



ACTION PLAN: CRAWLSPACES

Stop bad crawlspace air. It accumulates moisture and mold, including insects and rodents. You wouldn't sleep there, so stop the crawlspace air from coming up to you.



HAYWARD
SCORE

QUICK START: CRAWLSPACES

You can stop bad crawlspace air from entering your home. While each step by itself will result in significant improvement, completion of all three, in the order listed below, will provide maximum benefit.



1

Seal the dirt floor of the crawl space by installing a true moisture barrier to stop soil gases and moisture from polluting the crawlspace air.



2

Air seal between the crawlspace and the living space to stop the crawlspace air from flowing into your living space.



3

Add active or mechanical filtered ventilation to your crawlspace to ensure that the air is the best it can possibly be. (optional, but recommended)

WARNING!

You may encounter mold, pests, years of accumulated pesticides, dirt, dust, standing water and more when you enter your crawlspace. Be prepared when you go in with at least a face mask (rated N95 or better) to limit your exposure and resulting health effects.

IMPLEMENTATION MANUAL



HAYWARD
SCORE

TIP!

Crawlspaces are best addressed by a qualified professional willing to follow the Hayward Score Crawlspace Implementation Manual. If you choose to do it yourself closely follow the manual, observe all precautions, and don't skip steps!



MATERIALS LIST

SAFETY FIRST

- Personal Protection Equipment (PPE)
- BREATHING MASK WITH A MINIMUM N-95 RATING FOR PARTICULATES. (N-100 IS IDEAL).
- RESPIRATOR (TO PROTECT FROM VOCs) IS RECOMMENDED IF YOU ARE CHEMICALLY SENSITIVE
- PROTECTIVE CLOTHING (TYVEK OR EQUIVALENT)
- SAFETY GLASSES
- MOISTURE BLOCKING GLOVES

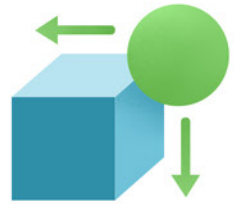
IF YOU ARE PLANNING TO DO WORK IN YOUR CRAWLSPACE, ADD:
- VENTILATION EQUIPMENT (TO PROVIDE NEGATIVE AIR)

FOR PREP STEPS

- Moisture probe for soil
- Moisture meter for structure
- Flashlight
- Plastic wrap or clean storage containers (to hold any contents removed from crawlspace)
- Wizard Stick, Dragon Puffer, or similar non-flamable indicator smoke to identify air pathways,

FOR INSTALLATION

- Air flow control equipment for negative pressure in crawlspace. Containment material for partial crawlspaces.
- Soil barrier with an ASTM permeability rating less than 1 and is tear/puncture resistant.
 - CHOOSE ONE WITH A MATERIAL/THICKNESS SUFFICIENT TO PREVENT TEARS AND PUNCTURES.
- "U-channel" or equivalent
- Equipment to ramset the support nails to install the U-channel.
- Water leak sensors



OVERVIEW

This manual is designed to help you address the issues in your crawlspace by preventing the dust, mold, soil gasses, odors, and other contaminants from circulating out of the crawlspace and into the living space. This will improve the air quality inside your home and increase your Hayward Score.

Many of these actions and their combinations are new, even to contractors, because they have been trained to comply with local building codes and general industry standards, not these higher standards which include the impact of the house on the people who live in them.

Our methodology encompasses building science and academic research, in combination with extensive practical experience of what works and what doesn't work. It exceeds most industry standards, and dramatically reduces crawlspace air from entering your living spaces. It is critically important that the steps be completed as specified and in the order listed.

