Erosion Control for Construction Sites

By

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3 PDH HOURS

EROSION CONTROL FOR CONSTRUCTION SITES

COURSE DESCRIPTION:

Erosion control at a construction site is a continuing issue for contractors, design engineers and regulators. Contractors must typically submit an erosion control plan (SWPPP – Storm Water Pollution Prevention Plan) and regulators are often required to review these plans for approval. Regulators are also often required to inspect construction sites during the construction process to ensure the approved plan is being followed. Locations where erosion control is necessary include along slopes, in drainage channels and adjacent to drainage channels, and around the overall construction site. There are a variety of Best Management Practices (BMPs) available to limit the erosion potential. This course will discuss a number of different BMPs, including slope roughening, erosion control mats (or blankets), silt fence, straw logs, straw bales, mulch, vegetated buffers, check dams, gravel berms, inlet inserts, sediment traps and gravel entrances. The appropriate selection of a BMP for a particular location requires and understanding of how each of these features functions and where they work effectively. Proper design of an erosion control plan includes much more than constructing silt fence all around the site.

COURSE OUTLINE:

- General overview
- BMPs for slopes
- BMPs for channels and drainages
- BMPs around inlets
- BMPs for general site conditions
- BMP failures

LEARNING OBJECTIVES:

At the conclusion of this course, the user will:

- Understand the purpose of erosion control on a site
- Understand the best choices for BMPs to use on a slope
- Understand why some BMPs are inappropriate for use on a slope
- Understand the best choices for BMPs to use in a drainage channel and why some BMPs are guaranteed to fail if used in a drainage channel
- Understand the options available for BMPs around storm water inlets and some of the common mistakes made around inlets
- Understand the purpose of BMPs around a construction site

PREREQUISITES:

There are no special prerequisites.

INTENDED AUDIENCE:

This course is intended as an introduction to selection of Best Management Practices for erosion control on a construction site and therefore the intended audience includes engineers and contractors preparing erosion control plans and regulators and enforcement officials reviewing the design plans and the site implementation of the SWPPP.

COURSE SUMMARY:

This course will cover Best Management Practices (BMPs) for slopes, channels and drainages. It will also cover BMPs around inlets and for general site conditions. Finally it will include a look at a few failures because there's sometimes way more to be learned from an installation that has failed than there is from a successful installation.

Purpose of BMPs

BMPs are often required to meet regulations. While many of the tasks we complete as engineers are dictated by regulations, that doesn't mean there aren't other good reasons to include BMPs. Oftentimes the impetus for BMPs is the regulation but their real purpose is to protect water quality. Even if the rules don't require protecting water quality, part of the duty of engineers is to protect public health, safety and welfare. Protecting water quality certainly falls in that category.

The most common pollutant of concern on a construction site is sediment because during construction of any facility there's going to be some excavation, some fill and some earth movement and all of that activity is going to dislodge soil from its natural condition and make it much more susceptible to erosion. It is desirable to keep as much of that sediment on site as possible. Other pollutants of concern in a typical construction site include oil and grease primarily from the equipment itself. If the sediment is contained the chances are at least very high much of the oil and grease will also be contained. Obviously if there is a major leak of some kind the BMPs for sediment aren't going to contain that but they should contain at least most of the oil and grease deposited on the site.

BMPs for Slopes

BMPs for slopes include slope roughening, silt fence, straw logs or fiber rolls and erosion control blankets. Slope roughening uses heavy equipment to create ridges or furrows high spots and low spots that are perpendicular to the slope. Heavy equipment is typically a tractor and disc or it can also be the tracks of the dozer. These ridges are typically at least two inches high. The spacing should be roughly equal to twice the height but spacing and height are really related directly to the equipment used for construction. These measures can be used on slopes that are steeper than three horizontal to one vertical and that are greater than five feet high. Figure 1 shows an example of slope roughening. This project included widening the roadway and flattening the slopes. Once the slopes were flattened to the edges of the paved surface, rather than leave that as a nice flat, well-compacted surface it was necessary to reduce the erosion potential. The contractor came in with a tractor and a disk and created ridges across this landscape. In Figure 1 water flows essentially from left to right. When the water starts to collect sediment, the sediment gets trapped in the low spot. Water builds up so it has to go over the ridge and then fall into the next low spot, so it it's a cascading effect. It is more or less a long series of very small waterfalls and each pool collects some sediment.

Figure 1 – Slope roughening

Another approach to BMPs on slope is a silt fence. The silt fence has to be anchored at least 6 inches into the ground and this is one of the features that is often missed when BMPs are installed on a project. It is really easy to pound the posts in and place the silt fence along the perimeter of the site and be done. If the silt fence is not anchored into the soil then water simply runs underneath the silt fence and the BMP is of no value. Post spacing is typically 4 to 8 feet. A silt fence is usually backed by a wire fence – often some type of woven wire fence - for structural support. Silt fence is used for sheet flows. It is not good for channel flows. It is effective on flat slopes, generally less than 10%. It is ineffective on steep slopes primarily because the velocity of the water is too high. It can be effective at the toe of a steep slope, however, where the slope gets much flatter. Silt fence is permeable in that water will slowly seep through the silt fence. However, water goes through a silt fence very slowly and so any significant volume of water will cause failure of the silt fence.

