating.

## Slotted PVC and Underdrain Pipe Specifications

This chart illustrates standard manufacturing capabilities only. Not all products shown are routinely stocked – call for availability.
Slot configurations not included on this chart are covered under CertainTeed's non-standard product warranty.

| NOM. SIZE | NOM. O.D. | NO. OF ROWS | CLASS | MIN. WALL THICKNESS | JOINT AVAILABILITY | O.D. OPEN AREA, SQ. INCHES PER FOOT OF SCREEN (.25" SLOT SPACING) SLOT WIDTH INCHES | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 0.010 | 0.013 | 0.016 | 0.020 | 0.025 | 0.032 | 0.040 | 0.050 | 0.085 | 0.100 | 0.125 |
| 2" | 2.375 | 4 | SCH40 | 0.154 | SW | 2.4 | 3.1 | 3.7 | 4.6 | 5.6 | 7.0 | | | | | |
| 3" | 3.500 | 4 | SCH40 | 0.216 | SW | 2.6 | 3.4 | 4.1 | 5.0 | 6.2 | 7.7 | | | | | |
| 4" | 4.500 | 4 | SDR26 | 0.173 | SW | | | | | | | | | | | |
| | | | SDR21 | 0.214 | SW | 3.0 | 3.9 | 4.8 | 8.0 | 9.7 | 12.2 | 14.8 | 18.2 | 27.2 | | |
| | | | SCH40 | 0.237 | SW,CLIB | | | | | | | | | | | |
| 4 1/2" | 4.950 | 4 | SDR26 | 0.190 | SW,CLIB | | | | | | | | | | | |
| | | | SCH40 | 0.248 | SW,CLIB | 3.0* | 4.5* | 5.4* | 9.2 | 11.3 | 14.1 | 17.1 | 21.0 | 31.5 | | |
| | | | SDR17 | 0.291 | SW,CLIB | | | | | | | | | | | |
| 5" | 5.563 | 4 | SDR26 | 0.214 | SW | | | | | | | | | | | |
| | | | SDR21** | 0.265 | SW,CLIB | | 4.5* | 5.4* | 10.0 | 12.3 | 15.4 | 18.7 | 23.0 | 34.4 | | |
| | | | SDR17 | 0.327 | SW,CLIB | | | | | | | | | | | |
| | | | SCH80 | 0.375 | CLIB | | | | | | | | | | | |
| 6" | 6.625 | 6 | SDR26 | 0.255 | SW | | | | | | | | | | | |
| | | | SCH40 | 0.280 | SW,CLIB | | | | | | | | | | | |
| | | | SDR21 | 0.316 | SW,CLIB | | | 8.2* | 12.6 | 15.4 | 19.2 | 23.4 | 28.7 | 43.0 | | |
| | | | SDR17 | 0.390 | SW,CLIB | | | | | | | | | | | |
| 6 1/4" | 6.900 | 6 | DR27.6 | 0.250 | SW | | | | | | | | | | | |
| 6 1/8" | | | SDR21 | 0.329 | SW,CLIB | | | | 12.6* | 15.4 | 19.2 | 23.4 | 28.7 | 43.0 | | |
| 6.9"O.D. | | | SDR17 | 0.406 | SW,CLIB | | | | | | | | | | | |
| 8" | 8.625 | 6 | SDR26 | 0.332 | SW | | | | | | | | | | | |
| | | | SDR21 | 0.410 | SW | | | | 14.2* | 20.3 | 25.4 | 30.8 | 37.9 | 56.7 | 63.8 | 74.6 |
| | | | SDR17 | 0.508 | CLIB | | | | | | | | | | | |
| 10" | 10.750 | 6 | SDR26 | 0.413 | SW | | | | | | | | | | | |
| | | | SDR21 | 0.511 | SW | | | | | 22.5* | 28.1 | 34.1 | 41.9 | 62.7 | 70.7 | 82.5 |
| | | | SDR17 | 0.632 | CL | | | | | | | | | | | |
| 12" | 12.750 | 8 | SDR26 | 0.490 | SW | | | | | | | | | | | |
| | | | SDR21 | 0.606 | SW | | | | | 30.0* | 37.4 | 45.5 | 55.9 | 83.7 | 94.2 | 110.1 |
| | | | SDR17 | 0.750 | CL | | | | | | | | | | | |
| 14" | 14.000 | 8 | SCH40 | 0.437 | SW | | | | | 32.9* | 41.1 | 49.9 | 61.3 | 91.8 | 103.4 | 120.7 |
| | | | SDR17 | 0.823 | CL | | | | | | | | | | | |
| 16" | 16.000 | 10 | SCH40 | 0.500 | SW | | | | | | | | | | | |
| | | 10 | SDR26 | 0.616 | SW,CL | | | | | 36.3 | 45.3 | 55.1 | 67.6 | 101.2 | 114.0 | 133.1 |
| | | 8 | SDR21 | 0.762 | CL | | | | | 31.0 | 38.7 | 47.0 | 57.7 | 86.4 | 97.3 | 113.6 |
| | | 8 | SDR17 | 0.941 | CL | | | | | | 43.5 | 52.8 | 64.9 | 97.2 | 109.4 | 127.8 |
| 17.4" O.D. | 17.400 | 8 | SDR17 | 1.024 | CL | | | | | | | 52.8 | 64.9 | 97.2 | 109.4 | 127.8 |