STEP 1: PROTECT

STEP 2: PREPARE

STEP 3: INSPECT

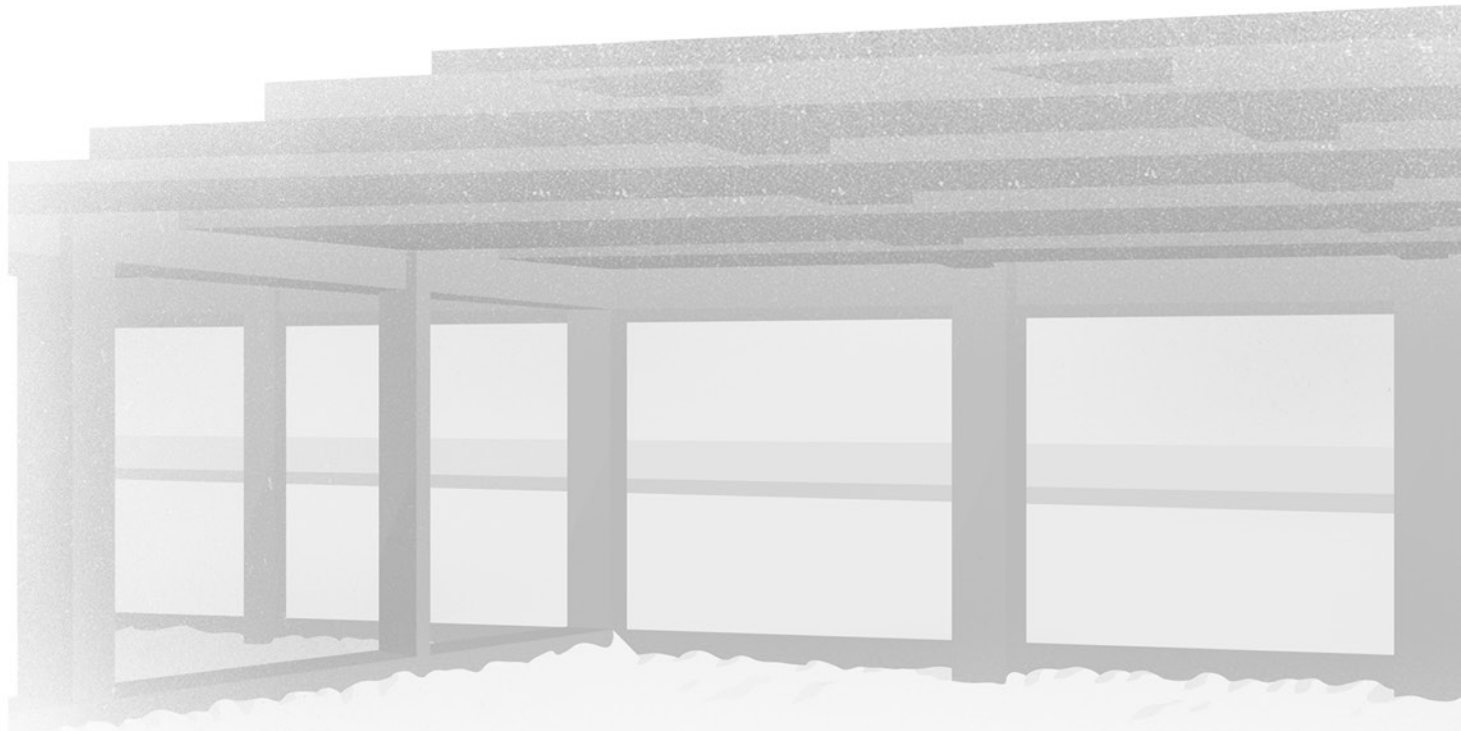
STEP 4: REPAIR

**STEP 5: AIR SEAL BETWEEN
CRAWLSPACE AND LIVING SPACE**

STEP 6: SEAL THE DIRT FLOOR

STEP 7: ADD MECHANICAL VENTILATION

STEP 8: VERIFY SUCCESS



STEP 1: PROTECT

Chances are you don't know what is in your crawlspace. So before you venture under the house, make sure you are protected!

For any inspection and when working in the crawlspace:

- **Protect yourself with Personal Protection Equipment**
 - BREATHING MASK WITH A MINIMUM N-95 RATING FOR PARTICULATES. N-100 IS IDEAL.
 - RESPIRATOR FOR VOCs IS RECOMMENDED IF YOU ARE CHEMICALLY SENSITIVE
 - PROTECTIVE CLOTHING (TYVEK PREFERRED)
 - SAFETY GLASSES
 - MOISTURE BLOCKING GLOVES
 - KNEE PADS

Working in the crawlspace disturbs everything - dust, mold, soil gasses, pesticides, etc. That can get into your living spaces making occupants sick and depositing a layer of dust and dirt.

- **Protect the air in the house above the crawlspace with:**
 - CONTAINMENT AND AIR FLOW CONTROL EQUIPMENT.
 - YOU WANT TO ESTABLISH AIRFLOW CONTROL IN THE CRAWLSPACE, USING A HEPA FILTERED NEGATIVE AIR MACHINE PROPERLY SIZED FOR THE SPACE, ALL BUT ONE VENT BLOCKED, WITH THE FILTERED OUTPUT EXHAUSTED TO THE OUTSIDE THROUGH A VENT. IF YOU DIY, YOU MAY BE ABLE RENT ONE FROM A MOLD OR ASBESTOS REMEDIATION CONTRACTOR. OTHERWISE, THE PROFESSIONAL SHOULD HAVE THE PROPER EQUIPMENT AND THE EXPERIENCE TO USE IT CORRECTLY.

STEP 2: PREPARE

In order to make an accurate assessment of what needs to be done to improve your crawlspace, you need to be able to see it - all of it!

- **Remove stored contents**

Contents like luggage, seasonal decor, books, papers, or photos can become contaminated by the crawlspace.
- **IF THE ONLY OPENING TO THE CRAWLSPACE IS INSIDE THE HOUSE:**
 - DON'T BRING ITEMS OR DEBRIS DIRECTLY FROM THE CRAWLSPACE INTO THE HOUSE OR ATTACHED GARAGE.
 - CREATE A CLEAN PATHWAY USING PLASTIC ON THE FLOOR TO CREATE "WALLS" OF A "TUNNEL" TO TRANSPORT THE CONTENTS OUTSIDE, INTO THE GARAGE OR OTHER NON-LIVING SPACE.
- **IF THE OPENING TO THE CRAWLSPACE IS OUTSIDE THE HOUSE:**
 - CONTENTS AND DEBRIS CAN BE REMOVED DIRECTLY TO THE OUTDOORS. BUT DON'T BRING CONTENTS BACK INTO THE HOUSE UNTIL THEY HAVE BEEN CLEANED.