Another option is mulch and consists of a mixture of fibers, stabilizing emulsion and tackifiers. It can and usually does include a seed mixture that may be temporary. It might also be the permanent seed mixture depending on the climate and the season when the slope is being mulched. The slope should be roughened before application especially if the sloped surface is really well compacted. If a well-compacted surface is mulched the seeds don't have much of a chance to adhere to that well-compacted surface. If the surface is roughened first then the seeds and the mulch have a chance to get intertwined with the soil. One of the challenges with mulch is it needs to be reapplied after significant rain events and after additional construction disturbance. If mulch is being used as a BMP, unlike some of the other products, once it has been applied it is necessary to continue to monitor these areas to make sure the mulch is still in place and hopefully see that some of the seeds are starting to grow. Figure 2 shows an example of hydroseeding or mulching along with outlet protection. This channel was revised to make it a little widen and flatten the slopes to eliminate some of the erosion that had occurred. The darker green color along the edges of the channel is the mulch with hydroseed, which is sprayed on the banks of the channel. Note the bottom of the channel does not have hydroseed since it is not effective in the bottom of the channel because even low flows will wash the mulch away. At the end of the culvert there is some rock, sometimes called riprap. Sometimes a BMP is not only a temporary feature, it can also serve as permanent erosion control.

Figure 2 Riprap outlet protection and mulch/hydroseed along banks.

Straw logs, sometimes called wattles, are composed of straw that is wrapped with a biodegradable, a photodegradable or a burlap netting. The fiber roll is an erosion control material that's prefabricated in a tubular roll. They are used on slopes to shorten the slope length. Figure 3 shows a series of fiber rolls or straw logs that have been placed along this long slope. The purpose of these straw logs is to slow the water down so there isn't a long run. As water starts to accumulate and starts running down this slope, it hits the fiber roll and then slows down, dropping the sediment out. Depending on how much water is flowing down the slope, the water will typically go through, not over, the straw logs or the fiber rolls and continue down the slope. However, the sediment will be left on the slope.

Figure 3 – Straw Logs on a Slope

Erosion control blankets or erosion control mats are probably the most effective measure to use on a slope. They are also probably the most expensive BMP so there is a tradeoff between what is the most effective and what is the least expensive. A contractor is going to want the least expensive material, but on the flip side of that, the contractor doesn't want a material they will have to replace three or four times during the course of the construction project. The contractor will typically prefer a BMP they can put in place and not have to replace. If the contractor saves money on the first installation but then they have to do it three more times, they probably haven't saved any money. In addition they have probably also slowed down the overall construction process because the people working on the project have to divert their attention from the construction and take care of some erosion problems. There are many different types of erosion control mats and numerous manufacturers, including plastics, jute and coconut. All of the products have advantages and disadvantages. In general, the better products are often the more expensive products. The manufacturers can typically provide the best recommendations for which type of product is most effective for a specific application.

There are a variety of types of blankets that are used including the following.

- Photodegradable Blankets – These typically have a netting made from some type of plastic material. The plastic contains a UV stabilizer that is designed to stop functioning after a specific amount of time. After that happens, parts of the netting break down under exposure to sunlight, degrading the overall effectiveness of the mat.

- Biodegradable Blankets – These typically contain natural fibers rather than plastics. The most common fibers are coconut (coir) and straw. The fibers break down into the natural environment. The length of time depends on the fiber – coconut mats can last two years or longer while straw mats will usually last a shorter time period.
- Permanent Blankets – These typically contain a blend of synthetic fibers, nets and wire mesh bound together to form a durable blanket. While the matrix may decompose, the blankets are design to not break down over time. These include Turf Reinforcement Mats (TRMs) and High-Performance Turf Reinforcement Mats (HPTRMs). TRMs are typically used in applications involving water control, such as channels or ditches, on steep slopes or along banks of streams. These mats help protect the soil and reinforce plant life. HPTRMs are TRMs that are constructed with stronger materials. They have a higher tensile strength and improved reinforcement for stabilizing and protecting soils. They are used in areas where this is little to no natural vegetation.

Erosion control mats are usually part of the permanent erosion control not just the temporary erosion control. They can also function as part of the temporary erosion control depending on how the project progresses. It may be possible to install some of the permanent erosion control early in the project. These mats will typically have seed underneath and there will be enough open space allowing the plants to grow through the blanket or the mat. The plants serve several important purposes. First, they improve the erosion control by creating a rougher surface. They also help to anchor the mat. Because most of these mats are eventually biodegradable, when the mat has completely degraded there should be a vegetated surface that is much more stable than the bare ground. While these mats are usually biodegradable, the time period for degradation varies. Some of these will biodegrade over the course of a single construction season, some of them will last several years and some of them will last quite a few years so it's necessary to pick a material that meets the requirements of the site without being outrageously expensive. The manufacturers can provide more detailed information on the survivability of each material.

Figure 4 – Erosion Control Mat on a steep slope.

It is important to anchor these mats at the top of the slope. If that isn't done, the mat will simply unravel and roll down the slope, resulting in the expenditure of significant money for a product that did not provide any erosion protection. The mats also need to be extended to the toe of the slope. If it's not extended to the bottom, then at the end of the mat erosion will start and cause some failure, along with significant sediment being transported. It is common to broadcast seed under erosion control mats. Some mats come with a layer on the bottom that includes the seed material. It wouldn't be typical to broadcast seed on a steep slope like that shown in Figure 4, so this slope would either be hydroseeded or a mat with the seed on the bottom would be used.

Based on the bare soil at the base of the slope, it appears the mat may have been installed very recently. Figure 5 shows close-up of a recently constructed slope that has an erosion control blanket. There is some vegetation growing through this mat. Based on the vegetation, it's growing through the mat so this mat has been in place for quite some time because the vegetation has been successful in growing through. There is still a significant amount of fiber in this part of the mat as well.