KEY: SW = Solvent Weld Belled End, CL = Certa-Lok (w/coupling), CLIB = Certa-Lok Integral Bell
* = Not available in SDR17 or SCH80
** = Equivalent to SCH40

Notes:
1. As a general rule, Flow Rating (GPM/ft) in a gravel-packed well = O.D. Open Area ($in^2/ft$)* (.50 blockage factor)* (.31 conversion factor) at an entrance velocity of 0.1 fps.
2. Open area percentage varies from 2% to over 20%, depending upon casing size and slot width.
3. CertainTeed can supply a detailed Engineering Specification for any of the products shown, or for special made-to-order products.
4. Slots can often be lengthened on thick-wall products to provide additional I.D. penetration; revised specifications showing increased open area are available upon request.
5. Standard slot spacing = .25". Smaller and wider spacing is available - wider spacing is recommended for slot widths of .100" and above.
6. Specifications subject to change. Standard manufacturing tolerances apply.
7. All dimensions are in inches.

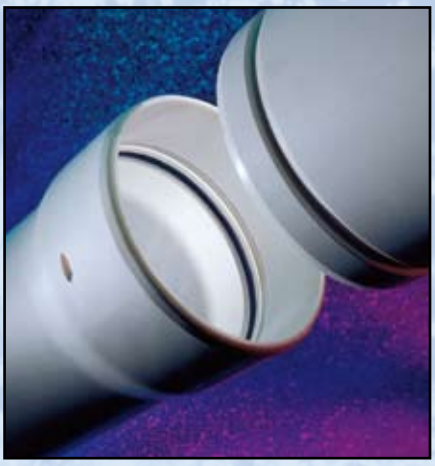
# Our Slots Pay Off Three Ways!

CertainTeed solid and slotted casing is available with a joining system to suit all of your needs:

Traditional Solvent - Weld Joint – Now with a deeper bell for a stronger, more durable bond. Available in sizes 2" - 16".

Sure-Fit™

Certa-Lok™ – Check out the Best Joint in Town. No more "glue and screw" attachments. Mechanical joint achieves full strength instantly in all weather conditions. Fast assembly and disassembly. Available in sizes 10"-17.4" O.D.



Certa-Lok™ Integral Bell Well Casing – All the advantages of the contractor-proven Certa-Lok joining system, now with a conventional belled-end joint for even faster assembly. The economical choice for all of your small-to-medium diameter well casing requirements. Available in sizes 4", 4 ½", 5", 6", 6.9" O.D., 8".

national ground water association®
MEMBER

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Product group from well-managed forests, controlled sources and recycled wood or fiber
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CertainTeed

40-37-33F  Printed in U.S.A.

# Standard Operating Procedure Installation and Extraction of the Vapor Pin®

Updated March 16, 2018

Scope:

This standard operating procedure describes the installation and extraction of the VAPOR PIN® for use in sub-slab soil-gas sampling.

Purpose:

The purpose of this procedure is to assure good quality control in field operations and uniformity between field personnel in the use of the VAPOR PIN® for the collection of sub-slab soil-gas samples or pressure readings.

Equipment Needed:

- Assembled VAPOR PIN® [VAPOR PIN® and silicone sleeve(Figure 1)]; Because of sharp edges, gloves are recommended for sleeve installation;
- Hammer drill;
- 5/8-inch (16mm) diameter hammer bit (hole **must** be 5/8-inch (16mm) diameter to ensure seal. It is recommended that you use the drill guide). (Hilti™ TE-YX 5/8" x 22" (400 mm) #00206514 or equivalent);
- 1½-inch (38mm) diameter hammer bit (Hilti™ TE-YX 1½" x 23" #00293032 or equivalent) for flush mount applications;
- ¾-inch (19mm) diameter bottle brush;
- Wet/Dry vacuum with HEPA filter (optional);
- VAPOR PIN® installation/extraction tool;
- Dead blow hammer;
- VAPOR PIN® flush mount cover, if desired;
- VAPOR PIN® drilling guide, if desired;
- VAPOR PIN® protective cap; and
- VOC-free hole patching material (hydraulic cement) and putty knife or trowel for repairing the hole following the extraction of the VAPOR PIN®.

