Modern geotextiles are made from a synthetic polymers such as polypropylene, polyester, polyethylene and polyamides. Geotextiles can be woven, knitted or non-woven. Varying polymers and manufacturing processes result in an array of products suitable for a variety of civil construction applications.

Woven Geotextile is a textile structure produced by interlacing two or more sets of strands at right angles. There are two types of strands: slit films, which are flat; and monofilaments, which are round. Woven slit-film geotextiles are generally preferred for applications where high strength properties are needed and filtration requirements are less critical. These fabrics reduce localized shear failure in weak subsoil conditions and aid construction over soft sub-soils. Woven monofilament Geotextiles are preferred for applications where both strength and filtration are a concern, such as shoreline rip rap applications.
WOVEN APPLICATIONS

- Stabilization
- Soil Separation
- Silt Fence

Non-Woven Geotextiles resemble felt and provide an equal distribution of water flow. They are commonly known as filter fabrics, although woven monofilament geotextiles can also be referred to as filter fabrics. Typical applications for non-woven geotextiles include aggregate drains, pipe wrap, asphalt pavement overlays landscaping and erosion control. **Excellent filtration and separation properties**

![Non-Woven Geotextile](image)

**NON -WOVEN GEOTEXTILE**

Nonwoven Geotextiles are also used as an asphalt overlay fabric. Overlay fabric increases pavement life by providing a solution for reflective cracking. In addition, nonwoven geotextiles are used in landscaping applications such as landscape fabric to retard weed growth.

They range from:

- Light Weight (3 to 5 oz/sq yd)
- Medium Weight (6 to 8 oz/sq yd)
- Heavy Weight (10 to 16 oz/sq yd).

Nonwovens in excess of 16 oz/sq yd are also available.

NON WOVEN APPLICATIONS

- Subsurface Drainage and Filtration
- Asphalt Overlays
- Stabilization and Separation Pond underlayments (under and/or over impermeable liners to provide puncture resistance)
- Landscaping
WOVEN GEOTEXTILES

HANES- GEO WOVEN GEOTEXTILES
PRODUCT DESCRIPTIONS

**TerraTex GS**
Industry-standard geotextile that performs the functions of separation and stabilization in marginal soil conditions. Grab tensile strength of 200 lbs.

**TerraTex HD**
Grab tensile strength of 315 lbs. Meets specifications set forth by AASHTO M288-00 for stabilization.

**TerraTex SC**
High strength silt fence fabric that meets FHWA, AASHTO, and many state DOT specifications for controlling sediment runoff.

**TerraTex EP**
Monofilament fabric which meets or exceeds the standard specifications of the Corps of Engineers for controlling the scouring of native soils behind embankments and slope protection surfaces.

Monofilament fabrics which have very high permeability and percent open area characteristics.

HANES-GEO NON-WOVEN TEXTILES
PRODUCT DESCRIPTIONS

**TerraTex NO3 & NO4**
Standard drainage geotextiles that meet or exceed commonly specified DOT and commercial drainage protection requirements.

**TerraTex SD & NO4.5**
Extra-strength drainage geotextiles designed for applications requiring high water permeability and burst resistance.

**TerraTex SO4**
Spunbond geotextile effective in many drainage protection and separation/stabilization applications. Has high tensile strength.
**TerraTex LBF, PU 1.5 & NS4**

Lightweight polyester/polypropylene geotextiles which meet commonly specified requirements for leach field protection, pipe wrap, and light-duty drainage protection.

**TerraTex NO5, NO6, NO7, NO8, N10, N12 & N16**

Heavyweight geotextiles for multiple applications: embankment protection, erosion control, ground stabilization, geomembrane underline, railroad bed stabilization, heavy duty drainage protection, and separation.

**TerraTex OL**

Paving geotextile designed to retard reflective cracking and extend the life of Asphalt Overlays. Meets commonly specified requirements.

**TerraTex WC**

Water permeable geotextile which reduces weed growth while allowing plants to be watered and the soil to breathe. Is UV resistant.
GLOSSARY

AASHTO: American Association of State Highway and Transportation Officials.

Apparent Opening Size: A property which indicates the approximate largest particle that would effectively pass through the geotextile.

Back Fill: Material used to re-fill an excavated area. Usually earthen materials.