NOTE:

Small particulates can get into your hair, nostrils, and clothes! To prevent exposure and spreading contaminants through the house:

- Take a shower
- Wash clothes immediately after coming out of the crawlspace.

STEP 3: INSPECT

Now that your crawlspace is empty and you can see into all the nooks and crannies, it is time to do a thorough inspection focusing on 6 key things: Moisture, Insulation, Air Pathways, Structural Damage, Visible Mold Growth, and Ventilation. This assessment is critical in determining a work plan specific to your crawl space so we've provided a lot of detail to help you.

MOISTURE

To assess how wet your crawlspaces is you need to test the soil and the wood structures and locate areas of condensation and water penetration.

SOIL

Wet soil adds moisture to the crawl space. Even if you can't see visible wet spots or puddles, soil can still be wet just below the surface (kind of like a juicy apple pie under a dry crust).

HOW TO:

USING A SOIL MOISTURE PROBE (FOR POTTED PLANTS) CHECK SEVERAL LOCATIONS LOOKING FOR HIDDEN AREAS OF MOISTURE.

WOOD

Water stains and mold are signs of moisture, but even if those things aren't visible, wood may have high moisture content (>20%). Your goal is not only to find the obvious wet areas but also the hidden damp spaces. Long-term leads can spread over larger areas that you might think. It is important to use a moisture meter to identify the boundaries of damp materials - this is called moisture mapping.

HOW TO:

USING A MOISTURE METER, CHECK THE DIFFERENT WOOD SURFACES IN YOUR CRAWL SPACE.

- MOISTURE METERS WITH PADS ARE A BIT EASIER TO USE THAN THOSE WITH PINS, BUT BOTH TAKE A LITTLE PRACTICE
- PRACTICE WITH IT ON AREAS INSIDE THE HOUSE THAT YOU KNOW ARE DRY AND AREAS YOU KNOW ARE WET SO YOU CAN COMPARE THE READINGS AND THE BEHAVIOR OF THE METER.
- PRACTICE PLACING THE METER ON METAL OBJECTS TO SEE HOW IT RESPONDS TO OBJECTS OTHER THAN WATER. BY BECOMING FAMILIAR WITH THE STRAIGHT LINES OF READINGS FROM ELECTRICAL WIRING IN A WALL OR METAL REINFORCEMENTS ON WALL CORNERS, YOU CAN LEARN TO COMPARE THOSE PATTERNS TO THE IRREGULAR OUTLINE OF DAMP AREAS.

AREAS OF WATER PENETRATION AND CONDENSATION

Visual observation and careful moisture meter readings can identify the starting water source and the full extent of where the water flowed.

HOW TO:

- LOOK FOR VISIBLE WATER STAINS, PUDDLES, AND AREAS OF SUSPECT VISIBLE MOLD. YOU MAY EVEN NOTICE ACTIVE LEAKS IF YOU ARE UNDER THE HOUSE WHEN IT IS RAINING.
- IDENTIFY FOR DAMPNESS THAT IS NOT VISIBLE BY USING THE MOISTURE METER AND SOIL PROBE.

INSULATION

Most crawl spaces have some form of insulation. You want to inspect the condition of the insulation and if it has been installed correctly (you'd be surprised at how much isn't!)

NOTE:

Fiberglass insulation has two sides: 1) the "unfaced" side is usually pink, yellow or brown and 2) the "moisture barrier" side has a paper or foil top layer.

HOW TO:

- CHECK THE CEILING AND SIDE WALL INSULATION TO SEE IF IT LOOKS DIRTY OR DISCOLORED.
- NOTE ANY AREAS WHERE THE INSULATION IS NOT FLUSH WITH A SURFACE (I.E., FALLING, HANGING DOWN)
- CHECK IF CEILING OR SILL PLATE INSULATION IS PRESENT AND IS CORRECTLY INSTALLED. THE SIDE WITH THE MOISTURE BARRIER SHOULD BE AGAINST THE STRUCTURE, IN COLD CLIMATES THE UN-FACED SIDE SHOULD BE EXPOSED TO THE CRAWLSPACE.

- IF THE INSULATION IS NOT PROPERLY INSTALLED, OR IS COMING AWAY FROM THE SURFACE IN ANY WAY, INSPECT THE STRUCTURE ABOVE OR BEHIND FOR MOISTURE CONTENT, WOOD ROT, OR SUSPECT VISIBLE MOLD GROWTH.

AIR PATHWAYS

Houses are not built airtight. This means there are small pathways through which air moves between different sections of a house, like from crawlspaces and basements to inside the house where you breathe. If you want to keep crawlspace air (and odors) out, you need know how it is getting in.

