An Overview of Traditional Backfill Materials

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An Overview of Traditional Backfill Materials

Whether digging the foundation of a new home, laying utility pipes or wires, or performing other key construction tasks, the choice of backfill is one of the most important decisions that will be made during the entire process. Depending on the type of backfill selected by today's construction professionals, the ground around any new construction can be significantly altered to either offer better drainage, significantly increased support to the structure being built, or even better soil composition for gardens, lawns, and other planting environments that will take shape around the construction site when work is finished.

For this reason, selecting a type of backfill should never be taken lightly. Choosing the right type and the right compound can produce benefits that last for the entire useful life of the new structure, while mismanaging the decision can have serious ramifications on plants, nearby wildlife, and even a building's structural integrity almost immediately.

The backfill material choices available to today's construction businesses are numerous, and they seem only to be getting more numerous as time goes on. Thanks to developments in the industry, new materials and new ways of filling in with backfill products continue to change the way construction proceeds and modify how well a structure stands the test of time. Sticking to the basics, whether in terms of material choice or backfill placement, will generally offer the best combination of structural support, affordability, and high-quality composition over the long-term.

Common Environments: A Look at the Most Common Areas of Usage for Backfill Materials

Backfill has long been a common way to restore the earth after it has been removed to permit for utility installation or new construction. Before choosing materials and backfill installation methods, it's worth reviewing the key areas where backfill simply makes the most sense and provides the most benefits in terms of cost, structural integrity, and wildlife impacts. Each of these environments will be handled differently, of course, and each one is receptive to different kinds of backfill based on the type of protection or support needed. By understanding these unique circumstances, the choices facing today's construction businesses can be made a great deal easier.

Pipes and Utility Installations

Perhaps one of the most common uses of backfill is simply to fill in the trenches that were created when installing new pipes or repairing old ones. This method is also commonly used when utility wires are buried in order to protect them from car accidents, weather damage, and other common concerns. Backfill in this case needs to be chosen so that it not only creates firmer ground, but also protects the integrity of pipes and wires from all kinds of underground hazards. Whether it's storm runoff, wildlife, foot traffic, or even car traffic, choosing backfill for utility installations is a crucial process.

For this reason, many construction businesses tend to go with highly compacted topsoil, often the topsoil removed when the original utility trench was created in the first place, to protect wires or pipes. This ensures easy access to the utility installation if the need arises, instead of preventing easy access like a cement-based backfill material would in most cases. Conversely, heavily compacted soil is one of the best defenses against storm runoff, wildlife, and all forms of manmade traffic.

New Building Foundations

If protecting utility wires and pipes is crucial to comfort in the home, then the use of backfill around a home's foundation should be considered the key to safety while living in that home. Foundations require a great deal of support after they have been dug out, framed, and built upon. Without the proper backfill, foundations tend to shift a great deal with the earth, and that can result in a home where walls crack, floors shift, and the structure's very integrity is called into question.

While many foundations are supported by topsoil backfill, with heavily compacted dirt that serves as a really great method of foundation stabilization, this is now considered only the second-best option for construction professionals. Many people now prefer to use something like flowable fill, which is especially useful when supporting retaining walls and larger foundations found with large office buildings, warehouses, and commercial facilities. Flowable fill is like a free-flowing backfill made largely of cement, and it hardens in a way that is entirely unique. Despite its cement-like composition, it's not impossible to dig through this kind of backfill if work needs to be done around the foundation or retaining wall at a later time.

Mines, Sewers, Tunnels, Bridges

Aside from utility, residential, and commercial construction projects, backfill is absolutely essential when working on projects of massive size. Mines often require backfill so that they're stabilized and protected from dangerous collapses or other safety hazards. Sewers need backfill so that their extensive network of pipes can maintain its integrity, without damaging shifting and cracks that could cause hundreds of thousands of dollars in emergency repairs. Tunnels, roads, and bridges all rely on backfill to support the construction, maintain the integrity of paved surfaces, and help with support mechanisms and structures that keep pedestrian or vehicle areas stable.

In all three of these areas, backfill is based largely on the unique environment surrounding the construction project and the overall strength required of a backfill choice. For bridges, tunnels, and mines, flowable fill is almost always the top option. Heavily compacted topsoil or sand has been used frequently with roadways, depending largely on local environment conditions. The choice, in this case, depends largely on local permits, general topography, and regional climate concerns.

Backfill Types and Considerations: A Look at the Options Traditionally Available

Though backfill is becoming an increasingly sophisticated construction component, with all kinds of new materials and placement processes that leverage new materials, water-based jetting, and much more, the options available to the vast majority of construction companies and projects remain the traditional options that have been on the table for decades. Each of these options presents a unique best-case scenario, with a few drawbacks that might be apparent for certain types of projects, certain climates, or certain post-construction considerations that might apply in a handful of cases. By understanding each material, as well as its pros, cons, and best uses, it will be easy to make an informed, long-lasting decision that will lead to minimal complications over time, if any at all.