Figure 5 – Close-up of Erosion Control Mat with vegetation.

Figure 6 shows a close-up of one of several different kinds of mats. This mat has wood chips or straw fibers in it, along with a netting that goes over the top and underneath the straw to keep the material in place.

Figure 6 – Straw Mat with netting

Figure 7 shows a site where the design had some challenges regarding erosion on the slope. In the lower left side of Figure 7, there is a pipe at the very bottom. This pipe conveys some of the water that comes off the roadway and discharges it at the bottom of the slope, which is a reasonable location for the discharge. There is also a pipe near the top of the slope that is discharging some runoff from the roadway. That pipe creates more of a challenge. First, the runoff is being discharged near the top of a steep slope. Some riprap was placed at the end of the back. The black that is visible under the riprap is the geotextile intended to keep the riprap in place or keep sediment under the riprap from eroding. This is a common riprap installation, but it's not very effective because there isn't a smooth, effective transition from the riprap to the erosion control mat. There's been some loss of soil, even though the erosion control blanket still looks very effective. The best solution in a situation like this is to redirect the discharge from a location high on the slope to a location at the bottom of the slope, similar to the pipe in the lower left of Figure 7.

Figure 7 – Riprap and Erosion Control Blanket on Slope

BMPs for Channels

BMP options for channels and drainages include silt fence, erosion control blankets, check dams or gravel berms, straw bales and vegetated buffers. A silt fence can be very effective when it is placed adjacent to the channel or the drainage. However, it is very ineffective when it's placed across the channel or the drainage. Silt fence is not very permeable. Watching water run through a silt fence, if water is ponded on one side, the silt fence will get wet and some water will seep through the silt fence. However it is not a permeable surface like many people believe.

Figure 8 – Silt Fence along a Channel

Figure 8 shows an example of a construction site along the drainage. The drainage is on the left and the construction equipment is on the right. Between the construction equipment and the drainage is a silt fence. When it rains there is going to be some runoff from the piles of soil adjacent to the equipment but whatever water and soil is carried away is going to be stopped by the silt fence. Because there isn't a direct channel from the stockpiles to the drainage, the silt should fairly uniformly collect along the silt fence. Eventually the water will seep through the silt fence. Between the construction site and the channel there is also a vegetated buffer where the native materials have not been disturbed. By far the best way to keep sediment out of the channel is to maintain some type of vegetated buffer. The more vegetation that can remain in place the more effective all of the other measures will be.

Figure 9 – Silt Fence after completed construction

Figure 9 shows the location of a silt fence adjacent to a channel. On the right hand side there is an area of silt fence that has collapsed. This silt fence has been in place for several years. The project was completed but because of the way many projects are designed and constructed, nobody was in charge of removing the temporary erosion control measures. That is much more common than it should be. Someone needs to be responsible for looking at this site and determining there is adequate vegetation on both sides of the silt fence, the silt fence is no longer performing a function, so consequently it needs to be removed. It is very difficult to require the construction contractor to do this work because it might take a year or more after construction to achieve adequate vegetation growth. The contractor is going to be very reluctant to extend the contract that long after construction and take the risks associated with weather and vegetation growth after they've completed the construction. If the contractor is responsible, it is going to be a significant cost item in the contract. It might make more sense for the municipality or the highway department to have their own staff remove the silt fence as part of their maintenance practices.

Figure 10 – Silt Fence in Roadside Ditch

Figure 10 shows an example of a silt fence used across a drainage channel. This location is at the edge of a roadway. This is a location where a silt fence is very ineffective. Water is flowing from the lower right towards the upper left in Figure 10. When the water reaches the silt fence there is enough flow that the water is going to do one of two things – it is either going to undercut the silt fence or it is going to pond enough that it will go around the silt fence. In either case the silt fence is not going to control the sediment and the sediment is going to leave this site.

Figure 11 – Silt Fence across a drainage channel

Figure 11 shows a classic example of where not to use a silt fence. This Figure shows a series of short fence installations across the channel. The water has simply cut underneath the silt fence and created a channel, so while there was significant cost associated with installation of the silt fence it is providing no value at all from an erosion control standpoint.

Erosion control blankets can be used in the bottom of the channel as well as along the slopes. They have to be well anchored throughout the length of the installation. The manufacturers typically provide really good recommendations for how to anchor them and for appropriate selection depending on velocities. The selection process is a function of the volume of water and the velocity. Manufacturers are the best resource to help select an appropriate product.

Figure 12 – Erosion Control Blankets and Straw Logs

Figure 12 shows an example of straw logs and erosion control blankets used together. Water is flowing from the bottom of Figure 12 towards the top and then angles to the left. There is a paved surface right up to that first straw log and then beyond the straw log is bare ground. The channel is protected by the erosion control blanket and the straw logs continue additional sediment control placed along this channel. There are a number of stakes in the straw logs to make sure they stay in place. If the logs get significantly distorted in shape, they can lose their ability to retain the water. In this case the straw logs are staked in five different locations to keep them in place so this portion of this installation looks really good and it worked really well.

Figure 13 – Erosion Control Blanket and Straw Logs

Figure 13 shows another example of this same location, a little farther downstream. To the right of the erosion control blanket, along the slope there is still slope roughening completed as an erosion control measure. However, close to the channel the slope roughening is not adequate so a more robust erosion control measure was used in those areas. This also likely represents a more permanent erosion control measure.