Blinding: The condition in which soil particles block the voids at the surface of a geotextile, thereby reducing the hydraulic conductivity of the geotextile.

Blue Tops: Blue flag markers for site excavation markers.

Clogging: The movement by mechanical action or hydraulic flow of soil particles into the voids of a fabric and retention therein, thereby reducing the hydraulic conductivity of a geotextile.

Confinement: The ability of a Geotextile to improve the resistance to lateral movement of an aggregate.

Cross-Plane: The direction of a geo-synthetic which is perpendicular to the plane of its manufactured direction. Referred to in hydraulic situations.

Direction, Cross-Machine: The direction perpendicular to the long, machine, or manufactured direction (synonyms: woven geotextiles, weft direction).

Direction, Machine: In textiles, the direction in a machine-made fabric parallel to the direction of movement the fabric followed in the manufacturing process (synonym: lengthwise, or long direction, and for woven geotextiles, warp direction).

Elongation: The increase in length produced in the gage length of the test specimen by a tensile load.

Elongation At Break: The maximum elongation before breaking.

Elongation, Percent: For geosynthetics, the increase in length of a specimen expressed as a percentage of the original gage length.

Enka Grid: Enkagrid is a rigid, biaxial geogrid of extruded polypropylene or polyester bars of equal tensile strength both in longitudinal and transverse direction, used for the stabilization of soil structures on low bearing capacity soils.
Fabric: A term used interchangeable with geotextile.

Filament Yarn: The yarn made from continuous filament fibers.

Fill: An abbreviated term for earthen back fill material

Filling: The yarn running from selvedge to selvedge at right angles to the warp in a woven fabric.

Filling Direction: See Direction, cross-machine. Note: For use with woven fabrics only.

Filter Cake: The soil residue accumulated on a geotextile in the separation of suspended soil from liquid as the mixture attempts to pass through a soil-fabric system.

Filter Cloth: An abbreviated term for geotextile.

Filtration/Drainage: Fabric to soil system that allows for free liquid flow (but no soil loss) across or through the plane of the fabric over an indefinitely long period of time.

French Drain: A water displacement system consisting of perforated pipe, filter cloth and aggregate.
Geocell: A three-dimensional structure filled with soil, thereby forming a mattress for increased stability when used with loose or compressible sub-soils.

Geocomposite: A manufactured material using geotextiles, geogrids, geonets and/or geomembranes in laminated or composite form.

Geogrid: A deformed or non-deformed grid like polymeric material formed by intersecting ribs joined at the junctions used for reinforcement with foundation, soil, rock, earth, or any other geotechnical engineering-related material as an integral part of a human-made project structure or system.

- **Biaxial:** Biaxial Geogrids are used to improve the performance of surrounding aggregates by way of lateral confinement. Confinement is achieved by the geogrid restraining the lateral and vertical movement of the aggregate. This spreads vehicle loads efficiently, resulting in longer lasting roads. Provides Strength in two directions.
• **Uniaxial:** Used to support base materials in reinforced slopes and retaining walls. Provides an increase in strength in one direction.

• **Geo Logs:** (Wattles) A term used to describe an erosion control product made of natural or synthetic fibers encased in a fibrous netting. They are available in varying diameters and lengths.

Geomembrane: An essentially impermeable membrane used as a liquid or vapor barrier with foundation, soil, rock, earth, or any other geotechnical engineering-related material as an integral part of a human-made project, structure, or system.
**Geonet:** A netlike polymeric material formed from intersecting ribs integrally joined at the junctions used for drainage with foundation, soil, rock, earth, or any other geotechnical-related material as an integral part of a human-made project, structure, or system.

![Geonet Image](image1.png)

**Geopipe:** Any plastic pipe used with foundation, soil, rock, earth, or any other subsurface related material as an integral part of a human-made project, structure, or system.

**Geosynthetic Clay Liner (GCL):** Factory-manufactured hydraulic barriers consisting of a layer of bentonite clay or other very low permeability material supported by geotextiles and/or geomembranes, and mechanically held together by needling, stitching, or chemical adhesives.

![Geosynthetic Clay Liner Image](image2.png)

**Geosynthetics:** The generic term for all synthetic materials used in geotechnical engineering applications; it includes geotextiles, geogrids, geonets, geomembranes, and geocomposites.