HOW TO:

- NOTE ODORS IN THE CRAWLSPACE THAT ARE SIMILAR TO ODORS IN THE LIVING SPACE.
- USE AN INEXPENSIVE TOOL THAT RELEASES SAFE "INDICATOR SMOKE" THAT WILL REVEAL THE DIRECTION OF AIR FLOW.
- CHECK ESPECIALLY THE AREAS AROUND DOORWAYS OR HATCHES INTO THE CRAWLSPACE, CUTOUTS FOR VENTS TO THE OUTSIDE OR FOR A FORCED AIR SYSTEM, AND DUCTS. IF YOU HAVE PARTIAL BASEMENT WITH A CRAWLSPACE, CHECK THE OPENING BETWEEN THEM.

NOTE:

You may need a **professional** to conduct pressure measurements and find all the air pathways so you can understand air flows in your home.

- IF THE FORCED AIR SYSTEM IS IN THE CRAWLSPACE, THEN REFER TO THE HAYWARD SCORE FORCED AIR MANUAL TO DETERMINE CORRECT ACTION TO STOP CRAWLSPACE AIR FROM CIRCULATING TO THE BREATHING ZONE UPSTAIRS VIA THE DUCTS.

MOLD GROWTH AND ROTTED WOOD

Mold and dampness in crawlspaces contribute to health effects in occupants and structural damage to joists and other support structures which can lead to collapsing floors and other expensive problems. Leaks must be repaired and damaged materials replaced before you start sealing the crawlspace or they'll continue to get worse and once the space is sealed, these repairs will be much more difficult to address.

If you can smell it or see it, you have to remove it and stop the source of water!

HOW TO:

- **INSPECT FOR SUSPECT VISIBLE MOLD GROWTH AND STRUCTURAL DAMAGE (INDICATED BY SAGGING, SOFT WOOD, DISCOLORATION).**

Even without evidence of structural damage, mold should be professionally assessed and remediated (if needed) by contractors with expertise in mold remediation who will comply with the written scope of work from the assessor.

VENTILATION

Ventilation and moisture control are the keys to crawlspace management. Because crawlspaces are directly connected to the outdoors, they are at the mercy of the local climate. If the combination of surface temperatures and air moisture exceeds the dew point, condensation will occur. Over several seasons of water on wood, insulation, and other structures, bacteria and mold can germinate, grow, reproduce, and flourish to the point where professional remediation is required.

HOW TO:

- **NOTE THE NUMBER AND LOCATION OF VENTS TO THE OUTDOORS AND WHETHER THEY ARE OPEN OR BLOCKED**
- **ASSESS IF THE VENTILATION IS APPROPRIATE FOR THE CLIMATE.**
 - **HOT HUMID CLIMATES, FOR EXAMPLE, WILL HAVE HIGH LEVELS OF MOISTURE (HUMIDITY) IN THE OUTSIDE AIR. AS IT COMES INTO THE COOLER CRAWLSPACE THE AIRBORNE MOISTURE CAN CONDENSE ON THE COOLER SURFACES. THE LIQUID WATER CAN BE SUFFICIENT TO GERMINATE MOLD SPORES, REACTIVATE DORMANT MOLD GROWTH, PLUS SUPPORT HIGHER POPULATIONS OF BACTERIA, INSECTS, RODENTS, AND RELEASE OF CHEMICALS FROM THE DAMAGED BUILDING MATERIALS. CONSULT YOUR LOCAL BUILDING DEPARTMENT, OR A RELIABLE LOCAL CONTRACTOR, FOR DETAILS ABOUT YOUR CLIMATE AND VENTILATION REQUIREMENTS.**
- **IF YOU ARE INSTALLING MECHANICAL VENTILATION, DETERMINE A LOCATION FOR THE INSTALLATION OF A HRV/ERV SEPARATE FROM ONE FOR THE LIVING SPACE.**

STEP 4: REPAIR (IF NEEDED)

If the inspection of your crawlspace didn't reveal anything in need of repair, you can skip this step. If you did notice one or more issues, check below for how to address them. It is important to remedy things fully and correctly – otherwise, your efforts to seal the space will be much less effective.

INSULATION

Whether your crawlspace is dry, wet, or just occasionally damp, it should be intact and properly installed.

HOW TO:

- INSULATION BETWEEN THE JOISTS SHOULD BE PLACED WITH THE VAPOR BARRIER (IF THERE IS ONE) TOWARDS THE WARM SIDE.
- INSULATION ON THE SILL PLATES IS USUALLY PLACED WITH THE VAPOR BARRIER (IF THERE IS ONE) TOWARDS THE WOOD IN COLD CLIMATES AND AWAY FROM THE WOOD IN WARM CLIMATES.
- REMOVE INSULATION THAT IS DISCOLORED, STAINED, OR IS WET OR DAMP.
- PULL BACK INSULATION TO MAKE SURE THERE IS NO WATER DAMAGE, WOOD ROT, OR VISIBLE SUSPECT MOLD GROWTH ON POSTS, BEAMS, AND JOISTS. ANY DAMAGE SHOULD BE REPAIRED OR REPLACED.
- IF INSULATION IS NOT PRESENT THEN OBTAIN BIDS FROM CONTRACTORS FOR PROPER TYPE OF INSULATION AND SUFFICIENT R-VALUE FOR THE STRUCTURE AND THE CLIMATE AND INSTALL IT.