Figure 14 – End of Erosion Control Blanket

One challenge with this installation is the downstream end of the erosion control blanket. Sometimes the end of the blanket is a property line or some arbitrary boundary that limits what can be done. The erosion control measures reduced erosion substantially where the blanket and the straw logs are installed. Figure 14 shows the end of the blanket, and now there is just bare soil subject to erosion. In Figure 14 downstream from the blanket there is noticeable erosion occurring.

Figure 15 – Downstream Channel

Figure 15 shows this channel farther downstream. Some riprap has been placed to address potential erosion but it is clearly not very effective.

Another means of erosion protection in a channel is the use of a check dam or a gravel berm. They can be constructed of gravel, sandbags or fiber rolls. They are generally used only in small channels draining less than maybe 10 acres. They can be used in steep channels but not in live streams.

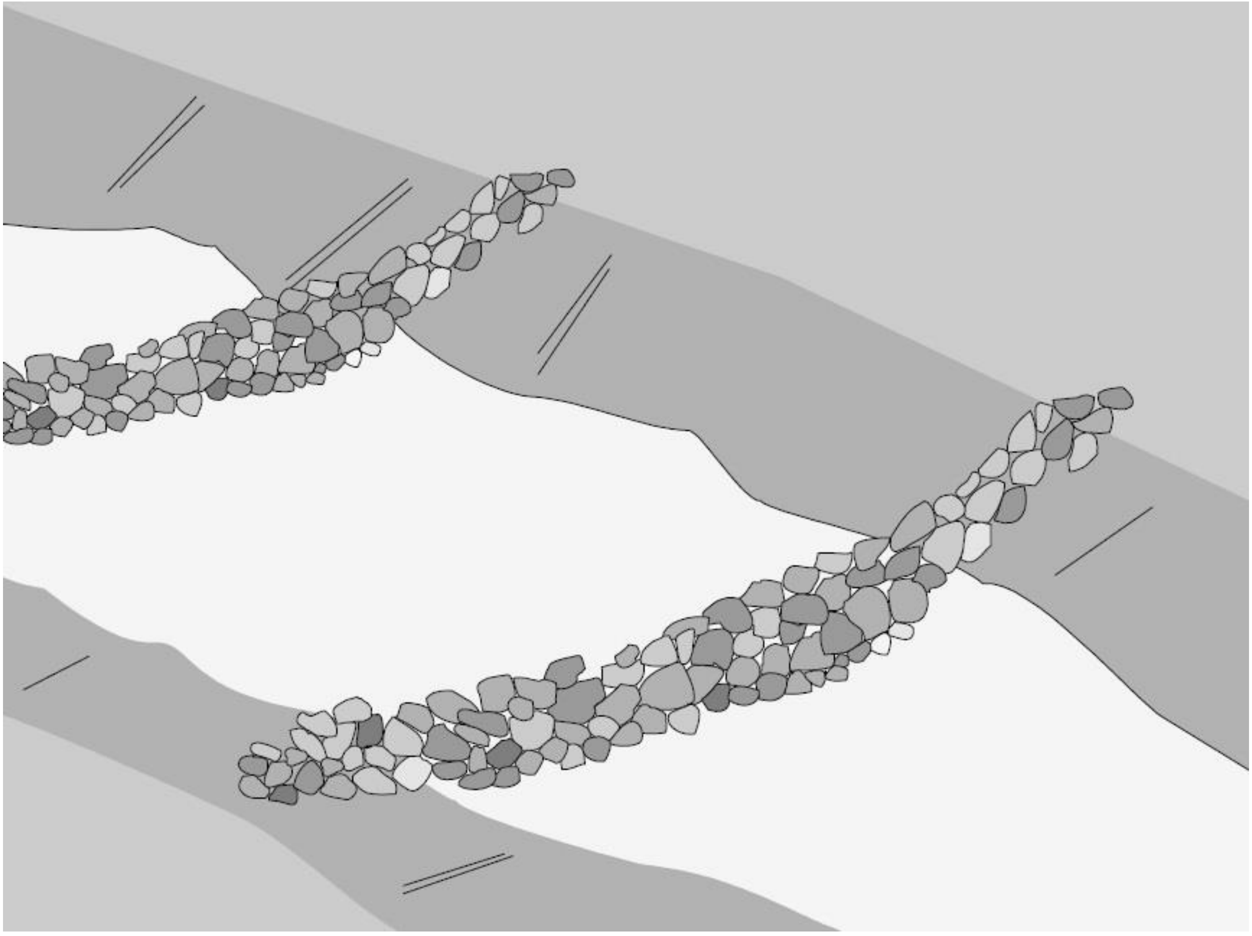

Figure 16 – Schematic of Gravel Berm

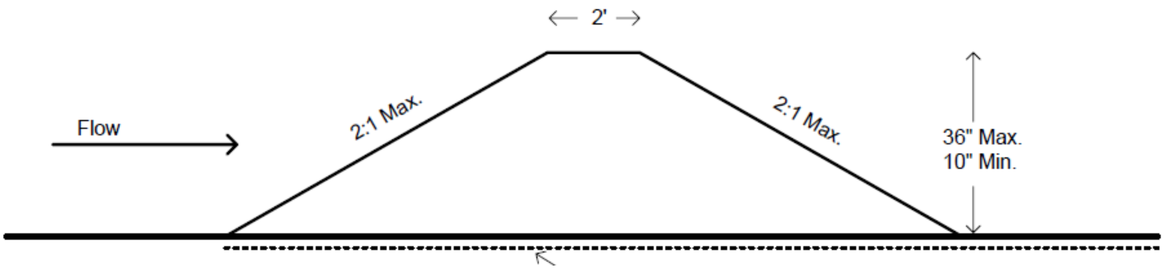

Figure 17 – Cross-section of Gravel Berm

A gravel berm should be constructed using clean gravel. There needs to be a low spot in the center of the check dam. Figure 16 shows a schematic of a gravel berm and shows a series of gravel berms along the channel. Each berm slows down the water and promotes deposition of sediment. Figure 17 shows a typical cross-section, with very generic dimensions. The gravel berm should be as large as necessary for the specific location. While Figure 17 shows a two horizontal to one vertical maximum slope on the gravel berm, if this location is within the clear zone of the roadway, then the berm needs to be safe for vehicle traffic. A 2:1 slope is probably not safe for vehicle traffic it probably needs to be a 6:1 or a 12:1 slope.

Figure 18 – Gravel Berm

Figure 18 shows a gravel berm on a steep slope. This location is in the median of an Interstate. There is some large rock used to create this gravel berm. In Figure 18 water is flowing from left to right. On the left hand side there is quite a bit of sediment that has accumulated, since the sediment settles out on the upstream side, as intended. The water flows over the rocks or through the rocks to the downstream side. On the downstream side, the water is now very clean, with very little sediment, so the water has the ability to erode more sediment. This is a on a steep slope and is a temporary erosion control measure that needs a fair amount of maintenance.

