ARTICLE V

Minimum Design Standards

Section 500. General. The following principals of subdivision and land development, general requirements, and minimum standards of design, shall be observed by the applicant in all instances.

A. All portions of a tract being subdivided shall be taken up in lots, streets, public lands or other proposed uses so that remnants and land locked areas shall not be created.

B. When only a portion of a tract is being reviewed relative to subdivision and land development, but where future subdivision or development is imminent, the applicant shall demonstrate, subject to approval of his plan, that the remainder of the tract or parcel may be subdivided or developed in conformance with the existing zoning classification of land use in a logical and satisfactory manner.

C. Wherever possible, applicants shall preserve trees, groves, waterways, scenic points, historic spots and other community assets and landmarks.

D. Subdivisions and land developments should be laid out so as to avoid the necessity for excessive cut or fill unless specifically warranted by terrain or location.

E. Flood plain and low lying land subject to periodic flooding shall not be subdivided or developed for residential development or for such other uses as may involve danger to the health, safety, morals, and general welfare of the residents of Honey Brook Township.

F. Where no public water supply is available for the proposed subdivision or land development, the Supervisors shall require the subdivider, developer or builder, to obtain from the district sanitarian of the Pennsylvania Department of Environmental Resources certificates of approval as to the quality and adequacy of the water supply proposed to be utilized by the subdivider, developer or builder, and approval of the type and construction methods to be employed in the installation of the individual water supply system.

G. Where the subdivision or land development is inaccessible to sanitary sewers, the Supervisors shall require the subdivider, developer, or builder to obtain from the County Sanitarian of Chester County, certificates of approval of the sewage disposal facilities to be provided by the subdivider, developer or builder.

H. Applicants shall observe the ultimate rights-of-way for contiguous existing streets as prescribed by the Official Map Summary for the Township. Additional portions of the corridors for such streets shall be offered to the State, County, or Township agency having jurisdiction at the time the subdivision or land development is consumated. Applicable building setback lines, as defined by the Honey Brook Township Zoning Ordinance of current adoption shall be delineated as measured from the ultimate right-of-way street line.

I. Proposed subdivision and land development shall be coordinated with existing nearby neighborhoods so that the community as a whole may develop harmoniously.

J. Improvement construction requirements will be completed under specifications of the Pennsylvania Department of Transportation, the Pennsylvania Department of Environmental Resources, the Chester County Soil and Water Conservation District, or other appropriate agencies, or the specifications included herein, whichever specifications shall result in the more favorable interpretation of this Ordinance.

K. The subdivider, developer or builder shall construct and install with no expense to the Township, the streets, curbs, sidewalks, water mains, sanitary and storm sewers, street lights, fire hydrants, street signs, shade trees, monuments, and other facilities and utilities specified in this Article. Construction and installation of such facilities and utilities shall be subject to inspection by appropriate Township officials during the progress of the work and the subdivider, developer or builder shall pay for such inspection.

L. In all proposed subdivisions the lots shall abut a proposed or existing public highway of sufficient design to provide safe ingress and egress.

M. All proposed mobile home and recreational vehicle parks should be designed to protect the health, safety and welfare of not only the residents of said parks, but other nearby residents.

O. Industrial areas should be laid out in such a manner to protect all nearby residential areas from excessive noise, odors, light, traffic and storm water runoff.

Section 501. Recommendation of Planning Commission.

A. The standards of design in this Article should be used to judge the adequacy of subdivision proposals. Wherever, in the opinion of the Planning Commission, the literal application of these standards in certain cases would serve to create an undue hardship or be plainly unreasonable to the applicant, the Township Planning Commission may recommend to the Supervisors such reasonable exceptions as will not be contrary to the public interest. The Supervisors may modify or adjust the standards to permit reasonable utilization of property while securing substantial conformance with the objectives of these regulations.

1. The standards included in these regulations are minimum design requirements. The Supervisors reserve the right in any case to request that development features exceed these standards if conditions so warrant.

2. In reviewing subdivision plans, the Supervisors may refer such plans to the Planning Commission for recommendations concerning the adequacy of existing and proposed community facilities to serve the additional dwellings proposed by the subdivision.

3. Subdividers are requested to give careful consideration to the desirability of providing adequate rights-of-way and paving on existing streets, and reserving areas and easements for facilities normally required in residential sections, including churches, libraries, schools and other public buildings, parks, playgrounds, and playfields; shopping and local business centers; rights-of-way and easements for storm and sanitary sewer facilities in those areas that cannot be immediately joined to the existing and proposed storm and sanitary sewer systems of Honey Brook Township.

4. Areas provided or reserved for such community facilities should be adequate to provide for building sites, landscaping and off-street parking as appropriate to the use proposed. The Supervisors reserve the right to accept or refuse offers of dedication for public uses.

Section 502. Streets. In accordance with the pertinent sections of the Second Class Township Code, all new streets and cul-de-sacs, and widened portions of all existing rights-of-way, intended for public use shall be dedicated to the Township, subject to final acceptance based on compliance with the following requirements and Section 901 of these regulations.

A. Street System.

1. Conformance with Adopted Plans. The proposed street pattern shall be properly regulated to existing streets, to the Township Official Map Summary and to such County and State road and highway plans as have been duly adopted by said agencies.

2. Arrangement. Streets shall be arranged in a manner to meet with the approval of the Township Supervisors, considered in relation to both existing and planned streets, and located so as to allow proper development of surrounding properties. Secondary and through highways shall be connected with such existing streets and highways so as to form continuations thereof. Residential streets shall be laid out to discourage their use as secondary streets or through highways.

3. Conformity with Topography. Streets shall be adjusted to the contour of the land so as to produce usable lots and streets of reasonable grade, alignment and drainage.

4. Grading. The street shall be graded to the full width of the right-of-way and provision made for slopes beyond the right-of-way in conformance with municipal specifications.

5. Provisions of Streets for Future Development. Access shall be given to all lots and portions of the tract in the subdivision and to adjacent unsubdivided territory. Streets giving such access shall be improved to the limits of the subdivision. Remnants, reserve strips and landlocked areas shall not be created.

6. New Streets. New streets shall be laid out to continue existing streets at equal or greater right-of-way and cartway width, where such continuations are reasonable and practical.

7. Dead-End Streets. Dead-end streets are prohibited, unless designed as cul-de-sacs or designed for access exclusively to neighboring tracts.

8. Street Names. Continuation of existing streets shall be known by the same name. Names for new streets shall not duplicate or closely resemble names of existing streets.

In all cases, however, all street names are subject to the approval of the Township Planning Commission and Board of Supervisors.

9. Half Street. The dedication of half streets at the edges of a new subdivision is prohibited. If circumstances render this impracticable, adequate provision for the concurrent dedication of the remaining half of the street must be furnished by the subdivider, developer or builder. When there exists a half street in an adjoining subdivision, the remaining half shall be provided by the proposed development.

B. Street Alignment.

1. Sight Distance on Horizontal and Vertical Curves. Proper sight distance should be provided with respect to both horizontal and vertical alignments. Measured along the center line, this should be five hundred (500) feet for major roads; three hundred (300) feet for secondary roads; and two hundred (200) feet for local residential streets, measured at the center line and at driver's eye height of five (5) feet.

2. Horizontal curves shall be used at all changes in excess of one degree. Long radius curves shall be used rather than a series of curves connected by short tangents. Minimum radius curves at the end of long tangents will not be approved.

   a. Curvature. The minimum radius at the center line for horizontal curves on major streets shall be three hundred (300) feet; for secondary streets, two hundred (200) feet; and for rural or residential streets, one hundred fifty (150) feet.

   b. Tangents Between Curves. Except for local streets there shall be a tangent of at least one hundred (100) feet measured at the center line between reverse curves.

3. Vertical Curves. Vertical curves shall be used at chang in grade of more than one percent (1%). The length of th curve shall approximate fifty (50) feet on secondary street and twenty-five (25) feet on residential streets for each one percent (1%) of change in grade. Over summits or in sumps, vertical curves shall not produce excessive flatness in grade. The high or low point on a vertical curve must be definitely and clearly shown.

4. Street Grades.

   a. Minimum grades. There shall be a minimum grade of at least one percent on all streets.

   b. Maximum grades. A maximum grade of seven (7) percent on major and secondary streets; and ten (10) percent on residential streets for distances of not more than fifteen hundred (1500) feet. However, grades in excess of five (5) percent shall be avoided wherever possible. The grade shall be measured along the center line.

   c. Curve-grade combinations. A combination of minimum radius horizontal curves and maximum grades will not be approved.

   d. Street Intersections. The grade within fifty (50) feet of any side of an intersection or the outer perimeter of a cul-de-sac shall not exceed three (3) percent. The grade will be measured along the curb line of the street.

   e. Street grading. All streets shall be graded to the grades shown on the street profile and cross-section plan submitted and approved with the preliminary plan of subdivision and land development. They shall be inspected and checked for accuracy by the Township Engineer.

