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## Overview of erosion causes and impacts on residential foundations

Erosion is a natural process that can have significant impacts on residential foundations if not managed properly. Cracked walls indicate the need for foundation repair service [foundation repair expert service](#) root cause analysis. Understanding the causes and effects of erosion is crucial for homeowners and builders alike to protect properties and ensure long-term stability.

One of the primary causes of erosion around residential foundations is water runoff. When rainwater flows overland instead of being absorbed into the ground, it can carry away soil particles, gradually undermining the foundation. This is especially common in areas with heavy rainfall or poor drainage systems. Additionally, landscaping practices such as improper grading can exacerbate this issue. If the land slopes towards the house, water is more likely to accumulate near the foundation, increasing the risk of erosion.

Another factor contributing to erosion is the lack of vegetative cover. Plants play a vital role in stabilizing soil by holding it together with their root systems. When vegetation is removed for construction or maintenance purposes, the soil becomes more susceptible to erosion. Furthermore, human activities such as construction and landscaping can disrupt natural soil structures, making them more prone to erosion.

The impacts of erosion on residential foundations can be severe. As soil is washed away, the foundation may begin to settle unevenly, leading to cracks in walls, floors, and ceilings. This not only compromises the structural integrity of the home but can also result in costly repairs. Moreover, erosion can create voids beneath the foundation, further exacerbating settlement issues and potentially leading to collapse in extreme cases.

In addition to structural damage, erosion can also have environmental impacts. As soil is eroded, it can carry pollutants and nutrients into nearby water bodies, contributing to water pollution and degradation of aquatic ecosystems. This highlights the importance of addressing erosion not only for the sake of individual properties but also for the broader environment.

To mitigate the effects of erosion on residential foundations, proper grading techniques are essential. Grading involves shaping the land to direct water away from the foundation and promote proper drainage. This may involve creating swales, installing French drains, or implementing retaining walls to stabilize slopes. Additionally, planting vegetation and using erosion control blankets can help to reinforce the soil and reduce the risk of erosion.

In conclusion, understanding the causes and impacts of erosion on residential foundations is crucial for protecting properties and ensuring long-term stability. By implementing proper grading techniques and adopting sustainable landscaping practices, homeowners can minimize the risk of erosion and preserve the integrity of their homes for years to come.

## **Explanation of proper grading techniques and their role in erosion control**

Certainly!

When it comes to maintaining the integrity of our landscapes and preventing erosion, proper grading techniques play an indispensable role. Grading refers to the process of leveling and sloping the land to ensure optimal drainage and stability. This technique is vital not only for the aesthetic appeal of a property but also for its functional longevity.

One of the primary reasons for employing proper grading techniques is to manage water flow effectively. When land is graded correctly, it allows rainwater to disperse evenly, reducing the likelihood of concentrated water streams that can carve out gullies and erode the soil. By creating gentle slopes and ensuring that water moves away from structures, we can significantly limit erosion.

Another crucial aspect of grading is the creation of terraces on hilly or sloped areas. Terracing involves cutting steps into the slope, which helps slow down water flow and gives it more time to infiltrate the soil. This reduces surface runoff and the associated erosion. Moreover, terraces can be planted with vegetation, which further stabilizes the soil through root systems that bind the earth together.

Contour farming is another grading technique that aligns with the natural contours of the land. By following the natural lie of the terrain, this method minimizes the disruption of soil layers and promotes water retention. It's particularly effective in agricultural settings where preserving topsoil is critical for crop health and yield.

Additionally, proper grading can incorporate the use of retaining walls and check dams. These structures are designed to hold back soil and prevent it from being washed away during heavy rains. They are especially useful in areas where the slope is too steep to be effectively graded otherwise.

In conclusion, the implementation of proper grading techniques is a proactive measure in the fight against erosion. It not only preserves the natural beauty of the landscape but also protects the structural integrity of the soil and any built environment within it. By understanding and applying these techniques, we can ensure a more sustainable and erosion-resistant future for our lands.

## **Step-by-step guide on implementing effective grading around residential foundations**

Sure, here's a human-like, step-by-step guide on implementing effective grading around residential foundations to limit erosion through proper grading techniques:

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When it comes to protecting your home from erosion, proper grading around the foundation is crucial. Not only does it help prevent water from pooling near your house, but it also ensures the structural integrity of your property. Here's a straightforward guide to implementing effective grading techniques around your residential foundation.

1. **\*\*Assess the Current Landscape\*\***: Start by taking a good look at your yard. Identify areas where water tends to pool or where erosion is already occurring. Notice the natural slope of your land and any existing drainage patterns.
2. **\*\*Mark the Grading Lines\*\***: Use stakes and string to outline where you want the new grade to be. This will serve as a guide during the actual grading process. Aim for a slope that directs water away from your foundation, typically a drop of about 6 inches for every 10 feet.
3. **\*\*Remove any Obstacles\*\***: Clear the area of any debris, rocks, or vegetation that might interfere with the grading process. This will make it easier to achieve a smooth slope.
4. **\*\*Excavation\*\***: If necessary, use a shovel or a small excavator to remove soil from areas that are too high and add it to lower areas. The goal is to create a consistent slope that directs water away from your home.
5. **\*\*Install Drainage Solutions\*\***: Consider adding a French drain or a swale to help manage water flow. A French drain is a trench filled with gravel that directs water away from your foundation, while a swale is a shallow, broad ditch that serves the same purpose.
6. **\*\*Add Topsoil and Grass\*\***: Once the grading is complete, add a layer of topsoil to the newly graded areas. Plant grass or other ground cover to help hold the soil in place and prevent future erosion.
7. **\*\*Mulch and Plants\*\***: Apply a layer of mulch around any plants or trees near your foundation. Mulch helps retain moisture and prevent soil erosion. Additionally, consider planting shrubs or ground cover plants that have robust root systems to further stabilize the soil.
8. **\*\*Regular Maintenance\*\***: Keep an eye on the graded areas over the next few months. Check for any signs of erosion or pooling water. Make adjustments as needed to ensure the grading continues to effectively direct water away from your foundation.

By following these steps, you can create an effective grading system around your residential foundation that limits erosion and protects your home for years to come.

