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Property Care White Papers

Site Drainage: Monitor and Maintain

Monitor and Maintain Site Drainage

Good site drainage is an important part of keeping water issues from affecting the building. The upkeep of existing systems should be an important part of any maintenance plan.

Guidelines for Maintaining Good Site Drainage

- Monitor the site for signs of poor site drainage.
- Keep existing gutters and downspouts cleaned and in good repair.
- Water from downspouts needs to be transported to a point in which the natural or man made drainage patterns will continue to transport the water away from the immediate area around the structure.
- Fill in minor holes or depressions in drives or along foundations that are allowing water to pool.
- Enact minor grading efforts to direct water away from buildings.
- Assess the impact of plantings and trees have on drainage especially around and adjacent to the perimeter of buildings and other important features.
- Inspect and clean out subsurface systems such as gravity drains, French drains, curtain drains, drywells, and catch basins.
- Keep drives and paths in good repair
- Aerate the soil in areas of maximum compaction to aid drainage.

Site Drainage: Monitor and Maintain

Technical Information on Monitoring and Maintaining Good Site Drainage

Monitor the site for signs of poor site drainage.

Look for signs of poor drainage in the landscape, around buildings and in the basement:

- Standing water after a hard rain.
- Erosion or other loss of material
- Yellowing or dying plant life.
- Mud and water splash signs on the building
- Mud or silt deposits.
- Structural damage related to moisture or excess water problems.
- Water intrusion into the structures through doors, sills, foundation walls, basement floors, garages, etc.
- Apparent and obvious grades that direct runoff toward the building/feature.

Keep existing gutters and downspouts cleaned and in good repair.

- Inspection and cleaning are best practices at all times.
- Clean gutters and run hose water into the downspouts to check for blockages.
- Observe the performance of roof drainage systems during a hard rainfall, for signs of overflowing gutters or roof runoff overshooting the gutters.
- See the Gutter White paper series for more information.

Ensure that the water from downspouts is transported far enough away from the foundation of the building.

- Avoid downspouts emptying water directly at grade through the use of leaders.
    - Ideally you will want to move the water at least 4 feet away from the foundation to avoid water running back to the house directly or through the soil.
    - Discharge points should allow water to continue to flow away from the building, but also avoid adversely impacting other downslope buildings/features either on or off the property.
        - Ensure discharge points allow water to be incorporated into natural or man made drainage patterns to effectively move water away from the building area.
    - Leaders should discharge to areas that will help spread out the flow and avoid a continuation of the concentrated flow out of the leader.
    - Wooden leaders, in box or v shapes, may be employed in interpreted spaces (“ye olde leaders”) with PPIP approval.
    - Leaders in the same material of the downspouts can be used in approved situations.
    - Commercially available leaders may be used in un-interpreted spaces or as an emergency measure to move water away from problem areas.

  - For interpreted spaces, keep emergency leaders ready and stored on site. When rain events are forecast, they can be brought out and installed quickly in advance of the storm, and uninstalled once the rain has ended.
- Make sure downspouts are attached to existing subsurface drainage systems.
  - Generally a solid pipe daylighted system is the preferred method for roof runoff subsurface drainage systems.
  - Make sure the subsurface systems are operational and can handle the water flow before attaching a downspout to them.
  - Do not attach gutters or any other type of surface runoff or groundwater collection system to septic systems or any similar system.
  - Make sure subsurface systems have cleanouts incorporated into the assembly. Elevation of cleanouts should be at or below grade and documented through photography and notations on site plans.
    - Buried access points somewhat defeat their purpose of quick/easy maintenance on the system, and Murphy's Law will dictate that you'll need to access the cleanout when the ground is frozen.
    - If cleanouts are extended to grade, they could be covered/hidden with a flat stone for a more natural look, or there are manufactured green plastic hand-holes that could cover the cleanout.
  - The downspouts might be able to discharge to drywells and cisterns.
    - Drywells depend greatly on the long term infiltrative capacity of the surrounding soils and the amount of roof area connected to it.
    - Cisterns depend on whether the collected runoff is relatively frequently used for any purpose.
    - Ideally, both drywells and cisterns should have overflow piping to daylight to deal with overcapacity flows.
    - Ensure that the size of drywells, catch basins and cisterns has been engineered to effectively manage its water infiltration.
      - Unless water discharging into drywells is treated and clean, the drywell's exfiltrative characteristics will diminish over time, typically with replacement the only solution.
      - Catch basins are solid structures and do not infiltrate/exfiltrate water.
      - Cisterns are typically solid structures that are meant to collect and hold water for practical uses (basically an underground reservoir).
- Containing water in barrels under downspouts should be avoided. Collecting water in this manner can lead to the general stagnation of water and a series of health concerns. It also seems unwise to create a reservoir of water adjacent to a structure you are trying to move water away from.
  - It may be desirable to collect rain water for practical uses. Any application of rain collection should be carefully planned and the collected

water should have a practical use and be used frequently to avoid stagnation.