**Geotextile:** Any permeable textile used with foundation, soil, rock, earth, or any other geotechnical engineering-related material as an integral part of a human-made project, structure, or system.
Grab Test: A test used to measure the breaking strength and elongation of a Geotextile. ASTM D5034

Knit: Textile structure produced by inter-looping ends of yarn.

Mass Per Unit Area: The proper term to represent and compare to the amount of material per unit area (units are oz./yd.² or g/m²). Often incorrectly called "weight" or "basis weight."

Modulus of Elasticity: The measurement of a product's stiffness / elastic qualities when presented with movement or elongation.

Mullen Burst Test: Measures the pressure required to puncture a Geotextile as an indicator of its load carrying capacity under specific conditions.

Needle-Punched: Mechanically bonded textiles by needling with barbed needles.

Nonwoven: For geotextiles, a planar and essentially random textile structure produced by bonding, interlocking of fibers, or both, accomplished by mechanical, chemical, thermal, or solvent means and combinations thereof.

Normal Direction: For geotextiles, the direction perpendicular to the plane of a geotextile.

Permeability: A generic term for the property that reflects the ability of a material to conduct a fluid or vapor through a porous media such as soil or geotextiles. Properly called hydraulic conductivity.

Permittivity: For a geotextile, the volumetric flow rate of water per unit cross-section area, per unit head, under laminar flow conditions, in the normal direction through the fabric.

Pin Flags: Various colored flags used to designate substrate grades for excavation projects
Pipe Wrap: Nonwoven geotextiles are designed to filter soil particles from drainage pipe systems. This product is used extensively on highway drainage systems.

Post-Consumer Waste Material: Waste generated by households or by commercial, industrial and institutional facilities in their role as end-users of the product, which can no longer be used for its intended purpose.

Pre-Consumer Waste: Material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated the waste.

Reinforcement: Improvement of the system strength created by the introduction of a geosynthetic into a soil/aggregate system.

Rip-Rap: is rock or other natural material used to protect shorelines, streambeds, road & bridge abutments, pilings and other shoreline structures against water or ice erosion.
**Separation:** Geotextile function placed between dissimilar materials so that the integrity of both can remain intact or be improved.

**Substrate:** A term used to identify the base, foundation or underpinning on which a substance or material is to be placed. In this case a Geotextile.

**Tear Strength:** The maximum force required to tear a substance or product. In this case a geotextile.

**Tensile Strength:** The maximum force or stress that a material can withstand while being stretched, pulled or torn.

**Turbidity Barrier / Curtain:** A floating geotextile material which is intended to minimize sediment transport from a disturbed area adjacent to or within a body of water.

**Transmissivity:** For a geotextile, the volumetric flow rate per unit thickness under laminar flow conditions, within the in-plane direction of the fabric.

**Transverse Direction:** An abbreviated term for cross-machine direction.

**Ultraviolet Degradation:** The breakdown of polymeric structure when exposed to sunlight.

**Warp:** The yarn running the length of the fabric in the machine direction when manufacturing woven fabrics.

**Warp direction:** See Direction, machine. *Note:* For use with woven fabrics only.

**Water Table:** The upper surface of the zone of saturation in ground water.

**Weft:** The cross-machine direction when manufacturing woven geotextiles.

**Width:** For a geotextile, the cross-direction edge-to-edge measurement of a fabric in a relaxed condition on a flat surface.
Woven: A planar textile structure produced by interlacing two or more sets of elements, such as yarns, fibers, rovings, or filaments, where the elements pass each other, usually at right angles, and one set of elements are parallel to the fabric axis.

Woven Monofilament: The woven fabric produced with monofilament yarns.

Woven, Multifilament: The woven fabric produced with multifilament yarns.

Woven, Slit-Film: The woven fabric produced with yarns produced from slit film.

Woven, Split-Film: See Woven, slit-film.

Yarn: A generic term for continuous strands of textile fibers or filaments in a form suitable for knitting, weaving, or otherwise intertwining to form a textile fabric. Yarn may refer to (1) a number of fibers twisted together, (2) a number of filaments laid together without twist (a zero-twist yarn), (3) a number of filaments laid together with more or less twist, or (4) a single filament with or without twist (a monofilament).