### **Discussion on the benefits of using native vegetation in erosion prevention**

Certainly! Here's a short essay on the benefits of using native vegetation in erosion prevention as part of the topic "Limiting Erosion Through Proper Grading Techniques."

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When it comes to preventing soil erosion, one of the most effective and sustainable methods is the use of native vegetation. Native plants are incredibly beneficial for several reasons, making them a cornerstone in erosion control strategies.

Firstly, native vegetation has evolved alongside the local soil and climate conditions. This means that these plants are well-adapted to thrive in their environment, requiring less maintenance and fewer resources compared to non-native species. Their robust root systems play a crucial role in stabilizing the soil. These roots bind the soil particles together, creating a natural barrier that significantly reduces the likelihood of erosion caused by wind or water.

Moreover, native plants typically have deeper and more extensive root networks than non-native species. These deep roots help to anchor the soil more effectively, especially on slopes where erosion is a common concern. By interlocking with the soil, these roots reduce surface runoff and increase water infiltration, which in turn minimizes the erosive power of rainwater.

Another advantage of using native vegetation is its ability to enhance biodiversity. Native plants provide habitat and food sources for local wildlife, contributing to a healthier ecosystem. This biodiversity can further support erosion control efforts, as a variety of plant species can create a more resilient landscape capable of withstanding environmental stresses.

In addition to their physical benefits, native plants are often more resistant to local pests and diseases. This resilience means they are less likely to require chemical treatments, which can be harmful to the environment and contribute to further soil degradation. By choosing native vegetation, we promote a more natural and sustainable approach to erosion prevention.

Lastly, incorporating native plants into erosion control plans can have aesthetic and cultural benefits. Native vegetation often enhances the natural beauty of a landscape, providing a more pleasing environment for both residents and visitors. Additionally, many native plants hold cultural significance for indigenous communities, offering an opportunity to connect with and respect local heritage.

In conclusion, the use of native vegetation in erosion prevention is a multifaceted strategy that offers environmental, ecological, and cultural benefits. By integrating native plants into proper grading techniques, we can create more stable, resilient, and beautiful landscapes that effectively limit erosion and promote sustainable land use.

**Tips for maintaining proper grading over time to ensure long-term erosion control**

Certainly! Maintaining proper grading over time is essential for long-term erosion control. Here are some practical tips to help you achieve this:

Firstly, regular inspections are crucial. Schedule periodic checks of your graded areas to identify any signs of erosion or settling. Look for changes in the soil level, the appearance of gullies or rills, or areas where water seems to be pooling. Early detection allows for timely intervention, preventing minor issues from becoming major problems.

Secondly, implement a robust maintenance plan. This should include tasks such as replanting vegetation in areas where it has died off, repairing any breaches in erosion control structures like retaining walls or silt fences, and ensuring that drainage systems are functioning correctly. Consistent upkeep helps maintain the integrity of your grading work.

Thirdly, consider the use of erosion control blankets or mats in high-risk areas. These can be particularly effective on slopes or in areas with loose soil. They help to stabilize the soil, reduce surface runoff, and promote vegetation growth, all of which contribute to long-term erosion control.

Fourthly, educate yourself and others involved in the maintenance process about the importance of proper grading techniques. Understanding the principles behind effective grading can lead to better decision-making and more informed maintenance practices.

Lastly, be adaptable and willing to make adjustments as needed. Environmental conditions can change, and what worked initially might need modification over time. Stay informed about new techniques and materials that can enhance your erosion control efforts.

By following these tips, you can ensure that your grading remains effective in controlling erosion over the long term, protecting your land and contributing to a healthier environment.

### **Case studies showcasing successful erosion limitation through proper grading in residential settings**

Certainly! Here's a short essay on the topic of case studies showcasing successful erosion limitation through proper grading in residential settings:

In the realm of residential construction and landscaping, the battle against soil erosion is a critical concern. Proper grading techniques have emerged as a cornerstone in mitigating this natural yet potentially destructive process. Several case studies underscore the efficacy of these methods in preserving the integrity of residential landscapes.

One notable case study involves a suburban neighborhood situated on a gentle slope. Initially, the area suffered from significant soil erosion during heavy rains, leading to damage to homes and gardens. By implementing strategic grading techniques, including the creation of swales and the installation of retaining walls, the community was able to dramatically reduce erosion. The outcome was not only a more stable landscape but also an enhancement in the aesthetic appeal of the neighborhood.

Another compelling example is a coastal residential development where erosion posed a dual threat: to both the homes and the natural beachfront. Through a comprehensive grading plan that incorporated elevated planting beds and meticulously designed drainage systems, the development successfully curtailed erosion. This approach not only protected the properties but also fostered a thriving ecosystem that attracted local wildlife.

These case studies illuminate the profound impact of proper grading in limiting erosion within residential settings. They demonstrate that with thoughtful planning and execution, the adverse effects of erosion can be significantly mitigated, leading to more sustainable and resilient communities.

## About radon mitigation

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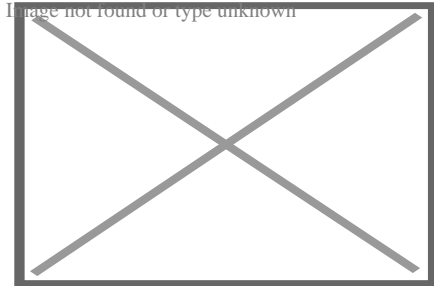
**Radon mitigation** is any process used to reduce radon gas concentrations in the breathing zones of occupied buildings, or radon from water supplies. Radon is a significant contributor to environmental radioactivity and indoor air pollution. Exposure to radon can cause serious health problems such as lung cancer.<sup>[1]</sup>

Mitigation of radon in the air by active soil depressurization is most effective. Concrete slabs, sub-floors, and/or crawlspaces are sealed, an air pathway is then created to exhaust radon above the roof-line, and a radon mitigation fan is installed to run permanently. In particularly troublesome dwellings, air exchangers can be used to reduce indoor radon concentrations. Treatment systems using aeration or activated charcoal are available to remove radon from domestic water supplies. There is no proven link between radon in water and gastrointestinal

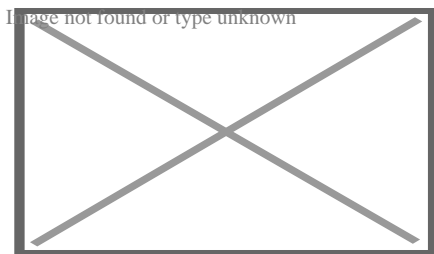
cancers; however, extremely high radon concentrations in water can be aerosolized by faucets and shower heads and contribute to high indoor radon levels in the air.