Figure 19 – Straw Logs

Figure 19 shows an example of straw logs on a site where they were installed, probably not very effectively initially and then they were never maintained. These straw logs are not providing the erosion control originally anticipated.

Figure 20 – Straw Logs Operated Effectively

Figure 20 shows an example of straw logs installed and operating very effectively. In Figure 20, water is flowing from right to left. The water surface on the upstream side of this straw log is much higher than it is on the downstream side, so water is flowing through that straw log. It is not going over the top, but rather through the log which is the most effective installation. Almost all the sediment is removed. Figure 20 does show the water is starting to pick up sediment again from the bare ground immediately downstream from the straw but a lot of sediment has been collected on the upstream side.

Figure 21 – Straw Bales used for Sediment Control

Straw bales to create a sediment barrier. The bales need to be at least 18 inches high and need to be set below the ground. If the bales are just set on the ground, water will simply go underneath the bale. A low spot also need to be provided over the straw bales so that water does not go around the edge of the bale. Figure 21 shows an example of a straw bale barrier. This is in a detention pond where these straw bales are placed right at the outlet of that detention pond. The low spot is about at the corner of the bales, so water will get around this structure rather than flow over the top. One the challenges shown in Figure 21 is this structure had been in place for a while and during high flows water goes through and around the bales. This causes sedimentation to occur right at the upstream side of the bales and over time, a berm is created where the sediment settles out. This needs to be maintained to remove that sediment because the bottom of the concrete pipe on the left side is the pond outlet. This pipe should be the low spot in this pond but because of the way the sediment has accumulated, it is no longer the low spot in the pond.

BMPs around Inlets

Options for BMPs around storm drain inlets include silt fence, straw bales, straw logs, or inlet inserts. Silt fence, straw bales and straw logs can be effective but essentially no water goes through any of these BMP's. Therefore, the water has to go over the top of these features. A gravel berm can be much more effective because water can easily go through a gravel berm especially crushed rock is used.

