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Drainage Definitions 10/28/08 DRAFT

**Abutment** – the sloping sides of valley that supports the ends of a dam.



**Abutment, Bridge**– part of a structure which supports the end of a span or accepts the thrust of an arch; often supports and retains the approach embankment.



**Appurtenances** – one of the components that make up a system. Ie. for drainage: manholes, pipes, catch basins, etc.

**Aggregate** – the sand and gravel portion of concrete (65 to 75% by volume), the rest being cement and water.

**Aggregate Base** – Aggregate base is typically composed of crushed rock comprised of material capable of passing through a ¾ inch rock screen. The component particles will vary in size from ¾ inch down to dust. The material can be made of virgin (newly mined) rock, or of recycled asphalt and concrete.



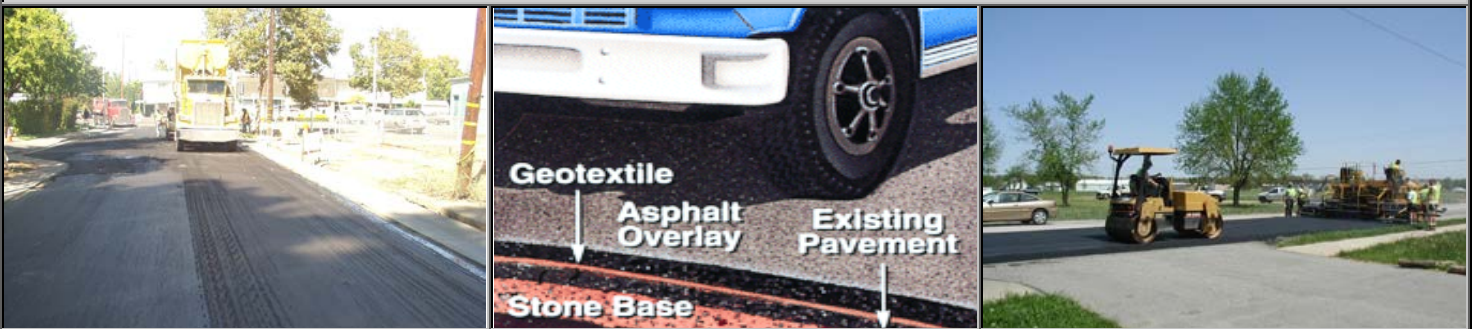
**Articulated Block Matting** – concrete revetments used to resist the erosive forces of flowing water resulting from elevated velocities and wave action in concentrated flow areas. A typical ACB revetment mat is formed by interlocking precast concrete blocks placed on a geotextile fabric. The interlocking matrix allows versatile structure design for use over varying land contours and grades. The term "articulated" implies the ability of individual blocks of the system to conform to changes in grade while remaining interlocked or otherwise restrained by virtue of the block geometry and/or additional system components such as cable, geotextiles or anchors. The interlocking property provided by the special shapes of the blocks also allow for expansion and contraction.



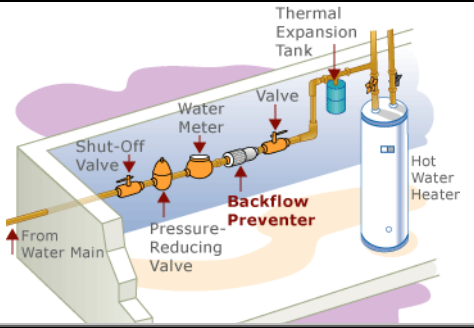
**Asphalt Cut and Patch** – repair made to asphalt. A square is cut beyond the damage, ripped out, regraded, and repaved with basecoat binder and bituminous asphalt topcoat. Edges of the patched pavement are emulsified to bond the new asphalt to the old.



**Asphalt Overlay** – a resurfacing technique typically utilizing 1/2" and 3/4" Asphalt mix. One or more layers of asphalt construction on an existing pavement.

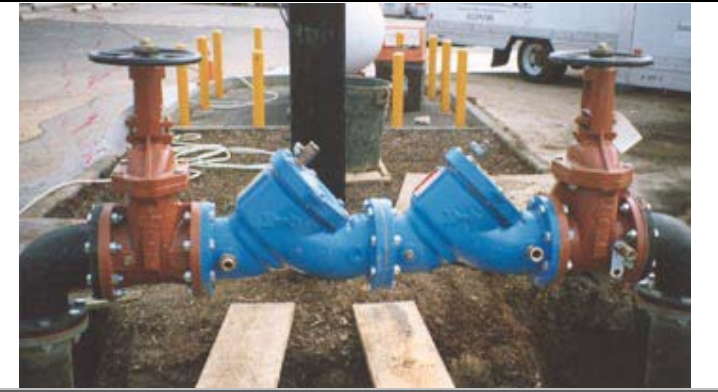
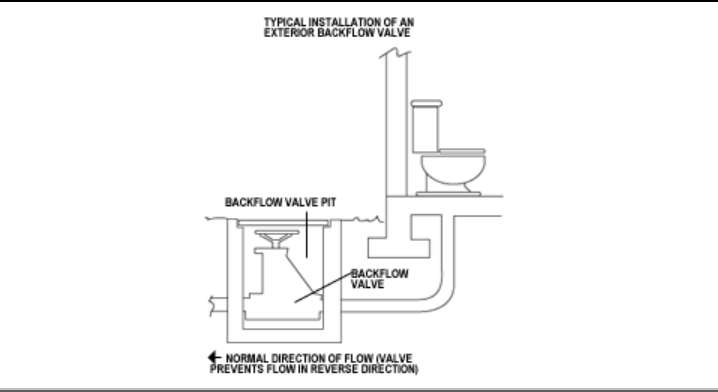


**Backflow** – the unwanted reverse flow of liquids in a piping system caused by negative pressure in the pipes

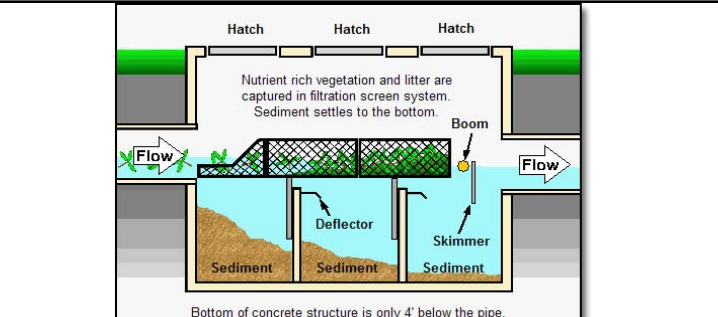
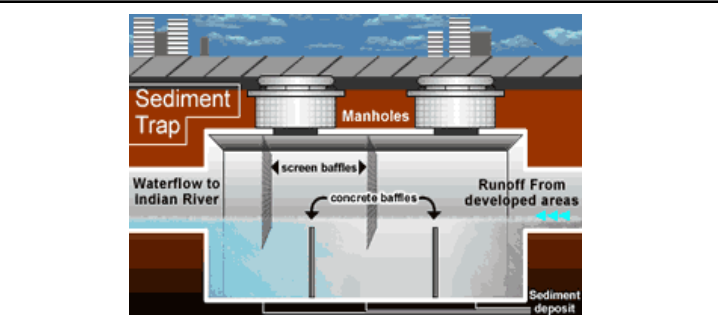


Backflow Preventer

**Backflow Valve** – prevents polluted or contaminated water from reversing direction and flowing backward.



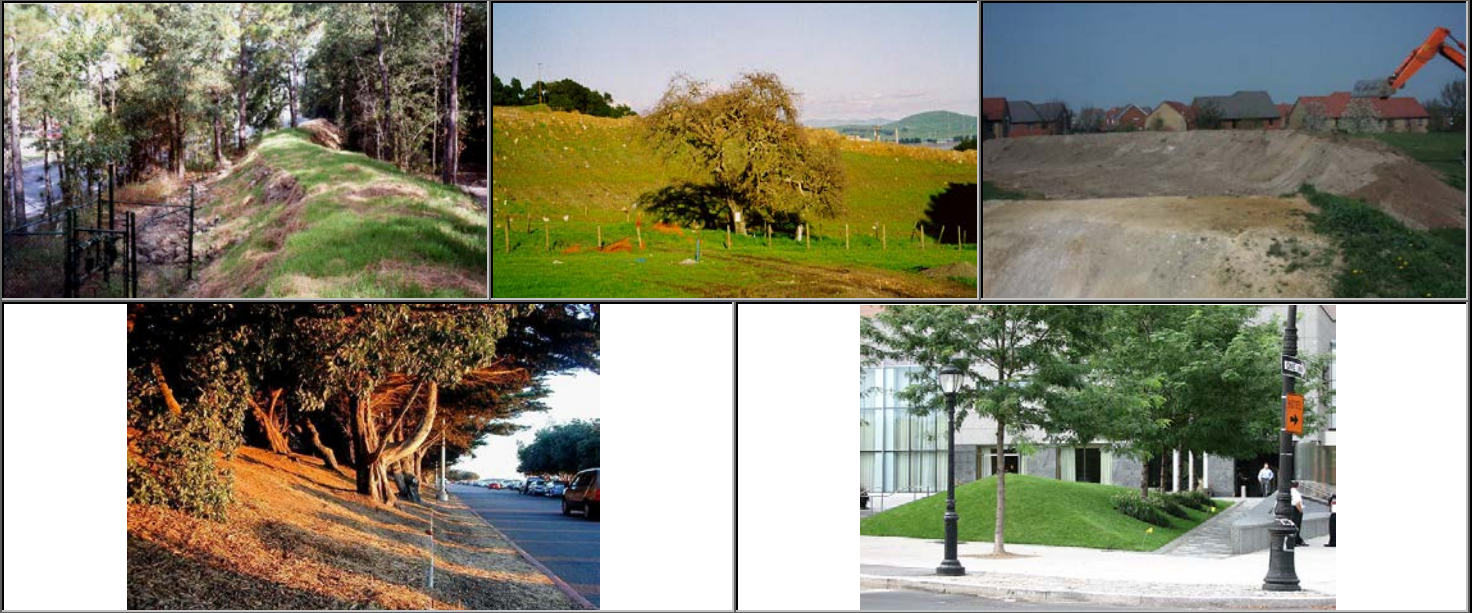
**Baffle Box** – a large sediment trap. The sediment accumulation rates vary from site to site depending on many factors such as drainage basin size, land use, soil type, ground slope, mowing frequency, etc.



**Bank Stabilization** – adding materials to a bank to prevent erosion



**Berm** – a raised earthen shoulder constructed as a barrier to water runoff or to screen view of unsightly area.



**Borrow Pit** – an area where material (usually soil, gravel or sand) has been dug for use at another location.



**Breakwater** – offshore coastal protective structures built of stone parallel to the coastline that help absorb the energy of breaking waves.



**Bulkhead** – a retaining wall, i.e. watershed retaining wall. Coastal bulkheads are most often referred to as seawalls, bulkheading, or riprap revetments. These manmade structures are constructed along shorelines with the purpose of controlling bank erosion. Construction materials commonly used include wood pilings, commercially developed vinyl products, large boulders stacked to form a wall, or a seawall built of concrete or another hard substance.

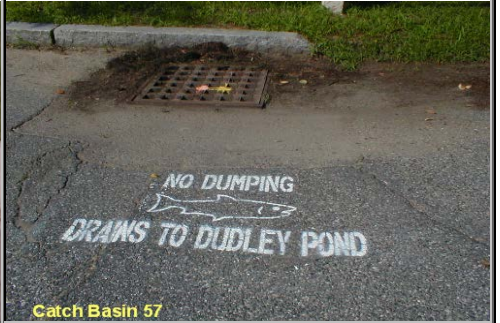
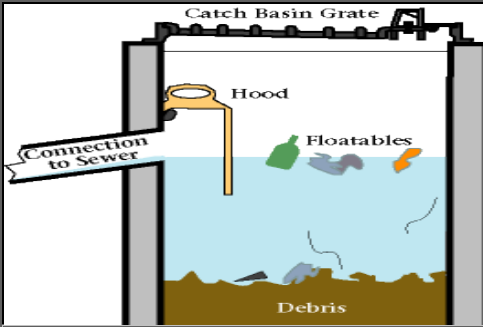


**Canal** – man-made channels for water.





**Catch Basin, also Storm Drain** – a large underground container with a grate on the top, for collection of storm water runoff. It catches or collects dirt and other debris and prevents them from polluting streams and lakes.



Catch Basin 57



Water flows into the removable basket, filtering trash, leaves, yard clippings, sediment, etc.



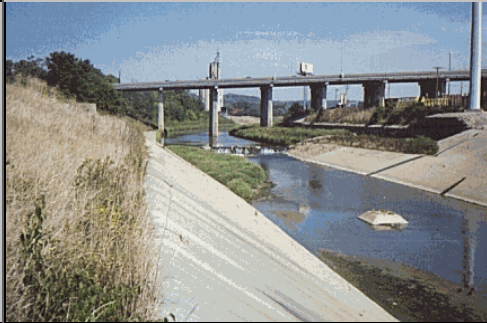
Round Catch Basin Filter



**Channel** – the bed of a stream or waterway.



Channel, continued...



Channel Excavation



Check Valve, see *Swing Check Valve*

Clearing & Grubbing



CMP, Corrugated Metal Pipe, see *Pipe*

**Cofferdam** – a temporary barrier used to provide a dry work area below the water level.



**Cofferdam, Sheet Pile**



**Compost Blanket** – a 1 to 4 inch surface application of compost/mulch or a blend of both to protect areas with erosive potential.



**Concrete Bags** – riprap alternative.



**Conduit** – a pipe system used to protect cables.



**Confluence** – the point at which two streams or rivers converge.



**Continuous Span** – a span that is supported on more than two piers or on more than one abutment and one pier and which distributes the load to the various supports



**Control Structure** – a structure on a stream or canal that is used to regulate the flow or stage of the stream or to prevent the intrusion of salt water.



**Coupling** – a fitting that joins two pieces of pipe (or other fittings) together.



**Culvert** – a conduit used to enclose a flowing body of water. It may be used to allow water to pass underneath a road Railway or embankment.



Culvert, continued...



Construction of culvert



Culvert, Box



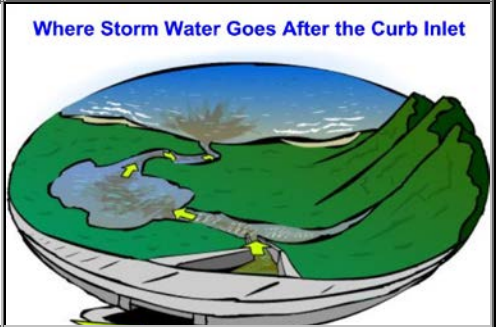
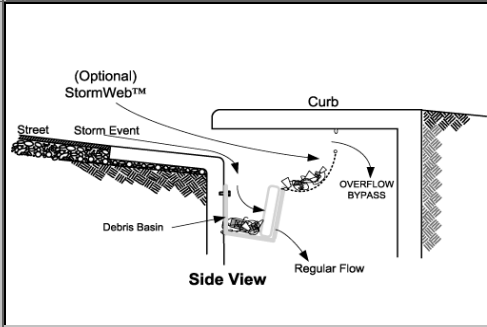
Culvert, Elliptical – same volume of water flows, but , but less height is required.