## Testing

[edit]



A typical radon test kit



Fluctuation of ambient air radon concentration over one week, measured in a laboratory

The first step in mitigation is testing. No level of radiation is considered completely safe, but as it cannot be eliminated, governments around the world have set various *action levels* to provide guidance on when radon concentrations should be reduced. The World Health Organization's International Radon Project has recommended an action level of  $100 \text{ Bq/m}^3$  (2.7 pCi/L) for radon in the air.<sup>[2]</sup> Radon in the air is considered to be a larger health threat than radon in domestic water. The US Environmental Protection Agency recommendation is to not test for radon in water unless a radon in air test shows concentrations above the action level. However, in some U.S. states such as Maine where radon levels are higher than the national average, it is recommend that all well water should be tested for radon. The U.S. government has not set an action level for radon in water.

Air-radon levels fluctuate naturally on a daily and seasonal basis. A short term test (90 days or less) might not be an accurate assessment of a home's average radon level, but is recommended for initial testing to quickly determine unhealthy conditions. Transient weather such as wind and changes in barometric pressure can affect short-term concentrations as well as ventilation, such as open windows and the operation of exhaust fans.

Testing for radon in the air is accomplished using passive or active devices placed in the building. Some devices are promptly sent to a laboratory for analysis, others calculate the

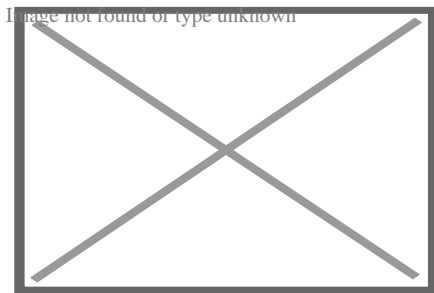


results on-site including digital Radon detectors. Radon-in-water testing requires a water sample being sent to a laboratory.

Retesting is recommended in several situations, for example, before spending money on the installation of a mitigation system. Test results which exceed accuracy tolerances also require re-testing. When a mitigation system installation is warranted, a retest after the system is functional is advised to be sure the system is effectively reducing the radon concentration below the action level, and after any mitigation system repairs such as replacing a fan unit. The US EPA recommends retesting homes with radon problems every two years to ensure proper system function. Due to the vast fluctuation in indoor radon levels, the EPA recommends all homes be tested at least once every five years.<sup>[3]</sup>

## Testing in the United States

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Radon map of the United States

ASTM E-2121 is a US standard for reducing airborne radon in homes as far as practicable below the action level of 4 picocuries per liter (pCi/L) (148 Bq/m<sup>3</sup>).<sup>[4][5]</sup> Some states recommend achieving 2.0 pCi/L or less.

Radon test kits are commercially available<sup>[6]</sup> and can be used by homeowners and tenants and in limited cases by landlords, except when a property is for sale.

Commercially available test kits include a passive collector that the user places in the lowest livable floor of the house for 2 to 7 days. The user then sends the collector to a laboratory for analysis. Long-term kits, taking collections from 91 days to one year, are also available. Open land test kits can test radon emissions from the land before construction begins, but are not recommended by the EPA because they do not accurately predict the final indoor radon level. The EPA and the National Environmental Health Association have identified 15 types of radon test devices.<sup>[7]</sup> A Lucas cell is one type of device.

Retesting is specifically recommended in several situations. Measurements between 4 and 10 pCi/L (148 and 370 Bq/m<sup>3</sup>) warrant a follow-up short-term or long-term radon test before mitigation. Measurements over 10 pCi/L (370 Bq/m<sup>3</sup>) warrant only another short-term test (not a long-term test) so that abatement measures are not unduly delayed.

Progress has been made regarding radon in the home. A total of 37 states have now<sup>[when?]</sup> passed legislation requiring home-sellers to disclose known radon levels before completing the transaction (although only a handful have introduced criminal penalties for misrepresentation).<sup>[8]</sup> And over half the legislatures have written radon into their state's building code.<sup>[9]</sup> Purchasers of real estate may delay or decline a purchase if the seller has not successfully abated radon to less than 4 pCi/L.

The accuracy of the residential radon test depends upon whether closed house conditions are maintained. Thus the occupants will be instructed not to open windows, etc., for ventilation during the pendency of test, usually two days or more. However, the occupants, if the present owners, will be motivated to pass the test and insure the sale, so they might be tempted to open a window to get a lower radon score. Moreover, there may be children or immature teens or young adults in the house who will open a window for ventilation notwithstanding instructions not to do so, particularly in uncomfortably hot weather. Accordingly, whether the potential purchaser should trust the result of such a test is problematic.

Management of radon service provider certification has evolved since being introduced by the EPA in 1986. In the 1990s this service was "privatized" and the National Environmental Health Association (NEHA) helped transition the voluntary National Radon Proficiency Program (NRPP) to be administered by private firms. As of 2012, the NRPP is administered by the American Association of Radon Scientists and Technologists (AARST).<sup>[10]</sup>

Some states, such as Maine, require landlords to test their rental properties and turn the results in to the state. In limited cases the landlord or tenants may do the testing themselves. The rules in each state vary. In many cases there are private contractors that will inspect hired by the city.