ROTTEN WOOD AND WATER DAMAGE

Long-term moisture will rot wood structures such as joists and support beams. Damaged wood and other materials, need to be removed and replaced properly.

This requires an assessment and repair by a professional.

MOLD

Your crawlspace should be free of visible suspect mold because it contributes to odors, increased health risks, and is an indicator of potential structural degradation.

HOW TO:

- SMALL AREAS OF SUSPECT VISIBLE MOLD GROWTH (ABOUT THE SIZE OF SHEET OF PAPER) CAN USUALLY BE CLEANED. ON NON-POROUS SURFACES (LIKE TILE), CLEAN WITH A DAMP CLOTH AND MILD DETERGENT. ON POROUS SURFACES (LIKE WOOD) YOU CAN REMOVE WITH CAREFUL HAND SANDING WHILE HOLDING A HEPA VACUUM NOZZLE.
- LARGER OR MULTIPLE AREAS OF MOLD, ESPECIALLY ON POROUS SURFACES, ARE BEST ADDRESSED BY A PROFESSIONAL COMPLIANT WITH INDUSTRY STANDARDS (SEE BELOW) AND WHO WILL PROVIDE REFERENCES, A WRITTEN SCOPE OF WORK, AND A WRITTEN GUARANTEE.
 - NEW YORK CITY DEPARTMENT OF HEALTH GUIDELINES
 - ANSI-IICRC S500 STANDARD AND REFERENCE GUIDE FOR PROFESSIONAL WATER DAMAGE RESTORATION.
 - ANSI-IICRC S520 STANDARD AND REFERENCE GUIDE FOR PROFESSIONAL MOLD REMEDIATION.

TRAPS TO AVOID:

Mold testing is rarely needed. The type of mold does not change the need to remove and does not change how to remove. Air samples in crawlspaces are mostly irrelevant. Surface samples identify suspect visible, and do not identify all locations. Simply remove the surface mold, or hire a professional to assess. Simply remove the surface mold, or hire a professional to assess the situation.

BE SAFE

Exposure to mold can cause a reaction, even if you never had one previously. For people who are particularly sensitive, even exposure to a small quantity of mold can cause symptoms.

Use caution whenever you might be around moldy areas. At the very least, use a good quality, tight-fitting mask with respiration and try to ventilate the space.

DRAINAGE REPAIR

Crawlspaces should not have water flowing into or through them. There should be no standing water or muddy soil. If any of these conditions are present then water is coming into the crawlspace from outside, either from surface water or water below the surface. The source of the water needs to be identified and strategies created to stop it. If it cannot be stopped then a drainage system needs to be installed to move the water away from, or out of, the crawlspace. French drains (perimeter drains either inside or outside the foundations walls) may be required, supplemented by a sump pump to forcibly remove water that doesn't sufficiently drain through the system. **Professionals are required to assess and remediate.**

STEP 5: SEAL THE DIRT FLOOR

To keep soil gasses and moisture from the earth from entering the crawlspace, you need to install a sealed moisture barrier. The barrier must cover all the dirt, sand, gravel and rock in the crawl space and physically attach with an air-tight seal to the perimeter foundation, piers, wire, and pipes.



CHOOSE THE RIGHT MOISTURE BARRIER

The purpose of the moisture barrier is to stop the migration of moisture, water vapor, soil gases, odors, bacteria, mold, and other contaminants into the crawlspace air from the soil. Most membranes are designed for radon mitigation where air is sucked through and out from under the membrane. The ones that allow some air to migrate through the membrane work best for that application but are not a moisture barrier.

HOW TO:

- CHECK THAT THE MEMBRANE PERMEABILITY RATING IS LESS THAN 1.0.
- MAKE SURE THAT THE MEMBRANE IS A MOISTURE BARRIER NOT A MOISTURE RETARDER.
- MAKE SURE THAT THE MEMBRANE IS PUNCTURE AND TEAR RESISTANT, SO THAT IT ISN'T DAMAGED WHEN THERE IS ROUTINE MAINTENANCE IN THE CRAWLSPACE.



COVER THE ENTIRE DIRT FLOOR

The membrane must cover the entire dirt floor. Any open spaces for any reason will create a strong flow from under the membrane up into the crawlspace air and eventually into the breathing zone of the living space.

HOW TO:

- IF YOU HAVEN'T ALREADY DONE IT, CLEAR ALL STORAGE ITEMS AND ANY DEBRIS (ROCKS, BRANCHES, AND ANYTHING TOO LARGE TO PASS THROUGH A GARDEN RAKE.)



TAPE ALL SEAMS AND SEAL THE PERIMETER

All seams need to be mechanically attached/sealed to the foundation as does the perimeter of the membrane. If not completely sealed, slight pressures that build up under the membrane can eventually push it away from the foundation wall, allowing the accumulated pollution to escape into the crawlspace air and eventually into the breathing zone of the living space.