**Curb Inlet**, see *Drainage Inlet* – a location where water runoff from the street or sidewalk enters the storm drain system; the openings to drainage inlets are typically covered by a grate or other perforated surface to protect pedestrians.



This inlet directs flow underground towards the center of the street where it connects into the main line, traveling down hill with the grade until it connects in to the 48" storm system emptying into a Creek.



**Debris Screen**



**Detention Pond** – a water detention pond, by definition, detains water. When an area is paved, or covered with a building, water runs off the property much faster than when it is in a natural state. The total amount of discharge is the same, but the discharge happens over a shorter amount of time. Typically in low-lying areas, the ponds temporarily detain the water and keep the runoff to the desired rate. When the rain ends, though, the water detention pond will be empty shortly afterwards. (Generally have one outfall unless very large.)



**Dewatering** – the process of natural, chemical, or mechanical removal of water from sludge, thereby reducing it to a damp solid with the lowest level of moisture attainable. The removal of ground or surface water from a construction site allows construction to be done "in the dry" (as opposed to under wet conditions). Water is usually removed using well points and power driven pumps. Dewatering of cofferdams and trenches is a common practice during the construction of bridges, culverts and public utilities.



Before

After

**DIP – Ductile Iron Pipe**, see *Pipe*

**Directional Boring** – commonly called horizontal directional drilling or HDD, is a method of installing underground pipes and conduits along a prescribed bore path from the surface, with minimal impact to the surrounding area.

Directional Boring Machine

The process begins when a directional bore machine pushes a bore head connected to hollow pipe into the ground at an angle. As each joint of drill pipe is pushed into the ground a new one is added behind.

**300.5 Underground Installations  
300.5(K) Directional Boring**

Reel of underground nonmetallic conduit with conductors being installed after directional boring process

Directional boring equipment

Dirt

**Discharge** – usually the rate of water flow. A volume of fluid passing a point per unit time commonly expressed as cubic feet per second, cubic meters per second, gallons per minute, or millions of gallons per day.

**Discharge Pipe** – a pipe used to carry wastewater from a factory or other facility into a receiving stream or lake.



**Ditch**, see *Swale*

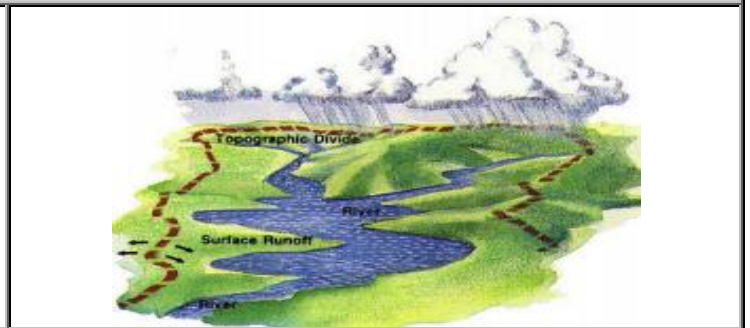
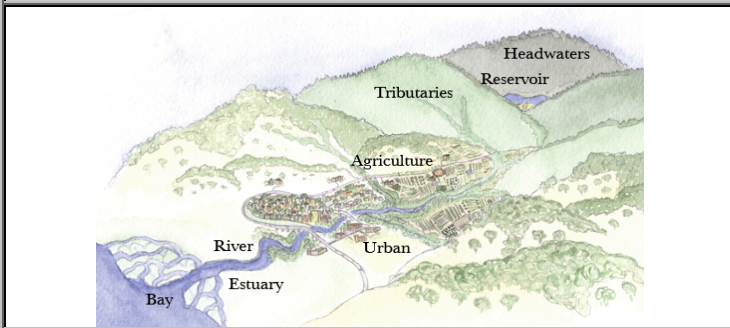
**DPE** – (Dual Phase Extraction) technology that uses pumps to remove various combinations of contaminated groundwater, separate-phase petroleum product, and hydrocarbon vapor from the subsurface. Extracted liquids and vapor are treated and collected for disposal, or re-injected to the subsurface (where permissible under applicable state laws).





**DRA (Drainage Retention Area)** – an area used to provide storage of stormwater runoff.

**Drainage Basin or Watershed Basin** – a region of land where water from rain or snowmelt drains downhill into a body of water, such as a river, lake, dam, estuary, wetland, sea or ocean. The drainage basin includes both the streams and rivers that convey the water as well as the land surfaces from which water drains into those channels. The drainage basin acts like a funnel – collecting all the water within the area covered by the basin and channeling it into a waterway. Each drainage basin is separated topographically from adjacent basins by a ridge, hill or mountain, which is known as a water divide or a watershed. Watershed refers to the drainage basin itself.



**Drainage Facility** – any pipe, ditch, retention area, etc., which stormwater flows through.

**Drainage Inlet**, see also *Curb Inlet*



**Drainage System** – The system through which water flows from the land. Drainage facilities, DRA's WRA's, swales, etc., all make up components of a drainage system.

**Dredging** – removal of mud from the bottom of a water body to make a deeper channel. This can disturb the ecosystem and causes silting which kills aquatic life. Dredging of contaminated mud's can expose biota to heavy metals and other toxics. Dredging activities may be subject to regulation under Section 404 of the Clean Water Act.



**Earthwork** – the moving of massive quantities of soil or unformed rock. Typical earthworks include roads, dams, dikes, canal, bunding and berms.



**Easement/Right of Way** – an easement is the right to do something or the right to prevent something over the real property of another. It allows another person the right to use your land for a specific purpose. The most usual easements are those granted to public utility or telephone companies to run lines on or under your private property and to neighboring houses to use a common driveway to give access to their home.

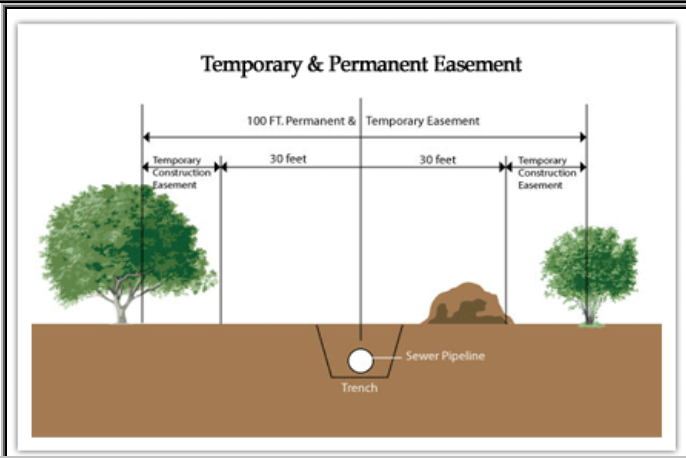
**Easements:**

- Access roads
- Pathways/walkways
- Utilities
- Right to park
- Right of light
- Right to commit a nuisance (noise, dust, etc.)

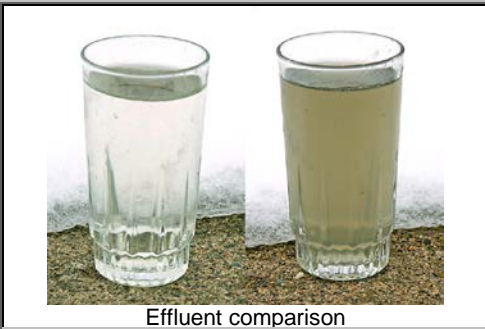
**Rights of Way:**

- Utility corridors
- Power lines
- Sewer/water lines
- Gas/oil transmission lines
- Road

Easement/Right of Way, continued...

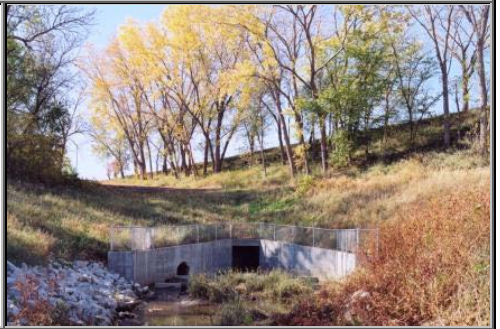


**Effluent** – wastewater or other liquid - raw (untreated), partially or completely treated - flowing from a reservoir, basin, treatment process, or treatment plant.

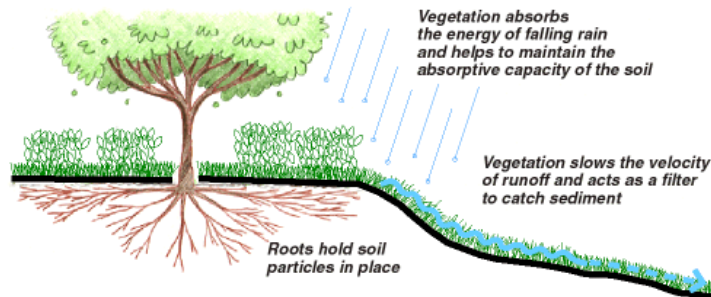


Effluent comparison

**Endwall** – (see also, *Wingwall*) – a wall at the end of a drainage structure to prevent roadway embankment from eroding around culvert.



**Erosion Abatement, Vegetation**



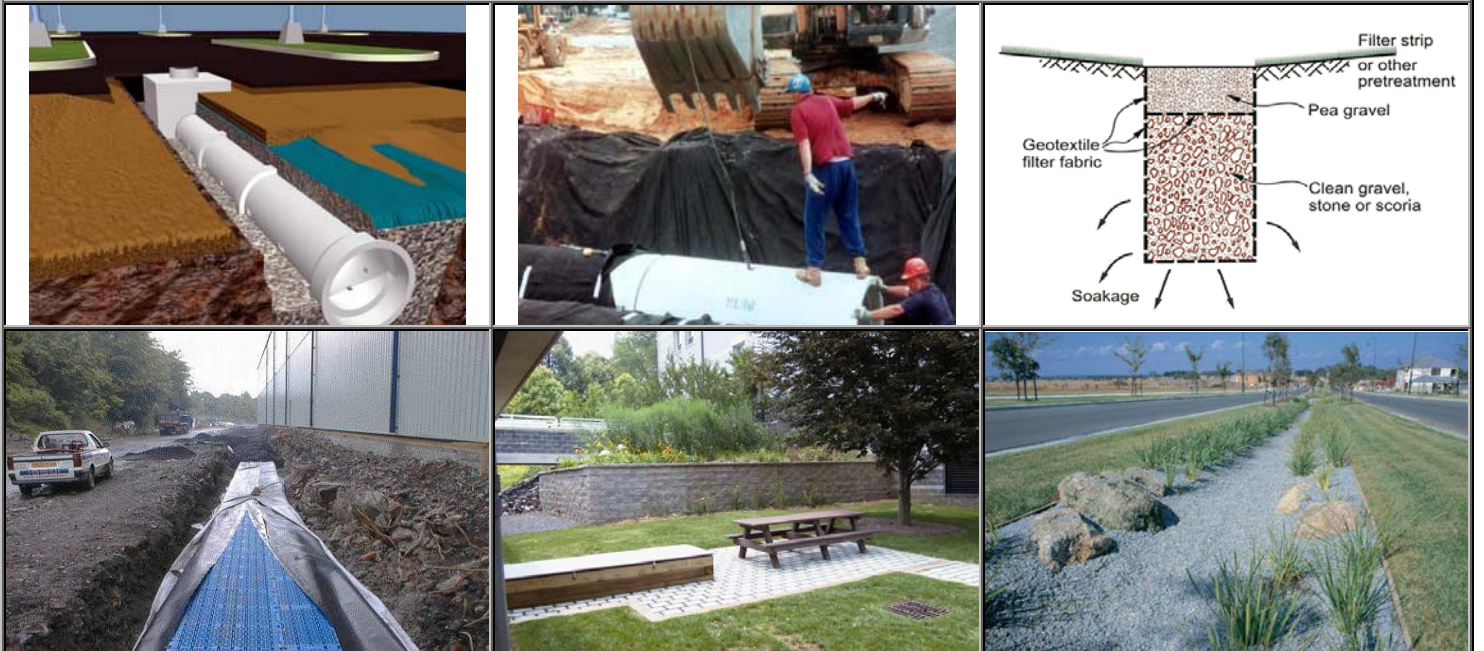
**Erosion Control Blanket** – placed onto prepared, seeded, soils to prevent washing away of the seed and erosion of the prepared seed bed. After the vegetation grows the Erosion Control Blanket degrades over time until only the vegetation is left in place. The vegetation, once established, provides permanent erosion control.



**Excavation** – a hole or cavity made by excavating.



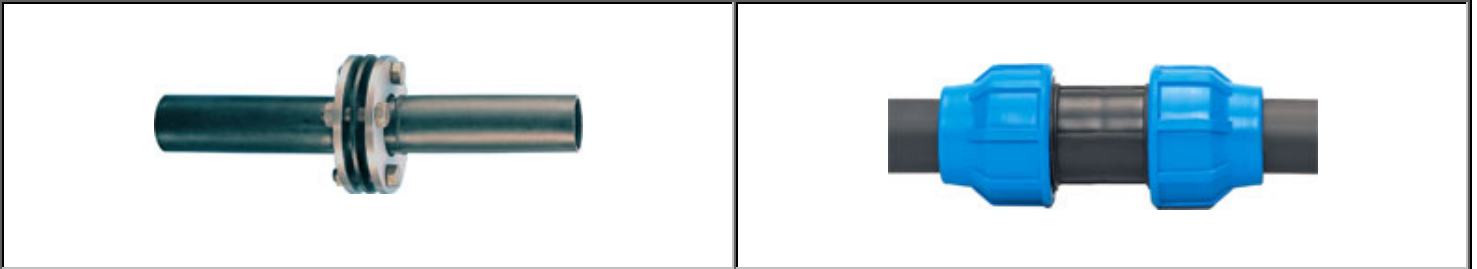
**Exfiltration Trench** – an infiltration trench is a shallow, excavated trench filled with gravel or rock, through which run-off drains. Stormwater transfers from the trench into the surrounding soil, while sediment and some dissolved pollutants are retained in the trench. The trench is lined with a layer of geotextile fabric, to prevent soil migration into the rock or gravel fill. The top surface of the fill is also covered with a layer of fiber fabric, then finished with a shallow layer of topsoil.