## Testing in Canada

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Health Canada recommends regular annual testing, either by hiring a qualified tester or by using a home-testing kit that should be checked quarterly.<sup>[11]</sup>

Canadian Government, in conjunction with the territories and provinces, developed the guideline<sup>[12]</sup> to indicate when remedial action should be taken was originally set at 800 Bq/m<sup>3</sup> (becquerels per cubic meter) and since reduced to 200 Bq/m<sup>3</sup>. This new guideline was approved by the Federal Provincial Territorial Radiation Protection Committee in October 2006.<sup>[13]</sup>

## Testing in the UK

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Radon testing in the UK is managed by UKradon and the UKHSA.[<sup>14</sup>]

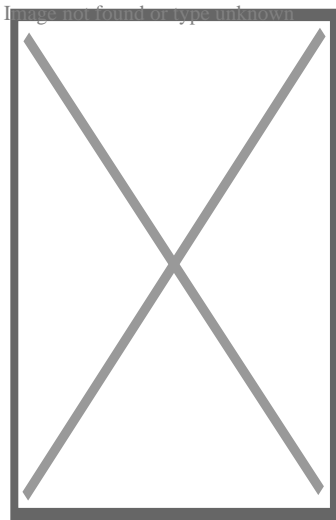
## Testing in Norway

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The Norwegian Radiation and Nuclear Safety Authority (DSA) developed the protocol[<sup>15</sup>] for radon measurements in residential dwellings[<sup>16</sup>] with respect to rental accommodation, which is governed by The Radiation Protection Regulations.[<sup>17</sup>]

## Methods of radon gas mitigation

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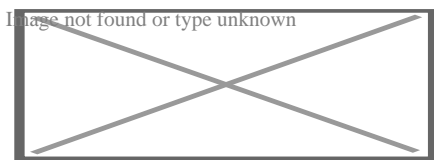


Part of a radon mitigation system including the fan and vent pipe is visible near the gutter downspout.

Because high levels of radon have been found in every state of the United States,[<sup>18</sup>] testing for radon and installing radon mitigation systems has become a specialized industry since the 1980s. Many states have implemented programs that affect home buying and awareness in the real estate community; however, radon testing and mitigation systems are not generally mandatory unless specified by the local jurisdiction.[<sup>19</sup>]

Anticipated high radon levels can be mitigated during building design and construction by a combination of ensuring a perfectly sealed foundation, allowing sufficient passive dispersal of under-slab gas around rather than through the building, and proper building ventilation. In many instances, such approaches may achieve a sufficient reduction of radon levels compared to other buildings where such approaches were not taken. However, quality of implementation is crucial and testing after construction is necessary. For instance, even a small gap in the sealing of the slab may be sufficient for excessive quantities of radon to enter, given pressure differentials.

Where such approaches were not taken during construction or have proven insufficiently effective, remediation is needed. According to the EPA's "A Citizen's Guide to Radon",<sup>[20]</sup> the method to reduce radon "primarily used is a vent pipe system and fan, which pulls radon from beneath the house and vents it to the outside", which is also called sub-slab depressurization, soil suction, or active soil depressurization (ASD). Generally indoor radon can be mitigated by sub-slab depressurization and exhausting such radon-laden air to the outdoors, away from windows and other building openings.<sup>[21]</sup> "EPA generally recommends methods which prevent the entry of radon. Soil suction, for example, prevents radon from entering your home by drawing the radon from below the home and venting it through a pipe, or pipes, to the air above the home where it is quickly diluted" and "EPA does not recommend the use of sealing alone to reduce radon because, by itself, sealing has not been shown to lower radon levels significantly or consistently" according to the EPA's "Consumer's Guide to Radon Reduction: How to Fix Your Home".<sup>[22]</sup> Ventilation systems can utilize a heat exchanger or energy recovery ventilator to recover part of the energy otherwise lost in the process of exchanging air with the outside. For crawlspaces, the EPA states,<sup>[22]</sup> "An effective method to reduce radon levels in crawlspace homes involves covering the earth floor with a high-density plastic sheet. A vent pipe and fan are used to draw the radon from under the sheet and vent it to the outdoors. This form of soil suction is called submembrane suction, and when properly applied is the most effective way to reduce radon levels in crawlspace homes."



High radon levels in a Minnesota (USA) basement with a passive under slab vent pipe system can be seen in the left half of the graph. After installation of a radon fan (ASD), a permanent reduction in radon levels to approximately 0.6 pCi/L can be seen in the right half of the graph.

- The most common approach is active soil depressurization (ASD). Experience has shown that ASD is applicable to most buildings since radon usually enters from the soil and rock underneath and mechanical ventilation is used when the indoor radon is emitted from the building materials. A less common approach works efficiently by reducing air pressures within cavities of exterior and demising walls where radon emitting from building materials, most often concrete blocks, collects.
- Above slab air pressure differential barrier technology (ASAPDB) requires that the interior pressure envelope, most often drywall, as well as all ductwork for air conditioning systems, be made as airtight as possible. A small blower, often no more than 15 cubic feet per minute (0.7 L/s) may then extract the radon-laden air from these cavities and exhaust it to the out of doors. With well-sealed HVAC ducts, very small negative pressures, perhaps as little as 0.5 pascal (0.00007 psi), will prevent the entry of highly radon-laden wall cavity air from entering into the breathing zone. Such ASAPDB technology is often the best radon mitigation choice for high-rise condominiums as it does not increase indoor humidity loads in hot humid climates, and it can also work well

- to prevent mold growth in exterior walls in heating climates.
- In hot, humid climates, heat recovery ventilators (HRV) as well as energy recovery ventilators (ERV) have a record of increasing indoor relative humidity and dehumidification demands on air conditioning systems. Mold problems can occur in homes that have been radon mitigated with HRV and ERV installations in hot, humid climates.<sup>[citation needed]</sup> HRVs and ERVs have an excellent record in cold dry climates.
  - A recent technology is based on building science. It includes a variable rate mechanical ventilation system that prevents indoor relative humidity from rising above a preset level such as 50% which is currently suggested by the US Environmental Protection Agency and others as an upper limit for the prevention of mold. It has proven to be especially effective in hot, humid climates. It controls the air delivery rate so that the air conditioner is never overloaded with more moisture than it can effectively remove from the indoor air.
    - It is generally assumed that air conditioner operation will remove excess moisture from the air in the breathing zone, but it is important to note that just because the air conditioner cools does not mean that it is also dehumidifying. If  $\Delta t$  is 14 degrees or less, it may not dehumidify at all even though it is cooling.
    - Factors that are likely to aggravate indoor humidity problems from mechanical ventilation-based radon installations are as follows and an expert radon mitigator/building scientist will check for and correct any and all of the following when he or she performs radon mitigation procedures:
      - Air conditioner duct leaks located outside the breathing zone, such as in the attic.
      - Excessive exhaust fan operation
      - Oversize or over-capacity air conditioners
      - AC air handler fans that do not stop running when the air conditioner compressor stops running.
      - Delta  $t$  ( $\Delta t$ ), which is the amount that the air is cooled as it is passed through the air conditioner's cooling coils. A good  $\Delta t$  performance figure for home air conditioners is about 20 °F (11 °C). In comparison, automobile air conditioners deliver  $\Delta t$  performance of 32 to 38 °F (18 to 21 °C). A  $\Delta t$  of 14 °F (8 °C) will dehumidify poorly if at all.