HOW TO:

- USE TAPEBOND OR EQUIVALENT ON SEAMS, PIERS, BLOCKS. USE THICK NON-TOXIC CAULK BETWEEN THE MEMBRANE AND THE FOUNDATION WALL TO FILL IN THE PORES AND THE UNEVEN SURFACES. SPRAY ADHESIVE ISN'T THICK ENOUGH.
- MECHANICAL PRESSURE PROVIDED BY SOLID WOOD OR U-SHAPED METAL RAMSET AGAINST THE MEMBRANE-CAULK-FOUNDATION ASSEMBLY IS REQUIRED TO RESIST PRESSURE BUILDUP FROM BELOW THE MEMBRANE. THIS APPLIES TO PIERS, FOOTERS, AND WALLS. RAMSETTING HANGERS OR NAILS EVERY FEW FEET IS NOT SUFFICIENT.

- PHYSICALLY ATTACH TO THE PERIMETER FOUNDATION, PIERS, WIRE, AND PIPES
- ENSURE THAT ALL SEAMS OVERLAP A MINIMUM OF 4" AND ARE SEALED BOTH WITH TAPEBOND OR EQUIVALENT BETWEEN THE LAYERS AND FOUR INCH APPROPRIATE TAPE TO SEAL THE EXPOSED EDGE.

TRAPS TO AVOID:

A common short cut is to overlap the seam by two to three feet under the assumption that moisture won't migrate that far between the layers. That assumption is incorrect! Tight sealing, not overlapping is the key to a sealed seam.



DEAL WITH WOOD AND METAL PENETRATIONS CORRECTLY

Seal the dirt, not the wall. It is unnecessarily costly and makes it difficult to inspect or repair the foundation in the future.

HOW TO:

- INSTALL MEMBRANE UP TO, BUT NOT ABOVE THE TOP OF CONCRETE WALLS AND PADS.
- NEVER WRAP MEMBRANE AROUND WOOD OR STEEL SUPPORT. THIS WILL RESULT IN MOISTURE ACCUMULATIONS THAT WILL CORRODE/ROT THE SUPPORT. IT ALSO ALLOWS A PATHWAY FOR TERMITES TO GET INTO WOOD.

- THE MEMBRANE CAN BE EXTENDED VERTICALLY TO COVER AREAS OF SEEPAGE (A VERY SMALL DRIP OR OOZE OF WATER) OR AIR FLOW. HOWEVER, IF THERE IS A CRACK OR EVIDENCE OF MORE SUBSTANTIAL WATER FLOW THAT NEEDS TO BE FIXED RATHER THAN JUST COVERED BY THE MEMBRANE.
- ALL PENETRATIONS, FROM SUPPORT PIERS, POSTS, PIPES, AND WIRING MUST BE SEALED WITH TAPEBOND OR EQUIVALENT.

WATER LEAK SENSORS

Crawlspaces are out of sight and out of mind. Water can flow through, condense, accumulate and remain undetected for years. Water can be detected with sensors to alert you to physically check the conditions of the crawlspace. Install on top of the membrane below areas with higher potential for water accumulation such as below water lines, drains, and near vents to the outside.

STEP 6:

AIR SEAL BETWEEN CRAWLSPACE AND LIVING SPACE

To keep crawlspace air out of your living space, you need to find and seal ALL of the air pathways between the two spaces.

HOW TO:

- AS DESCRIBED EARLIER, USE INDICATOR SMOKE TO FIND ALL AIR PATHWAYS BETWEEN CRAWL SPACE AND LIVING SPACE.
 - PULL BACK INSULATION WHERE NECESSARY TO FIND AIR PATHWAYS AROUND PIPES AND WIRES.
 - PAY CAREFUL ATTENTION TO THE AREAS AROUND DOORWAYS OR HATCHES INTO THE CRAWLSPACE, CUTOUTS FOR VENTS TO THE OUTSIDE OR FOR A FORCED AIR SYSTEM, AND DUCTS. IF YOU HAVE PARTIAL BASEMENT WITH A CRAWLSPACE, CHECK THE OPENING BETWEEN THEM.
 - LOOK FOR KNOTS IN PLYWOOD AND THE JOINTS BETWEEN SHEETS OF PLYWOOD THAT ALLOW AIR TO PASS THROUGH.
- MOST AIR PATHWAYS CAN BE EFFECTIVELY BLOCKED WITH NON-TOXIC CAULK, EXPANDING FOAM OR TAPE. SOMETIMES LARGER HOLES CAN BE SUFFICIENTLY BLOCKED BY TIGHTLY STUFFING INSULATION INTO THE OPENINGS.
- IF FORCED AIR DUCTING OR THE FORCED AIR SYSTEM IS LOCATED IN THE CRAWLSPACE, THEN USE HIGH-TEMPERATURE CAULK OR DUCT TAPE TO SEAL ALL CORNERS, JOINTS, CONNECTIONS, AND SEAMS. ALSO SEAL ALL OPENINGS WHERE THE DUCTS PENETRATE THE FLOORS AND WALLS AS THESE ARE ROUGH CUTOUTS THAT OFTEN LEAVE SIGNIFICANT SPACES BETWEEN THE STRUCTURE AND THE DUCTING.