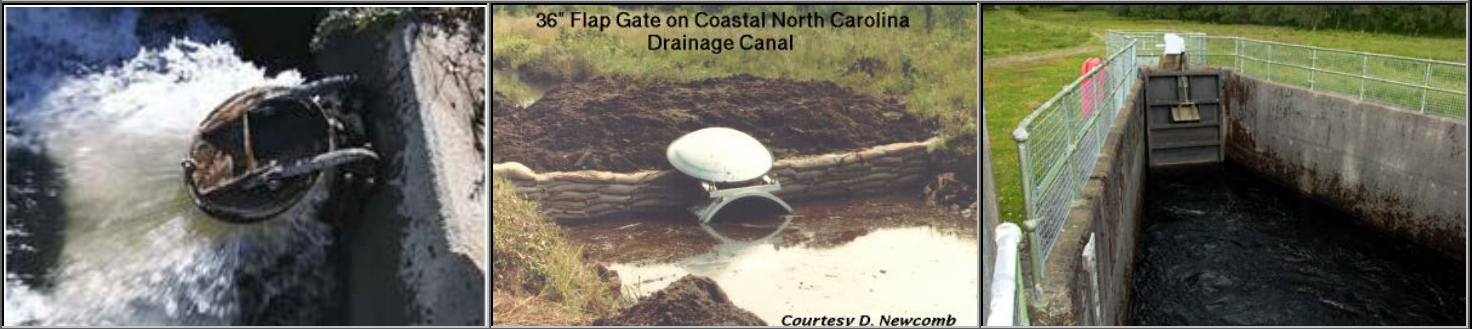
**Fiber Roll** – sausage-like cylinders of compacted fiber (typically coconut husk), wrapped with a fiber mesh. Roughly the diameter of a basketball, they are set areas subject to erosion. The rolls help to dissipate wave energy and trap eroded sediments.



**Flange Joint** – pipe fitting



**Flap Gate** – allows drainage from one direction only without allowing fluids back into the channel.



**Floating Turbidity Barrier** – floating barrier designed to control sediment contamination from construction sites into nearby oceans, rivers, lakes, or ponds.



Floating Turbidity Barrier, continued...



**Flocculation** – To cause to group together; process by which clumps of solids in water or sewage aggregate through biological or chemical action so they can be separated from water or sewage; a large portion of untreated water is mixed with chemicals known as coagulants. The floc attaches to bacteria, and other contaminants in the water to form a sticky glob called floc.



Flocculation Tank

**Floodgate** – an adjustable gate to control water flow in reservoir, stream or levee systems.



**Floodwall** – a long, narrow concrete, or masonry embankment usually built to protect land from flooding. If built of earth the structure is usually referred to as a levee. Floodwalls and levees confine streamflow within a specified area to prevent flooding. The term “dike” is used to describe an embankment that blocks an area on a reservoir or lake rim that is lower than the top of the dam.



**Flowable Fill** – A self-leveling, low-density cementitious back-fill material that attains 100% compaction without tamping or vibrating. It replaces compacted soil or conventional back-fill as a structural fill that drains and is no stronger than the surrounding soil after it has obtained its ultimate strength. Uses: trench backfill for storm drainage and utility lines on street and highway projects, to backfill abutments and retaining walls, fill abandoned pipelines and utility vaults, cavities, and settled areas, and help to convert abandoned bridges into culverts.



**Flume** – a constructed channel lined with erosion-resistant materials used to convey water on the steep grades without erosion.



**Force Main** – The discharge pipeline of a pumping station.



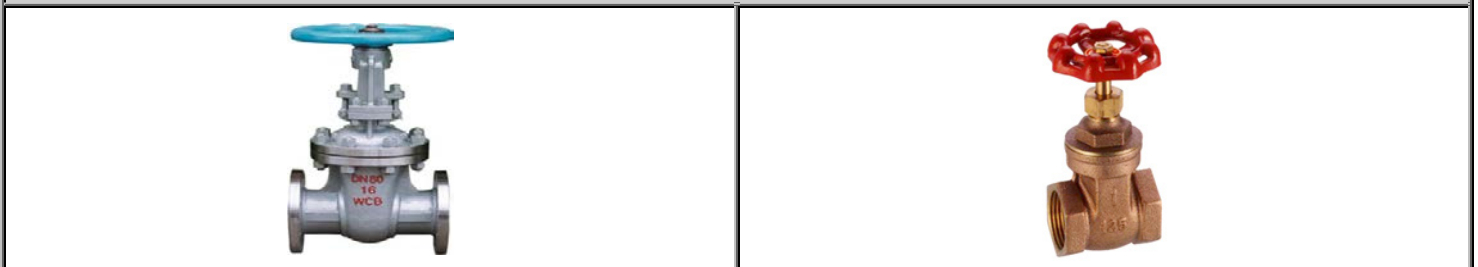
**French Drain** – simply a drain without a pipe using rock or gravel fill, however, many will include a pipe, typically perforated. Water is collected in a shallow trench filled with stone that leads the water to a different area.



**Gabion** – a wire mesh cage, usually rectangular, filled with rock and used to protect channel banks and other sloping areas from erosion.



**Gate Valve** – a valve that can be turned to completely stop or reduce the flow within a pipe.



**Geotextile** – permeable fabrics, which, when used in association with soil, have the ability to separate, filter, reinforce, protect, or drain.





Geotextile, continued...



Geotextile creates stable road base



The geotextile fabric is placed prior to asphalt paving. The fabric will help prevent reflective cracking in the concrete.

Grading – altering a land surface by cutting, filling and/or smoothing to meet a designated form and function.



Grading, Pond



Grubbing – removal of stumps, roots, and vegetable matter from the ground surface after clearing and prior to excavation.



HDPE – High-density Polyethylene, *see Pipe*

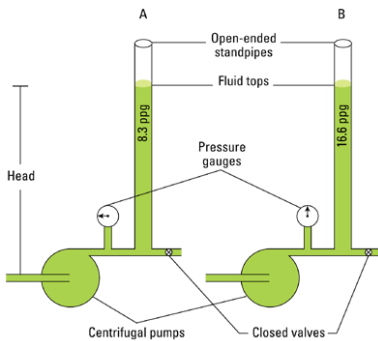
HERCP, Horizontal Elliptical Reinforced Concrete Pipe, *see Pipe*

H & H Study, (Hydraulics & Hydrology Study) – a set of related studies for a watershed and stream corridor that work to predict how the watershed and stream system react to rainfall events.

**Headwall** – a retaining wall at the outlet of a drain or culvert.

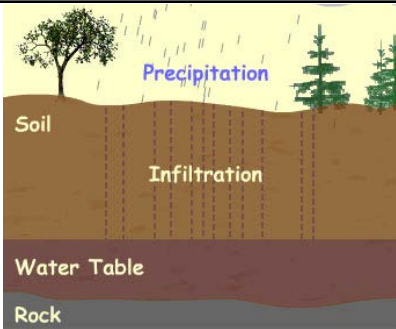


**Hydrostatic Pressure** – the pressure which is exerted on a portion of a column of fluid as a result of the weight of the fluid above it.



Hydrostatic head. The fluid height in columns A and B is identical, but the pressure reading on the gauges differs because of the different fluid densities. Hydrostatic head refers to the vertical column height; hydrostatic pressure refers to the force exerted by the fluid.

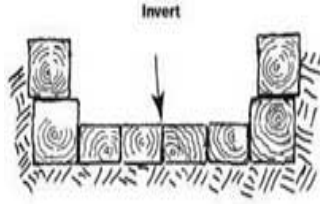
**Infiltration** – the movement of water from the land surface into the soil.



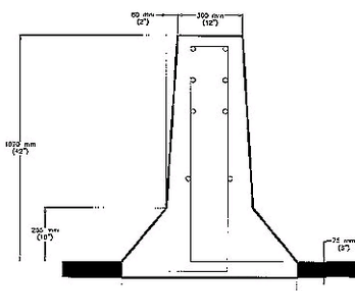
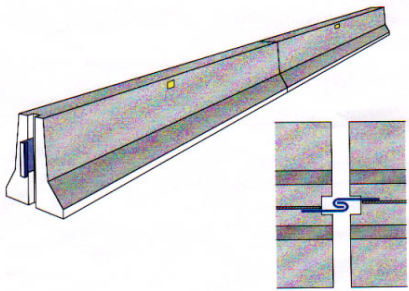
**Injection Well** – a well constructed for the purpose of injecting treated wastewater directly into the ground. Wastewater is generally forced (pumped) into the well for dispersal or storage into a designated aquifer. Injection wells are generally drilled into aquifers that don't deliver drinking water, unused aquifers, or below freshwater levels.



**Invert** – The interior surface of the bottom of any pipe, culvert, drain, or other conduit.



**Jersey Barrier** –A protective concrete barrier used as a divider and a means of preventing access to a prohibited area. Use for construction sites, traffic channelizing, road blocks, object protection, wall protection, and pedestrian traffic.

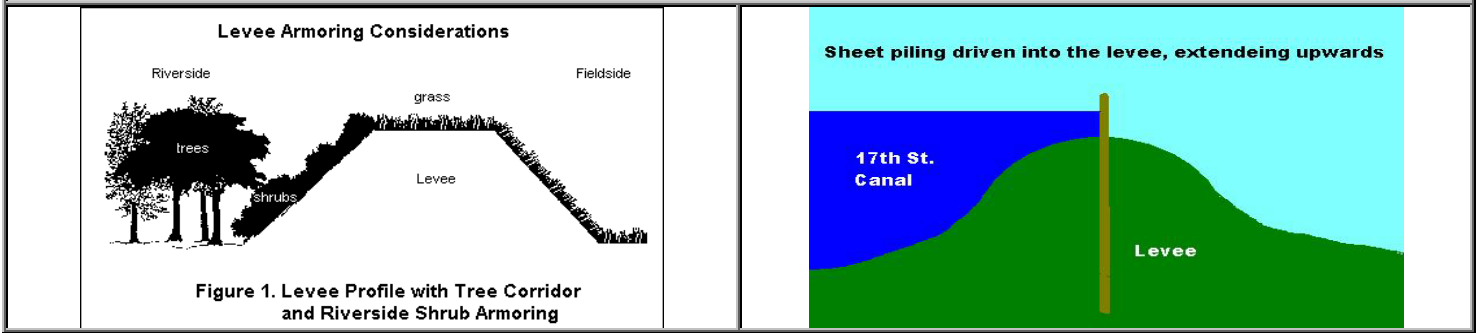


**Levee** – a natural or artificial slope or earthen wall, usually earthen, which parallels the course of a river. The main purpose of an artificial levee is to prevent flooding of the adjoining countryside; however, they also confine the flow of the river resulting in higher and faster water flow.



Levee failure

Levee, continued...



**Lift Station** – all sewage must flow through the collection system pipes to a wastewater treatment plant by gravity flow. If a neighborhood is located at a lower elevation than the nearest collection system connection, the sewage must be pumped up hill to the nearest sanitary sewer main line.



Loader



Loam – soil composed of sand, silt, and clay and have better infiltration and drainage than silty soils.



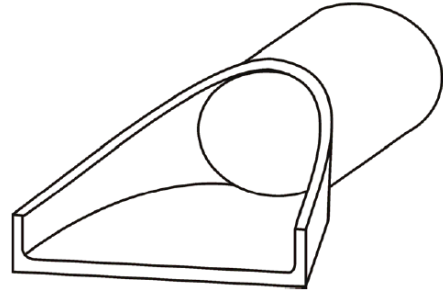
Manatee Gate



Mercury Switch – a switch that is closed or opened when an internal globule of mercury moves to or away from the contacts when the switch is tilted. Sometimes used in pump stations.



Mitered End Section, MES – End portion that is attached to pipe.



Outfall – the discharge point of a waste stream into a body of water; the outlet of a river, drain or a sewer where it discharges into the sea, or a lake.



Pipe



CMP Corrugated Metal Pipe



CMP – Corrugated Metal Pipe



DIP, Ductile Iron Pipe – Water Main

Pipe, continued...



DIP, Ductile Iron Pipe – Water Main



DIP, Ductile Iron Pipe – Water Main



Elliptical Pipe



Elliptical Pipe



Elliptical Pipe



HDPE – High Density Polyethylene Pipe



HDPE - High Density Polyethylene Pipe



HERCP – Horizontal Elliptical Reinforced Pipe



Perforated Concrete Pipe



Perforated Concrete Pipe



Polyethylene Pipe



PVC – Polyvinyl Chloride Pipe



PVC – Polyvinyl Chloride Pipe

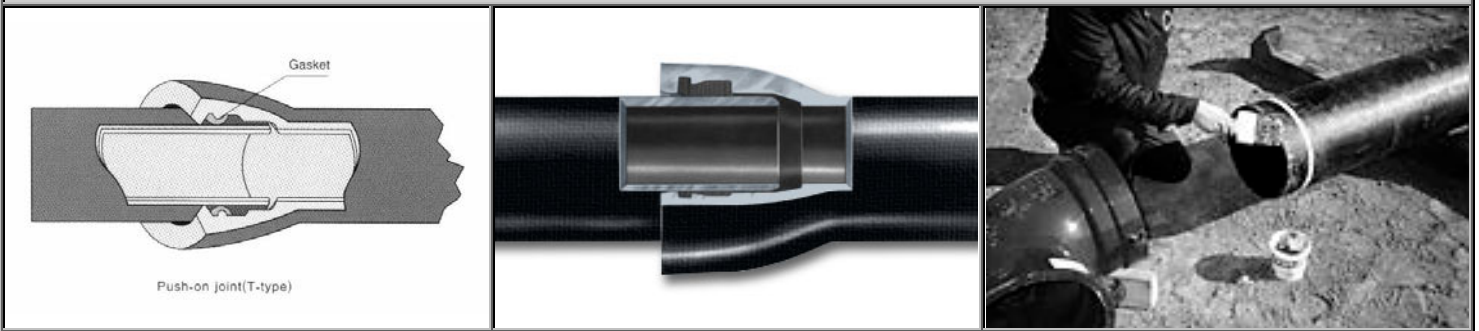


RCP – Reinforced Concrete Pipe

**Pump Station** – facilities used for pumping fluids from one place to another. They are used for a variety of infrastructure systems, such as the supply of water to canals, the drainage of low-lying land, and the removal of sewage to processing sites.



**Push-On Joint** – the most popular, quickest, and easiest-to-assemble joint for Ductile Iron pipe and fittings in underground applications is the push-on joint. This joint consists of a single rubber gasket placed in a groove inside the socket at the bell end of the pipe. After lubricating the joint in accordance with the manufacturer's instructions, the beveled end of the pipe is pushed past the gasket, compressing it and forming a pressure-tight and dependable seal.



**RCP, Reinforced Concrete Pipe**, see *Pipe*

**Rebar** – concrete reinforcing bar (rebar). A portmanteau for *reinforcing bar*, is common steel bar, an important component of reinforced concrete and reinforced masonry structures. It is usually formed from carbon steel, and is given ridges for better frictional adhesion to the concrete.