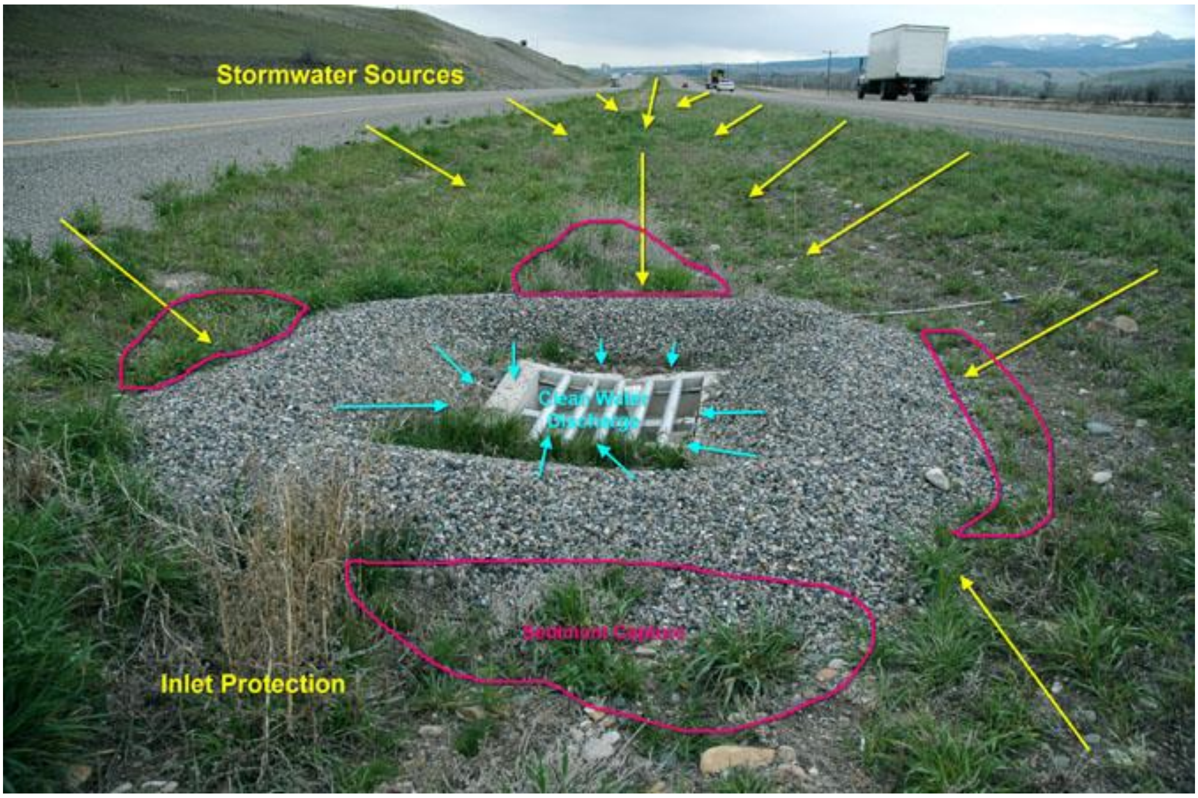

Figure 22

Figure 22 shows an example of a gravel berm around an inlet. Water is flowing in the roadway ditch as well as from both sides of the roadway. Clean gravels been placed around that inlet so when runoff does occur, the water has to pass through the clean gravel to reach the inlet. In this process, most of the sediment gets trapped on the outside of the gravel berm. One of the challenges here is when the gravel berm has served its purpose for temporary erosion control, it needs to be removed. It's not desirable to leave this feature in place permanently since it promotes additional ponding in the median since long-term saturation of the roadway subgrade is problematic.

Figure 23 – Straw Log in front of Storm Drain Inlet

Figure 23 shows an example of a common method of sediment control around a storm drain inlet. A straw log is extended the full length of the inlet (in this case a curb opening). This straw log will allow substantial sediment to accumulate just upstream from the inlet. The straw log can't be staked into the pavement, so there is some potential for water and sediment to get under the straw log, but for the most part this is pretty effective. When construction is completed, the straw log can be removed and the accumulated sediment can also be removed. The problem with this installation is the purpose of the inlet is to drain storm water so if the inlet is completely blocked, it doesn't allow any water into the inlet. During a rainfall event where does the water go? In this case, if the inlet is in a low spot, which is typical, the water will pond until it goes over the curb and erodes the material behind the curb. Using a curb inlet filter like this can be effective but there are some challenges associated with accommodating necessary drainage during construction.

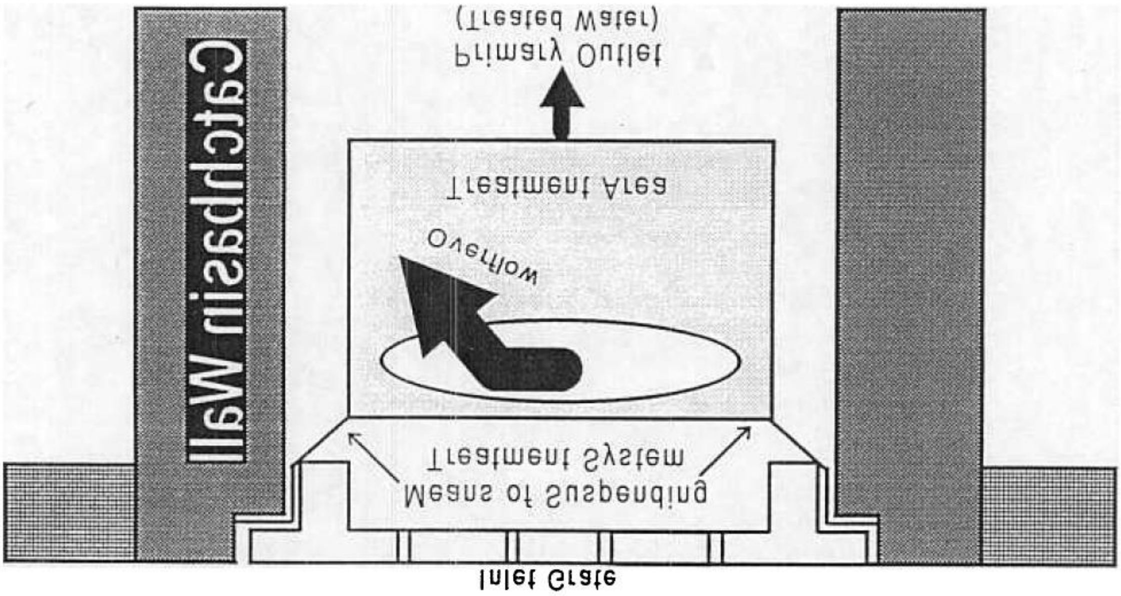

Figure 24 – Inlet Insert

Figure 25 – Geotextile used as inlet inserts

Inlet inserts can be used to contain sediment before it reaches the storm sewer. There are number manufacturers that make inlet inserts. One of the challenges with inserts is they require frequent maintenance. After any storm that transports sediment during construction, these inserts should be evaluated and probably replaced. When the inserts are not replaced regularly, they will become completely clogged and then one of two things will happen. One possibility is the insert fails and then the sediment is just washed away like it would be without the inlet. The other possibility is the fabric doesn't fail, but then the inlet is no longer functional. Inlet inserts are typically expensive for construction sites but sometimes they are necessary, depending on the regulatory environment and the quality of the receiving water. Figure 24 shows a schematic of an inlet insert. Figure 25 shows an example of a geotextile placed under and around an inlet for sediment collection. The example in Figure 25 will trap sediment but won't provide any drainage function, so the sediment is likely just transported to some other location.