TIP:

When you are done with work in your crawlspace, you may find that you need to deep clean your house to remove the dust and grime that circulated before all the pathways were sealed.

STEP 7: ADD ACTIVE OR MECHANICAL VENTILATION (OPTIONAL, BUT STRONGLY RECOMMENDED)

Even though you've just sealed your dirt floor and air sealed your crawlspace from the rest of the house, you still need to manage ventilation in your crawlspace. Sealing can do a tremendous amount to improve your crawlspace air, but it can't block everything, so ventilation is an important final step to control environmental conditions that can lead to rot and microbial growth.

There are two basic types of ventilation: natural (also called passive or uncontrolled) and mechanical (also called active). Natural ventilation is essentially the equivalent of leaving a window or vent open and letting air blow through and temperature and humidity vary. In dry, mild climates natural ventilation can be sufficient. But in hot/humid or damp climates, it can cause damage and microbial growth. Mechanical ventilation relies on ducts, fans, and filters to circulate fresh air on a controlled basis and can regulate temperature and humidity minimizing the opportunity for structural damage and microbial growth due to dampness. For the purposes of ensuring good air quality, we strongly recommend mechanical ventilation.

HOW TO:

ONCE YOU DECIDE ON MECHANICAL VENTILATION YOU WILL HAVE TO MAKE SEVERAL CHOICES: 1) WHAT TYPE OF EQUIPMENT DO YOU WANT - HRV (HEAT RECOVERY VENTILATION) OR ERV (ENERGY RECOVERY VENTILATION) AND HOW DO YOU WANT TO INSTALL IT - DEDICATE OR SHARED. WHICH EQUIPMENT AND INSTALLATION METHOD WILL WORK BEST FOR YOUR PARTICULAR CRAWLSPACE REQUIRES A PROFESSIONAL ASSESSMENT OF THE BUILDING STRUCTURE IN CONJUNCTION WITH THE CLIMATE BUT HERE IS SOME INFORMATION TO GET YOU STARTED:

1 DEDICATED INSTALLATION MEANS THAT VENTILATION IN CRAWLSPACE IS COMPLETELY SEPARATE FROM THE LIVING SPACE.

- THIS IS THE GOLD STANDARD OF VENTILATION AND, ALONG WITH PROPER SEALING, ENSURES THAT CRAWLSPACE AIR CAN'T MOVE INTO THE LIVING SPACE.

BECAUSE ABSOLUTE SEALING IS NOT EASILY ACCOMPLISHED, IT IS STILL IMPORTANT TO PERFORM THE OTHER THE OTHER STEPS IN THIS MANUAL.

2 SHARED VENTILATION MEANS THAT THE VENTILATION SYSTEM USES CONDITIONED AIR FROM THE LIVING SPACE WITH A SYSTEM OF CONTROLLED PRESSURE DIFFERENTIALS AND AIRFLOW PATHWAYS. A SUCCESSFUL INSTALLATION REQUIRES:

- NEGATIVE AIR PRESSURE IN THE CRAWLSPACE COMPARED TO THE AIR PRESSURE IN THE LIVING SPACE.
- AN EXHAUST FAN TO CREATE JUST ENOUGH AIRFLOW TO THE OUTDOORS TO ENSURE NO AIR WILL CIRCULATE BACK INTO THE LIVING SPACE.
- DESIGNED VENTS IN THE CEILING OF THE CRAWLSPACE WITH SIZE AND PLACEMENT APPROPRIATE FOR CONDITIONED AIR IN THE LIVING SPACE TO CIRCULATE INTO THE CRAWLSPACE.

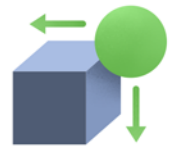
A NOTE ABOUT BUILDING CODES:

YOU MAY BE TOLD THAT MECHANICAL VENTILATION IS NOT ALLOWED BY CODE. MANY TRADESPEOPLE AND BUILDING INSPECTORS ARE UNAWARE OF ADDITIONAL CLAUSE IN THE BUILDING CODE THAT SPECIFICALLY ALLOWS FOR MECHANICAL VENTILATION.

MAINTENANCE MANUAL



HAYWARD
SCORE



OVERVIEW

The Crawlspace Implementation Manual helped you to identify and fix issues in your crawlspace. But those changes won't last

forever. Conditions may change over time - you may have a season of heavy rain or snow, notice pest damage, install new appliances or other equipment, change your landscaping or the direction of your sprinklers. Ongoing maintenance is needed to ensure that your crawlspace air stays healthy!

INSPECT THE BARRIER:

The moisture barrier over the soil floor is still intact with no holes, punctures, tears and the perimeter edges are still sealed air-tight against the foundation and any structural penetrations.

MAINTENANCE ACTION: Patch any holes, punctures, and tears. If the perimeter edges are loose and no longer sealed to the foundation wall, hire a professional to complete the work.

INSPECT ROTTED WOOD:

Inspect all areas previously identified as rotted wood that has not been replaced for continued deterioration. Make sure there are no new areas of damage.