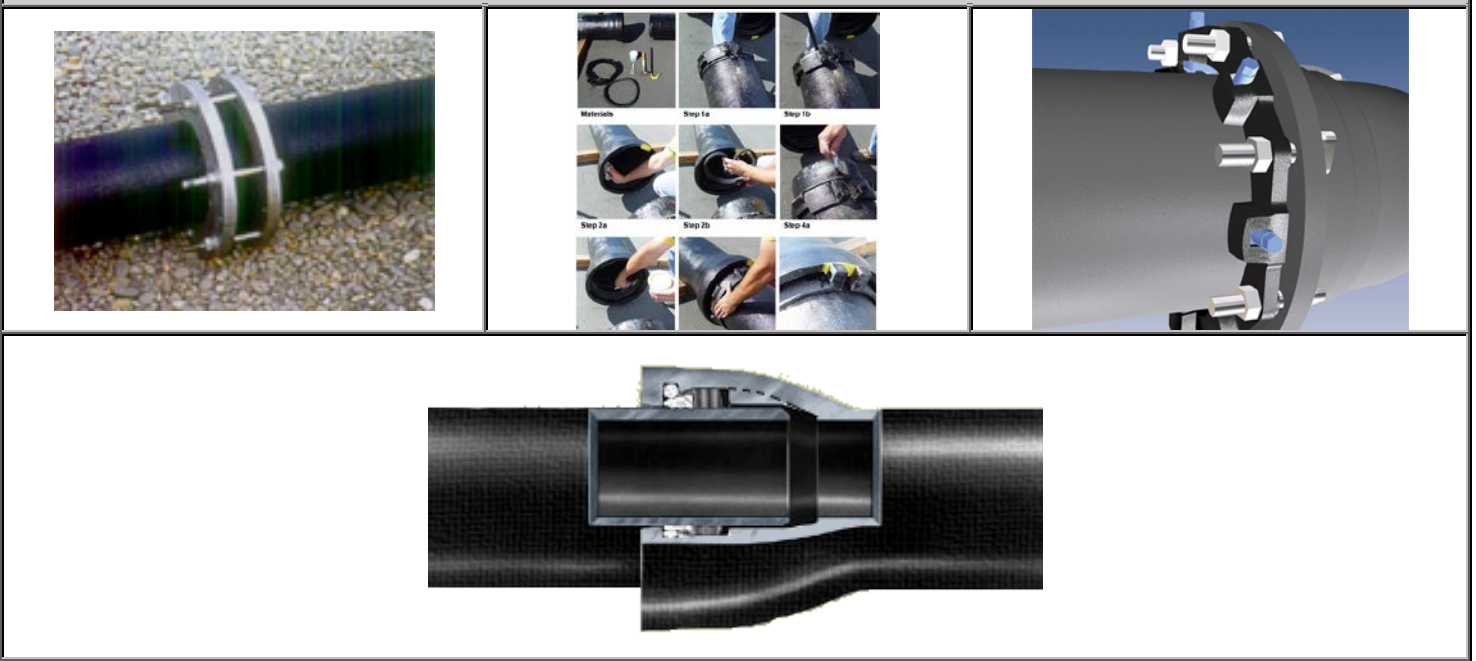




**Reservoir** – a place where water is stored until it is needed. A reservoir can be an open lake or an enclosed storage tank. Most often, a reservoir refers to an artificial lake, used to store water for various uses. Reservoirs are created first by building a sturdy dam, usually out of cement, earth, rock, or a mixture of all three. Once the dam is completed, a stream is allowed to flow behind it and eventually fill it to capacity. Reservoirs exist in a wide variety of shapes and sizes, and can be either natural or man-made.



**Restrained Joint** – fitting reinforcing two pipes.



**Retaining Wall** – a structure that holds back earth from a building or other structure. Retaining walls stabilize soil and/or rock from downslope movement or erosion and provide support for vertical or near-vertical grade changes. Cofferdams and bulkheads, structures that hold back water, are sometimes also considered retaining walls.



**Retention Pond**, *see also Detention Pond* – a water retention pond, retains water all the time. The pond level may go up and down, but ordinarily the pond has some water in it. If a pond is typically empty except during and shortly after rain or other precipitation, it is a detention pond. If the pond always has water in it, then it is a retention pond.



**Revetment** – Retaining wall to prevent erosion; to face a surface with stone slabs; a facing made of supporting material, such as masonry or concrete, used to support an embankment.



**Right-of-Way**, also see *Easement* – a section including road and easements or ditches owned by local government. In the strict sense of the word, right of way refers to the land on which infrastructure is built. Infrastructure could be anything from a highway to an airport. Projects such as pipelines, power lines, or telephone facilities all require right of way. Generally speaking, the term right of way is used to describe the industry as a whole and the professionals who are involved in it. There are many areas of specialization in right of way to include acquisition and negotiation, property management, relocation, appraisal, title, surveying, engineering, attorneys, and records management.



**Riprap** – rock or other material used to stabilize banks of the shore. Riprap reduces water erosion by resisting the hydraulic attack and dissipating the energy of flowing water or waves.



**Seawall** – a wall of stone, concrete, or other sturdy material, built along the shoreline to prevent erosion even by the strongest and highest of waves.



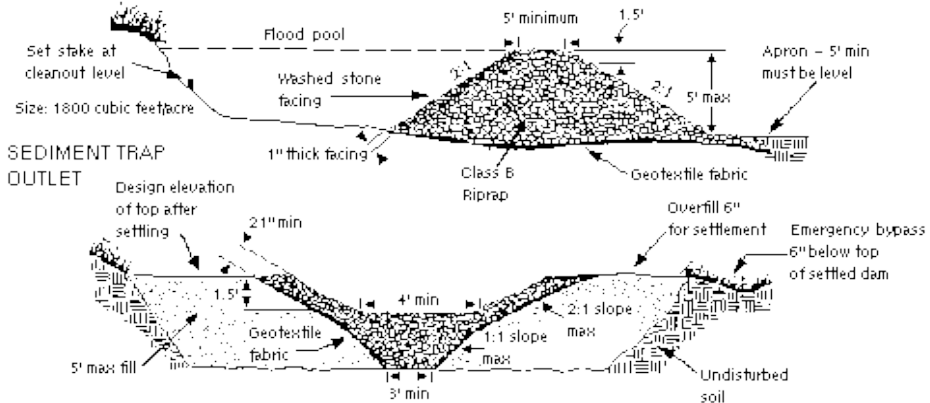
Seawall, continued...



**Sediment Trap** – a structure or vegetative barrier designed to collect soil material transported in run-off and also to reduce water flow velocity and therefore scouring and erosion. Sediment traps mitigate siltation of natural drainage features.



SEDIMENT TRAP CROSS SECTION



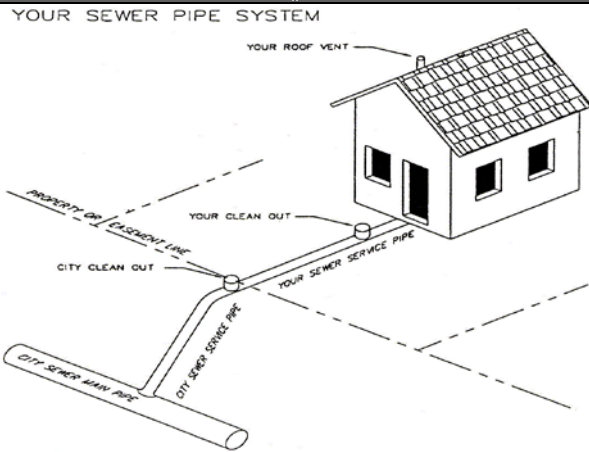
**Septic System** – a sewage system that relies on a septic tank and drainfield to store and/or treat wastewater.



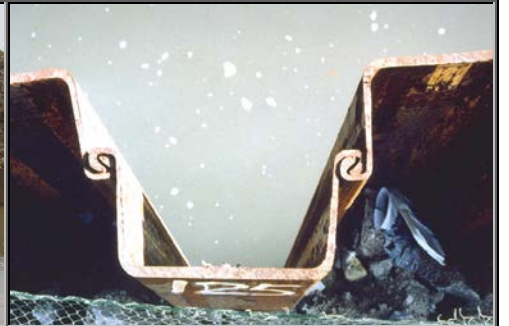
**Sewer** – a channel or conduit that carries wastewater and stormwater runoff from the source to a treatment plant or receiving stream. “Sanitary” sewers carry household, industrial, and commercial waste. “Storm” sewers carry runoff from rain or snow. “Combined” sewers handle both.



Sewer Pipe



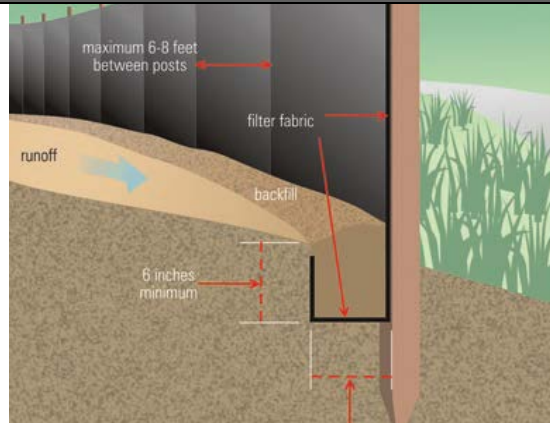
**Sheet Piles** – a form of driven piling using thin interlocking sheets of steel to obtain a continuous barrier in the ground. The main application of steel sheet piles is in retaining walls and cofferdams erected to enable permanent works to proceed.



**Silt Fence** – used to intercept and detain small amounts of sediment from disturbed areas during construction operations and to decrease the velocity of sheet flows from rainfall runoff. (Typically used in all HMGP drainage projects. The contract will spell out the silt fence usage.)



Silt Fence, continued...

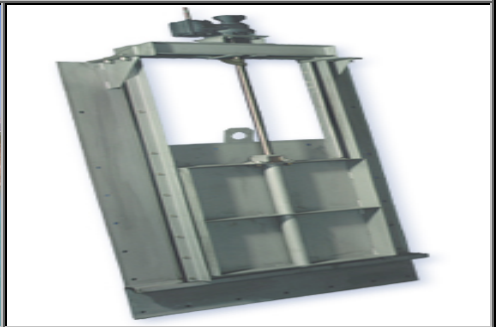


**Silting** – the process whereby waterways become choked by mud and soil that has washed off the land through erosion.

**Simple Span** – a span that rests on two supports, one at each end, and that does not affect the stresses in the adjoining spans.



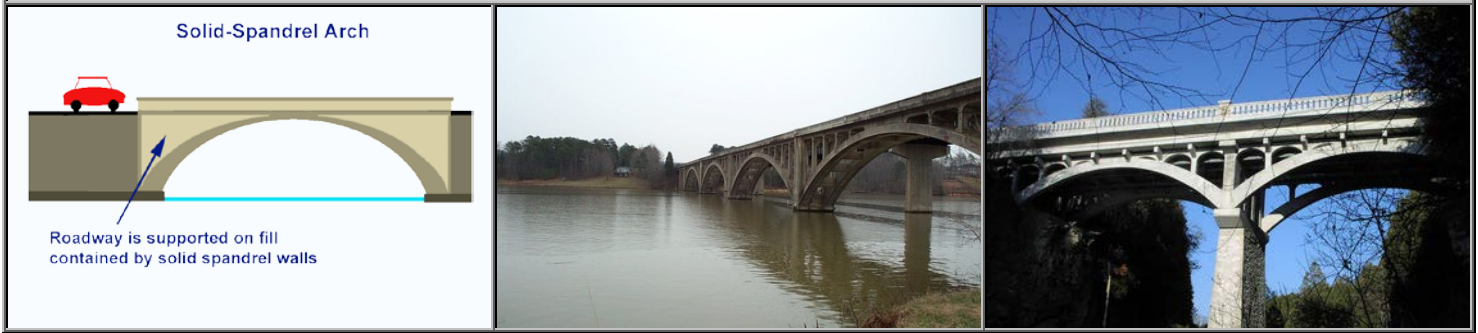
**Sluice Gates** – a sluice is a water channel that is controlled at its head by a gate. A *sluice gate* is traditionally a wooden or metal plate which slides in grooves in the sides of the channel. Sluice gates are commonly used to control water levels and flow rates in rivers and canals. Raising a sluice gate allows water to flow under it. (The term *sluice gate* refers to any gate that operates by allowing water to flow under it.) When a sluice gate is fully lowered, water sometimes spills over the top, in which case the gate operates as a weir.



**Soil Stabilization** – techniques used to protect soil areas at risk from erosion flooding or wind; i.e. planting grass or other vegetation on bare hillsides or sandy deserts.



**Spandrel**, (see also *Spandrel in the Wind Retrofit Section*) – the area between the arch ring and the roadway.



**Spillway** – a structure used to provide for the controlled release of flood flows from a dam or levee into a downstream area, typically being the river that was dammed. Spillways release floods so that the water does not overtop and damage or even destroy the dam. Except during flood periods, water does not normally flow over a spillway.



**Spillway, Morning Glory** – the Monticello Dam, which holds back Lake Berryessa, features a morning glory spillway. This type of spillway is basically a giant cement funnel. Rather than spilling over the dam, high waters spill into the funnel.



The other end

**Stilling Well** – a vertical pipe with a relatively small opening (intake) in the bottom. It is used in a gauge installation to dampen short period surface waves while freely admitting the long period waves; which can then be measured by a water level gauge sensor inside.



**Storm Drain**, see *Catch Basin*

**Storm Sewer**, see *Sewer* – a sewer that carries stormwater, surface drainage, street wash, and other wash waters but excludes sewage and industrial wastes. Also called storm drain.

**Stormwater Outfall** – The point where stormwater exits from a controlling device, such as a culvert, into a swale, retention area, lake or river.





Stormwater Outfall, continued...



**Stormwater Runoff** – the flow of water that results from and occurs following a rainfall event. As it travels across fields, yards, roads, etc., it will pick up a variety of pollutants and litter along the way.



**Subgrade** – the layer of naturally occurring material the road is built upon, OR It can refer to the imported fill material that has been used to create an embankment upon which the road pavement is constructed.

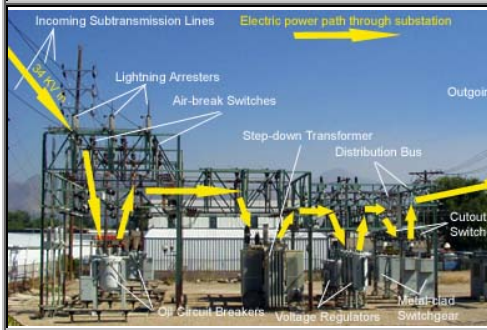


Subgrade preparation

**Substation** – generally a small building with a fenced-in yard containing switches, transformers and other equipment used to adjust voltages and monitor circuits to levels appropriate for end use.