GEOTEXTILE FABRIC SPECIFICATIONS

SILT FENCE

Definition: A silt fence is a temporary sediment control device used on construction sites to protect water quality in nearby streams, rivers, lakes and bays from sediment (loose soil) as well as to prevent site soil runoff into roads and streets surrounding a project site.

Silt fences are widely used on construction sites due to their low cost and simple design although their effectiveness in controlling sediment is often rather limited, due to problems with design, installation and/or maintenance.

TYPES:

Type A: A woven geotextile, 36” in height designed for use in situations where the life of the project is 6 months or greater. It has a flow rate of 25 gallons per minute per square foot and a tensile strength of 100 lbs per minute. It is used with a wire fabric in DOT applications.
Type B: A woven geotextile, 22” in height designed primarily for use on residential projects. It has a flow rate of 25 gallons per minute per square foot.

Type C: A woven geotextile, with a minimum of 36” in height that is used with a wire fabric. It allows a flow rate of 70 gallons per minute per square foot. It has a tensile strength of 180 lbs per minute.

COMMERCIAL: Standard Silt Fencing is depicted in the illustration above. It consists of a common woven geotextile with wooden or metal post, typically spaced 10’ apart.

D.O.T: This product consist of a woven geotextile fabric, metal “T” post as well as a welded wire fabric for reinforcement. It is typically required on major roads and highways. The height, post spacing, and wire fabric can vary according to individual state specifications. There are also varying restrictions for the useful life of the product according to varying state specifications.

Both types of Silt Fence are subject to degradation from ultraviolet rays and require replacement at intervals established by State Highway Departments.

ALABAMA SPECIFICATIONS:

<table>
<thead>
<tr>
<th>Commercial</th>
<th>DOT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type - A woven</td>
<td>Type - A Woven</td>
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<tr>
<td>Height - 24” or 36”</td>
<td>Height - 3’</td>
</tr>
<tr>
<td>Roll Length - 100’</td>
<td>Roll Length - 330’</td>
</tr>
<tr>
<td>Stake Size &amp; Type - 1 ½” X 1 ½” Hardwood</td>
<td>Stake Size &amp; Type - 5’ Metal T Wire - 12.5 Gauge</td>
</tr>
</tbody>
</table>

(i) SILT FENCE. ALABAMA DOT SPECIFICATION
Silt fence shall be a geotextile filter supported between posts with a wire mesh backing as shown on the plans. Posts shall be strong enough to provide and retain the fence configuration shown on the plans while being subjected to loading of silt, water and debris. Silt fence shall meet the requirements given in Section 810 and AASHTO M 288 as supplemented by the following requirements:
- The support backing for the geotextile shall be 14 gage steel wire mesh. The vertical spacing of the wire in the mesh shall be 6 {150 mm} inches. The minimum
horizontal spacing of the wires shall be 6 inches {150 mm} and the maximum horizontal spacing shall be 12 inches {300 mm}.
- The geotextile filter shall be either a non-woven geotextile or a woven geotextile composed of monofilament yarns.

A list of geotextile materials acceptable for use in this application (List II-3 “GEOTEXTILES”) is given in the ALDOT manual titled “Materials, Sources, and Devices with Special Acceptance

**FLORIDA SPECIFICATIONS**

<table>
<thead>
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<tr>
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<tr>
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<td>Height - 3’ Minimum</td>
</tr>
<tr>
<td>Roll Length - 100’</td>
<td>Roll Length - 330’</td>
</tr>
<tr>
<td>Stake Size &amp; Type - 1 ½” X 1 ½” Hardwood</td>
<td>Stake Size &amp; Type - Metal T</td>
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<tr>
<td></td>
<td>Type III Fabric &amp; 1 ¼” X 1 ¼” X 48” Wood Post</td>
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<tr>
<td></td>
<td>Type IV Fabric, Field Fence with 12.5 Gauge 6” Hor. &amp; 6” Vertical Spacing Field Fence</td>
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<tr>
<td></td>
<td>5’ Metal “T” post W / 6’ spacing.</td>
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**GEORGIA SPECIFICATIONS:**