1. Topsoil: The Standard Backfill Material

Long before things got much more advanced and technologically minded, backfill was almost always considered to come from a single source: The soil that was originally displaced during the digging of a foundation or the creation of a trench for pipes and utility wires. The reasons for this were pretty obvious: The material was essentially free and, even though it required compaction, the placement of pipes or foundation walls would reduce the area that needed to be filled and supported. Compaction would often not create a shortage of material, and construction companies would be able to save a significant amount of money simply by working with the existing topsoil.

This remains largely true today with many construction projects, from utility trenches to roadways and residential basements. With that said, however, there are a few pitfalls that come from the typical use of topsoil as a backfill material. Among the biggest cons associated with utilizing topsoil instead of alternative options:

- Topsoil almost always contains organic matter that is scientifically required to break down and decompose over time. This presents a serious problem in terms of utility protection or structural integrity. As the organic matter does begin to decompose, it leaves a small void in the backfill that can then be filled with water or other materials. It contributes to settling of the backfill material over time, creating small holes and ridges at the surface that can weaken the integrity of residential foundations or allow easier damage to utility wires and poles.

- The use of topsoil promotes erosion over time, especially in areas that get frequent, heavy rainfall. Like the presence of organic matter mentioned earlier, this erosion can seriously threaten the structural integrity of homes, utility installations, and other areas where compacted topsoil was used.

- Not all topsoil is good for supporting a foundation. One of the best examples comes in the form of clay-like soils, especially the red clay found throughout North and South Carolina, Georgia, and parts of Alabama, This soil simply lacks the ability to be compacted into a material that boosts the structural integrity of a construction project. It's prone to shifting, breaking apart, eroding, and even dissolving in rainwater. Construction operations in areas with clay soil deposits typically cannot utilize topsoil backfill. Even if they do, the company must mix in rocks, sand, or another component that can stabilize the clay and make it beneficial to the project.

2. Gravel: The Backfill Material with Drainage Benefits

Without a doubt, topsoil represents the most commonly used backfill material as well as the one that is most affordable to use and most readily available at virtually every construction site. That said, however, topsoil suffers from a unique drawback that wasn't mentioned above: It's really not good at promoting good drainage properties, especially in areas where the topsoil directly abuts a wooden retaining wall or home foundation. In these cases, topsoil can actually encourage moisture to linger around these surfaces, leading to a significant deterioration in the wood and causing significant structural problems over time.

The answer to this problem is gravel, which can come in sizes that vary from mere pebbles to small stones nearly an inch in diameter. The exact type of gravel used largely depends where it's being used, with larger stones making more sense for large construction projects and areas where flowable fill is used for structural support. Smaller stone sizes are a good idea for typical retaining walls a well as home or small business foundations. Gravel backfill is typically considered an "accessory" option, since it's typically paired with either flowable fill or topsoil. It's also a highly affordable and versatile option that construction companies can keep on hand for those moments when it's needed in in a pinch.

The affordability and convenience of gravel, as well as its ability to promote great drainage around foundations and retaining walls without sophisticated technology or modifications of the building plan, make it a smart option for today's construction companies. Even so, as with topsoil, it's still a good idea to consider the potential drawbacks that can arise from using gravel.

- Though affordable, the type of gravel required by construction companies when backfilling is generally specialized and slightly more costly. That's because it must included small rocks that are not completely rounded. Rounded edges are not as good for drainage, very poor for structural support, and generally not a good mix with topsoil or flowable fill.

- Gravel storage is a tall order, typically requiring a large industrial facility so that it maintains non-rounded edges and integrity between construction jobs. Some companies simply don't have the space to store this material, making it more time consuming to secure gravel for each individual job.

- Gravel will not typically promote great drainage with some types of soils, including sandier soils that are prone to filling in the gaps between the rocks. This type of soil is most common to areas that lie past the fall line, closer to the coast. In those areas, alternative drainage solutions can be used that work better with this type of very fine, very difficult topsoil.

3. Flowable Fill: The Relative Newcomer for Backfill Purposes

Gravel and topsoil are two of the oldest and most affordable backfill materials currently available to construction businesses, but there's a newcomer in town that is increasingly stealing the show from these materials, at least in part: flowable fill. Despite its somewhat wonky and awkward name, the benefits of flowable fill are pretty easy to understand. The material is essentially a low-water cement mixture, which creates the kind of protection and structural support that topsoil can only dream about as it sits next to a home's foundation. Flowable fill is generally at least somewhat affordable, and it can typically be used comfortably in large commercial building projects, retaining wall support, roadway construction, bridges, tunnels, sewers, utility pipes, and much more.