Fill in minor holes or depressions in drives or along foundations that are allowing water to pool.

- Holes and depressions can be indicative of a larger drainage issue causing that hole and site drainage should be analyzed. This is especially true when the hole/depression forms unexpectedly, forms near or above underground piping or adjacent to foundations (especially stone foundations).
    - If there area no known contributing problems and the hole/depression reappears after being filled, either at the same location or nearby, then that would indicate problems underground.
    - Holes/depressions (large or small) that form suddenly and for no apparent reason, and/or get worse after runoff events, should be investigated thoroughly.
- Investigate the cause of the hole/depression.
    - When a hole/depression is first observed, check the immediate area for other holes/depressions and animal/rodent burrow holes.
    - If the hole is adjacent to a foundation, check in the basement/crawl space for signs of soil infiltration into the open space and in void spaces between the stones in the foundation wall. Also, check outside for roof drainage issues that may be spilling onto the ground in that area.
    - If there are known subsurface drains in the area, locate the outlet of the drain and look for signs of soil and silt deposits at and around the end of the pipe.
    - Check the written records of the subsurface drains for it's location, depth, and methods and materials of construction.
    - If the hole/depression is in a drive or roadway:
        - A relatively slow forming and shallow depression is most likely a pothole formed by vehicle traffic.
        - If the depression forms relatively quickly and deepens relatively quickly in runoff events then it may be a sink hole.
            - Under drives and roads these are typically caused by problems with underground piping (cracked or deteriorating pipes, broken or separated joints, etc…).
- Excavate out to firm, unaffected material, and replace material in-kind.
    - The fill material should be compacted in lifts (6" +/-) to the approximate density of the surrounding undisturbed soil.
- Rodent and animal holes can also create travelways for water and should be filled.
    - Once filled, the area should be checked frequently to fill any other burrows that appear, especially in areas of dense vegetation.

- Discuss the removal of dense vegetation, especially next to building foundations or other important features.
- This will be an ongoing battle, but if done will tend to disrupt and discourage burrowing animals from settling in the area.

Enact minor grading efforts to direct water away from buildings.

- A minor effort is one in which it is clear that a very small portion of ground has been purposefully or accidentally changed in a way that redirects or allows water to pool against or near the resource, and which can be restored to it's earlier drainage friendly state. Changes can include aesthetic/formal landscaping additions or modifications.
  - Excavate the area until reaching firm, unaffected, material and then replace with in-kind material until the grade matches surrounding grade and directs water away from the resource.
  - Compact the disturbed soil to the approximate density of the surrounding undisturbed soil.
  - If the excavation related to the repair is deep, then the filling and compaction should be done in lifts (6"+/-).
  - Grading should be designed when possible to harmonize with the natural drainage patterns of the site.
- A major grading effort entails changing the grade along a significant portion of a foundation or feature, a grade change affecting historic plantings or trees, any grading modifications which may result in changes to existing downslope runoff flowpaths or flow characteristics, any site drainage project of similar scope or project that involves rented equipment or contracted workers.
  - Major grading efforts require some level of professional consultation with the possible need for preparation of site engineering plans, and review of affected resources and how the grading effort will interact with the site.
  - Major grading efforts may need to incorporate archaeological review into the planning process.
  - Grading should be designed when possible to harmonize with the natural drainage patterns of the site.
- Proper grading slope should be between 1% and 5% and should reach at least 10 feet from the structure. However be sure to analyze where the water goes from there and plan accordingly.

Assess the impact of plantings and trees have on drainage

- Historic plantings and trees are a significant part of the historic site and maintenance and/or work on those materials should follow an established maintenance plan.