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<td>Type - C Woven</td>
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<tr>
<td>Height - 24” or 36”</td>
<td>Height - 3’</td>
</tr>
<tr>
<td>Roll Length - 100’</td>
<td>Roll Length - 330’</td>
</tr>
<tr>
<td>Stake Size &amp; Type -1 1/2” X 1 1/2” Hardwood</td>
<td>Stake Size &amp; Type - 5’ Metal T Post</td>
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<tr>
<td>Stake Spacing - 6’</td>
<td>Stake Spacing- 4’</td>
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<td>Wire - 6” x 6” 12.5 Gauge</td>
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**MISSISSIPPI SPECIFICATIONS:**

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<td>Height - 3’</td>
</tr>
<tr>
<td>Roll Length - 100’</td>
<td>Roll Length - 330’</td>
</tr>
<tr>
<td>Stake Size &amp; Type - 1 ½” X 1 ½” Hardwood</td>
<td>Stake Size &amp; Type - Metal T post</td>
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<tr>
<td></td>
<td>Wire - 12.5 Gauge</td>
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**TENNESSEE SPECIFICATIONS:**

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<th>Commercial</th>
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<tbody>
<tr>
<td>Type - A Woven</td>
<td>Type C Woven</td>
</tr>
<tr>
<td>Height - 24” or 36”</td>
<td>Height - 3’ Minumum</td>
</tr>
<tr>
<td>Roll Length - 100’</td>
<td>Roll Length - 330’</td>
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<tr>
<td>Stake Size &amp; Type - 1 ½” X 1 ½” Hardwood</td>
<td>Stake Size &amp; Type - 5’Metal T Post</td>
</tr>
<tr>
<td>Wire - 6 X 6 12.5 Gauge</td>
<td></td>
</tr>
</tbody>
</table>

**INSTALLATION PROCEDURES**

There are strict requirements for the proper installation of silt fencing which addresses the height of the fence, the depth of the post in the ground, as well as the burying of the fabric below the surface. These requirements are typically determined by individual State Highway Departments.

![Diagram of Silt Fencing Installation](image)

Sediment should be removed from the fence once it has reached 30% of the original height of the fence.

**MISCELLANEOUS EROSION CONTROL PRODUCTS:**

**CURLEX BLANKETS:** A biodegradable blanket specifically designed to promote growing conditions for grass seed, while protecting topsoil from wind and water erosion. They are used on most Federal and State Highway projects. Stakes are required for confinement.
JUTE NETTING: Is a net made of a vegetative fiber that is laid and anchored over straw or other mulch to protect the mulch from wind and water damage. It reduces soil erosion and provides a good environment for vegetative re-growth. Jute is a biodegradable material that will eventually decompose and is not a threat to the environment.

![Jute Netting Image]

STRAW MATTING: Single or double ply biodegradable rolls of vegetative matting laid directly over soil substrate to retard erosion, stabilize soil and foster the growth of natural vegetation.

![Straw Matting Image]
DRAIN PIPE

High Density Polyethylene Drain Pipes are used to carry away drain water from an undesired area to an area of containment or distribution. Common construction drain systems can consist of the following drain systems:

- HDPE drain pipe in rolls or lengths with wyes, tees, elbows, reducers and catch basins
- Concrete drain pipes with wyes, tees, reducers, elbows and catch basins
- Galvanized, Corrugated drain pipe with wyes, tees, elbows, reducers and catch basins.
- Pre-Constructed Polymer Trench Drain Systems with caps, grates and catch basins

HDPE DRAIN SYSTEMS:
Construction Materials Inc. typically sells HDPE drainage pipe in rolls of 4” and 6” diameters. These rolls are 100 feet in length. They are available in solid or perforated styles and can be purchased plain or with a non-woven geotextile filter sock. Straight length Drain Pipe is also available in diameters ranging from 4” to 48” in 20’ lengths.

GLOSSARY:

Adaptor: A fitting that unites different types of pipe together, e.g. ABS to cast iron pipe.

Cap: A cover used to terminate water flow through a drainage system.

Catch Basin: A formation, natural or manufactured, used to collect drain water and enter it into a drain system.

Co-Extrusion: Method of manufacturing that combines various plastic polymers to produce a range of colors, clarities and modifications, such as flame retardance, impact strength and weatherability.

Copolymer: A product, manufactured through co-extrusion, which features combined properties of various polymers.
Coupling: A fitting that joins two pieces of pipe of the same diameter.