**Figure 1.** Assembled VAPOR PIN®

Installation Procedure:

1) Check for buried obstacles (pipes, electrical lines, etc.) prior to proceeding.

2) Set up wet/dry vacuum to collect drill cuttings.

3) If a flush mount installation is required, drill a 1½-inch (38mm) diameter hole at least 1¾-inches (45mm) into the slab. Use of a VAPOR PIN® drilling guide is recommended.

4) Drill a 5/8-inch (16mm) diameter hole through the slab and approximately 1-inch (25mm) into the underlying soil to form a void. Hole **must** be 5/8-inch (16mm) in diameter to ensure seal. It is recommended that you use the drill guide.

5) Remove the drill bit, brush the hole with the bottle brush, and remove the loose cuttings with the vacuum.

6) Place the lower end of VAPOR PIN® assembly into the drilled hole. Place the small hole located in the handle of the installation/extraction tool over the vapor pin to protect the barb fitting, and tap the vapor pin into place using a dead blow hammer (Figure 2). Make sure the installation/extraction tool is aligned parallel to the vapor pin to avoid damaging the barb fitting.

**Figure 2.** Installing the VAPOR PIN®

During installation, the silicone sleeve will form a slight bulge between the slab and the VAPOR PIN® shoulder. Place the protective cap on VAPOR PIN® to prevent vapor loss prior to sampling (Figure 3).

**Figure 3.** Installed VAPOR PIN®

7) For flush mount installations, cover the vapor pin with a flush mount cover, using either the plastic cover or the optional stainless-steel Secure Cover (Figure 4).

**Figure 4.** Secure Cover Installed

8) Allow 20 minutes or more (consult applicable guidance for your situation) for the sub-slab soil-gas conditions to re-equilibrate prior to sampling.

9) Remove protective cap and connect sample tubing to the barb fitting of the VAPOR PIN®. This connection can be made using a short piece of Tygon™ tubing to join the VAPOR PIN® with the

Nylaflow tubing (Figure 5). Put the Nylaflow tubing as close to the VAPOR PIN® as possible to minimize contact between soil gas and Tygon™ tubing.

**Figure 5.** VAPOR PIN® sample connection

10) Conduct leak tests in accordance with applicable guidance. If the method of leak testing is not specified, an alternative can be the use of a water dam and vacuum pump, as described in SOP Leak Testing the VAPOR PIN® via Mechanical Means (Figure 6). For flush-mount installations, distilled water can be poured directly into the 1 1/2 inch (38mm) hole.

**Figure 6.** Water dam used for leak detection

11) Collect sub-slab soil gas sample or pressure reading. When finished, replace the protective cap and flush mount cover until the next event. If the sampling is complete, extract the VAPOR PIN®.

Extraction Procedure:

1) Remove the protective cap, and thread the installation/extraction tool onto the barrel of the VAPOR PIN® (Figure 7). Turn the tool clockwise continuously, don't stop turning, the VAPOR PIN® will feed into the bottom of the installation/extraction tool and will extract from the hole like a wine cork, DO NOT PULL.

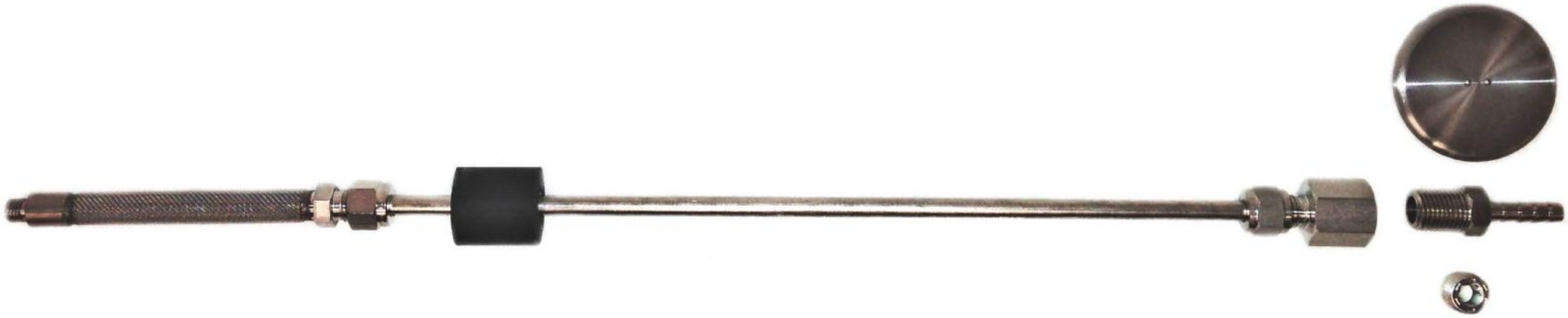
2) Fill the void with hydraulic cement and smooth with a trowel or putty knife.