- Trees growing near structures often contribute to the buildup of grade around the building, affecting natural and historic drainage patterns. The effect that trees have on drainage should be observed and incorporated into drainage plans and modifications.
- Removals of historic trees or trees contributing to the interpretation of the site, and historic planting beds can only be removed with the approval of the Proactive Preservation Interpretation and Planning (PPIP) committee.
    - Hazardous trees can be removed without PPIP approval with the proper documentation.
    - Documentation of the location of a removed tree is as important for understanding site drainage because the stump and root system deteriorate over time causing a depression leading to potential changes to grade and moisture paths.
- Foundation plantings are notorious for contributing to poor drainage.
    - Plantings can trap moisture around the building
    - Plantings can also affect grade changes around the foundation.
        - Plantings ultimately leave organic debris that builds up over the years. This debris is being deposited just off of the foundation ultimately leading to the grade sloping back towards the foundation.
        - If plantings are to be placed around a foundation, avoid an excavated "edging" along the transition from lawn to planting area, as this will trap runoff next to the foundation.
- It may be possible to keep an edge of about one foot clear between the foundation and the plantings, as long as runoff will not be trapped in this one foot clear zone or in the adjacent planting area/bed.
    - This will be approved by PPIP on a site by site basis.
    - The findings of PPIP should be incorporated into the maintenance manual for the site.
- Foundation plantings may play an important role for sites without gutters.
    - Foundation plantings may mitigate the impact of roof runoff on the soil by absorbing the impact of the water.
    - It is important that the runoff be allowed to continue to drain overland, away from the foundation, and not be collected or trapped in the planting area/bed.

Inspect and clean out subsurface systems such as gravity drains, French drains, curtain drains, drywells, and catch basins.

- DO NOT ENTER ANY UNDERGROUND DRAINAGE STRUCTURES OR CONFINED SPACES. PERFORM AS MUCH OF THE INSPECTION AND MAINTENANCE OF THE STRUCTURE (MANHOLES, CATCH BASINS, DRYWELLS, ETC…) FROM THE GROUND SURFACE AS IS POSSIBLE.

- Open access points, clean outs and outlets where available to visually inspect systems.
    - Look for signs of blockages
        - Standing water in drywells, pipes, and above the bottom of the outlet pipe in catch basins.
        - Accumulated sediments and debris in catch basins and drywells.
        - Tree roots along the path of the pipes can cause blockages or collapse the pipe.
        - Animal nests at system outlets can block the flow of water, especially in systems that infrequently carry water (such as foundation drains in the dry seasons).
    - Look for signs of silt buildup.
        - Although most newer drainage systems are designed to prevent the infiltration of fine material and silt, over time (possibly because of poor installation techniques) certain systems may need to be thoroughly cleaned. Check the outlet pipes and their discharge areas for signs of accumulated silts and sediments.
            - Flush the system, through the systems access points/cleanouts with a garden hose on an annual basis.
            - If there is a large accumulation of silt and sediments, then professional jetting of the system may be required.
            - In the case of foundation drains, french drains, and curtain drains, heavy accumulation of silt and sediments in the piping may indicate that the drainage stone around the drainage pipe is clogged and the system may need to be replaced.
    - Known systems that do not have visible access points should be reviewed.
        - Sometimes access points are buried under grade or the system has no access points at all.
        - Failure in the system will reveal itself in higher levels of water on the surface or working into the foundation.
        - Consider installing observation ports and cleanouts on systems with no apparent access points.
            - Depending on the length of the system installation of additional observation points may help when using camera and video devices (often there are limitations to the lengths that a contractor may have)
            - The top elevation of the cleanout should be installed at or below grade to reduce the visual impact on the landscape.
            - Document through photography and notations on site plans the locations of each cleanout.

        - Also consider installing vertical monitoring tubes upstream and downstream of groundwater lowering systems (foundation drains, french drains, curtain drains) to monitor their effectiveness.
- Snake/flush subsurface systems on a cyclical basis to ensure system is kept clear of debris.
- If system appears to be clogged contract out to inspect and clear out drains.
    - Drains can be inspected with video or other devices.

Keep drives and paths in good repair

- Note elevations of existing drives in terms of how they influence the movement of water across the site.
- Maintain roadways annually focusing on retaining the existing crowning or banking of the traveled surface of the drive.
- Fill potholes as they begin to form to prevent larger drainage issues from occurring.
- Rutting of the traveled surface of a drive is a sign of a poor or failing road base, which eventually would need removal and replacement.
- Historically many paths and drives were constructed with porous materials. Some drives have subsequently been over paved with modern, non-porous paving materials.
    - Restoration of traditional materials may aid in drainage of the site. PPIP approval is required changing any existing material or construction detail.

Aerate the soil in areas of maximum compaction to aid drainage.

- Functions, parking and high use can compact the soil. Water is less readily absorbed into compacted soil leading to surface water issues that may allow runoff into adjacent areas or buildings.
    - Aeration of surfaces should be limited to high use lawn area, function areas, and lawn areas that are used for overflow parking.
    - Aeration of dedicated parking areas will cause muddy conditions and allow water and fine soil particles into the base layers of the parking area, eventually clogging those layers.