C. Right-of-Way Width, Paving Width and Curbing.

1. Classification. All streets will be classified as marginal access, rural, residential, cul-de-sac, secondary or primary and shall be governed as follows:

a. Marginal Access Streets serve as minor streets for access to adjacent properties on only one side of the street. This type of facility runs parallel with and adjacent to a primary or secondary street and serves to reduce the number of access points which intersect the larger streets, thereby increasing the efficiency and safety of traffic flow along the major street while providing adequate access to abutting development.

All marginal access streets shall consist of an additional Right-of-Way abutting and measured from the ultimate Right-of-Way line of the major street as defined by the Township Comprehensive Plan. The Rights-of-Way shall contain the features listed below, in order, moving outward from the ultimate Right-of-Way.

(1) Industrial: 5' minimum grass strip; 32' cartway including two 12' travel lanes; contained in a 40' R.O.W. No parking allowed.

(2) Commercial or Multi-Family Residential: 5' grass strip; 24' cartway consisting of two 12' travel lanes; contained in a 40' R.O.W. No parking allowed.

(3) Single Family Residential, two-way: 5' minimum grass strip; 28' cartway consisting of two 10' travel lanes and one 8' parking lane; contained in a 40' R.O.W. Parking allowed, one side.

(4) Single Family Residential, one-way: 5' minimum grass strip; 18' cartway consisting of one 10' travel lane and one 8' parking lane; contained in a 30' R.O.W. Parking allowed one side.

In addition to the above regulations, marginal access streets shall meet the following standards:

(a) Marginal cul-de-sac's will meet marginal street regulations with a standard cul-de-sac turnaround at the closed end.

(b) Where marginal access streets form a necessary leg of another classification of street, they shall be governed by the regulations of the other street classification.

(c) Where sidewalks do not exist or should be replaced, they shall be installed in the outermost portion of the right-of-way of the marginal street.

b. Rural Streets are those not qualifying under any of the other classifications, and on which at least 75% of all road frontage consists of lots greater than two acres, with minimum lot widths of 200 ft. Rural streets shall have a minimum right-of-way of 50 ft. and a minimum paved cartway of 24 ft.

c. Residential Streets shall be those which are used strictly to serve residential areas and do not serve as through streets in a development. They shall have a minimum right-of-way width of fifty (50) feet and shall have a minimum paved width of thirty-two (32) feet. Construction of the street, curbing and sidewalk shall be in accordance with specifications hereinafter included in these standards.

d. Cul-de-Sac Streets shall be those streets with one end open for vehicular access and the other terminating in a vehicular turnaround, and shall be defined in two ways:

(1) Temporary cul-de-sacs are those cul-de-sacs constructed to an abutting property line with the intention that such road will be extended onto the adjoining property at a future date as a logical step in the circulation network of neighborhood, superblock, or area. Temporary cul-de-sacs shall be required by the Supervisors where conditions so warrant. Temporary cul-de-sacs shall be governed by the same design standards as permanent cul-de-sacs.

(2) Permanent cul-de-sacs provide access only to abutting lots within the tract being subdivided or developed. A permanent cul-de-sac:

(a) Shall be constructed to the specifications of street, curbing, and sidewalks hereinafter included in these standards for residential streets.

(b) Shall have a minimum right-of-way of 50 ft., a circular turnaround with a minimum right-of-way radius of 50 ft. and an outer paving radius of 40 ft.

(c) Will not be approved as a part of a four (4) way intersection or as a continuation of any through street, unless special conditions warrant approval of either of the above by the Supervisors, and Planning Commission.

(d) Will not be approved when a through street is practicable.

(e) Will not be more than 750 ft. in length unless special conditions warrant approval by the Supervisors, and Planning Commission.

(The burden of proof regarding (c), (d), and (e) shall be on the subdivider.)

e. Secondary Streets shall be defined in two ways:

(1) A secondary feeder street shall be those which are used as connecting and through streets to serve residential areas and to connect residential streets to collector roads, and community facilities with low traffic volumes. They shall have a minimum right-of-way of sixty (60) feet and shall have a minimum paved width of thirty-eight (38) feet. Curbing and/or sidewalk shall be provided as required. Construction of the street, curbing and sidewalk shall be in accordance with specifications hereinafter included in the standards;

(2) A secondary collector street shall serve to connect feeder streets and residential streets to other feeder roads, community facilities, and major highways with medium traffic volume. Additionally, collector streets may also serve business or industrial areas. They shall have a minimum right-of-way width of eighty (80) feet and shall have a minimum paved width of forty (40) feet. The street must be provided with curbing and sidewalk and shall conform with construction specifications hereinafter included in these standards.

f. Primary Streets. Connect district centers or communities serving large volumes of fast moving through traffic and shall be defined in three ways:

(1) Limited access highways that deny access to adjacent property owners, and provide access at only a limited number of grade-separated interchanges. They shall have a minimum Right-of-Way of 120 ft., widened appropriately at interchanges, containing:

(a) Four 12-ft. travel lanes (minimum)

(b) Two 10-ft. shoulders

(c) Median (4-foot minimum)

(d) Acceleration and deceleration lanes

(e) Entrance and exit roadways

(2) Controlled access highways which provide for access at a few grade level intersections (e.g., with other major streets, large shopping centers, etc.). They shall have a minimum Right-of-Way of 100 ft., appropriately widened at intersections for turning lanes, channelization, etc., and containing:

(a) Four 12-ft. travel lanes

(b) Two 10-ft. shoulders

(c) 4-ft. median

(3) Semi-controlled access highways which place lesser restrictions on the access of adjacent property owners by providing more frequent access points at grade-level intersections (e.g. with secondary streets, marginal access streets, etc.). They shall have a minimum Right-of-Way of 100 ft., appropriately widened at intersections for turning lanes, channelization, etc., and containing:

(a) Four 12-ft. travel lanes

(b) Two 8-ft. shoulders

(c) Appropriate median

2. Street Width. The following general standards shall apply to street width:

(a) The minimum widths of the right-of-way and paving, and the requirements for curbing, shall not be less than those of an existing street of which the new street is to be a continuation, nor less than as required above under Classification.

(b) Minimum right-of-way width for development along existing streets shall correspond with the ultimate right-of-way for these streets, as defined in the Township Comprehensive Plan, and/or shown on the right-of-way map.

(c) The area between an existing right-of-way line and the ultimate right-of-way line should be offered for dedication to the authority having jurisdiction over the road when land is subdivided or developed along an existing right-of-way.

(d) Islands, Medial Strips, and Channelization may be required in any area where traffic volumes warrant their use for safety and efficiency, and may be permitted in any area at the discretion of the Supervisors. Such devices on State roads must meet or exceed the requirements of the Pennsylvania Department of Transportation.

(e) No fences, hedges, trees, shrubbery, walls, plantings, or other obstructions shall be located or be permitted within the right-of-way except for ground covers such as grass, ivy, crown-vetch, or horizontally spreading shrubs less than one (1) foot high, or retaining walls necessitated by road widening and constructed by the authority having jurisdiction over the road.

D. Street Paving. All street paving must conform to the specifications incorporated in this section of the Standards and be approved by the Township Engineer or other duly authorized person prior to acceptance by the Township Supervisors. All grades, horizontal curves, vertical curves, intersections, sight distances, and tangents shall conform to the requirements established by this Ordinance and shall be subject to the approval of the Township Engineer, or other duly authorized person.

1. Subgrade. The bottom of the excavation and the top of the fill between the outer limits of the paving or base course, when completed will be known as the subgrade and shall conform to the lines, grades and cross-sections given. The subgrade for macadam paving shall conform to the established lines, grade and cross-section as approved by the Township Supervisors. The subgrade shall be solidly compacted to a firm and unyielding state by rolling with a minimum of ten (10) ton power roller. Unstable areas shall be removed and replaced with suitable fill and then rerolled as required to provide a uniform even surface.

   a. Construction Methods. After the excavation of rough grading has been performed and all drains have been constructed, the subgrade shall be fine graded and shaped to the proper cross-section. It shall be brought to a firm unyielding surface by rolling the entire area with an approved three wheel power roller having a metal weight of not less than ten (10) tons. Solid rock, boulders, soft clay and all spongy material which will not consolidate under the roller shall be removed from the subgrade to a depth to be determined by the Township Engineer or other person designated by the Township Supervisors. The space shall be filled with suitable material from the excavation and the subgrade re-rolled until it presents a smooth and firm surface of the proper shape and cross-section. Crown board and straight edge shall be used for checking road and street construction. Maximum deviation shall not exceed one-quarter (1/4) of an inch.