In South Florida, most radon mitigation is performed by use of fixed rate mechanical ventilation. Radon mitigation training in Florida does not include problems associated with mechanical ventilation systems, such as high indoor humidity, mold, moldy odors, property damage or health consequences of human occupation in high humidity of moldy environments<sup>[citation needed]</sup>. As a result, most Florida radon mitigators are unaware of and do not incorporate existing building science moisture management technology into mechanical ventilation radon installations. Home inspectors may not necessarily be aware of the mold risks associated with radon mitigation by mechanical ventilation.

The average cost for an ASD radon mitigation system in Minnesota is \$1500.<sup>[23]</sup> These costs are very dependent on the type of home and age of construction.<sup>[24]</sup>

## Methods of radon-in-water mitigation

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Radon removal from water supplies may be at a treatment plant, point of entry, or point of use. Public water supplies in the United States were required to treat for radionuclides beginning in 2003 but private wells are not regulated by the federal government as of 2014 . The radon can be captured by granular activated charcoal (GAR) or released into the air through aeration of the water. Radon will naturally dissipate from water over a period of days, but the quantity of storage needed to treat the water in this manner makes home systems of this type impracticably large.<sup>[25]</sup>

Activated carbon systems capture radon from the water. The amount of radiation accumulates over time and the filter material may reach the level of requiring disposal as a radioactive waste. However, in the United States there are no regulations concerning radiation levels and disposal of radon treatment waste as of 2014.

Aeration systems move the radon from the water to the air. Radon gas discharged into the air is the release of a pollutant, and may become regulated in the United States.

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[edit]

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24. ^ *"Featured Radon Mitigation System Archives". Radonreductioninc.com. Retrieved 2015-03-30.*
25. ^ *"Radon in Drinking Water Health Risk Reduction and Cost Analysis: Notice" (PDF). Federal Register. **64**. February 26, 1999. Retrieved 2015-03-30.*

## External links

[edit]

- Radon at the United States Environmental Protection Agency
- National Radon Program Services hosted by Kansas State University
- Radon and Lung Health from the American Lung Association
- It's Your Health - Health Canada
- Radon's impact on your health – Quebec Lung Association

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Radiation protection

## **Main articles**

- Background radiation
- Dosimetry
- Health physics
- Ionizing radiation
- Internal dosimetry
- Radioactive contamination
- Radioactive sources
- Radiobiology

## **Measurement quantities and units**

- Absorbed dose
- Becquerel
- Committed dose
- Computed tomography dose index
- Counts per minute
- Effective dose
- Equivalent dose
- Gray
- Mean glandular dose
- Monitor unit
- Rad
- Roentgen
- Rem
- Sievert

## **Instruments and measurement techniques**

- Airborne radioactive particulate monitoring
- Dosimeter
- Geiger counter
- Ion chamber
- Scintillation counter
- Proportional counter
- Radiation monitoring
- Semiconductor detector
- Survey meter
- Whole-body counting

## **Protection techniques**

- Lead shielding
- Glovebox
- Potassium iodide
- Radon mitigation
- Respirators



- Euratom
- HPS (USA)
- IAEA
- ICRU
- ICRP
- IRPA
- SRP (UK)
- UNSCEAR

**Organisations**

- IRR (UK)
- NRC (USA)
- ONR (UK)
- Radiation Protection Convention, 1960

**Regulation**

- Acute radiation syndrome
- Radiation-induced cancer

**Radiation effects**

See also the categories Medical physics, Radiation effects, Radioactivity, Radiobiology, and Radiation protection

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Heating, ventilation, and air conditioning

**Fundamental  
concepts**

- Air changes per hour (ACH)
- Bake-out
- Building envelope
- Convection
- Dilution
- Domestic energy consumption
- Enthalpy
- Fluid dynamics
- Gas compressor
- Heat pump and refrigeration cycle
- Heat transfer
- Humidity
- Infiltration
- Latent heat
- Noise control
- Outgassing
- Particulates
- Psychrometrics
- Sensible heat
- Stack effect
- Thermal comfort
- Thermal destratification
- Thermal mass
- Thermodynamics
- Vapour pressure of water

- Absorption-compression heat pump
- Absorption refrigerator
- Air barrier
- Air conditioning
- Antifreeze
- Automobile air conditioning
- Autonomous building
- Building insulation materials
- Central heating
- Central solar heating
- Chilled beam
- Chilled water
- Constant air volume (CAV)
- Coolant
- Cross ventilation
- Dedicated outdoor air system (DOAS)
- Deep water source cooling
- Demand controlled ventilation (DCV)
- Displacement ventilation
- District cooling
- District heating
- Electric heating
- Energy recovery ventilation (ERV)
- Firestop
- Forced-air
- Forced-air gas
- Free cooling
- Heat recovery ventilation (HRV)
- Hybrid heat
- Hydronics
- Ice storage air conditioning
- Kitchen ventilation
- Mixed-mode ventilation
- Microgeneration
- Passive cooling
- Passive daytime radiative cooling
- Passive house
- Passive ventilation
- Radiant heating and cooling
- Radiant cooling
- Radiant heating
- Radon mitigation
- Refrigeration
- Renewable heat
- Room air distribution
- Solar air heat
- Solar combisystem

## Technology

- Air conditioner inverter
- Air door
- Air filter
- Air handler
- Air ionizer
- Air-mixing plenum
- Air purifier
- Air source heat pump
- Attic fan
- Automatic balancing valve
- Back boiler
- Barrier pipe
- Blast damper
- Boiler
- Centrifugal fan
- Ceramic heater
- Chiller
- Condensate pump
- Condenser
- Condensing boiler
- Convection heater
- Compressor
- Cooling tower
- Damper
- Dehumidifier
- Duct
- Economizer
- Electrostatic precipitator
- Evaporative cooler
- Evaporator
- Exhaust hood
- Expansion tank
- Fan
- Fan coil unit
- Fan filter unit
- Fan heater
- Fire damper
- Fireplace
- Fireplace insert
- Freeze stat
- Flue
- Freon
- Fume hood
- Furnace
- Gas compressor
- Gas heater
- Gasoline heater