BMPs for General Site Conditions

There are a number of general construction site conditions that will require the use of BMPs. When runoff is concentrated on a site, a sediment trap can be used. Figure 26 shows a schematic of a sediment trap. It is basically a detention pond with a riser pipe. The concept is the pond stays more or less full of water. This creates a long residence time for new flows, allowing for sedimentation to occur. The water then slowly trickles out through the outflow. There is also a spillway to provide for overflows if the runoff exceeds the capacity of the riser pipe.

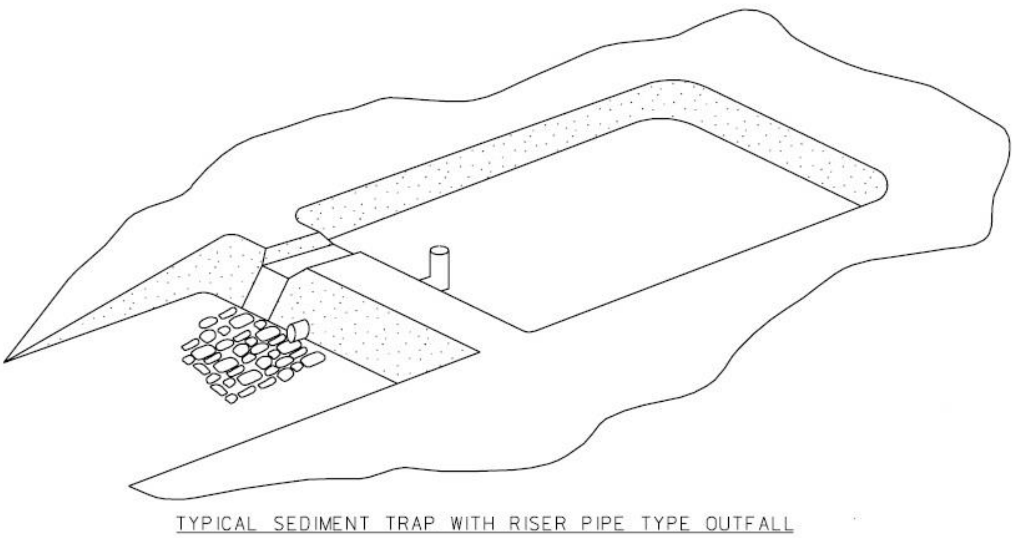

Figure 26 – Sediment traps

At entrances to construction sites, the use of gravel entrances and truck washing sites should be considered. Gravel entrances are very common on construction sites. If there is no BMP between the bare soil and the adjacent paved roadway, when the site is wet, mud accumulates on the truck tires and is carried onto the pavement. Figure 27 shows a schematic of a gravel entrance including a tire wash/truck wash site.

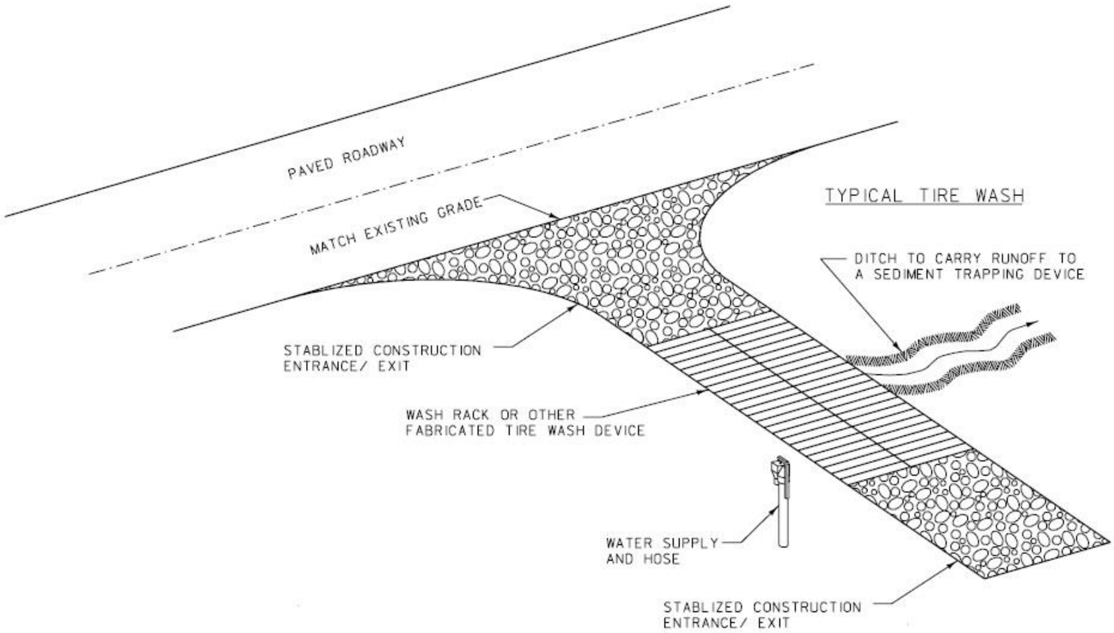

Figure 27 – Schematic of Gravel Entrance

Figure 28 – Gravel Entrance at Disturbed Site

Figure 28 shows a gravel entrance where it connects to the disturbed construction site. All construction equipment must drive across this gravel entrance when leaving the site. If mud is present on the site and has become attached to the vehicle tires, driving across this open-graded gravel will help to remove the mud from the tires.