2. Shoulder. Supporting shoulder shall be constructed on all sections of projects where a base course or pavement is to be constructed without other permanent support along the sides. All shoulders shall be thoroughly compacted and graded to provide drainage from the macadam surface.

   a. Construction Methods. Where concrete curbing is not to be constructed, shoulders are to be constructed adjacent to the paving of the proposed road. The width and type of construction, grade, and construction methods of these shoulders is to be determined by or must meet the approval of the Township Engineer or other person designated by the Township Supervisors.

3. Paving Base Course. The base course shall be a "Crushed Aggregate Base Course" to a compressed thickness after completion of eight inches. Construction will conform with the Pennsylvania Department of Transportation Specifications Form 408, dated 1973, or the latest revision thereof.

a. Materials. The materials used and the construction methods shall meet the requirements of this specification. Type A stone meeting the requirements as specified in Section 310 of the Pennsylvania Department of Transportion Specifications 408, dated 1973 shall be used.

(1) The coarse stone shall conform to the grading requirements as given in Section 703.3 for Pennsylvania No. 4 aggregate.

(2) The fine stone shall conform to the grading requirements as given in Section 703.3 for Pennsylvania No. 1 aggregate.

b. Construction Methods. The construction methods for the base course shall comply with the following:

(1) Before spreading any of the coarse material the contractor or owner shall furnish a sufficient number of grade stakes to represent the finished grade of the proposed roadway as shown on the drawings. This shall be done to the satisfaction of the Township Engineer or other person designated by the Township Supervisors.

(2) Fine Material for Initial Layer - Prior to placing the coarse material, a layer of fine material as specified shall be spread uniformly over the subgrade as a bed and filler at a minimum thickness of one (1) inch.

c. Spreading the Coarse Material. The crushed stone shall be placed in two (2) four (4) inch layers and spread uniformly on the prepared subgrade so as to distribute the material to the required depth for the full width of the base, unless otherwise specified for part-width construction. Each course shall be thoroughly screened and rolled. This material shall not be placed in a wet or frozen subgrade. No material shall be placed without first obtaining the consent of the Township Engineer or other person designated by the Township Supervisors. Not more than an average day's work shall be placed in advance of filling or rolling.

d. Rolling Coarse Material. The coarse material shall be compacted by rolling with a three wheel power roller having a metal weight of not less than ten tons. The rolling shall begin at the sides and progress to the center, except on super-elevated curves where the rolling shall begin on the low side and progress to the high side. The rolling shall be parallel to the center line of the roadway, uniformly lapping each preceding track and covering the entire surface with the rear sheels, and continuing until the material does not creep or wave ahead of the roller wheels. Areas of the base inaccessible to the roller shall be satisfactorily compacted by means of approved tampers. The base course shall be compacted to insure no movement in the base.

e. Application of Fine Material. The fine material generally shall be cast or spread in a series of thin applications, parallel with the roadway. If spread by hand the spreading shall be performed with a sweeping motion of a square-pointed shovel alternately in opposite directions, this process being continued until no more material can be forced into the voids. Hand brooms shall be used to spread the material over the surface, to insure even distribution and filling of all voids in the coarse material. All excess filler material forming in piles or cakes upon the surface shall be loosened and scattered. The rolling of the surface shall be continued during the process of spreading the filler material and shall be as specified for rolling the coarse material. Additional filler shall be applied where necessary to fill the voids and the rolling continued until the base course is thoroughly compacted and firmly set. The quantity of filler material necessary shall be determined by the Township Engineer or other person designated by the Township Supervisors. After the completion of the application and rolling of dry screening, the surface shall be sprinkled with water and rolled. If, at any time, subgrade material should become churned up or mixed with the base course materials, the contractor shall dig out and remove the mixture, reshape and compact the subgrade and replace the materials removed with clean materials which shall be filled and rolled until compacted satisfactorily.

4. Bituminous Surface Course ID-2A. This surface course shall consist of two (2) courses: binder course and wearing course, of hot-mixed, hot-laid asphaltic concrete, constructed on the prepared base course. The bituminous surface course shall have a total thickness, after final compaction, as specified by the Township Engineer or other persons designated by the Township Supervisors but in no case shall it be less than two and one-half (2-1/2) inches after compression. All street pavement cross-sections, except where superelevated for curves, will be a minimum slope from the center of the road to the gutter of a minimum of one-quarter (1/4) inch per foot to a maximum of one-half (1/2) inch per foot.

a. Materials. The materials shall conform with the requirements as given in Section 420 of the Pennsylvania Department of Transportation Specifications 408, dated 1973, or the latest revision thereto.

b. Construction Methods. The surface coursing shall be Type ID-2A as specified in Pennsylvania Department of Transportation Specifications Form 408, dated 1973, or the latest revision thereto and shall be applied in strict accordance therewith.

No visible moisture shall be present prior to the laying of each course. Road surface temperature shall be 50° F or greater prior to the laying of a bituminous surface. The air temperature shall be 40° F or greater with the temperature rising. All bituminous surface courses shall have a total thickness after compression of two and one-half (2-1/2) inches minimum. All edges shall be kept straight and sharp forming a clean cut line between finished road and gravel shoulder where shoulder construction is used.

c. Honey Brook Township will require delivery slips for all materials used in the construction of streets.

E. Street Intersections.

1. Number of Intersections. No more than two streets shall cross at the same point. Four-way intersections are to be avoided in the layout when three-way or (T) intersections can be utilized. When existing streets intersect at odd angles, or have more than

four (4) approaches, the subdivider, developer or builder shall be required to make corrective changes to eliminate the odd angle or reduce the number of approaches to the intersection by curving the lesser street.

2. Minimum Angle of Intersection. Right angle intersections shall be used whenever practicable, especially when local streets empty into major or secondary streets; there shall be no intersection angle, measured at the centerline, of less than sixty (60) degrees minimum.

3. Centerlines. Where centerlines of residential or secondary dary streets open into opposite sides of a major street within one hundred (100) feet of each other they shall be made to coincide by curving the minor street or streets.

4. Primary Thoroughfare. Wherever practicable, intersections with through highways shall be kept to a minimum and shall be located at least twelve hundred (1200) feet apart.

5. Sight Distance. Proper sight lines as provided in Section 502, B-1, of this Ordinance shall be maintained at all intersections of streets. There shall be measured along the centerline a minimum clear sight triangle of seventy-five (75) feet from the point of intersection. No building, trees, hedge, shrubbery or other obstruction whatsoever will be permitted in this area. Any obstruction to sight shall be removed at the time the street is graded or at the time a building or structure is erected, whichever shall first occur.

6. Maximum Grade. Maximum grade within any intersection shall not exceed one (1) percent and approaches to an intersection shall follow a straight horizontal course for one hundred (100) feet.

7. Approach Grades. All approaches to an intersection shall not exceed three (3) percent for a distance of fifty (50) feet measured from the nearest right-of-way line of the intersecting street.

8. Radii of Pavement and Right-of-Way at Intersections. Street intersections shall be rounded with tangential arcs at pavement edge (curb line) and right-of-way lines as listed below. Where two streets of different right-of-way widths intersect, the radii of curvature for the widest street shall apply.

Type of Street	Minimum Radius of arc at intersection of pavement edge or curb line (in feet)	Minimum Radius of arc at intersection of right-of-way line (in feet)
Major	40 (or more as may be required)	20 (or more as may be required)
Secondary	30	20
Residential	25	15
Rural	25	15
Cul-de-sac	25	15
Marginal Access	25	15

F. Street Names and Signs. No street name shall be used which will duplicate or be confused with the name of an existing street. Existing street names shall be projected whenever possible. Sign posts and name plates approved by the Township authorities shall be placed at street intersections.

G. Obstructions. No fences, hedges, walks, planting or other obstructions shall be located within the right-of-way.

H. Street Lights. The location of poles or standards for street lights shall be located on the plan, and when required by the Township authorities, said poles or standards, of a type approved by the Township authorities shall be erected.

Section 503. Alleys, Driveways and Parking Areas.