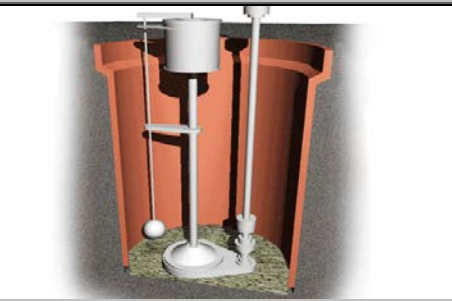
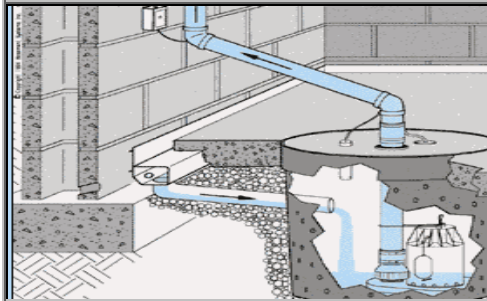
Substation, continued...



Inside a substation



**Sump Pump** – a pump used to remove water that has accumulated in a sump pit. A sump pit, commonly found in the home basement, is simply a hole to collect water. The water may enter via the perimeter drains of a basement waterproofing system, funneling into the pit, or may arrive because of rain or because of natural ground water, if the basement is below the water table level. In some cases, a sump pump is used when a lower floor is below the municipal sewer lines, to pump greywater or blackwater waste from that floor to the sewer lines.

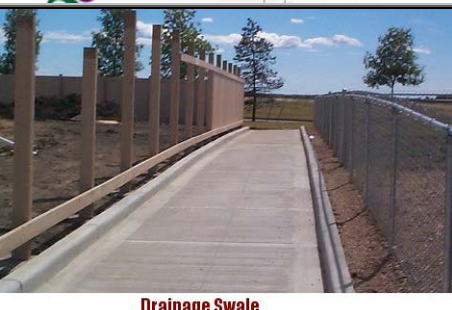


**Swale** – a low tract of land especially when moist or marshy; can appear to be a dry creek diverting and directing water run off after heavy rains. A ditch that does not direct water but holds it, allowing it to gradually infiltrate the soil down slope of it.



Grassed Swale

V-Notch Weir Sampling Area



Drainage Swale



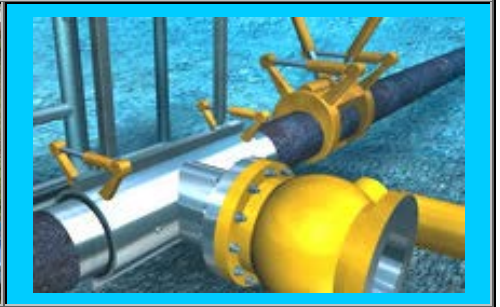
**Swing Check Valve** – improves efficiency in sewage diaphragm pumps, maintains prime in freshwater suction lines, and prevents back flow.



**Tapping Sleeve**



**Tee Joint**



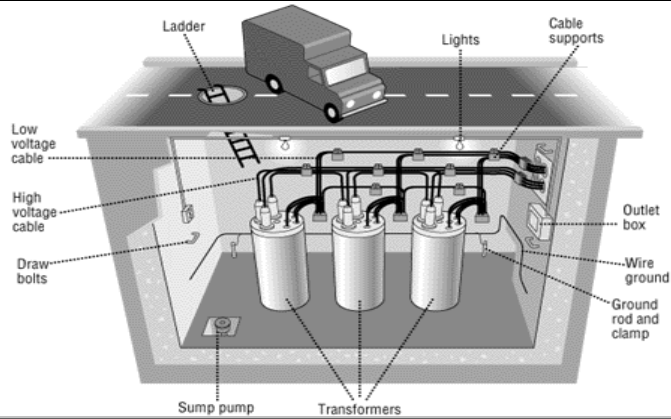
**Tilting Gate** – tilting gates consist of flaps held by hinges along their lower edges that permit water to flow over the top when they are lowered.



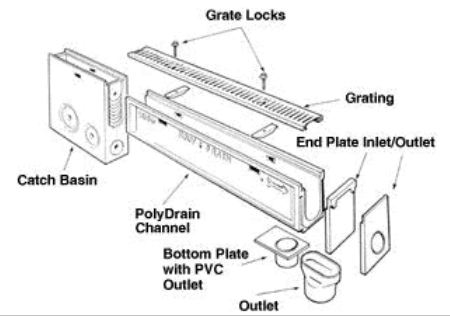
**Trackhoe**



**Transformer** – an electrical device that transfers energy from one circuit to another by magnetic coupling.



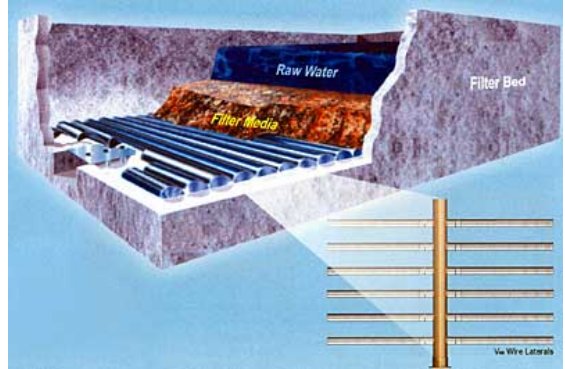
**Trench Drain** – floor drain used for the rapid evacuation of surface water, with solid cover or grating that is flush with the adjoining surface. Characterized by its long length and narrow width, the cross section of the drain is a function of the maximum flow volume anticipated from the surround surface. Trench drains are commonly confused with french drains, which consist of a perforated pipe that is buried in a gravel bed and whose purpose is to evacuate ground water.



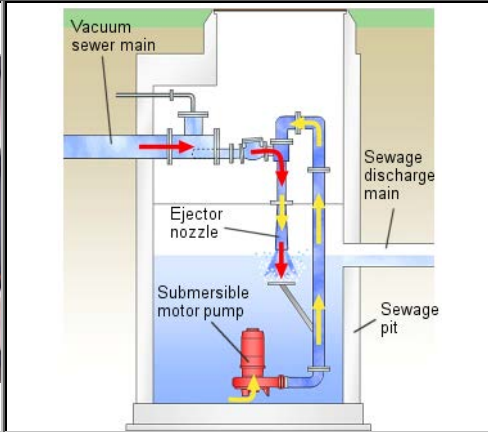
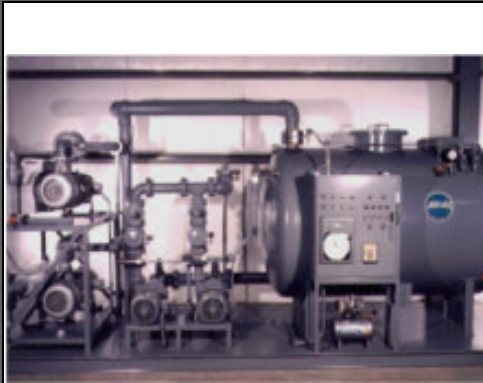
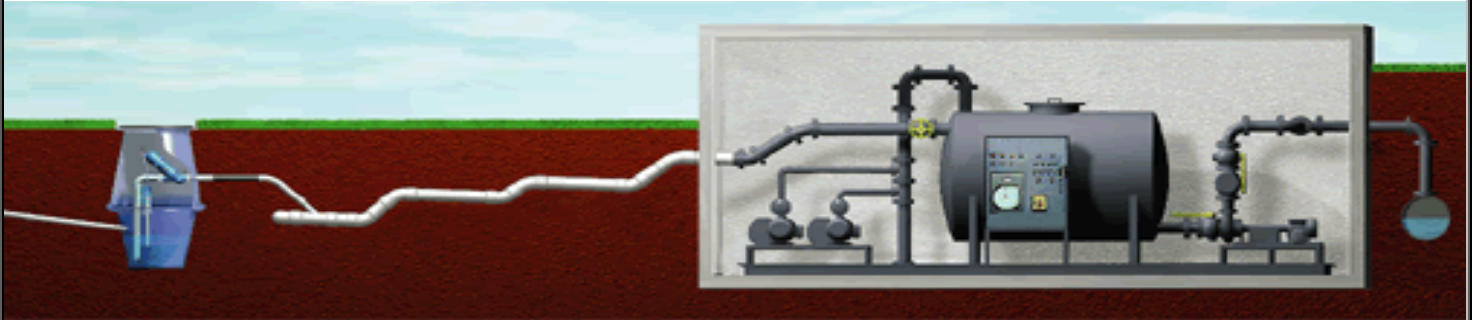
**Underdrain** – a drainage system installed under a road or road ditch to collect and transport subsurface water. These buried conduits come in a variety of shapes and sizes and are usually wrapped in geotextile fabric which allows water to enter the conduit while keeping sediment out.



The ditch above carries water from roadside springs. An underdrain can collect this flow to keep the roadbed and ditch dry.



**Vacuum Sewer System** – cost-effective, inexpensive alternative to traditional gravity sewers providing low maintenance, efficient and reliable sewage collection.



**Water Treatment Plant** – a plant where water is treated to make it fit for potable use.



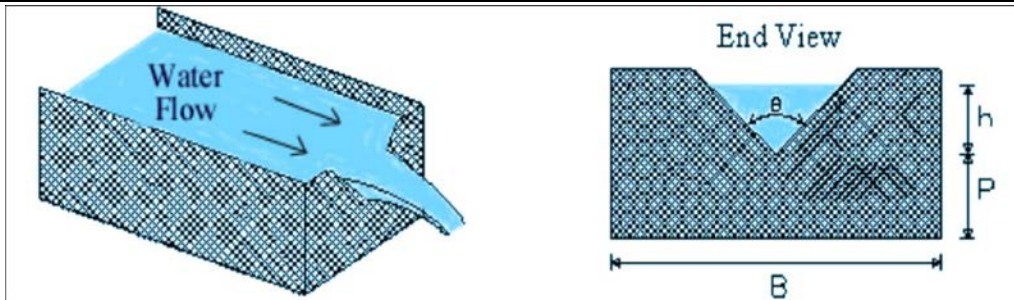
**Weir** – a small overflow-type dam commonly used to raise the level of a river or stream. Water flows over the top of a weir, although some weirs have sluice gates which release water at a level below the top of the weir. The crest of an overflow spillway on a large dam is often called a *weir*.



Outfall Weir



V-notch Weir



V-notch Weir

**Weir, Inflatable** – A weir constructed of elastic material and anchored to a concrete foundation, which inflates by water pressure and automatically deflates when the upstream water reaches a prescribed level.



**Wet Well** - sewage to be transferred is retained in a containment vault commonly referred to as a wet well. In a standard submersible application the submersible pumps and associated items are all housed in the wet well; wet wells are used on ponds and water features to house pumps while allowing for fluctuating water levels. They're also used to pre-screen the incoming water to keep the pumps from getting clogged, and more importantly, for keeping the constructed wetland from becoming clogged.



**Wing Walls** – essentially retaining walls adjacent to an abutment. The walls can be independent or integral with the abutment wall.

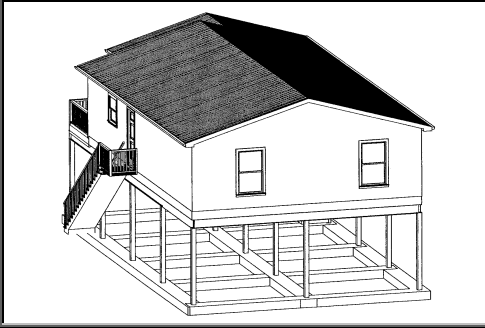


Elevation

Elevation: Utilites and Homes

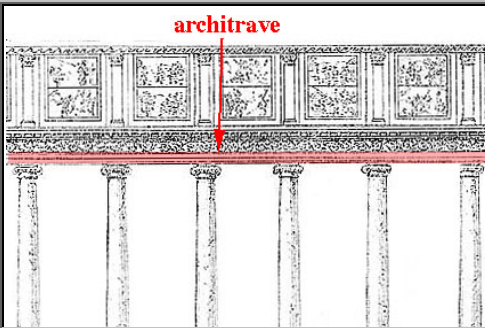
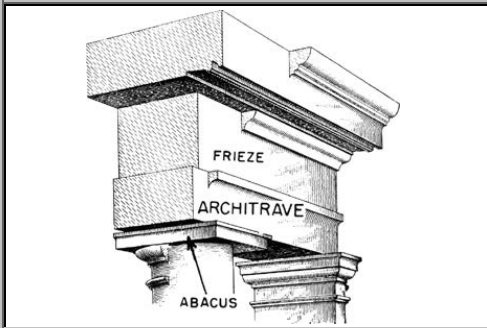


Elevation: Utilites and Homes , continued...



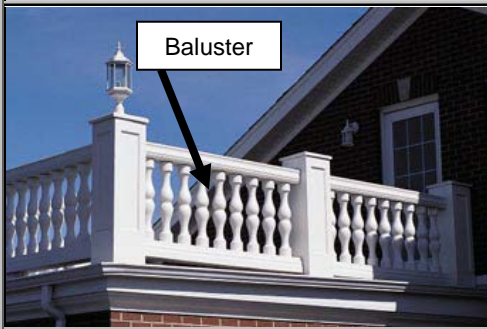
Wind Retrofit

Architrave – moulding surrounding a door or window opening.

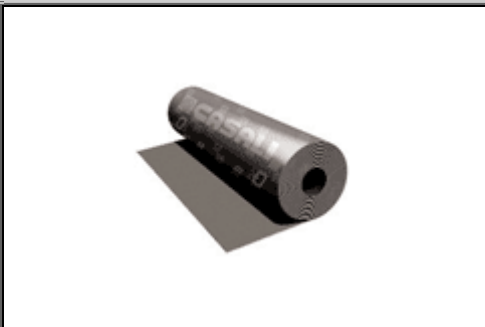


Armor Screen, see Hurricane Screen

Balustrade – a row of repeating balusters -- small posts which support the upper rail of a railing. Staircases and porches often have balustrades.



Bituminous Membrane – A material, usually a membrane or applied compound, used to make a surface impervious to water.





**Cantilever** – a beam or structural element supported on only one end.



**Clear Span** – horizontal distance between interior edges of supports; a building without internal columns.



**CMU** – (Concrete Masonry Unit) – The term to describe either a solid or hollow masonry unit. The holes inside concrete block allow rebar and concrete (creating reinforced concrete) to run vertically through the block to compensate for the lack of tensile strength.