Despite its versatility and its cement-based strength, however, there are some considerations that do need to be made when considering flowable fill as a logical source of backfill and structural support. These considerations are based largely on the cement properties of the material, as well as the expense and time associated with preparing flowable fill for practical use in construction settings.

- Because flowable fill is a cement mixture, it does require a significant amount of time to properly mix and distribute the material. Likewise, there is a proper window of time to dispense the mixed backfill material into the proper channels before it begins to harden and set. This certainly increases the stress on construction professionals, and it can lead to cost overruns if the material is not mixed properly or allowed to set on schedule.

- Gravel still has to be a part of the backfill process when using flowable fill. In fact, there are no real ways to avoid at least a small mixture of gravel when backfilling any area where drainage is a necessity. The use of gravel typically precedes the dispensing of flowable fill, as would also be the case with topsoil use.

- Flowable fill cannot be dispensed directly into utility trenches, sewers, and other areas where pipes are placed. Without a barrier of gravel between the flowable fill and the pipe, there is virtually no way to safely dig the pipe out for repair work or replacement without causing significant damage. Because this directly involves utility wires or essential pipes, any damage could cost thousands of dollars to fix. It cold also lead to wide-ranging neighborhood safety concerns, inconveniences like power outages or lost broadband Internet connections, and numerous other problems that can massively inflate the cost of construction work.

- Transportation of flowable fill is typically not as easy as the transportation of soil or gravel. Unlike those two materials, flowable fill must be constantly mixed and agitated, much like the cement used to create paved surfaces like sidewalks and basements. Construction companies will probably spend a great deal not on the material itself, but on transportation and preservation of flowable fill once it has been mixed with water and prepared for distribution around a foundation, retaining wall, or utility trench.

Despite the considerations and drawbacks of flowable fill, it's worth noting that the material does offer quite a few benefits. In addition to the cost, structural support, and versatility benefits that were mentioned earlier, the material is also highly customizable and adaptable based on the construction company's unique needs. Its cement base means that companies can mix it as they see fit, with varying levels of water content, gravel addition, or other procedures that might suit a particular construction project.

Another key benefit of flowable fill is the fact that most construction companies already have the materials on hand to create a backfill composition right away. Though transportation remains a concern that each company will have to solve in its own unique way, the easy availability of cement, water, and gravel, means that this solution is often ready to go in just a few days' time.

This level of versatility helps to explain with flowable fill is rapidly taking the place of backfill previously composed mainly of topsoil or gravel. With the ability to make the material as strong and sturdy, or even spongy and porous as needed, today's construction businesses can ensure great drainage, support, and wildlife protection all at once.

Don't Forget About Local Laws and Zoning When Choosing Backfill Materials

Construction professionals have some really great options open to them when choosing how to backfill areas as diverse as residential foundations, highways, and even utility trenches. In many cases, that decision is largely one that depends on the unique climate, soil type, and environment that surrounds the construction project being undertaken. It should be noted, however, that many municipalities have established best practices, guidelines, and even some requirements that dictate how, where, and what type of backfill should be used during construction.

These guidelines are almost always part of local zoning ordinances and regulations. Construction companies that are serious about providing long-term, sustainable results to their customers must also be just as concerned with ensuring that their finished product falls within local laws, regulations, and zoning considerations. Most often, these zoning concerns mandate certain levels of compaction or certain flowable fill mixtures that are deemed best for the climate, ecology, and other aspects unique to the area.

Before starting any construction project that involves the displacement and eventual backfill of topsoil or other materials, it's generally a good idea to check local ordinances that discuss structural support and integrity, drainage requirements, and any backfill composition requirements. If local laws cannot be found on the subject, construction companies should always feel free to call planning officials or local leadership to establish a clearer picture of requirements and local best practices.

Backfill is Still the Gold Standard Way to Promote Better, Longer Lasting Buildings

Construction companies that are serious about delivering a structure that stands the test of time need to make a serious determination about the kind of backfill they'll use for each type of project. For many homes and smaller business structures, traditional topsoil backfill is a logical choice and one that provides greater affordability to the construction company and the consumer all at the same time. Gravel is great for residential drainage, sound soil composition, and even roadway drainage concerns that can arise in very wet areas.

Flowable fill, meanwhile, is an innovative way to provide structural support and great drainage while also protecting foundation walls, utility wires, and pipes. The ability to customize this mixture makes it easily adaptable to projects of all sizes and types, and those companies that frequently use flowable fill will be able to find ways to easily transport, mix, and dispense the material without experiencing cost overruns.