A. Alleys. Alleys are prohibited in residential developments except as the completion extension of one in existence. In commercial or industrial districts without expressly designed loading areas, alleys with a minimum width of twenty-five (25) feet shall be required. Where such alleys dead-end, they shall be provided with a turn-around having a radius of not less than twenty-five (25) feet. The cartway shall be a minimum of twenty (20) feet.

1. Paving. The paving requirements shall be the same as for street paving.

2. Intersections. Intersections of right-of-way lines shall be rounded by a tangential arc, the minimum radius of which shall be ten (10) feet, and the edge of the paving at intersections shall be rounded by a tangential arc the minimum radius of which shall be fifteen (15) feet.

3. Obstructions. No fences, hedges, trees, shrubbery, walls, plantings or other obstructions shall be located within the right-of-way. Reasonable sight distance shall be provided at intersections with streets.

B. Driveways.

1. Location. Driveways shall be so located as to provide reasonable sight distance at intersections with streets. A stopping area measured twenty (20) feet behind the right-of-way line shall be provided not to exceed a four (4) percent grade.

2. Intersections. Driveways shall be located not less than forty (40) feet from the street intersection and shall provide access to the street of a lesser classification when there are streets of different classes involved.

3. Pavement Widths and Grade. Driveway paving widths and grades shall be as follows:

Land Use	Mininum Paving Width (ft.)	Minimum Radius at Curb (ft.)	Maximum Grade Percent	Maximum Change of Grade per ten (10) feet
Single Family Residential	10	5	8	10%
Multi-Family Residential	12(one way)	10	8	10%
	24(two way)	10	8	10%
Commercial & Industrial	12(one way)	15	5	7%
	24(two way)	15	5	7%

4. All driveways shall be located, designed and constructed in such a manner as not to interfere or be inconsistent with the design, maintenance and drainage of the highway.

5. Access driveways should be located in such manner that they will not cause the following:

   a. Interference to the traveling public,

   b. A hazard to the free movement of normal highway traffic; or

   c. Areas of undue traffic congestion on the highway.

6. Frontages of fifty (50) feet or less shall be limited to one driveway. Normally not more than two (2) driveways need to be provided to any single property, tract or business establishment. Exceptions may be made where the frontage exceeds three hundred (300) feet in length.

C. Driveways for Land Developments.

1. The Township Supervisors shall have the authority to approve driveways intended for the use of two or more families, apartment developments, commercial and industrial projects where usage by the occupants constitutes essentially a private street. Driveways constituting private streets are those access-ways used by two or more families daily or ten or more workers for vehicular circulation. Driveways serving as private streets shall not be dedicated to the Township nor does the Township assume any responsibility for their maintenance.

2. Construction of driveways to be used as private streets shall conform to all minimum design standards for public streets, other than those applicable to rights-of-way, and width, provided however, that the width of the cartway shall not be in any event less than twenty-four (24) feet.

3. Location and placement of driveways serving as private streets shall comply with Section 503, B, Driveways. Additionally, provisions for drainage and storm water runoff shall be approved by the Township Engineer.

4. The owner, and all successors, of any property which is to abut any driveway serving as a private street shall be fully responsible for the permanent improvement of the driveway(s) and for the maintenance thereof in a good and safe condition.

5. The Township Supervisors shall evaluate the location, placement and alignment of driveways serving as private streets based upon the ease of accessibility to and efficient maneuverability throughout the development for protective services of fire and police.

D. Parking Areas.

1. Automobile parking facilities shall be provided off street in accordance with requirements of the Honey Brook Township Zoning Ordinance and this Ordinance.

2. At no time shall angle or perpendicular parking along the curbs of local, public or private access roads or streets be permitted. All parking lots and bays allowing any parking other than parallel shall be physically separated from the cartway by a minimum of seven (7) feet and confined to barrier curbing.

3. No one area for off-street parking of motor vehicles in residential areas shall exceed thirty six (36) cars in capacity. Separate parking areas on a parcel shall be physically separated from one another by eight (8) foot planting strips.

4. No less than twenty (20) feet of open space shall be provided between the curb line of any parking area and the outside wall of the dwelling unit in residential areas.

5. Parking may be permitted within the minimum side and/or rear yards when the side and/or rear yards abut a district zoned industrial and/or commercial. However, no parking shall be permitted within five (5) feet of a side or rear property line unless formal arrangements, satisfactory to the Township have been made for the establishment of "common parking facilities."

6. In commercial and industrial districts, provision of "common parking facilities" is hereby encouraged in recognition of their increased flexibility and efficiency. Subject to formal arrangements between the proposed users of the common parking facilities, satisfactory to the Township, the Zoning Hearing Board may reduce the aggregate amount of required parking space upon determination that greater efficiency is effected by joint use of the common parking area. When common park-

ing facilities are approved, side and/or rear yard parking requirements may be waived in order to establish unified and continuous parking areas. In such cases, access drives and sidewalks shall be so aligned as to maximize parking efficiency and minimize traffic congestion. Entrances and exits must have clear site lines and good visibility so that, both going in and coming out, drivers can see and cars can be seen.

7. Parking stall dimensions shall be not less than ten (10) feet in width and twenty (20) feet in depth, and paved to provide an all-weather parking area.

8. Buffer planting requirements shall be applicable to parking lot facilities, along the area fronting major or secondary roads and along the area adjacent to other properties.

9. All dead-end parking lots shall be designed to provide sufficient back up area for the end stalls.

10. No less than a five (5) foot radius of curvature shall be permitted for all curblines in all parking areas.

11. Parking lot dimensions shall be no less than those listed in the following table:

Angle of Parking	Parking Stall		Aisle Width	
	Depth	Width	One-Way	Two-Way
90°	20'	10'	25'	25'
60°	21'	10'	18'	20'
45°	19'	10'	15'	18'

Section 504. Sidewalks and Curbs.

A. Sidewalks.

1. Where Required. Sidewalks shall be provided along all streets excepting where in the opinion of the Township Supervisors and the Planning Commission they are unnecessary for the public safety and convenience.

2. Width. Sidewalks shall not be less than four (4) feet in width in residential areas. A greater width shall be required in areas in which apartments or business buildings are located, or deemed necessary at the discretion of the Township Supervisors, and the Planning Commission.

3. Location. Sidewalks shall be located between the curb and right-of-way line five (5) feet from the curb line. The grade and paving of the sidewalk shall be continuous across driveways except in certain cases where heavy traffic volume dictates special treatment.

4. Construction Methods. Sidewalks shall be constructed so as to discharge drainage to the street, the grade of which shall not be less than one-quarter (1/4) inch per foot. The finished grade between the outside of the sidewalk to the curbline (edge of the cartway) shall never exceed a total vertical elevation change of one foot.

Sidewalks shall be constructed of cement concrete to a width as approved for the various areas. All undesirable material shall be removed from the subgrade.

Cement concrete used in sidewalks shall have a compressive strength of at least 3000 P.S.I. at 28 days with certification of the mix furnished to the Township Engineer or other person designated by the Township Supervisors. Concrete shall be placed in forms that are straight and securely braced. Care shall be taken to control the water content to prevent separation of the aggregates. The concrete shall have a broom finish and the edges shall be finished with an approved edging tool.

All cement concrete sidewalks shall be constructed on a four (4) inch crushed stone or gravel base to insure proper drainage. The concrete shall be placed so that there is a separate joint every five (5) feet and shall be so constructed so that the five (5) foot sections are completely separated from adjacent sections. One-half (1/2) inch premolded expansion joints shall be placed every twenty (20) feet and between all points where the concrete sidewalk abuts a concrete curb.

All cement concrete sidewalks shall have a minimum thickness of four (4) inches except under driveways where they shall have a minimum thickness of six (6) inches. The

with 6x6-9/9 steel wire fabric (minimum). Two (2) layers of this wire fabric shall be utilized with a minimum of two (2) inch spacing between layers. The wire shall be installed so that it is not closer than one-half (1/2) inch from the top or bottom surfaces of the driveway.

B. Curbs.

1. Concrete curbs shall be installed along each side of every residential, secondary or commercial street or road excepting wherein the opinion of the Township Supervisors and the Planning Commission they are unnecessary for the public safety and convenience. Concrete curbs shall be twenty-two inches (22") deep, six inches (6") wide at the top, and eight inches (8") wide at the base on Secondary, Commercial and Primary streets. Concrete curbs shall be eighteen inches (18") deep, six inches (6") wide at the top, and eight inches (8") wide at the base on Residential streets. The nominal distance from the top of curb to flow line of the gutter shall be seven inches (7") on Secondary, Commercial and Primary streets, and six inches (6") on Residential streets, Curbing shall be built in ten foot (10') lengths, and an approved expansion joint of one-quarter inch (1/4") minimum thickness shall be used at each joint. A combination curb and gutter may be used at the option of the developer when approved by the Township Engineer. Where combination curb and gutter is used, it must be placed on a minimum of four (4) inches of crushed stone or gravel to provide adequate drainage beneath the curb.