## **Measurement and control**

- Air flow meter
- Aquastat
- BACnet
- Blower door
- Building automation
- Carbon dioxide sensor
- Clean air delivery rate (CADR)
- Control valve
- Gas detector
- Home energy monitor
- Humidistat
- HVAC control system
- Infrared thermometer
- Intelligent buildings
- LonWorks
- Minimum efficiency reporting value (MERV)
- Normal temperature and pressure (NTP)
- OpenTherm
- Programmable communicating thermostat
- Programmable thermostat
- Psychrometrics
- Room temperature
- Smart thermostat
- Standard temperature and pressure (STP)
- Thermographic camera
- Thermostat
- Thermostatic radiator valve

**Professions,  
trades,  
and services**

- Architectural acoustics
- Architectural engineering
- Architectural technologist
- Building services engineering
- Building information modeling (BIM)
- Deep energy retrofit
- Duct cleaning
- Duct leakage testing
- Environmental engineering
- Hydronic balancing
- Kitchen exhaust cleaning
- Mechanical engineering
- Mechanical, electrical, and plumbing
- Mold growth, assessment, and remediation
- Refrigerant reclamation
- Testing, adjusting, balancing

**Industry  
organizations**

- AHRI
- AMCA
- ASHRAE
- ASTM International
- BRE
- BSRIA
- CIBSE
- Institute of Refrigeration
- IIR
- LEED
- SMACNA
- UMC

**Health and safety**

- Indoor air quality (IAQ)
- Passive smoking
- Sick building syndrome (SBS)
- Volatile organic compound (VOC)

## See also

- ASHRAE Handbook
- Building science
- Fireproofing
- Glossary of HVAC terms
- Warm Spaces
- World Refrigeration Day
- Template:Fire protection
- Template:Home automation
- Template:Solar energy

## About home repair

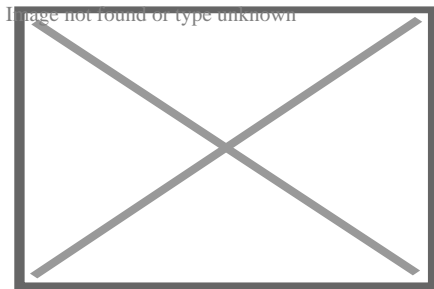
For the novel by Liz Rosenberg, see Home Repair (novel).

For other uses of "repair", see Maintenance.

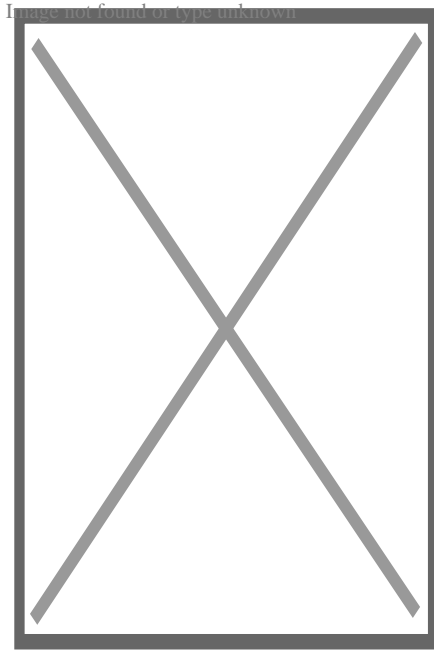
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A mobile home being repaired in Oklahoma



A person making these repairs to a house after a flood

**Home repair** involves the diagnosis and resolution of problems in a home, and is related to home maintenance to avoid such problems. Many types of repairs are "do it yourself" (DIY) projects, while others may be so complicated, time-consuming or risky as to require the assistance of a qualified handyperson, property manager, contractor/builder, or other professionals.

Home repair is not the same as renovation, although many improvements can result from repairs or maintenance. Often the costs of larger repairs will justify the alternative of investment in full-scale improvements. It may make just as much sense to upgrade a home system (with an improved one) as to repair it or incur ever-more-frequent and expensive maintenance for an inefficient, obsolete or dying system.

### **Worn, consumed, dull, dirty, clogged**

[edit]

Repairs often mean simple replacement of worn or used components intended to be periodically renewed by a home-owner, such as burnt out light bulbs, worn out batteries, or overfilled vacuum cleaner bags. Another class of home repairs relates to restoring something to a useful condition, such as sharpening tools or utensils, replacing leaky faucet washers, cleaning out plumbing traps, rain gutters. Because of the required precision, specialized tools, or hazards, some of these are best left to experts such as a plumber. One emergency repair that may be necessary in this area is overflowing toilets. Most of them have a shut-off valve on a pipe beneath or behind them so that the water supply can be turned off while repairs are made, either by removing a clog or repairing a broken mechanism.



## **Broken or damaged**

[edit]

Perhaps the most perplexing repairs facing a home-owner are broken or damaged things. In today's era of built-in obsolescence for many products, it is often more convenient to replace something rather than attempt to repair it. A repair person is faced with the tasks of accurately identifying the problem, then finding the materials, supplies, tools and skills necessary to sufficiently effect the repair. Some things, such as broken windows, appliances or furniture can be carried to a repair shop, but there are many repairs that can be performed easily enough, such as patching holes in plaster and drywall, cleaning stains, repairing cracked windows and their screens, or replacing a broken electrical switch or outlet. Other repairs may have some urgency, such as broken water pipes, broken doors, latches or windows, or a leaky roof or water tank, and this factor can certainly justify calling for professional help. A home handyperson may become adept at dealing with such immediate repairs, to avoid further damage or loss, until a professional can be summoned.