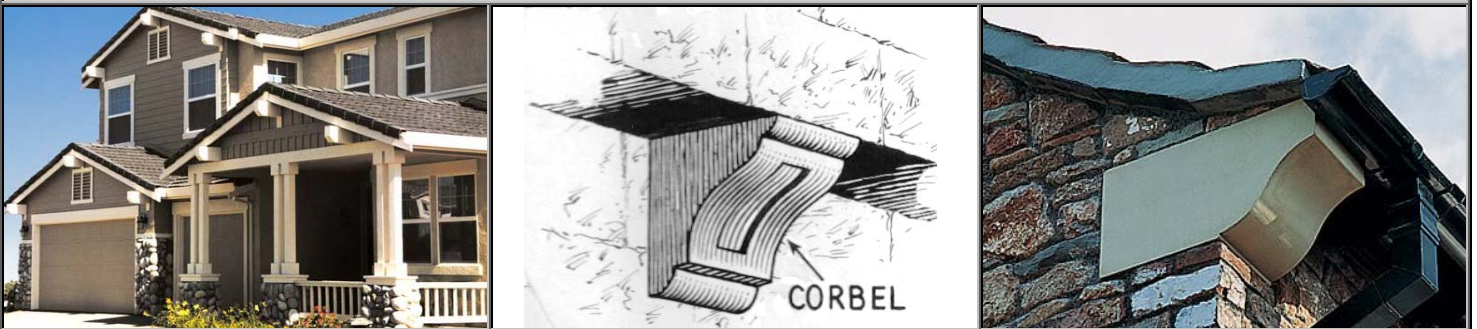
**Column** – upright supporting beam.



**Coping** – the top layer or course of a masonry wall, often having an inclined upper surface to shed water; brick that is laid sideways at the top of a wall.



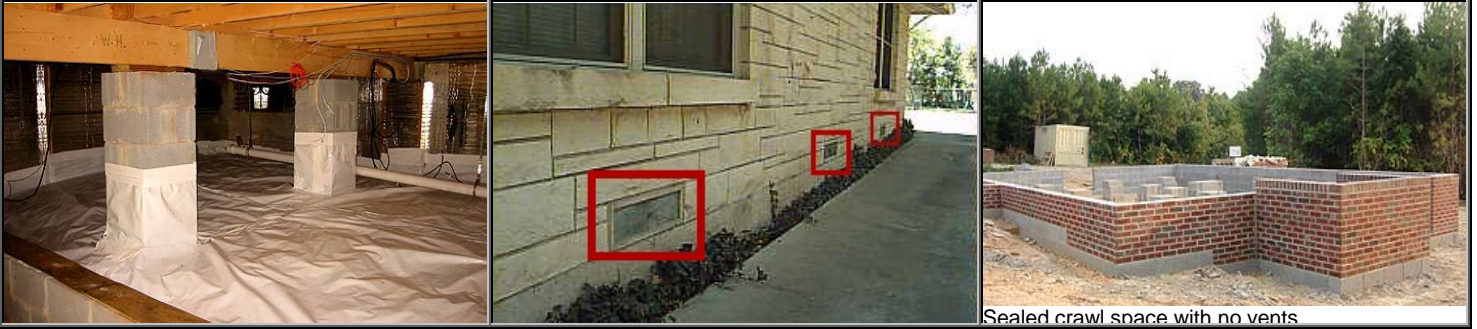
**Corbel** – projection of stone, brick, timber or metal jutting out from a wall to support a weight above it.



Corbel, continued...



Crawl Space – low space below the living quarters of a basementless house; gives workers access to wiring or plumbing.



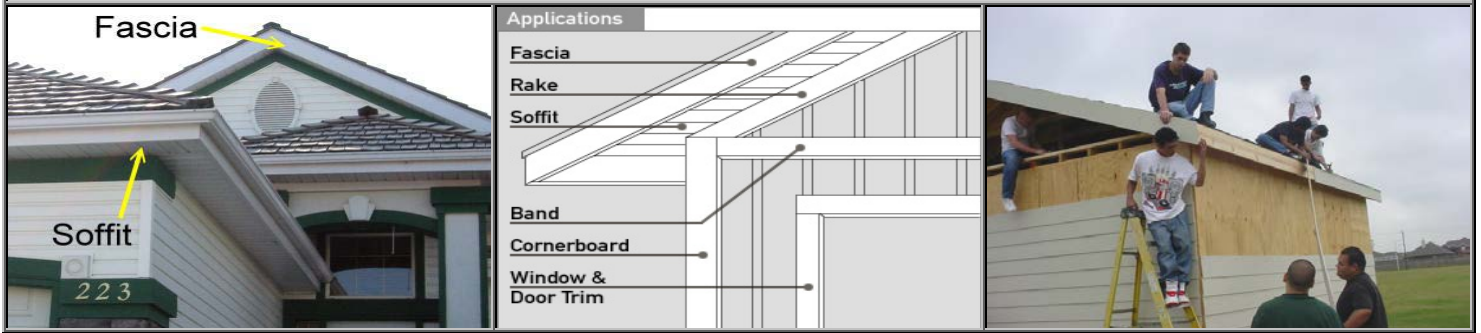
Door, Overhead



EIFS – (Exterior Insulation Finishing System) – a “synthetic” stucco system, which is applied to the exterior of residential or commercial buildings. Has a reputation for accumulating moisture if installed incorrectly. The following photos show damaged EIFS.

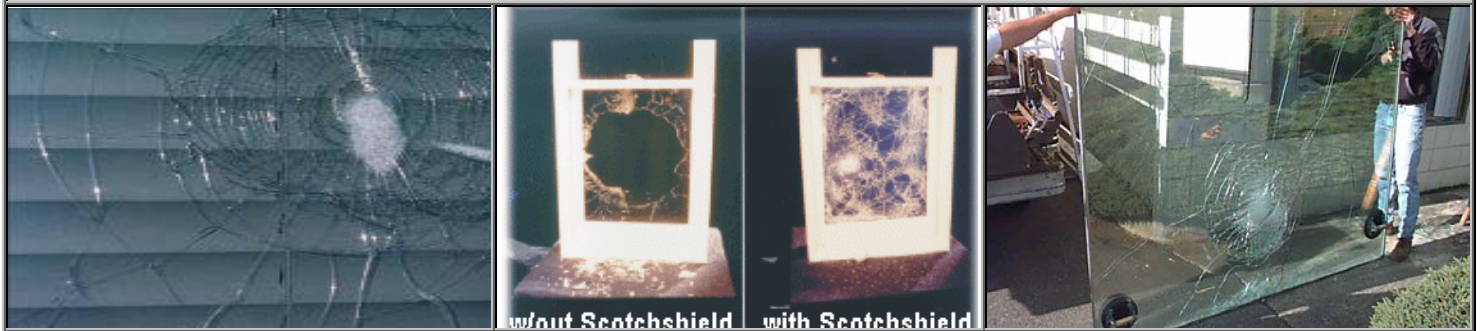


**Fascia** – a flat, horizontal board enclosing the overhang under the eave.



**Fenestration** – the design and placement of windows in a building.

**Film, Window** – laminates that can hold broken glass in place in winds up to 130 miles per hour. **Not approved for HMGP projects.**



**Flashing**, see *Roof Flashing*

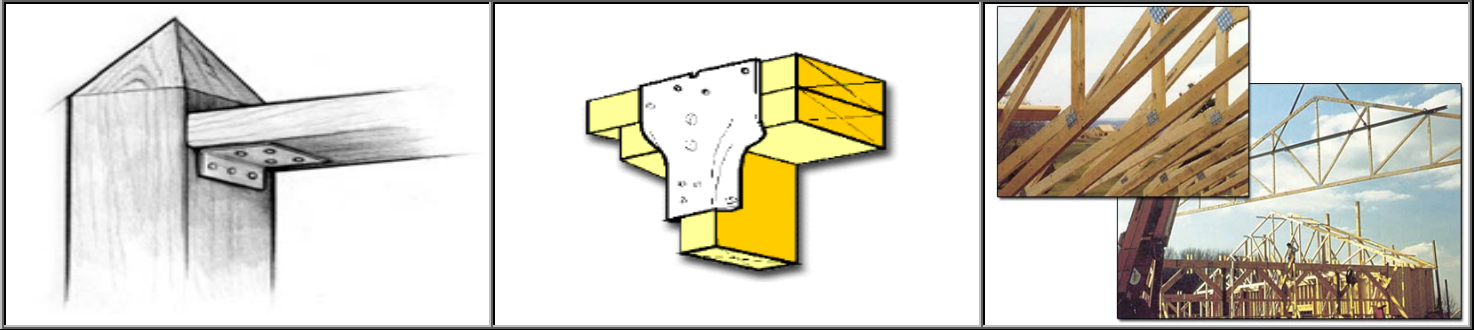
**Footing** – a concrete pad (or strip) located under a column, wall, or other structural member that distributes loads from that member into the supporting soil.



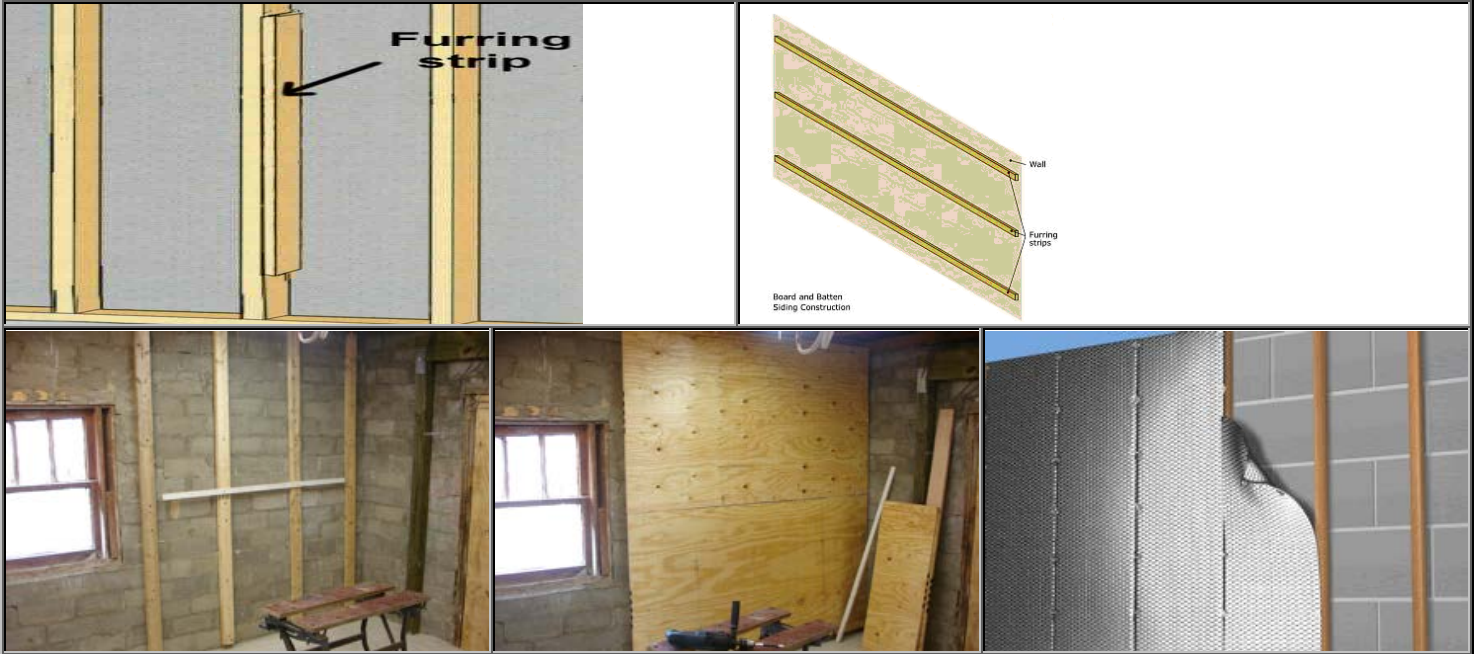
**Foundation** – the portion of a building that has the sole purpose of transmitting structural loads from the building into the earth. That portion of a structure that lies beneath the floor system of all building structures.



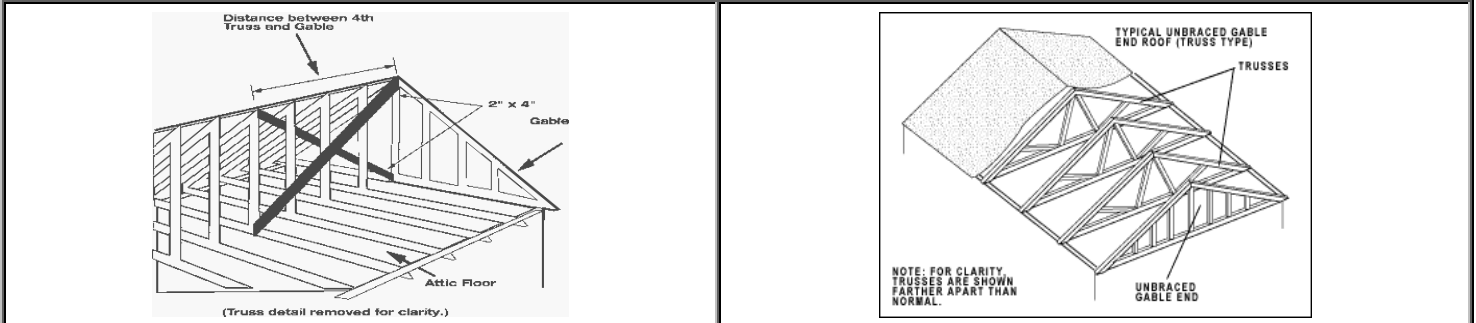
**Framing Connector** – a metal bracket or plate used to connect framing lumber.



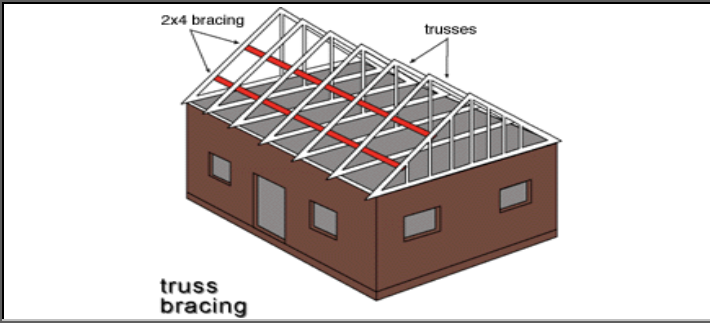
**Furring** – in light-frame construction, furring strips are long thin strips of wood used to make backing surfaces to support the finished surfaces in a room. Furring refers to the backing surface, the process of installing it, and may also refer the strips themselves.