All concrete used in the construction of improvements shall be certified to develop a compressive stress of at least 3000 P.S.I. at 28 days with certification of the mix furnished to the Township Engineer or other person designated by the Township Supervisors.

Concrete shall be placed in forms that are straight and securely braced. Care shall be taken to control the water content to prevent separation of the aggregates. All concrete shall be thoroughly tamped into the forms. After the concrete has set sufficiently, the form shall be removed and the exposed surface shall be rubbed to provide an even finish. All edges shall be finished with an approved edging tool.

To provide for planed driveways depressions in the curbing shall be constructed and finished during the time of pouring.

Section 505. Blocks

A. Length. In general all blocks in a subdivision shall have a minimum length of five hundred (500) feet and a maximum length of twelve hundred (1200) feet unless special conditions warrant a variance.

B. Width. Whenever practicable blocks shall be of such width as to provide two (2) tiers of lots of the minimum size permitted under the applicable zoning classification except in the case of lots along a major thoroughfare where the lot fronts on an interior street.

1. Through Lots. Double frontage lots are to be avoided and generally will not be permitted except where reversed frontage is desired away from a major thoroughfare to a street of lesser traffic volume.

C. Crosswalk. Crosswalks not less than ten (10) feet wide, and with concrete sidewalks not less than four (4) feet wide may be required where necessary to provide access to schools, churches, parks and commercial areas. They shall be maintained by the abutting property owners in the same manner as sidewalks on public streets.

D. Non-Residential Blocks. Blocks for commercial and industrial areas may vary from the elements of design contained in this section if the nature of the use requires other treatment. In such cases, off-street parking for employees and customers may be required along with safe and convenient limited access to the street system. Space for off-street loading may also be required with similar access. Space for the extension of streets, railroad access right-of-way, and utilities shall be provided. The amount of parking space shall be as required by the zoning ordinance.

Section 506. Lots.

A. Lots in Residential Areas.

1. Area. All lots shall be no smaller than the minimum lot area requirements of the applicable zoning classification.

2. Depth. Lots excessively deep in relation to width are to be avoided. A proportion of two and one-half to one (2-1/2 to 1) is generally regarded as proper maximum for lots 60 feet or more in width.

3. Width. The minimum width of a lot shall be that width in feet which is specified for the applicable zoning district.

4. Corner Lots. All corner lot widths on each frontage shall be a minimum of one and one-half (1-1/2) times the minimum width of the interior lots of the same block.

5. Frontage. Every lot shall have frontage along the ultimate right-of-way line of a street, but double frontage lots are prohibited except as provided for in Section 505, B of this ordinance.

   The frontage shall not be less than the minimum requirements of the zoning ordinance, except that on the outside of curved residential streets, and on the turnaround of the cul-de-sacs, a minimum frontage of 50 ft. may be acceptable provided that proper lot width is attained at the building setback lines, in conformity with the provisions of the Township zoning ordinance.

6. Sidelines. Whenever practicable, the sidelines of a lot shall be set at right angles or radial to the right-of-way line.

7. Building Lines. Building lines for all lots shall be in conformance with the minimum front, side, and rear yard line requirements of the applicable zoning district.

8. Lot Numbers. For the purpose of development, each subdivision may have an overall system of lot numbers, the number one (1) being assigned to a lot in the first section to be developed. (Such system of lot numbers shall not be confused with the regular house or building numbering system based on a Township-wide plan).

9. Building Numbers. House or building numbers shall be assigned by the Township based on an overall street numbering plan. Numbers will be assigned in such a way as to allow for vacant parcels and future development.

B. Subdivisions or land developments with Existing Structures on Land. No subdivision of land will be approved with the property line extending through any portion of any existing structure.

1. If structure(s) is to remain.

   a. In residential zoning districts of the Township, the lot size and the lot dimensions of the newly created lot containing the structure(s) must be in scale with the height and bulk of the existing structure even if this requires a lot area and/or dimensions exceeding the minimum zoning requirement for that district. Structures proposed on the vacant portions of lands being subdivided shall conform to the extent possible with the height, bulk, building material and architectural character of the existing structures in the immediate vicinity and the subdivision plans shall show building plans at suitable detail.

   b. In other zoning districts of the Township (especially commercial and industrial districts) the subdivision of the land must provide adequate service and parking facilities, etc., in keeping with the minimum requirements of the zoning ordinance for each lot and cumulatively for all lots in the subdivision. No subdivision will be approved in such instances if the servicing and/or parking facilities, etc., attendant to the existing structure are deemed inadequate or would be considered to become inadequate with the development of the now vacant lands. Any new structures contemplated on the newly subdivided parcels shall be in conformity with the existing structures in the immediate vicinity to the extent possible in regard to height, bulk, building material and architectural character and the subdivision plans shall show building plans at suitable detail.

   c. Alterations and replacements will be permitted within the existing structure, but exterior extensions of the building must conform to the requirements of the Honey Brook Township Zoning Ordinance, as amended.

   d. Conversions. In cases where the principal building use has not been as a dwelling, its conversion to a dwelling shall comply with all of the requirements of the Zoning Ordinance and the Building Codes of Honey Brook Township.

2. If existing structure(s) is to be removed. Subdivision approval will be issued "conditional" to the expeditious removal of existing structures in complete conformity to all other pertinent Township procedural requirements. The subdivision plans shall furthermore show in detail the proposed development of each parcel of ground and the proposed development shall not provide less service and parking facilities, etc., than now exist. In commercial and industrial areas, plots of land that have been cleared, as well as the existing vacant portions of such lands should be developed in conformity with the long range needs of the area to the extent possible and all developmental requirements embodied in this ordinance and the Zoning Ordinance shall be adhered to. If roadway realignments and other similar requirements are deemed necessary in the immediate vicinity of the plot being subdivided, they shall be corrected as part of the subdivision design to the utmost of the subdivider's ability.

3. If existing structure(s) is to be partly replaced or is to be added to. Demolition plans and/or construction plans must be detailed as part of the subdivision plan review and subsequent subdivision approval will be conditional upon compliance with said proposed details. Additions to existing structures shall be in harmony with existing structures in the immediate vicinity, especially in respect to height, bulk, building material and architectural characteristics. In the case of partial demolition of existing structures, the remaining structure must be in keeping with the existing buildings in the immediate vicinity in relation to type, bulk, building material and architectural characteristics. Renovation work to the remaining portion of a structure following partial demolition must be completed promptly and expeditiously.

Section 507. Recreation Areas and Community Assets. Wherever practicable, provision shall be made for suitable open space for parks, playgrounds, and recreational areas. In commercial areas, provision shall be made for suitable open space for walkways (connecting parking facilities with commercial structures), malls, sitting areas, etc. Due consideration shall be given to the preservation of natural features, including large trees, groves, waterways, scenic vistas, historic grounds and structures and other community assets.

Section 508. Reserve Strips, Rights-of-Way and/or Easements, Deeds.

A. Reserve strips controlling access to streets, alleys, subdivisions or adjacent areas are prohibited.

B. Right-of-Way and/or Easements for sanitary utilities, road construction or maintenance, or for drainage purposes, public utilities or for any specific purpose shall be required by the Township Supervisors as needed; the location and width in each case to be as determined by the Supervisors.

1. Building setback lines shall be measured from the nearest side of the right-of-way or easement to the proposed building.

2. Nothing shall be permitted to be placed, planted, set or put within the area of an easement. The area shall be kept as lawn.

3. The owner of any lot, upon written request by the Township, and at the owner's sole expense, shall remove anything placed, planted, set or put, (with or without knowledge of this regulation) within the area of any easement.

4. To the fullest extent possible easements shall be adjacent to rear or side lot lines.

C. No right-of-way nor easement for any purpose whatsoever shall be recited or described in any deed unless the same has been shown on the approved plan.

1. Any error found in a deed shall be immediately corrected and re-recorded in the Office of the Recorder of Deeds for Chester County at West Chester, Pennsylvania, at the sole expense of the subdivider.

D. Easements.

1. Utility. Easements with a minimum width of twenty (20) feet shall be provided for common utilities and drainage when provided in unwanted dedicated land. Nothing shall be permitted to be placed, planted, set or put within the area of an easement, but shall be maintained as lawn.