**Figure 7.** Removing the VAPOR PIN®

- Prior to reuse, remove the silicone sleeve and protective cap and discard. Decontaminate the VAPOR PIN® in a hot water and Alconox® wash, then heat in an oven to a temperature of 265° F (130° C) for 15 to 30 minutes. For both steps, **STAINLESS – ½ hour, BRASS 8 minutes**

3) Replacement parts and supplies are available online.

***Part# 52955 - Sub-Slab GVP Tamper Resistant Implant***



# Standard Operating Procedure Use of the VAPOR PIN® Drilling Guide and Secure Cover

Updated March 16, 2018

Scope:

This standard operating procedure (SOP) describes the methodology to use the VAPOR PIN® Drilling Guide and Secure Cover to install and secure a VAPOR PIN® in a flush mount configuration.

Purpose:

The purpose of this SOP is to detail the methodology for installing a VAPOR PIN® and Secure Cover in a flush mount configuration. The flush mount configuration reduces the risk of damage to the VAPOR PIN® by foot and vehicular traffic, keeps dust and debris from falling into the flush mount hole, and reduces the opportunity for tampering. This SOP is an optional process performed in conjunction with the SOP entitled "Installation and Extraction of the VAPOR PIN®". However, portions of this SOP should be performed prior to installing the VAPOR PIN®.

Equipment Needed:

- VAPOR PIN® Secure Cover (Figure 1);
- VAPOR PIN® Drilling Guide (Figure 2);
- Hammer drill;
- 1½-inch diameter hammer bit (Hilti™ TE-YX 1½" x 23" #00293032 or equivalent);
- 5/8-inch diameter hammer bit (Hilti™ TE-YX 5/8" x 22" #00226514 or equivalent);
- assembled VAPOR PIN®;
- #14 spanner wrench;
- Wet/Dry vacuum with HEPA filter (optional); and
- personal protective equipment (PPE).

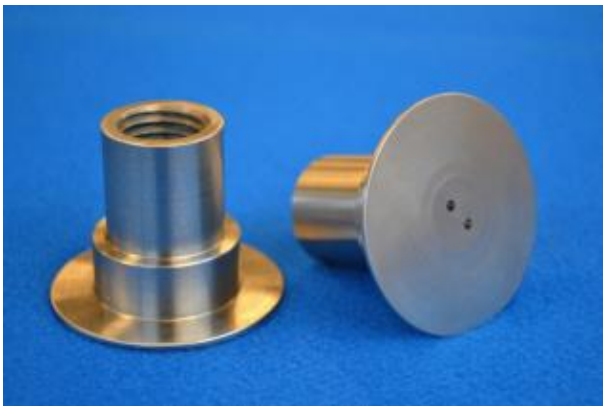


**Figure 1.** VAPOR PIN® Secure Cover

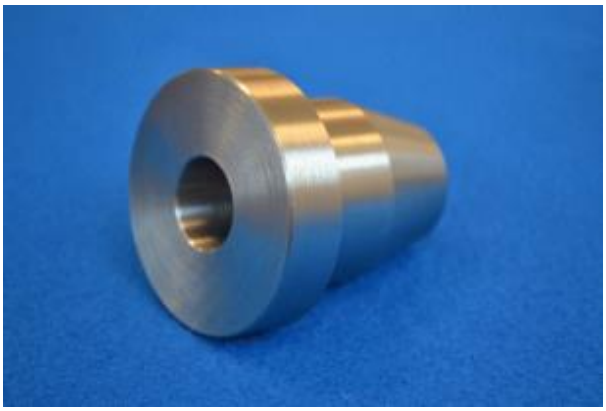


**Figure 2.** VAPOR PIN® Drilling Guide

Installation Procedure:

1) Check for buried obstacles (pipes, electrical lines, etc.) prior to proceeding.

2) Set up wet/dry vacuum to collect drill cuttings.

3) While wearing PPE, drill a 1½-inch diameter hole into the concrete slab to a depth of approximately 1 3/4 inches. Pre-marking the desired depth on the drill

bit with tape will assist in this process.

4) Remove cuttings from the hole and place the Drilling Guide in the hole with the conical end down (Figure 3). The hole is sufficiently deep if the flange of the Drilling Guide lies flush with the surface of the slab. Deepen the hole as necessary, but avoid drilling more than 2 inches into the slab, as the threads on the Secure Cover may not engage properly with the threads on the VAPOR PIN®.