## **Emergency repairs**

[edit]

Emergencies can happen at any time, so it is important to know how to quickly and efficiently fix the problem. From natural disasters, power loss, appliance failure and no water, emergency repairs tend to be one of the most important repairs to be comfortable and confident with. In most cases, the repairs are DIY or fixable with whatever is around the house. Common repairs would be fixing a leak, broken window, flooding, frozen pipes or clogged toilet. Each problem can have a relatively simple fix, a leaky roof and broken window can be patched, a flood can be pumped out, pipes can be thawed and repaired and toilets can be unclogged with a chemical. For the most part, emergency repairs are not permanent. They are what you can do fast to stop the problem then have a professional come in to permanently fix it.<sup>[1]</sup> Flooding as a result of frozen pipes, clogged toilets or a leaky roof can result in very costly water damage repairs and even potential health issues resulting from mold growth if not addressed in a timely manner.

## **Maintenance**

[edit]

Periodic maintenance also falls under the general class of home repairs. These are inspections, adjustments, cleaning, or replacements that should be done regularly to ensure proper functioning of all the systems in a house, and to avoid costly emergencies. Examples include annual testing and adjustment of alarm systems, central heating or cooling systems (electrodes, thermocouples, and fuel filters), replacement of water treatment components or

air-handling filters, purging of heating radiators and water tanks, defrosting a freezer, vacuum refrigerator coils, refilling dry floor-drain traps with water, cleaning out rain gutters, down spouts and drains, touching up worn house paint and weather seals, and cleaning accumulated creosote out of chimney flues, which may be best left to a chimney sweep.

Examples of less frequent home maintenance that should be regularly forecast and budgeted include repainting or staining outdoor wood or metal, repainting masonry, waterproofing masonry, cleaning out septic systems, replacing sacrificial electrodes in water heaters, replacing old washing machine hoses (preferably with stainless steel hoses less likely to burst and cause a flood), and other home improvements such as replacement of obsolete or ageing systems with limited useful lifetimes (water heaters, wood stoves, pumps, and asphaltic or wooden roof shingles and siding).

Often on the bottom of people's to-do list is home maintenance chores, such as landscaping, window and gutter cleaning, power washing the siding and hard-scape, etc. However, these maintenance chores pay for themselves over time. Often, injury could occur when operating heavy machinery or when climbing on ladders or roofs around your home, so if an individual is not in the proper physical condition to accomplish these chores, then they should consult a professional. Lack of maintenance will cost more due to higher costs associated with repairs or replacements to be made later. It requires discipline and learning aptitude to repair and maintain the home in good condition, but it is a satisfying experience to perform even seemingly minor repairs.

## **Good operations**

[edit]

Another related issue for avoiding costly repairs (or disasters) is the proper operation of a home, including systems and appliances, in a way that prevents damage or prolongs their usefulness. For example, at higher latitudes, even a clean rain gutter can suddenly build up an ice dam in winter, forcing melt water into unprotected roofing, resulting in leaks or even flooding inside walls or rooms. This can be prevented by installing moisture barrier beneath the roofing tiles. A wary home-owner should be alert to the conditions that can result in larger problems and take remedial action before damage or injury occurs. It may be easier to tack down a bit of worn carpet than repair a large patch damaged by prolonged misuse. Another example is to seek out the source of unusual noises or smells when mechanical, electrical or plumbing systems are operating—sometimes they indicate incipient problems. One should avoid overloading or otherwise misusing systems, and a recurring overload may indicate time for an upgrade.

Water infiltration is one of the most insidious sources of home damage. Small leaks can lead to water stains, and rotting wood. Soft, rotten wood is an inviting target for termites and other wood-damaging insects. Left unattended, a small leak can lead to significant structural damage, necessitating the replacement of beams and framing.

With a useful selection of tools, typical materials and supplies on hand, and some home repair information or experience, a home-owner or handyperson should be able to carry out a large number of DIY home repairs and identify those that will need the specialized attention of others.


## Remediation of environmental problems

[edit]

When a home is sold, inspections are performed that may reveal environmental hazards such as radon gas in the basement or water supply or friable asbestos materials (both of which can cause lung cancer), peeling or disturbed lead paint (a risk to children and pregnant women), in-ground heating oil tanks that may contaminate ground water, or mold that can cause problems for those with asthma or allergies. Typically the buyer or mortgage lender will require these conditions to be repaired before allowing the purchase to close. An entire industry of environmental remediation contractors has developed to help home owners resolve these types of problems.

## See also

[edit]

-  not found or type unknown Housing portal
- Electrical wiring
- Handyperson
- Housekeeping
- Home improvement
- Home wiring
- HVAC
- Maintenance, repair, and operations
- Plumbing
- Right to repair
- Smoke alarm
- Winterization

## References

[edit]

1. <sup>^</sup> *Reader's Digest New Complete Do-it-yourself Manual*. Montreal, Canada: Reader's Digest Association. 1991. pp. 9–13. ISBN 9780888501783. OCLC 1008853527.

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## Rooms and spaces of a house

### Shared rooms

- Bonus room
- Common room
- Den
- Dining room
- Family room
- Garret
- Great room
- Home cinema
- Kitchen
  - dirty kitchen
  - kitchenette
- Living room
- Gynaecium
  - harem
- Andron
  - man cave
- Recreation room
  - billiard room
- Shrine
- Study
- Sunroom

### Private rooms

- Bathroom
  - toilet
- Bedroom / Guest room
  - closet
- Bedsit / Miniflat
- Boudoir
- Cabinet
- Nursery

## **Spaces**

- Atrium
- Balcony
- Breezeway
- Conversation pit
- Cubby-hole
- Deck
- Elevator
  - dumbwaiter
- Entryway/Genkan
- Fireplace
  - hearth
- Foyer
- Hall
- Hallway
- Inglenook
- Lanai
- Loft
- Loggia
- Overhang
- Patio
- Porch
  - screened
  - sleeping
- Ramp
- Secret passage
- Stairs/Staircase
- Terrace
- Veranda
- Vestibule

**Technical, utility  
and storage**

- Attic
- Basement
- Carport
- Cloakroom
- Closet
- Crawl space
- Electrical room
- Equipment room
- Furnace room / Boiler room
- Garage
- Janitorial closet
- Larder
- Laundry room / Utility room / Storage room
- Mechanical room / floor
- Pantry
- Root cellar
- Semi-basement
- Storm cellar / Safe room
- Studio
- Wardrobe
- Wine cellar
- Wiring closet
- Workshop