2. Drainage. Drainage easements shall be required along natural water courses to a minimum width of twenty-five (25) feet from the center line and may be used for storm and sanitary sewers, and as open space. Where conditions warrant, such as in flood plains, additional width shall be required in such cases where run-off treatment requires a wider easement. Run-off studies must prove such requirements beyond the delineated flood plain.

3. Dedication. Where storm water or surface water will be gathered within the subdivision or land development and discharged or drained in volume over lands within or beyond the boundaries of the subdivision or land development, the subdivider, developer, or builder shall reserve or obtain easements over all lands affected. The easements shall be adequate for such discharge of drainage and for carrying off of such water and for the maintenance, repair, and reconstruction, of the same, including the right of passage over by vehicles, machinery and other equipment for such purposes, and which shall be of sufficient width for such passage and work. The subdivider, developer, or builder, shall convey, at no cost, the easements to the Township upon demand.

Section 509. Survey Monuments.

A. Monuments shall be of stone or concrete and located on the right-of-way lines at corners, angle points, beginning and end of curves, and as otherwise required. Monuments shall be indicated on all plans. They shall be placed after a new street has been completed. The center line of all new streets shall be marked with spikes and referenced to permanent monuments or structures. A certified copy of this reference information shall be given to the Township Engineer. Permanent reference monuments of cast concrete or durable stone twenty (20) inches by four (4) inches, by four (4) inches, with forty-five (45) degree beveled edges shall be set by the subdivider, developer, or builder, at all corners and angle points of the boundaries of the original tract to be subdivided and at all street intersections and intermediate points as may be required.

B. Bench Marks. The Township elevations are based on the Township Sanitary Sewer System Datum and/or the 1929 mean sea level datum. Location and elevation is available to all Engineers and Surveyors upon request to the Township Engineer's office. All contours and elevations shown on plans must be based on this system.

C. Staking Requirements. All lots shall be staked by the registered engineer or surveyor for the subdivider, when final grading has been completed. This stake out shall be visible and completed before an owner or occupant moves into the property. All lot corner markers shall be permanently located and shall be at least five-eights (5/8) inch metal pin with a minimum length of twenty-four (24) inches, located in the ground to existing grade.

Section 510. Storm Drains, Storm and Surface Drainage.

A. General. The subdivider, developer or builder shall furnish, with the preliminary plan, a report in triplicate, prepared by a registered Professional Engineer, covering any analyses, computations and design recommendations, in tabular form insofar as is possible, for storm drainage facilities necessary to adequately serve the area being subdivided or developed. The report shall include adequate plans and maps to accurately delineate the tributary watersheds. The storm drainage facilities shall be designed hydraulically and structurally to adequately handle the maximum expected discharge, or peak discharge created by the design storm at the particular point of design. If detention or retention facilities are included as part of the storm drainage facilities, they should further be designed hydraulically and structurally to adequately handle the volume of storm runoff created by the design storm at the particular point of design.

The maximum expected discharge, or peak discharge, from drainage areas less than one-half square mile (320 acres) in size, shall be determined either by use of the Rational Formula, or by use of the Soil Cover Complex method as found in the U.S. Soil Conservation Service Engineering Field Manual. The maximum expected discharge from drainage areas greater than one-half square mile in size, shall be determined by use of the appropriate discharge-frequency-drainage area curves available in publications of the Pennsylvania Department of Environmental Resources.

The volume of storm runoff shall be determined either by use of the Soil Cover Complex method or the unit-hydrograph method.

B. Design Criteria. The design storm for storm drainage facilities, other than detention or retention facilities, shall be the 50-year frequency storm. The design storm for detention or retention facilities shall be the 100-year frequency storm. Storm drainage facilities serving a drainage area larger than one-half square mile shall be constructed only after a permit has been obtained from the Pennsylvania Department of Environmental Resources.

The storm drainage facilities shall be adequate for the anticipated watershed conditions when the area is fully developed as permitted by Township Zoning on the date the application is submitted. Runoff indexes or factors shall be based on up-to-date published data. Hydraulic calculations shall be based on accepted methods appropriate to the hydraulic situation. Where swales, channels, ditches or emergency spillways are proposed on soil, grass, or sod, soil tests shall be required to verify the soil's ability to resist erosion. Where said tests indicate possible erosion, such methods shall not be permitted.

C. Design Features. Materials and methods of construction for all storm drainage facilities shall conform to Pennsylvania Department of Transportation Specifications, Form 408, dated 1973, or as later revised. Storm drains shall be constructed of Reinforced Cement Concrete Pipe, Class III or stronger if special conditions so dictate, or Elliptical Reinforced Cement Concrete Pipe, Class HE-III or stronger if special conditions so dictate. Inlets, manholes, endwalls and other incidental structures shall be of a type appropriate to the installation and application, and shall have adequate capacity to handle the design flows.

D. Location. Wherever practicable storm drains shall be located behind the curb and within the right-of-way of the street. They shall be protected by a cover of at least eighteen (18) inches.

E. Size and Grade. Storm drains shall have a minimum internal diameter of fifteen (15) inches and a minimum grade of 0.5 percent (1/2 of 1%) unless otherwise approved by the Township Engineer.

F. Change in Direction. Special curved storm drain sections may be used where abrupt changes are made in alignment in lieu of constructing manholes if the circumstances so warrant.

G. Manholes. Manholes shall be constructed at all changes in horizontal or vertical alignment; shall be spaced not more than three hundred (300) feet apart on pipe of twenty-four (24) inches internal diameter or less, and not more than five hundred (500) feet apart where larger sizes are installed. Inlets may be substituted for manholes where they will serve a useful purpose.

H. Inlets. Inlet spacing shall be so arranged that ninety-five percent (95%) of the gutter flow will be captured. Inlets at street intersections shall be placed on the tangent and not on the curved portions. The gutter adjacent to and immediately upgrade from the inlet shall be so warped as to direct the water into the inlet.

I. Castings. Manhole and inlet castings, together with their covers or gratings shall conform to Township Standards, as may be in effect at the time the design is submitted.

J. Storm Water Roof Drains. Storm water roof drains and pipes shall not discharge water directly onto a road surface or road right-of-way. Where storm drains are accessible, the roof drain shall be connected thereto.

K. Unnatural Drainage. Wherever construction stops or concentrates the natural flow of storm drainage in such a way as to affect adjoining properties, approval of the owners should be obtained in writing and a copy filed with the Township Secretary. Approval of plans by the Township does not authorize or sanction drainage affecting adjoining properties.

L. Drainage from Non-natural Sources. Water originating from other than natural sources, such as air conditioning units, swimming pools, sump pumps, or other dry weather flow, wherever practicable, shall be discharged into natural watercourses on the property, or into the storm drainage system. These facilities shall not discharge water directly onto a road surface or road right-of-way. No discharge of toxic drainage will be permitted.

M. Design Submission.

1. All plans showing the proposed storm sewer construction must be accompanied by a complete design submitted by the registered Engineer.

2. When subdivisions or land developments are submitted to the Township for approval in sections, a complete storm sewer design for the proposed subdivision and land development shall be submitted. The proposed design must include the entire tract and not a portion.

3. If only a section of a subdivision or land development is contemplated for construction, the engineer shall show how he proposes to handle storm water from this section in order to prevent damage to adjacent properties. If temporary construction is required, the engineer shall include such structures in the plan submitted.

4. In the event such temporary measures cannot insure protection to adjacent properties, then the main outfall line of the storm sewer shall be included as part of the construction for the proposed section.

Section 511. Bridges and Culverts. Bridges and culverts shall be designed to meet the current Pennsylvania Department of Transportation Standards to support expected loads and to carry expected flows. They shall be constructed to the full width of the right-of-way.

Approval of the Pennsylvania Department of Environmental Resources is required when the area drained upstream of the point under consideration exceeds an area of one-half square mile (320 acres).

Section 512. Sanitary Sewers and On-Site Disposals.

A. Sewers. Wherever practicable sanitary sewers shall be installed and connected to the Township sanitary sewer system. In any subdivision or land development in which the developer proposes a community sewage treatment system, the sanitary sewers shall be installed in accordance with Township Authority specifications. In areas not presently served by public sanitary sewers, and where the subdivider or developer does not propose a community sewage treatment system, the Township may require, according to Act No. 537 passed by the General Assembly of Pennsylvania (1965), in addition to installation of temporary individual on-site sewage disposal facilities, the installation and capping of sanitary sewer mains and house connections, if studies by the Township Supervisors indicate that extension of public sanitary sewer trunks or laterals to serve the property subdivided, or developed appears probable or necessary to protect public health.