**Figure 3.** Testing Depth with the Drilling Guide

5) When the 1½-inch diameter hole is drilled to the proper depth, replace the drill bit with a 5/8-inch diameter bit, insert the bit through the Drilling Guide (Figure 4), and drill through the slab. The Drilling Guide will help to center the hole for the VAPOR PIN®, and keep the hole perpendicular to the slab.

6) Remove the bit and drilling guide, clean the hole, and install the VAPOR PIN® in accordance with the SOP "Installation and Extraction of the VAPOR PIN®.

**Figure 4.** Using the Drilling Guide

7) Screw the Secure Cover onto the VAPOR PIN® and tighten using a #14 spanner wrench by rotating it clockwise (Figure 5). Rotate the cover counter clockwise to remove it for subsequent access.

**Figure 5.** Tightening the Secured Cover

Limitations:

On slabs less than 3 inches thick, it may be difficult to obtain a good seal in a flush mount configuration with the VAPOR PIN.®


*How a finished implant should look after being recessed & installed with the tamper-resistant cap*

# Standard Operating Procedure
# Leak Testing VAPOR PIN®
# Via Mechanical Means

Updated March 29, 2016

## Scope:

The operating procedure describes the methodology to test a VAPOR PIN® or equivalent sub-slab sampling device and sample train for leakage of indoor air. Mechanical leak testing is generally simpler and less costly than testing with tracer gases such as helium, but relevant state, program, or other guidance documents should be consulted to determine if a specific type of leak test is needed.

## Purpose:

The purpose of this procedure is to ensure that indoor air does not leak past the VAPOR PIN® or associated tubing and hardware, and dilute the sub-slab soil gas sample with indoor air.

## Equipment Needed:

- VAPOR PIN®;
- 3 stopcocks
- 2 Tee fittings
- Vacuum pump or peristaltic pump
- Photo-Ionization Detector (PID) or other pump for purging soil gas
- Sample container
- Vacuum gauge
- 0.25-inch Outer Diameter sample tubing (Nylaflow LM shown)
- Tubing or fittings to connect sample tubing to equipment (Tygon™ R-3803 tubing shown)
- Distilled Water

For stick-up configuration only:

- Play-Doh or VOC-free modeling clay
- 2-inch diameter plastic pipe couple;

## Procedure:

1) Drill a 5/8" diameter hole in the concrete slab and install the VAPOR PIN® as per the Standard Operating Procedure (SOP). For a flush-mount installation, drill the 1-1/2" diameter hole first, and follow the SOP Use of the VAPOR PIN® Drilling Guide and Secure Cover. Testing evacuated ("Summa") canisters and regulators in accordance with ASTM standard D7663-11 or Restek Corporation's A Guide to Whole Air Canister Sampling prior to starting field work eliminates most risk of leakage when sampling with the VAPOR PIN®. Leave the canister closed until leak testing is completed.

2) Install the VAPOR PIN® as described in the SOP Installation and Extraction of the VAPOR PIN®.

3) Clean the slab within a 2-inch radius of the VAPOR PIN® to remove all dust. Avoid wetting the concrete or wait until the concrete is dry before proceeding, and avoid cleaning with VOC-containing substances. A whisk broom or shop vacuum is recommended. Remaining dust can be picked up with a scrap of clay.

4) For a flush-mount installation, water is poured directly into the 1-1/2" depression without the PVC couple or modeling clay-proceed to the next step. For a stick-up installation, roll a 1-inch diameter ball of clay between your palms to form a "snake" approximately 7 inches long and press it against the end of the 2" pipe couple. Push the couple against the slab to form a seal between the pipe and the concrete. Notice that water soluble clays such as Play-Doh may absorb enough water to be unsuitable for tests lasting more than one hour.

5) Assemble the sample train as shown in Figure 1. Notice that the figure shows Photo-Ionization Detector (PID) at the end of the sample train, which should be replaced with the hand-held vacuum pump next to it, or a peristaltic pump, during shut-in testing. The shut-in test is conducted by closing stopcock 1, opening stopcocks 2 and 3, and imposing a vacuum of 15" mercury equivalent (in Hg) with the vacuum pump or peristaltic pump. Close stopcock 3, and observe the vacuum gauge for one to five minutes to verify that pressure in the sample train increases no more than 0.5 in Hg. Tighten or replace leaking components, if needed. The compression fitting connecting sample tubing to the sample canister is a common leak point.

6) Attach the peristaltic pump or PID and pour enough distilled water into the pipe couple or flush-mount depression to immerse the tubing connection to the VAPOR PIN®.

7) Open all stopcocks and purge and sample the sample point as required by the data quality objectives. Water level might drop slightly due to absorption into the concrete, but if there is a sudden drop in water level, the appearance of water in sample tubing, or other indication of water entering the sub-slab, remove the distilled water from the couple or depression, and reposition the VAPOR PIN® to stop the leakage before resuming the leak test and sampling.