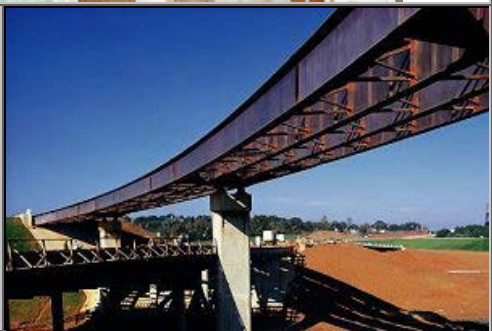
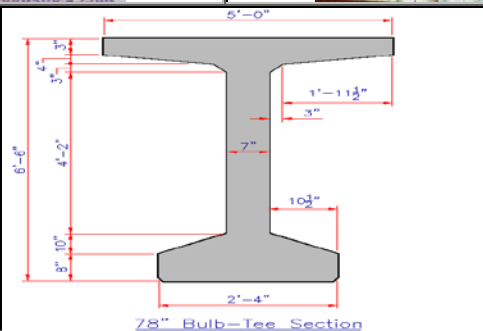
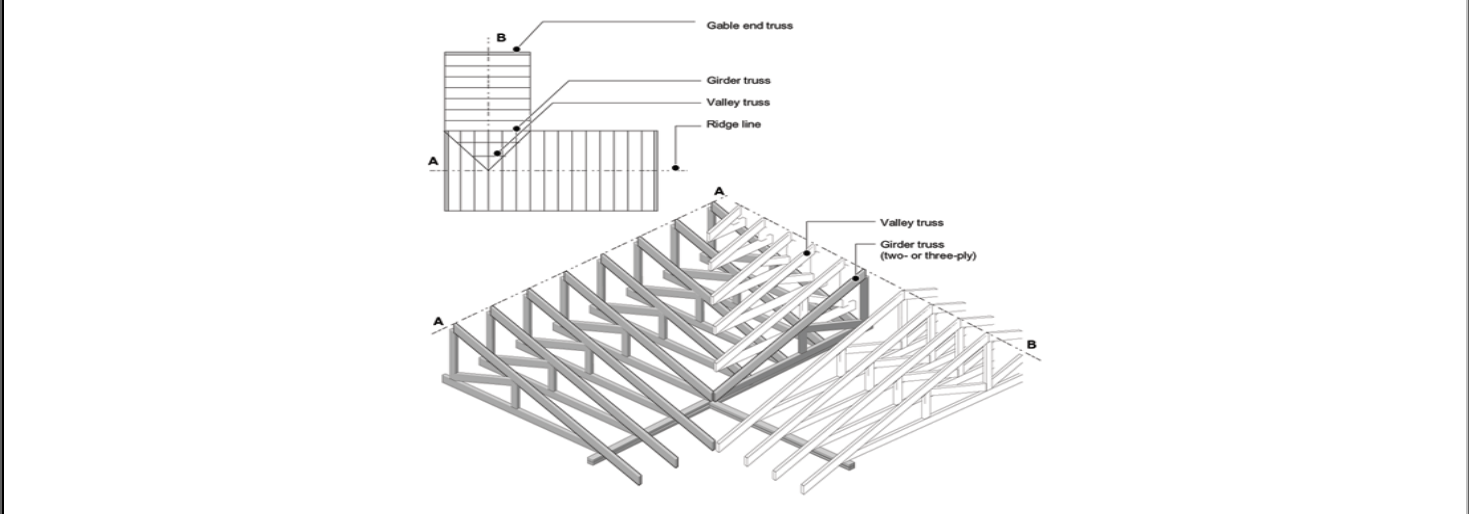
**Gable End Bracing** – the brace that runs from the roof ridge board at the gable end to the top wall plate at the gable end and adds stability to the ridge board. Gable end roofs are more susceptible to damage by high winds than hip roofs or flat roofs. The gable end presents a large obstacle to the wind and receives its full force. If the framing of the gable end and the rest of the roof is not adequately braced to resist the wind, the roof can fail. Roof failures, especially in unbraced gable roofs, are a common cause of major damage to houses and their contents in high winds.



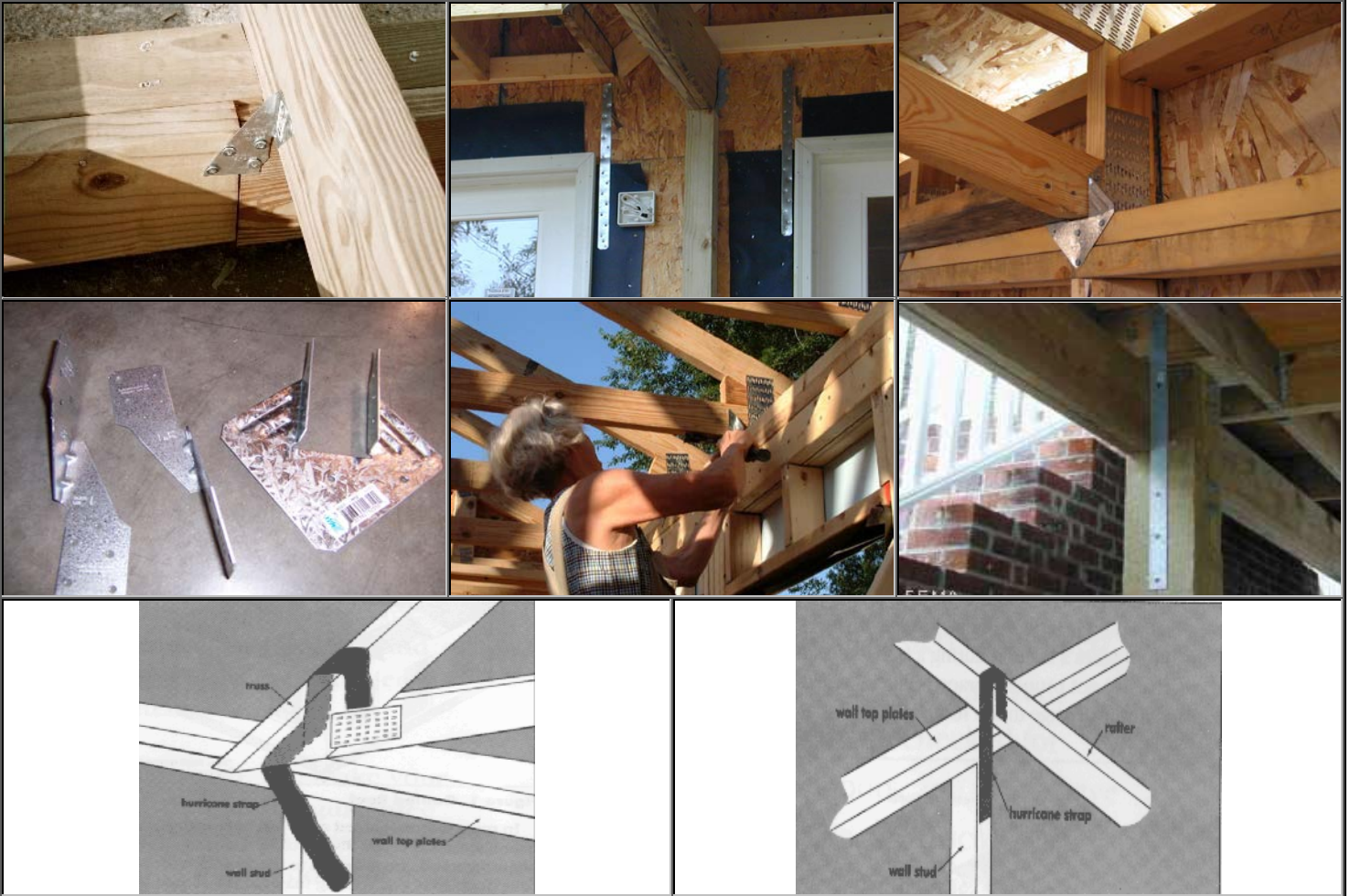
Gable End Bracing, continued...



**Girder** – a large support beam used in construction, normally of iron or steel. Girders often have an I beam cross section for strength. Girder is the term used to denote the main horizontal support of a structure which supports smaller beams.



**Hurricane Clips/Straps** – galvanized steel clips used to connect rafters to a roof to prevent strong winds from ripping the roof off a house during a storm.



**Hurricane Screens, (Armor Screen, Storm Catcher, Force 12)** – lightweight, geo-synthetic fabric used to protect buildings from hurricane force winds and flying debris. Allows natural light in, protecting from winds up to 200 mph. Miami-Dade and Florida Building Code approved.



Hurricane Screens, continued...



HVAC – Heating Ventilating and Air Conditioning



**Impact-resistant Windows** – consist of impact-resistant glass surrounded by a heavy duty frame which is securely fastened to the interior window header and frame.





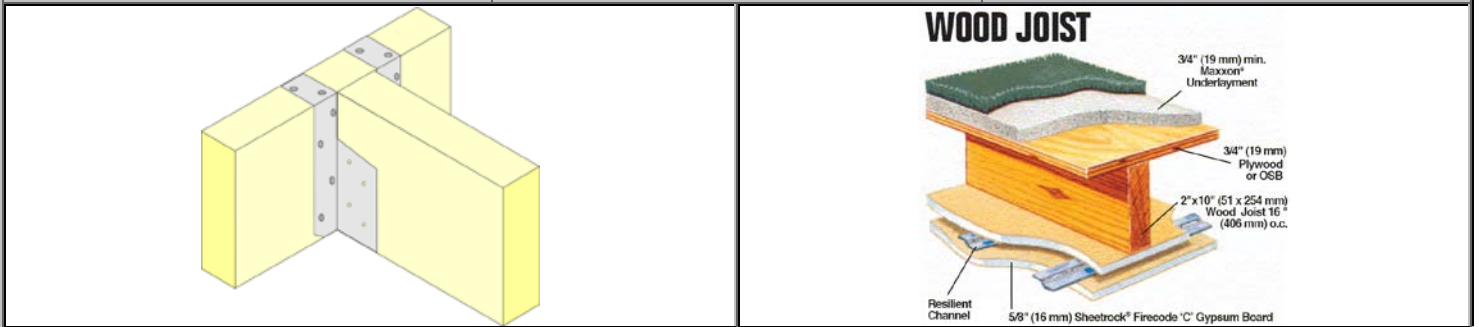
Impact-resistant Windows, continued...



**Jamb** – The vertical member forming the side of a door, window or wall opening frame. The vertical side member of a doorway or window.



**Joist** – any of the wood, steel, or concrete beams set parallel from wall to wall or across or abutting girders to support a floor or ceiling. Typically a beam is bigger than a joist and thus is distinguished from a joist. Joists will often be supported by beams. Joists support the sub-floor (floor deck) directly.



**Lites** – when a window is divided up into smaller panes of glass, the individual panes are called lites; ie. the window in the first photo is comprised of 12 lites.



True divided lites



Simulated divided lites

**Masonry** – the building of structures from individual units laid in and bound together by mortar. The common materials of masonry construction are brick, stone such as marble, granite, travertine, limestone; concrete block, glass block, and tile. Masonry is generally a highly durable form of construction.

**Mullion** – a structural element which divides adjacent window units; a division between panes of a window or between adjacent windows.



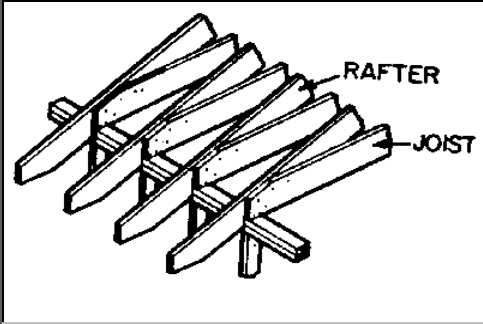
**Parapet Wall** – the part of a perimeter wall immediately adjacent to the roof which extends above the roof.



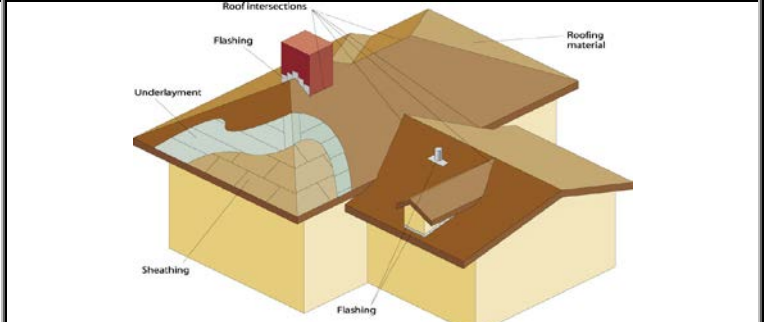
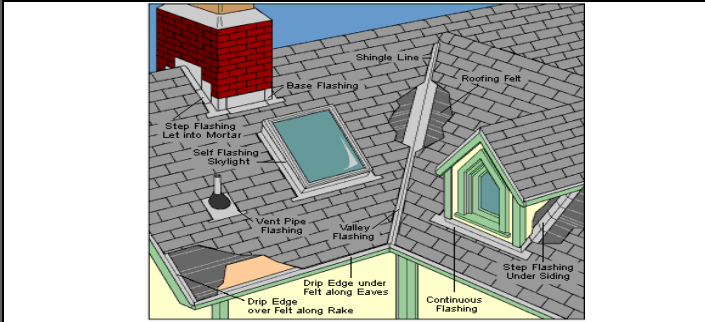
Parapet Wall, continued...



**Rafter** – a type of beam, which supports the roof of a building. In home construction. In many buildings, rafters have been replaced by engineered trusses, normally because of span limitations and/or roof load (weight from above).



**Roof Flashing** – flashing is material, usually aluminum or galvanized steel that directs water away from the roof in areas where it could be trapped or put unnecessary strain on the roofing materials. Most houses probably have flashing in the valleys, around the chimney and pipes, and around any dormer windows or skylights. Most damage shows up either in flashing that's deteriorating due to weathering and oxidizing, or in flashing that has come loose.



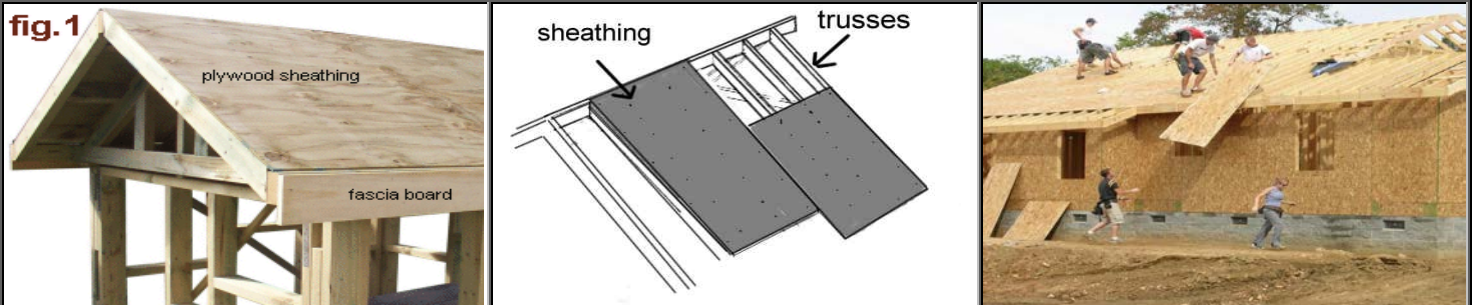
**Roof Rafters** – structural part of the roof that supports the roof boards or plywood.