1. When a feasibility analysis, conducted by the Township Engineer, [illegible] and County Sanitarian has ascertained that sanitary sewers are practicable, then sanitary sewers, with connection to each building in a subdivision or land development, shall be installed and connected to the Township sanitary sewer system, at the expense of the applicant or subdivider.

2. If outfall sewers are not available in the vicinity, but are considered reasonably necessary in the foreseeable future by the Township, Chester County Health Department, or Pennsylvania Department of Environmental Resources for the area in question, a system of sewers, together with all necessary laterals extending from mains to the street right-of-way line shall be installed at the expense of the subdivider, developer or applicant. The sewer lines shall be suitably capped at the limits of the subdivision or land development and the laterals shall be capped at the right-of-way line. The sewer installation shall include the construction within rights-of-way or easements to bring the sewer to the future connection with the Township sanitary sewer system.

3. If sanitary sewers are not to be installed at the time of subdivision and development, but would probably be required in the future, the developer or subdivider shall prepare a Preliminary Application Sewer Plan acceptable to the Valley Forge Sewer Authority. All proposed structures requiring sewer service shall be servable by gravity flow to the proposed system. All necessary rights-of-way, easements, and other sewerage facility sites shall be conveyed to the Authority without cost to the Authority.

4. A sewer shall be considered to be planned for extension to a given area any time after preliminary engineering and related studies have been completed and the construction of facilities adequate to serve the area containing the subdivision or development has been programmed for completion within a reasonable time.

5. When capped sewers are provided, on-site disposal facilities shall also be provided.

6. All sanitary sewers constructed in the Township shall conform to the requirements and specifications of the Township, the Pennsylvania Department of Environmental Resources, the Chester County Health Department, and the Honey Brook Authority.

7. Laterals. Lateral connections to each lot or building shown on the final plan shall be installed to the right-of-way line of the street prior to paving. Each building shall have a separate connection to the Township sanitary sewer system.

8. This section shall be applicable to all subdivisions and land developments, whether utilizing public or private streets; and in the case of a subdivision or land development utilizing private streets, the subdivider, developer or the applicant shall execute a recordable covenant with the Township and/or Township Authority that, for the purposes of sewer connections, assessments and rentals, the rights and liabilities of himself and his grantees, heirs, successors, and assigns shall be the same as if his property abutted a public street.

B. On-Lot Disposal System. If public sewage disposal is not available, and the sewage treatment is on a project or individual lot basis, such private facilities must be installed by the subdivider, developer, or builder under the direct supervision of the Chester County Health Department or Sewage Enforcement Officer for Act 537.

1. Necessary Tests and Inspection. Such officials shall require percolation tests, soil samples and other data to determine the size and extent of facilities needed. Copies of all percolation tests shall be submitted to the Township. During installation of such facilities, and before final coverage, such officials shall make inspections and checks to assure that all requirements and specifications have been met. They shall be granted free access to the development area at all times during this period.

2. Certificate of Approval. After assuring that all requirements and specifications have been met, the appropriate officials will then issue a certificate of approval to the Township Secretary as a requirement to final plan approval.

   a. The type of on-site sewage disposal system to be installed shall be determined on the basis of location, topography, available area, soil characteristics, permeability and ground water elevation. The disposal area to be provided shall be determined by the results of percolation tests, soil classification and depth of water table and such other tests as may be deemed necessary. Proof of the adequacy

of such facilities shall be furnished by a Registered Professional Engineer or other person qualified to the satisfaction of the Township Supervisors. The reports of such tests shall be required at each disposal area. One percolation test per lot shall be required when the subdivider is dividing ground into lots and is not building immediately.

b. All percolation tests shall conform to the Standards of the Commonwealth of Pennsylvania.

c. The "usable area" for sewage disposal shall be shown on the preliminary plan for each lot. The "usable area" shall be situated beyond the radius of the water supply well and shall conform to all rules and regulations or future amendments thereto of the Pennsylvania Department of Environmental Resources and the Chester County Department of Health.

d. Proximity to Wells. In no instance shall a septic tank, tile field or other effluent disseminating system be located uphill from a drilled well and shall not be closer to it than one hundred (100) feet, and twenty-five (25) feet from any dwelling or property line.

Section 513. Public Utilities. All water and gas mains and other underground facilities shall be installed prior to street paving at locations approved by the Township for the full width of the right-of-way.

A. Underground Utilities. All gas and water mains shall be installed underground. All electric, telephone, and communication services, both main and service lines, shall be provided by underground cables, installed in accordance with the prevailing standards and practices of the utility or other companies providing such services, except where it is demonstrated to the satisfaction of the Township Supervisors that underground installations herein required are not feasible because of physical conditions of the lands involved, or other valid reasons. All main underground cables which are within the right-of-way of a street shall be located as specified by the Township Supervisors.

1. In order to promote and facilitate the undergrounding of utility distribution lines, a letter of endorsement shall be required from the suppliers of utility service (not limited to electrical, telephone, or cable television) of the developer's

choice wherein the applicant acknowledges that underground utilities are feasible and shall be consummated as part of the improvement plan. A statement relative to the intent of the developer to provide underground utility service shall be placed on the final plan requisite to final approval of such plan.

2. The provisions in this Ordinance shall not be construed as to limit or interfere with the construction, installation, operation and maintenance of public utility structures or facilities which may hereafter be located within public easements or rights-of-way designated for such purposes.

3. Light standards are to be placed as required by Ordinance. Power sources for such standards shall be placed underground as required.

4. Along arterial roads and major highways all new electrical service should be placed underground.

Section 514. Shade Trees. Shade trees shall be provided by the subdivider or developer along all streets. Trees shall be so located so as not to interfere with the installation and maintenance of sidewalks and utilities. Trees shall be planted not less than forty (40) feet apart no more than fifty (50) feet apart. A minimum size of not less than two (2) inches (measured twelve (12) inches above ground level) shall be planted; provided however, that an alternate plan may be approved consistent with the policy of the Township of Honey Brook encouraging the use of shade trees in subdivisions and developments. Species of trees shall be approved by the Township Supervisors, with the advice of the Planning Commission, or Shade Tree Commission.

Section 515. Specifications. The minimum requirements for all improvements, where applicable, shall be those contained in the Pennsylvania Department of Transportations' Specifications, Form 408, dated 1973 or as later revised.

Section 516. Special Drainage Problems, Flood Plain Areas.

A. Those areas defined as floodplain or flood hazard areas in the Township Zoning Ordinance or the Township Flood Hazard District Ordinance shall be subject to the requirements and restrictions contained herein and in the above noted Ordinances.

In addition, the following regulations shall apply:

(1) The Township Supervisors may, when it is deemed necessary for the health, comfort, safety, or welfare of the present and future population of the area, and necessary to the conservation of water, drainage and sanitary facilities, prohibit subdivision or development of any portion of the property which lies within the floodplain of any stream or drainage course.

(2) All floodplain areas shall be preserved from any and all destruction or damage by clearing, grading, or dumping of earth, waste material, stumps, or other material of any kind.

(3) Any development which creates a significant change in the characteristics of the watershed, thus increasing volume and velocity of surface water runoff, due to the decrease in retention and infiltration of storm water, shall not be permitted until guarantees are made of improvements that will reduce the likelihood of erosion, sedimentation, inundation, and water drainage from peak periods of precipitation and provide for controlled disposal of excess surface water. Such improvements must satisfy the requirements and regulations of the Pennsylvania Department of Environmental Resources.

The Board of Supervisors in its consideration of any preliminary plan of subdivision and land development, shall condition its approval upon the execution of measures designed to prevent accelerated soil erosion and resulting sedimentation, as required by the Pennsylvania Department of Environmental Resources. All applicable regulations and permit requirements of said Department shall be followed by all parties engaged in earth-moving activities.

B. Any natural watercourses not governed by A, above, shall be governed by the following:

(1) All continuously flowing watercourses (as indicated on U.S.G.S. 7-1/2' Quadrangles) shall be maintained in their natural state, except that removal of debris and correction of severe erosion shall be required.

(2) Intermittent watercourses shall be maintained essentially at their existing alignments and gradients except that they may be improved by minor regrading and shall either be

planted in grass or provided with erosion preventive improvements such as rip-rap. Paving of such watercourses shall not be allowed, nor shall piping, except under roads, driveways and walkways.

(3) Intermittent watercourses often are significant elements at the headwaters of larger streams, and are usually small in size. Therefore, developers should be encouraged to design and build around and with respect for these drainageways, and the Supervisors may allow rerouting of these drainageways only when serious considerations so warrant, or when the site drainage will be improved by such proposed alignment changes.

Section 517. Water Supply.