8) If long-term sampling is conducted (e.g. 8-hour or 24-hour), the vacuum gauge, stopcock 3, PID and pumps can be removed immediately after closing stopcock 2, for use at subsequent sample locations.


**Figure 1.** Example of Sub-Slab Sampling and Leak-Test Setup

# TYGON® Ultra Chemical Resistant Tubing

Tygon® 2375 provides the highest degree of chemical resistance in clear, flexible tubing.

## Unequaled Chemical Resistance

Until now, many applications for clear flexible tubing were limited due to chemical attack from the fluid being transported. Tygon® 2375 Ultra Chemical Resistant Tubing broadens the range of usability with its expanded chemical resistance. The tubing is virtually unaffected by acids, bases, ketones, salts and alcohols (see Relative Chemical Resistance Properties chart on other side).

## Environmentally Friendly

Tygon® 2375 Ultra Chemical Resistant Tubing is unique when it comes to disposing. When properly incinerated, it does not release hazardous and corrosive hydrochloride gas, which contributes to acid rain.

## Non-DEHP and Plasticizer Free

Tygon® 2375 Ultra Chemical Resistant Tubing is entirely free of plasticizers, eliminating fluid contamination resulting from leaching plasticizers, a common occurrence with other flexible tubing.

## Longer Life

Tygon® 2375 has improved the maximum working pressure by 30-50% compared to 2075. It will not embrittle or crack prematurely due to extraction of plasticizer, thus providing a longer service life.

## *FORMULATION 2375 (Replaces Tygon® 2075)*

*Provides the highest degree of chemical resistance in clear, flexible tubing*

### Features/Benefits

- Improved pressure rating by 30-50%
- Outstanding chemical resistance
- Non-DEHP for high purity
- Plasticizer-free for low extractables
- Safer disposal – releases no harmful and corrosive hydrochloride gas
- Smoother inner surface – provides better flow and inhibits particulate build-up
- Low sorption – to minimize cross contamination
- Clear tubing for easier and better observation
- Industry compliances: FDA, EU Food Contact 2002/72/EC, NSF 51 food standards
- REACh

### Typical Applications

- Chemical transfer systems
- Transfer lines for chemical analyzers
- Detergent supply lines
- Battery acid filling
- Ink and printing fluid dispensing
- Industrial X-ray processing
- Power generation sampling and drain lines
- Paint and solvent production
- Hazardous materials handling
- Wine dispensing

SAINT-GOBAIN
PERFORMANCE PLASTICS

## Tygon® 2375 Manufactured Sizes and Pressures

| Saint-Gobain Part Number | I.D. (inches) | O.D. (inches) | Wall Thickness (inches) | Max. Working Pressure at 73˚F (psi)* | Minimum Bend Radius (inches) | Vacuum Rating, In. of Mercury at 73˚F |
|---|---|---|---|---|---|---|
| AJK00002 | 1/16 | 1/8 | 1/32 | 40.0 | 1/4 | 29.9 |
| AJK00003 | 1/16 | 3/16 | 1/16 | 65.0 | 1/8 | 29.9 |
| AJK00004 | 3/32 | 5/32 | 1/32 | 25.0 | 1/4 | 29.9 |
| AJK00007 | 1/8 | 1/4 | 1/16 | 40.0 | 1/4 | 29.9 |
| AJK00009 | 5/32 | 7/32 | 1/32 | 20.0 | 1/4 | 29.9 |
| AJK00012 | 3/16 | 5/16 | 1/16 | 30.0 | 1/2 | 29.9 |
| AJK00017 | 1/4 | 3/8 | 1/16 | 25.0 | 3/4 | 29.9 |
| AJK00022 | 5/16 | 7/16 | 1/16 | 20.0 | 1-1/4 | 29.9 |
| AJK00027 | 3/8 | 1/2 | 1/16 | 17.0 | 1-1/2 | 20.0 |
| AJK00029 | 3/8 | 5/8 | 1/8 | 25.0 | 1-1/8 | 29.9 |
| AJK00038 | 1/2 | 3/4 | 1/8 | 25.0 | 1-1/2 | 29.9 |
| AJK00046 | 5/8 | 7/8 | 1/8 | 20.0 | 2-1/2 | 29.9 |
| AJK00053 | 3/4 | 1 | 1/8 | 17.0 | 2-3/4 | 20.0 |
| AJK00064 | 1 | 1-3/8 | 3/16 | 19.0 | 3-1/4 | 25.0 |

*Working pressures are calculated at a 1:5 ratio relative to burst pressure using ASTM D1599.