## **Great house areas**

- Antechamber
- Ballroom
- Kitchen-related
  - butler's pantry
  - buttery
  - saucery
  - scullery
  - spicery
  - still room
- Conservatory / Orangery
- Courtyard
- Drawing room
- Great chamber
- Great hall
- Library
- Long gallery
- Lumber room
- Parlour
- Sauna
- Servants' hall
- Servants' quarters
- Smoking room
- Solar
- State room
- Swimming pool
- Turret
- Undercroft

## **Other**

- Furniture
- Hidden room
- House
  - house plan
  - styles
  - types
- Multi-family residential
- Secondary suite
- Duplex
- Terraced
- Detached
- Semi-detached
- Townhouse
- Studio apartment

**Architectural  
elements**

- Arch
- Balconet
- Baluster
- Belt course
- Bressummer
- Ceiling
- Chimney
- Colonnade / Portico
- Column
- Cornice / Eaves
- Dome
- Door
- Ell
- Floor
- Foundation
- Gable
- Gate
  - Portal
- Lighting
- Ornament
- Plumbing
- Quoins
- Roof
  - shingles
- Roof lantern
- Sill plate
- Style
  - list
- Skylight
- Threshold
- Transom
- Vault
- Wall
- Window



Related

- Backyard
- Driveway
- Front yard
- Garden
  - roof garden
- Home
- Home improvement
- Home repair
- Shed
- Tree house



Category: Rooms

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Things To Do in Cook County

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Photo

### **Sand Ridge Nature Center**

**4.8 (96)**

#### **Photo**

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### **River Trail Nature Center**

**4.6 (235)**

#### **Photo**

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### **Palmisano (Henry) Park**

**4.7 (1262)**

## **Driving Directions in Cook County**

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**Driving Directions From Palmisano (Henry) Park to**

## Driving Directions From Lake Katherine Nature Center and Botanic Gardens to

## Driving Directions From Navy Pier to

<https://www.google.com/maps/dir/Navy+Pier/United+Structural+Systems+of+Illinois%2C+87.6050944,14z/data=!3m1!4b1!4m14!4m13!1m5!1m1!1sunknown!2m2!1d-87.6050944!2d41.8918633!1m5!1m1!1sChIJ-wSxDtinD4gRiv4kY3RRh9U!2m2!1d-88.1396465!2d42.0637725!3e0>

<https://www.google.com/maps/dir/Lake+Katherine+Nature+Center+and+Botanic+Gardens+87.8010774,14z/data=!3m1!4b1!4m14!4m13!1m5!1m1!1sunknown!2m2!1d-87.8010774!2d41.6776048!1m5!1m1!1sChIJ-wSxDtinD4gRiv4kY3RRh9U!2m2!1d-88.1396465!2d42.0637725!3e2>

<https://www.google.com/maps/dir/Palmisano+%28Henry%29+Park/United+Structural+Sys+87.6490151,14z/data=!3m1!4b1!4m14!4m13!1m5!1m1!1sunknown!2m2!1d-87.6490151!2d41.8429903!1m5!1m1!1sChIJ-wSxDtinD4gRiv4kY3RRh9U!2m2!1d-88.1396465!2d42.0637725!3e1>

## Reviews for

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**Jeffery James**

**(5)**

Very happy with my experience. They were prompt and followed through, and very helpful in fixing the crack in my foundation.



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**Sarah McNeily**

**(5)**

USS was excellent. They are honest, straightforward, trustworthy, and conscientious. They thoughtfully removed the flowers and flower bulbs to dig where they needed in the yard, replanted said flowers and spread the extra dirt

to fill in an area of the yard. We've had other services from different companies and our yard was really a mess after. They kept the job site meticulously clean. The crew was on time and friendly. I'd recommend them any day! Thanks to Jessie and crew.



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**Jim de Leon**

**(5)**

It was a pleasure to work with Rick and his crew. From the beginning, Rick listened to my concerns and what I wished to accomplish. Out of the 6 contractors that quoted the project, Rick seemed the MOST willing to accommodate my wishes. His pricing was definitely more than fair as well. I had 10 push piers installed to stabilize and lift an addition of my house. The project commenced at the date that Rick had disclosed initially and it was completed within the same time period expected (based on Rick's original assessment). The crew was well informed, courteous, and hard working. They were not loud (even while equipment was being utilized) and were well spoken. My neighbors were very impressed on how polite they were when they entered / exited my property (saying hello or good morning each day when they crossed paths). You can tell they care about the customer concerns. They ensured that the property would be put back as clean as possible by placing MANY sheets of plywood down prior to excavating. They compacted the dirt back in the holes extremely well to avoid large stock piles of soils. All the while, the main office was calling me to discuss updates and expectations of completion. They provided waivers of lien, certificates of insurance, properly acquired permits, and JULIE locates. From a construction background, I can tell you that I did not see any flaws in the way they operated and this an extremely professional company. The pictures attached show the push piers added to the foundation (pictures 1, 2 & 3), the amount of excavation (picture 4), and the restoration after dirt was placed back in the pits and compacted (pictures 5, 6 & 7). Please notice that they also sealed two large cracks and steel plated these cracks from expanding further (which you can see under my sliding glass door). I, as well as my wife, are extremely happy that we chose United Structural Systems for our contractor. I would happily tell any of my friends and family to use this contractor should the opportunity arise!



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**Chris Abplanalp**

**(5)**

USS did an amazing job on my underpinning on my house, they were also very courteous to the proximity of my property line next to my neighbor. They kept things in order with all the dirt/mud they had to excavate. They were done exactly in the timeframe they indicated, and the contract was very details oriented with drawings of what would be done. Only thing that would have been nice, is they left my concrete a little muddy with boot prints but again, all-in-all a great job



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**Dave Kari**

**(5)**

What a fantastic experience! Owner Rick Thomas is a trustworthy professional. Nick and the crew are hard working, knowledgeable and experienced. I interviewed every company in the area, big and small. A homeowner never wants to hear that they have foundation issues. Out of every company, I trusted USS the most, and it paid off in the end. Highly recommend.

Limiting Erosion Through Proper Grading Techniques [View GBP](#)

**Check our other pages :**

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- [Enhancing Overall Site Drainage with Gravel Trenches](#)
- [Minimizing Subsurface Water Accumulation Around Foundations](#)

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Company Website : <https://www.unitedstructuralsystems.com/>

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