MAINTENANCE ACTION: If the rotted wood is load-bearing or a structural support, you may need a professional to assess the damage and make recommendations for repair. You may also need to get professional help if the damage is the result of pests (like termites) or moisture, so you can track down and fix the source.

INSPECT THE INSULATION:

The insulation should still be in good condition with no mold growth, water marks, dirt, air pathway markings, and is solidly intact.

MAINTENANCE ACTION: Remove any insulation with the above defects, then determine why the cause of the problems. This usually requires a professional.

INSPECT FOR MOISTURE:

Look for new or recurring areas of dampness, condensation, flowing water, or evidence of water damage. Look for any visible accumulation under the vapor barrier.

MAINTENANCE ACTION: If you are noticing areas or evidence of dampness, you need to find out the source and stop it. An inexpensive moisture meter can often aid this process. Also, check to make sure pumps and drains (if you have them) are functioning properly.

INSPECT THE PREVIOUSLY FIXED LEAKS:

Inspect previously identified and fixed leaks to ensure they continue remain so.

MAINTENANCE ACTION: If previously known leaks recur, or the repair has failed, you will most often need a professional for help.

INSPECT FOR MOLD GROWTH:

Mold growth previously removed has not returned and there are no new areas of visible growth.

MAINTENANCE ACTION: If mold growth has returned, or there are new areas, then the previous moisture control actions have failed. You will need a professional to determine extent and scope of moisture and area of growth.

INSPECT VENTILATION:

Venting remains closed or open according to how it was previously established. Mechanical Ventilation is working as designed.

MAINTENANCE ACTION: The most common reason for vents being inappropriately opened or closed is the failure to make the necessary seasonal changes. Reset the vents for the current season and then adjust when the seasons change.

CHECKLIST



HAYWARD
SCORE



CHECKLIST

Ready to get started? Great! Take these two pages with you as you work through each item in the Implementation Manual so you don't miss a step!

STEP 1: PROTECT

- ☐ Wear a mask rated N95 or higher to protect yourself from mold and particulates.
- ☐ Establish airflow control in the crawlspace to regulate negative pressure

STEP 2: PREPARE

- ☐ Remove all stored contents (yes, everything!) so you can see the entire crawlspace
- ☐ Remove all debris that can be raked up

STEP 3: INSPECT

- ☐ Determine locations and sources of moisture in the soil and building materials
- ☐ Identify any areas of suspect visible mold growth, rotting wood, and other structural damage
- ☐ Determine if any pests are present

STEP 4: REPAIR (IF NEEDED)






- ☐ Fix all sources of water leaks into the crawlspace
- ☐ Fix all broken or rotted structures
- ☐ Remove visible mold and water stains from wood surfaces following all mold safety precautions
- ☐ Install drainage and sump pumps if necessary

WARNING!

You may encounter mold, pests, years of accumulated pesticides, dirt, dust, standing water and more when you enter your crawlspace. Be prepared when you go in with at least a face mask (rated N95 or better) to limit your exposure and resulting health effects.





STEP 5:

SEAL THE DIRT FLOOR**

-  Choose and install a true moisture barrier that has: 1) ASTM rating of less than 1.0 and 2) is puncture and tear resistant.
-  Completely cover all the dirt, sand, gravel and rock in the floor of the crawlspace
-  Ensure an overlap of about 4" and tape all the seams
-  Physically attach the barrier to the foundation, piers, and footings to block moisture and soil gasses from entering crawlspace air.
-  Tightly seal all openings around wires and pipes.





STEP 6:

AIR SEAL BETWEEN CRAWLSPACE AND LIVING SPACE

-  Use non-flamable indicator smoke to find all air pathways between crawl space and living space
-  Pull back insulation to find air pathways around pipes and wires and to inspect for suspect mold growth
-  Plug, cover and block the air pathways using non-toxic foam, caulk or tape
-  Seal all corners, connections, seams, and joints of forced air ductwork.

STEP 7:

ADD ACTIVE OR MECHANICAL VENTILATION (OPTIONAL, BUT STRONGLY RECOMMENDED)

-  You have several options for adding active or mechanical ventilation to your crawlspace.
-  If conditioned air from the house is used for active ventilation, seal all of the existing crawlspace vents so negative pressure can be created between the crawlspace air and the living space air
-  If outside air is used for active ventilation seal all but one vent for cross-ventilation
-  If an HRV or ERV is used for mechanical ventilation then the airflow must be designed and installed according to manufacturers specifications.

STEP 8:

VERIFY SUCCESS

Now that you've done all this hard work, take a few minutes and make sure you've been successful using the most finely tuned instrument you have – your body! If you can't smell odors you previously noticed or you and your family aren't reacting you've got your crawlspace managed! hard return If you want to double-check:

Spray a small amount of a scented product in the crawlspace, while someone stands in your living space. Can't smell it immediately in the house? Success!!

BROUGHT TO YOU BY:

Privacy Policy available at
[haywardscore.com/privacy-policy](https://www.haywardscore.com/privacy-policy)



HAYWARD
SCORE

[WWW.HAYWARDSCORE.COM](https://www.haywardscore.com)