The values listed for working pressures are derived from tests conducted under controlled laboratory conditions. Many factors will reduce the tubing's ability to withstand pressures including temperature, chemical attack, stress, pulsation and the attachment to fittings. It is imperative that the user conduct tests simulating the conditions of the application prior to specifying the tubing for use.

## Tygon® 2375 Typical Physical Properties

| Property | ASTM Method | Value or Rating |
|---|---|---|
| Durometer Hardness Shore A, 15 Sec | D2240 | 75 |
| Color | – | Clear |
| Tensile Strength psi (MPa) (at break) | D412 | 1900 (13.1) |
| Ultimate Elongation, % | D412 | 850 |
| Tear Resistance lb-f/inch (kN/m) | D1004 | 240 (42.0) |
| Specific Gravity | D792 | 0.9 |
| Water Absorption, % 24 hrs. @ 23˚C | D570 | <0.01 |
| Compression Set Constant Deflection, % @ 158˚F (70˚C) for 22 hrs. | D395 Method B | 100 |
| Brittleness By Impact Temp., ˚F (˚C) | D746 | -103 (<-75) |
| Maximum Recommended Operating Temp., ˚F (˚C) | – | 130 (54) |
| Low Temp. Flexibility, ˚F (˚C) | – | -103 (-75) |
| Tensile Modulus, @ 100% Elongation, psi (MPa) | D412 | 425 (2.9) |
| Tensile Set, 75% of Ultimate Elongation, % | D412 | 300 |

Unless otherwise noted, all tests were conducted at room temperature (73˚F). Values shown were determined on 0.075" thick extruded strip or 0.075" thick molded ASTM plaques or molded ASTM durometer buttons.

## Relative Chemical Resistance Properties*

| Tubing | Acids | | | Bases | | | Salts | Alcohols | Ketones |
|---|---|---|---|---|---|---|---|---|---|
| | Conc. | Med. | Weak | Conc. | Med. | Weak | | | |
| Tygon® 2375 | F | E | E | E | E | E | E | E | F |
| Fluoroelastomers | E | E | E | U | F | F | E | F | U |
| Urethane | U | U | U | U | F | F | F | U | U |
| PVC | F | E | E | E | E | E | E | F | U |
| Thermoplastic Rubber | U | F | F | F | E | E | E | F | U |
| Neoprene | U | F | E | E | E | E | E | E | U |
| Nitrile Rubber | F | F | E | U | E | E | E | E | U |
| Silicone | U | U | U | U | F | F | F | F | U |
| EVA | U | F | E | F | E | E | E | E | U |

E = Excellent F = Fair U = Unsatisfactory

*All tests conducted at room temperatures.

Saint-Gobain Performance Plastics
2664 Gilchrist Road
Akron, OH 44305
Tel: 800-798-1554
Tel: (330) 798-9240
Fax: (330) 798-6968

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Tygon® is a registered trademark.

QUIKRETE® CEMENT & CONCRETE PRODUCTS™

## 1. Product Name

QUIKRETE® Non-Shrink Precision Grout #1585-00

## 2. Manufacturer

The QUIKRETE Companies
One Securities Centre
3490 Piedmont Rd., NE, Suite 1300
Atlanta, GA 30305
(404) 634-9100
Fax: (404) 842-1424
www.quikrete.com

## 3. Product Description

BASIC USE

Typical applications for QUIKRETE Non-Shrink Precision Grout include grouting of:

- All types of machinery
- Steel columns
- Bearing plates
- Precast concrete
- Other anchoring conditions that require high in-service strength

The nonshrink characteristics of Non-Shrink Precision Grout make it stable and capable of handling high load transfers.

COMPOSITION & MATERIALS

QUIKRETE Non-Shrink Precision Grout is a non-metallic Portland cement based material. Non-Shrink Precision Grout is a preblended product including expansive additives, requiring only the addition of water to obtain flowable properties and high strengths.

SIZES

- 50 lb (22.7 kg) bags

COLORS

- Gray

YIELD

A 50 lb (22.7 kg) bag of QUIKRETE Non-Shrink Precision Grout will yield 0.45 cu ft (12.7 L) at flowable consistency.

LIMITATIONS

The proper cleaning and wetting of surfaces to be grouted is vital to maximum performance. Hot and cold temperature precautions, as they apply to concrete, should also be followed.