Figure 29 – Gravel Entrance at Roadway

Figure 29 shows the end of the gravel entrance. Some mud is visible on the sidewalk adjacent to the roadway, so a gravel entrance won't remove all of the mud from vehicle tires, but they are still effective.

BMP Failures

Failures can be the result of inappropriate selection of a BMP, poor installation, poor maintenance of the BMP or extreme rainfall events.

Figure 30 – Silt Fence around an Inlet

Figure 30 shows a silt fence placed around an inlet. This was an inlet on a construction site. It was a permanent inlet but in order to keep sediment out of the inlet silt fence was placed all the way around the inlet. As previously noted, silt fence is not very permeable. About halfway up on the silt fence there is a water stain, so water got that deep before the silt fence collapsed and failed. The failure was a combination of several factors. Water got underneath the silt fence. In additional the force created by the ponded water caused the fence to collapse so water went over the top of the silt fence. Silt fence around an inlet is not effective in the same way that silt fence in the bottom of the channel is not effective.

Figure 31 – Silt fence at the end of a culvert

Figure 31 shows a classic example of silt fence in a channel at the outlet of a culvert. The silt fence was placed across this channel right at the outlet of the culvert with the intent that the silt fence would prevent erosion from the water that is coming out of the culvert. The flow of water that can go through a silt fence is probably measured in gallons per hour and the water that is going through the pipe is measured in cubic feet per second. Consequently, the silt fence has no chance of being successful in this application.

Figure 32 – Fiber roll around an inlet

Figure 32 is an example of a fiber roll that initially was placed around an inlet. It was fairly effective when installed, but during the construction process part of the fiber roll was in the way of the construction so it was just moved out of the way rather than reset. It was easier to move it out of the way but that eliminates the function of the fiber roll.

Figure 33

Figure 33 shows another example of silt fence that was originally properly installed but has not been maintained. This silt fence performs no function at all in its current condition.

Figure 34 – Construction Sediment

One of the biggest challenges with the use of BMPs is maintenance. BMPs are fairly commonly used during construction of streets and utilities. However, once the streets are completed, the BMPs are removed. Then the housing contractors come in to build the homes and other buildings. Depending on the jurisdiction, if significant regulations and enforcement are not in place, it is possible to have situations like that shown in Figure 34. In this case, the building contractors have tracked significant sediment off the construction site on the paved street. When it rains at this site all of the sediment that is in the gutter is going to get washed into the storm drain system and into a receiving stream.

Figure 35 – Construction without BMPs

Figure 35 shows another challenge for construction BMPs. At this site, the contractor simply ignored the fact that there is soil being placed in a roadway ditch, so there are no BMPs at all installed.

Erosion Control for Construction Sites - Quiz

Updated: 6/24/2023

1. What is the primary purpose of a BMP
   a. Protect water quality
   b. Reduce construction noise
   c. Provide a visual shield for construction activities
   d. All of the above

2. What is the most common pollutant of concern?
   a. Oil and grease
   b. Sediment
   c. Nitrogen
   d. Phosphorus

3. Which of the following is the least effective on steep slopes?
   a. Slope roughening
   b. Silt fence
   c. Erosion control blankets
   d. Straw logs

4. Which of the following installation procedures is standard for silt fence?
   a. Anchored into the ground
   b. Post spacing of 4 to 8 feet, maximum
   c. Backed by wire fence
   d. All of the above

5. Mulch includes which of the following components?
   a. Fibers
   b. Stailizing emulstion
   c. Tackifiers
   d. All of the above

6. Once mulch is applied, when does it need to be reapplied?
   a. After significant rainfall events
   b. After additional construction disturbance
   c. Both of the above
   d. Never

7. Which of the following is usually the most effective on slopes?
   a. Erosion control blankets
   b. Silt fence
   c. Mulch
   d. Straw Logs

8. Erosion control blankets that contain a blend of synthetic fibers, nets and wire mesh bound together to form a durable blanket are referred to as which of the following?
   a. Photodegradable Blankets
   b. Biodegradable Blankets
   c. Permanent Blankets
   d. All of the above

9. What is the preferred location for a pipe discharge on a slope?
   a. At the top of the slope
   b. At the bottom of the slope
   c. Halfway up the slope
   d. Discharge location has no impact on erosion

10. Which of the following is effective adjacent to a drainage channel?
   a. Silt fence
   b. Vegetated buffer
   c. Erosion control blankets
   d. All of the above

11. Which of the following is the least effective in a drainage channel?
   a. Silt fence
   b. Check dams
   c. Erosion control blankets
   d. All of the above are equally effective

12. What is the preferred material for check dams?
   a. Silty clay
   b. Well graded gravel with sand and silt
   c. Clean, washed gravel
   d. Concrete

13. Where should the low spot be located in a straw log installation?
   a. At the end of the straw logs
   b. Near the center of the straw logs
   c. Location of the low spot doesn’t make any difference
   d. A low spot is not required.

14. How is an erosion control blanket installed in a channel
    a. It is simply placed on top of the ground and the weight keeps it in place
    b. It must be anchored at the beginning and end of each roll
    c. It must be anchored throughout the length of the installation
    d. Any of the above will work.

15. Which of the following is a concern when using filters over storm drain inlets?
    a. Filters don't slow the velocity enough so solids will settle out
    b. The filter can reduce the flow capacity of the inlet significantly causing unanticipated flooding
    c. Both of the above
    d. None of the above

16. BMP failures are usually a result of which of the following?
    a. Inappropriate selection of BMP
    b. Poor installation or maintenance
    c. Extreme flood event
    d. Any of the above