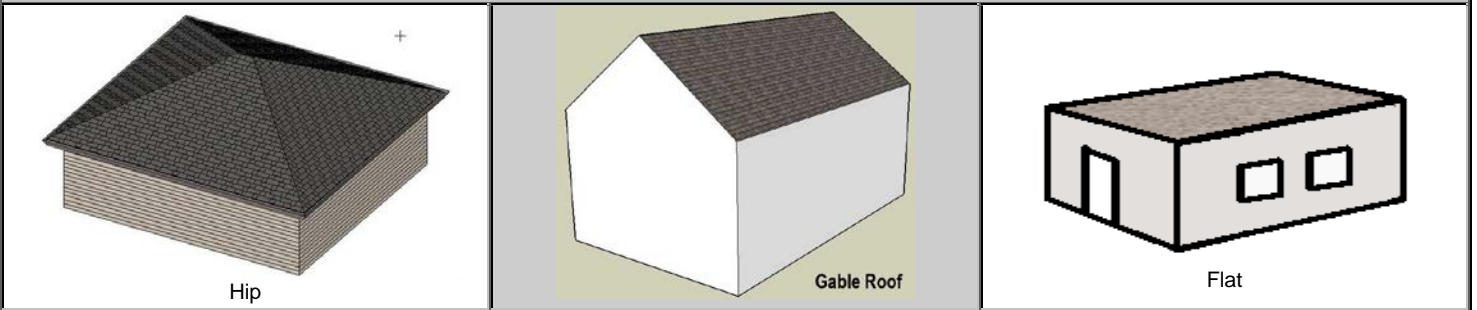
**Roof Scupper** – tubes used to carry water from a roof through a wall and then down through the side of a building. Sometimes they are used as an overflow, providing an alternate drain in the event that the drain system should fail.



**Roof Sheathing** – sheets, usually of plywood, which are nailed to the top edges of trusses or rafters to tie the roof together and support the roofing material.



**Roof Types**



Roof Types, continued...



Hip

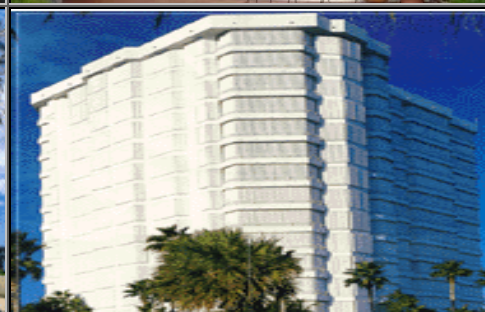


Gable

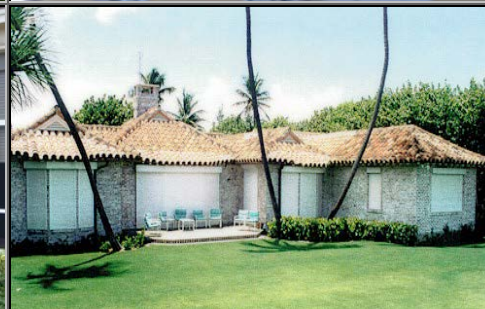


Flat

**Shutters, Accordion** – hurricane shutters are used to protect houses and other structures from damage caused by storms. They are frequently constructed from steel or aluminum. The shutters are affixed to the outside of the building with screws or a track system. Advanced shutters may be motorized, and they may fold away when not in use.



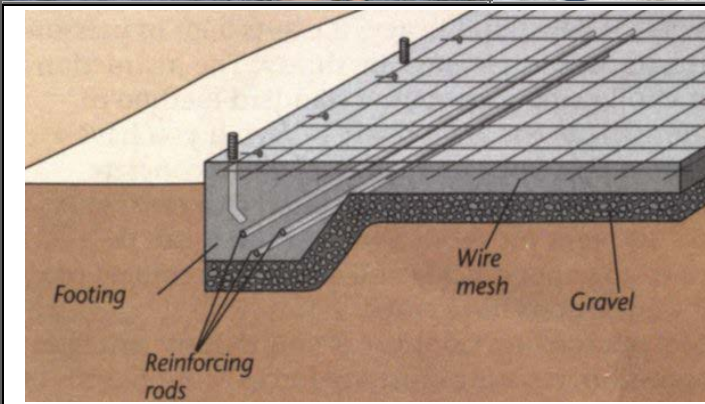
Shutters, Roll-down



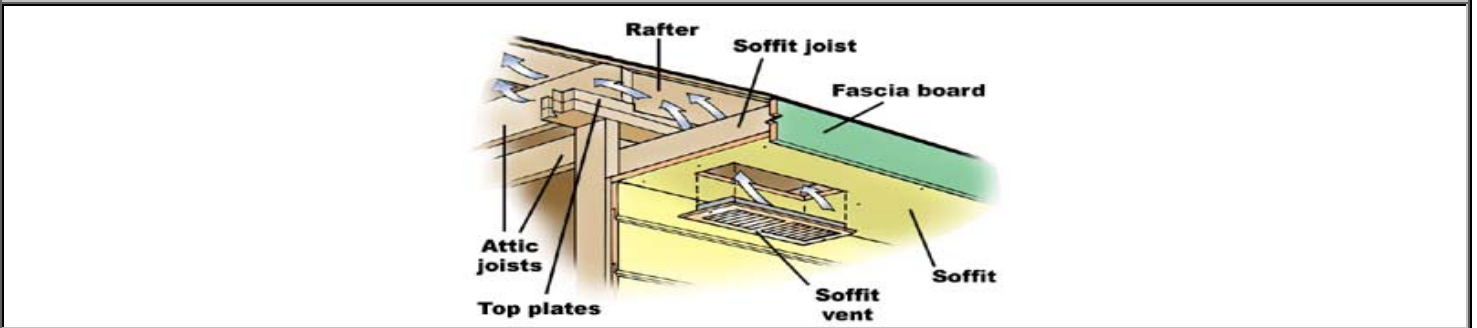
Shutters, Roll-down, continued...



**Slab-on-Grade** – serves as the foundation for the structure is that formed from a mold set into the ground. The concrete is then poured into the mold, leaving no space between the ground and the structure. This type of construction is most often seen in warmer climates, where ground freezing and thawing is less of a concern and where there is no need for heat ducting underneath the floor.



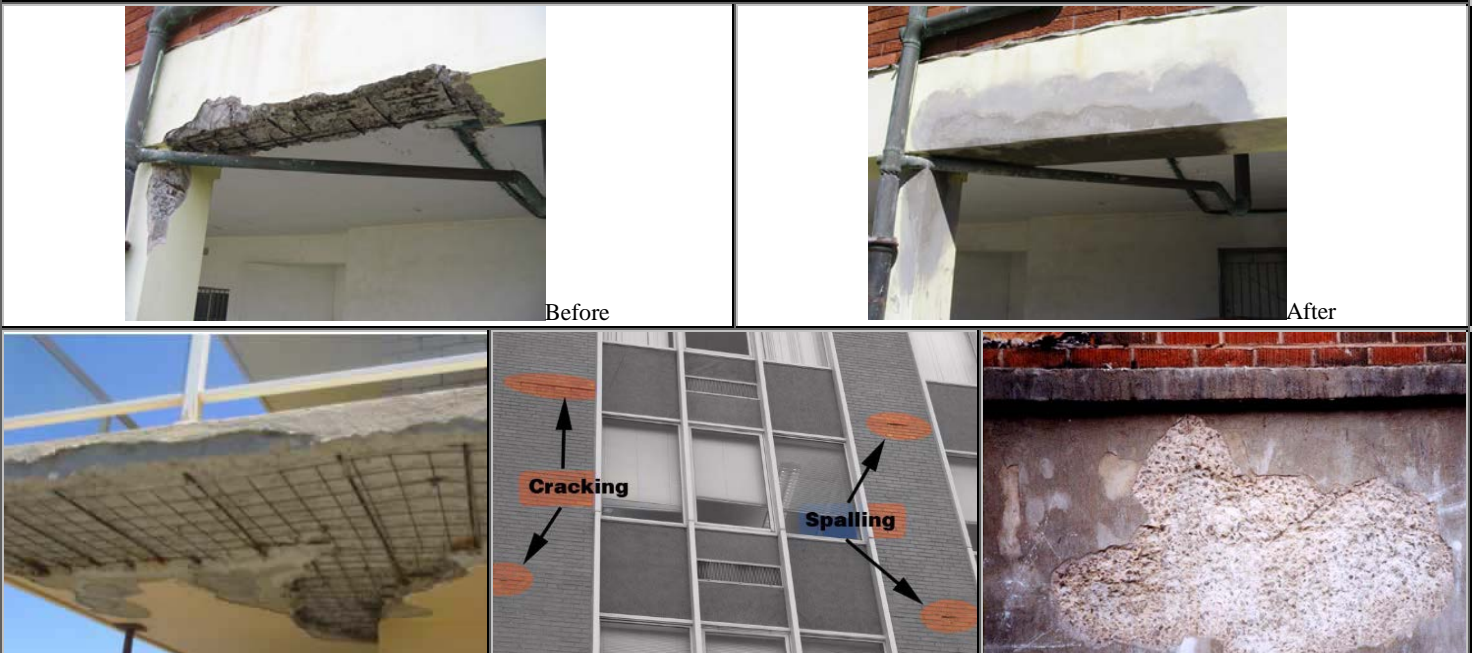
**Soffit** – most often refers to the material forming a ceiling from the top of an exterior house wall to the outer edge of the roof, i.e., bridging the gap between a home's siding and the roofline.



Soffit, continued...



Spalling – The chipping or erosion of masonry caused by abuse or weathering.



Storm Catchers, see Hurricane Screens

Spandrel – the space between two arches or between an arch and a rectangular enclosure; The approximately triangular shape between the curve of an arch and the rectangular frame above it



**Storm Panels** – corrugated metal or polycarbonate hurricane panels attach to the walls around windows and doors on bolts or tracks. Florida Building Code and Miami-Dade approved.



**Storm Panels, Clear** – lightweight, transparent, extremely durable Polycarbonate plastic, (Lexan). Florida Building Code and Miami-Dade approved. By nature, Lexan XL-10 sheet has 250 times the impact strength of glass and 30 times that of acrylic. Wind-rated to 140-150 mph.





**Storm Panels, Clear** – (StormBusters Clearview) – Polycarbonate Florida Building Code certified, Miami-Dade approved.



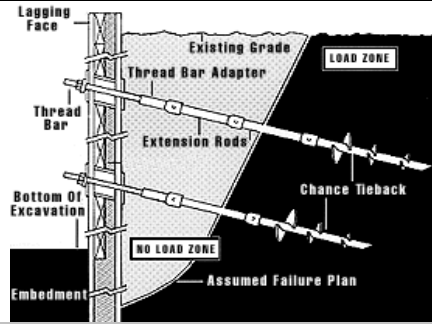
**Storm Panels, Fabric** – (Fabric Shield) – translucent PVC woven fabric that has been tested to Block wind, rain, and storm driven projectiles. Meets stringent building code requirements.



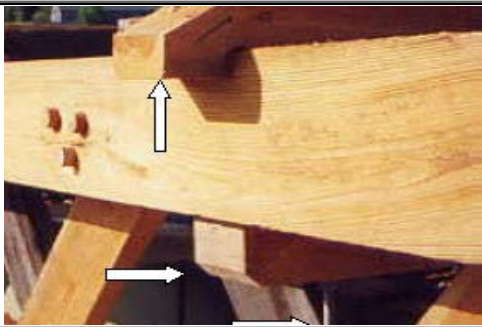
**Studs, Wall** – a vertical member in light frame construction.



**Tie-Back Systems** – essentially, a wall anchor which acts in tension and receives its support in earth or rock.

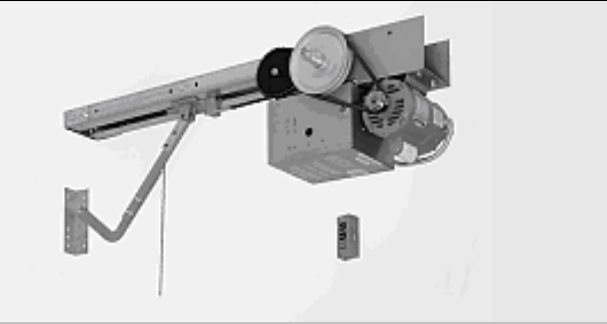


**Tie Beam** – a horizontal beam forming the base of a triangular truss for a pitched roof, connecting the two side walls and supporting a pair of principals



**Tie Down**, see *Hurricane Clips/Straps*

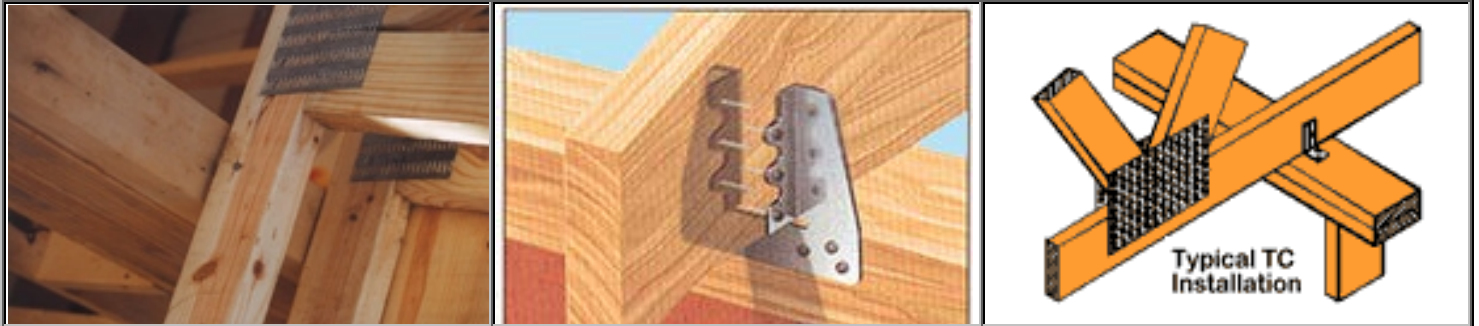
**Trolley Opener** – garage door opener



**Truss** – a manufactured wood member often in the form of a large triangle which is used to form the ceiling joists and rafters on the top floor of a home.



**Truss Clips** – galvanized steel clip to attach girders, trusses and rafters to wall plates to provide wind restraint.



**V-Crimp Roof** – metal roofing



**Weep Hole** – a hole which allows for drainage of entrapped water from masonry or glazing structures.



Weep Hole, continued...



Window Barriers, (Storm Shield by Exeter) – constructed of super strong, virtually transparent perforated steel, Security Shield window barriers are capable of stopping flying debris and withstanding the strongest hurricane winds. Miami-Dade and Florida Building Code approval.



Miscellaneous

Hardscape – parts of landscape constructed from materials other than plants, such as walks, walls, and trellises made of wood, stone, or other materials.



Hardscape, continued...



**Junction Box** – a metal or plastic enclosure within which electrical connections are made; removable cover provides easy access.



**MOSCAD System** – (Motorola SCADA) Motorola product specifically designed to the specifications of the SCADA (Supervisory Control and Data Acquisition) systems.



**Surveying** – the art and science of accurately determining the position of points and the distances between them. These points are usually, but not exclusively, associated with positions on the surface of the Earth, and are often used to establish land boundaries for ownership or governmental purposes.