## 4. Technical Data

APPLICABLE STANDARDS

ASTM International

- ASTM C109/C109M Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens)
- ASTM C827 Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures
- ASTM C939 Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method)
- ASTM C1090 Standard Test Method for Measuring Changes in Height of Cylindrical Specimens from Hydraulic-Cement Grout

TABLE 1 TYPICAL PHYSICAL PROPERTIES AT 73°F (23°C)

| | |
|---|---|
| Compressive strength, ASTM C109 modified per ASTM C1107 | |
| Plastic consistency | |
| 1 day | 3000 psi (20.7 MPa) |
| 3 days | 9500 psi (65.5 MPa) |
| 7 days | 10,000 psi (68.9 MPa) |
| 28 days | 14,000 psi (96.5 MPa) |
| Height change, ASTM C1090 1, 3, 7 and 28 days | 0 - 0.2% |
| Height change, ASTM C827 | + 0.6% |
| Flowable consistency | |
| 1 day | 3000 psi (20.7 MPa) |
| 3 days | 9000 psi (62.1 MPa) |
| 7 days | 9500 psi (65.5 MPa) |
| 28 days | 12,500 psi (86.2 MPa) |
| Height change, ASTM C1090 1, 3, 7 and 28 days | 0 - 0.2% |
| Height change, ASTM C827 | + 0.4% |
| Fluid consistency | |
| 1 day | 2500 psi (17.2 MPa) |
| 3 days | 5000 psi (34.5 MPa) |
| 7 days | 6000 psi (41.4 MPa) |
| 28 days | 8000 psi (55.2 MPa) |
| Height change, ASTM C1090 1, 3, 7 and 28 days | 0 - 0.2% |
| Height change, ASTM C827 | + 0.3% |
| Pull-out strength, ASTM E488 [1] | 35,000 psi (241 MPa) |

[1] 1 1/4" (31 mm) bolts embedded 9" (225 mm) deep in 3" (75 mm) hole in 2000 psi (13.8 MPa) concrete.


QUIKRETE® Non-Shrink Precision Grout #1585-00

- ASTM C1107 Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
- ASTM E488 Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements

U.S. Army Corps of Engineers (USACE) - CRD 621

PHYSICAL/CHEMICAL PROPERTIES

QUIKRETE Non-Shrink Precision Grout complies with all properties of ASTM C1107 and CRD 621 producing the results shown in Table 1.

## 5. Installation

MIXING

QUIKRETE Non-Shrink Precision Grout should be mechanically mixed for a minimum of 5 minutes.

PRECAUTIONS

Add the minimum amount of water necessary to produce the desired flow characteristics as indicated in Table 2. Do not exceed a flow of 20 seconds per ASTM C939.

METHODS

Surfaces to receive the grout must be clean

TABLE 2 APPROXIMATE WATER REQUIRED FOR 50 LB (22.7 KG) OF GROUT

| | |
|---|---|
| Plastic | 1 gal (3.8 L) |
| Flowable | 1 gal + 1 pt (4.3 L) |
| Fluid | 1 gal + 3 pt (5.2 L) |

TABLE 3 WORKING TIME

| Temperature | Working time |
|---|---|
| 50°F (10°C) | 25 min |
| 73°F (23°C) | 25 min |
| 90°F (32°C) | 15 min |

and free of any type of foreign matter, grease, paint, oil, dust or efflorescence. In some cases it may be necessary to roughen smooth surfaces or etch old ones with acid. The area should be flushed and soaked with clean water prior to grouting leaving no standing water. Place the grout quickly and continuously using light rodding to eliminate air bubbles.

WORKING TIME

When properly mixed to a fluid consistency QUIKRETE Non-Shrink Precision Grout will comply with all portions of ASTM C1107 and CRD 621 and retain a fluid consistency for the maximum usable working times stated in Table 3.

TEMPERATURE

Grout temperature should be maintained from 50 - 90 degrees F (10 - 32 degrees C) to achieve specified results. Use cold water in hot weather or hot water in cold weather to achieve desired grout temperature. Do not pour grout if temperature is expected to go below 32 degrees F (0 degrees C) within a 12 hour period.

CURING

A damp cure of at least 3 days is necessary to control the nonshrink characteristics and maintain strength levels.

**6. Availability**

QUIKRETE Non-Shrink Precision Grout is available at leading concrete construction supply houses and distributors. Contact QUIKRETE Construction Products for the name of the nearest dealer.

**7. Warranty**

The QUIKRETE Companies warrant this product to be of merchantable quality when used or applied in accordance with the instructions herein. The product is not warranted as suitable for any purpose or use other than the general purpose for which it is intended. Liability under this warranty is limited to the replacement of its product (as purchased) found to be defective, or at the shipping companies' option, to refund the purchase price. In the event of a claim under this warranty, notice must be given to The QUIKRETE Companies in writing. This limited warranty is issued and accepted in lieu of all other express warranties and expressly excludes liability for consequential damages.

**8. Maintenance**

None required.

**9. Technical Services**

The QUIKRETE Companies maintain technical field representatives throughout the country. Contact a local distributor for the name and number of the nearest representative, or call QUIKRETE Construction Products.

**10. Filing Systems**

- Reed First Source
- Additional product information is available from the manufacturer.