Culvert - a transverse and totally enclosed drain under a road, bridge or railway

DWV: Abbreviation for Drain, Waste and Vent.

Elbow: A pipe fitting with two openings that changes the direction of the line. Also called an ell. It comes in a variety of angles, from 22 1/2° to 90°.

Extrusion: One of the basic methods of shaping molten plastic resins. Likened to squeezing toothpaste, extrusion involves solid resins melting as a screw pushes them through a heating chamber. The opening through which the resins are forced gives the product its form, resulting in consistent thickness and gauge control.

Fall/Flow: The proper slope or pitch of a pipe for adequate drainage.

Grate: A metal or plastic grid used to cover horizontal drain systems which allows drain water to enter but prevents the entry of large objects into the drain system.
I.D.: Abbreviation for inside diameter. All pipes are sized according to their INSIDE DIAMETER.

Inlet: The point at which drain water enters a drain system.

O.D.: Abbreviation for OUTSIDE DIAMETER.

Outlet: The point at which drain water exits a drain system

Perforated Pipe: Pipe with holes at predetermined locations to allow the seepage of water collected in the drain pipe into surrounding soil.

Permeability: The rate of flow of a liquid through a porous material

Plastic: Material, usually polymers developed from the by-products of oil refining and coal distillation, which, though stable in normal use, changes its shape when pressure or heat (or both) is applied. If the materials soften again when reheated, they are said to be thermoplastic. If, after fashioning, they resist further applications of heat, they are said to be thermoset.

Polymer: A high-molecular-weight organic compound, natural or synthetic, whose structure can be represented as a plastic or cementitious product. Often used as a durable substitute for cast in place concrete.

PVC: An acronym for polyvinyl chloride, PVC is a thermoplastic that is strong and especially resistant to water, acids and abrasion.

Reducer: A fitting that connects pipes of different diameters.

Riser: A vertical assembly of fittings and pipes that distributes water upward.

Scupper: A drain that allows water on the deck of a vessel to flow overboard
Sock: (Filter Sock) Non-woven geotextile fabric which encases plastic drainage pipe to reduce sediment intrusion in perforated pipe.

Tee: A “T”-shaped fitting with three openings used to create branch lines.

Thermoforming: Any process of forming thermoplastic sheet which consists of heating the sheet and forcing it into a surface mold. Also known as pan forming.

Thermoplastic: Widely used materials, such as ABS, acrylic, polycarbonate and PVC, which can be melted again and again. They melt when heated to a certain temperature, but harden again as they cool.

Union: A fitting that joins two sections of pipe, but allows them to be disconnected without cutting the pipe. (See Coupling)

Vent Stack: The upper portion of the soil stack above the topmost fixture through which gases and odors escape.

WYE: A Y-shaped fitting with three openings used to create branch lines.

TRENCH DRAIN SYSTEMS
Cast in place Trench Drain Systems are found in sidewalks, nurseries, industrial plants, commercial kitchens, athletic fields and many other applications. A typical system consists of a polymer or fiberglass drain channels, grates, grate locks, end caps, catch basins and connectors. If installed correctly, they will provide a safe traffic bearing surface that will transport water drainage to a confinement or distribution system.

Polymer drains are typically chemical resistant and provide excellent drainage in areas where toxic chemicals are discarded in drain water.

They are typically manufactured to specific drainage specifications and requirements which address the amount of liquid to be moved, width of the grate and the substrate the drain is to be placed in.
<table>
<thead>
<tr>
<th>Category</th>
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<tbody>
<tr>
<td>FABRICATED REBAR</td>
<td>CONCRETE FORMING ACCESSORIES</td>
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<tr>
<td>CONCRETE CHEMICALS</td>
<td>HAND TOOLS</td>
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<tr>
<td>WHEEL BARROWS</td>
<td>WOOD STAKES</td>
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<td>BLUE TOPS</td>
<td>FLAGGING</td>
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<td>PIN MARKERS</td>
<td>SEALANTS</td>
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<td>WATTLES</td>
<td>JUTE NETTING</td>
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<td>CURLEX BLANKETS</td>
<td>STRAW MATTING</td>
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<td>EROSION CONTROL FABRIC</td>
<td>STABALIZATION FABRIC</td>
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<td>ENKA GRID</td>
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<td>TURBIDITY BARRIER</td>
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