A. The subdivider shall provide public water service to provide adequate supply to each lot in a subdivision.

B. Where no public water service is available and it would be an undue hardship for the subdivider to have the public water service extended, the subdivider may on approval of the Township Supervisors, be permitted to construct a well on each lot. All wells shall be constructed according to present rules and regulations, or any future amendments thereto, of the Department of Environmental Resources, the Chester County Department of Health, and the Township of Honey Brook.

C. The proposed location of the wells shall be shown on the preliminary plan for each lot. Where there are existing wells on the property or adjoining lots, they must also be shown.

D. A circular area with a radius conforming to the rules and regulations or future amendments thereto, of the Department of Environmental Resources, the Chester County Department of Health, and the Township of Honey Brook shall be shown around each well to denote clear space in which no on-site sewage disposal system is to be located.

E. Where public water service is furnished the circles are not necessary, with the exception of those wells lying immediately adjacent to the subdivision. However, the usable area for on-site sewage disposal systems is limited by a clear zone surrounding the water service line to each house as required by the Department of Environmental Resources, the Chester County Department of Health, and the Township of Honey Brook.

F. Hydrants. Fire hydrants shall be located at accessible points throughout the subdivision when public water supply is available, and shall be located within six hundred (600) feet of all existing and proposed structures. Fire hydrants to comply with the local Fire Company requirements.

G. Water Mains. When public water supply is to be installed, the minimum size water main shall be eight (8) inches in diameter.

Section 518. Grading, Excavation, Erosion & Sediment Control

A. Purpose: No development or subdivision shall proceed; no changes shall be made in the contour of the land; no grading, excavating, removal or destruction of the topsoil, trees or other vegetative cover of the land shall be commenced until such time that a Grading, Erosion and Sedimentation Control Plan for minimizing erosion, sedimentation and increased runoff from the tract of ground in question has been processed with, reviewed and approved by the Township; or there has been a determination by the Township that such plans are not necessary, except that this regulation shall not apply to:

(1) Work in a public street or alley or in a Township park, playground, or recreation area or on other public property;

(2) The mining, quarrying, excavating, processing or stockpiling of rock, sand, aggregate or clay unless such work affects the support of adjacent or contiguous property or structures; and

(3) The depositing of rubbish or other material at any land fill operated by the Township.

B. Application. Every application for approval of plans required under Section 518.A., above, shall:

(1) Describe the land on which the proposed work is to be done, by lot, block, tract or street address or similar description which will readily identify and definitely locate the proposed work;

(2) Be accompanied by plans and specifications prepared by a registered engineer, including: a contour map showing the present contours of the land and the proposed contours of the land after completion of the proposed grading; a plot plan showing the location of the grading, boundaries, lot lines, neighboring streets and alleys, buildings, trees over six inches in diameter

two feet above the ground, and sufficient dimensions and other data to show the location of all work; description of the type and classification of the soil with measures used to control erosion and reduce sedimentation and shall insure compliance with the appropriate specifications; details and location of any proposed drainage structures and pipes, walls and cribbing; nature of fill material and such other information as the Township Engineer may require to carry out the purposes of this regulation. All plans shall be dated and bear the name of: (1) the person who prepared the same; (2) the applicant; and (3) the owner of the land. Plans shall be submitted in triplicate; a building permit must be obtained for all walls and cribbing;

(3) State the estimated dates for the starting and completion of the work; and

(4) State the purpose for which the application is filed.

(5) Be accompanied by calculations indicating the volume of storm water runoff and peak discharge from the tract of ground in question before, during and after the proposed work. These calculations shall be based upon the 100-year frequency, 24-hour storm, and the Soil Cover Complex Method unless the applicant can demonstrate the inappropriateness of such method.

The Township Engineer may waive the requirement for any or all plans and specifications listed above provided if he finds that the information on the application is sufficient to show that the work will conform to the provisions of these Regulations. The Township Engineer may call for a conference with applicant to discuss modification of plans presented.

C. Standards for Grading.

1. Excavation. No excavation shall be made with a cut face steeper in slope than two horizontal to one vertical, except under one or more of the following conditions:

(a) The excavation is located so that a line having a slope of two horizontal to one vertical and passing through any portion of the cut face will be entirely inside the property lines of the property on which the excavation is made.

(b) The material in which the excavation is made is sufficiently stable to sustain a slope of steeper than two horizontal to one vertical, and a written statement to

that effect by a civil engineer, licensed by the Commonwealth of Pennsylvania and experienced in erosion control, is submitted and approved by the Township Engineer. The statement shall state that the site has been inspected and that the deviation from the slope specified above will not result in injury to persons or damage to property.

(c) A retaining wall or other approved support is provided to support the face of the excavation.

The Township Engineer may require an excavation to be made with a cut face flatter in slope than two horizontal to one vertical if he finds the material in which the excavation is to be made unusually subject to erosion, or if other conditions exist which make such flatter cut slope necessary for stability and safety.

Excavations shall not extend below the angle of repose or natural slope of the soil under the nearest point of any footing or foundation of any building or structure unless such footing or foundation is first properly underpinned or protected against settlement.

Before commencing any excavation which will in any way affect an adjoining property or structures thereon, the person making or causing the excavation to be made shall notify in writing the owners of the adjoining buildings not less than thirty days before such excavation is to be made that the excavation is to be made. Adjoining properties and structures shall be protected as required by the Building Code of Honey Brook Township.

Grading will not be done in such a way so as to direct water onto the property of another landowner in an unnatural manner. During grading operations, necessary measures for dust control must be exercised. Grading equipment will not be allowed to cross live streams; provisions must be made for the installation of culverts and bridges.

2. Fills. No fill shall be made which creates any exposed surface steeper in slope than two horizontal to one vertical, except under one or more of the following conditions:

(a) The fill, as determined by the Township Engineer, is located so that settlement, sliding or erosion of the fill material will not result in property damage or be a hazard to adjoining property, streets, alleys or buildings.

(b) A written statement shall be submitted to and approved by the Township Engineer from a Professional Engineer, licensed by the Commonwealth of Pennsylvania and experienced in erosion control, certifying that he has inspected the site and that the proposed deviation from the slope specified above will not endanger any property or result in property damage.

(c) Adequate provisions shall be made to prevent surface water from damaging the cut face of excavations of the sloping surfaces of fills.

(d) Fills shall not encroach on floodplains or constructed channels.

(e) Fills placed adjacent to floodplains or constructed channels shall have suitable protection against erosion during periods of flooding.

(f) The Township Engineer may require that the fill be constructed with an exposed surface flatter than two horizontal to one vertical if he finds that under the particular condition such flatter surface is necessary for stability and safety.

(g) Whenever a fill is to be made of materials other than clean soil or earth, the grading shall be subject to the following limitations and requirements:

(1) The fill shall be completed within a reasonable length of time, the said time limit to be determined by the Township Engineer and to be specified on the escrow agreement;

(2) Clean soil or earth shall be placed over the top and exposed surfaces of the fill to a depth sufficient to effectively conceal all materials, other than clean soil or earth, within the fill. Where the nature of the fill requires,

the Township Engineer may require clean soil or earth to be placed over the top and exposed surfaces of the fill to a depth sufficient to conceal all materials at the end of each day's operations.

3. Compaction of Fills. All fills shall be compacted to provide stability of material and to prevent undesirable settlement. The fill shall be spread in a series of layers, each not exceeding twelve inches in thickness, and be compacted by a sheepsfoot roller or other approved method after each layer is spread. The Township Engineer may require tests or other information if he shall determine the condition or materials are such that additional information is necessary.

4. Drainage. Adequate provisions shall be made to prevent any surface waters from damaging the cut face of an excavation or the sloping surface of a fill. Slopes of more than ten feet in vertical height shall be separated by level berms of at least four feet in width. Berm ditches shall be constructed where necessary to prevent erosion and as a safe place to deposit and receive such waters. The Township Engineer may require drainage structures or pipes to be constructed or installed which in his opinion are necessary to prevent erosion damage and to satisfactorily carry off surface waters.

5. Maintenance. The owner of any property on which an excavation or fill has been made shall maintain in good condition and repair all retaining walls, cribbing, drainage structures, fences and other protective devices. The developer shall provide a bond to insure this maintenance for a period of one year after completion and approval by the Township Engineer.

D. General Requirements.

1. The top or bottom edge of slopes shall be at least three feet from property or right-of-way lines of streets in order to permit the normal rounding of the edge without encroaching on the abutting property. At property lines where walls or slopes are steeper than one and one-half to one and six feet or more in height, they shall be protected by a substantial fence located on top of slope. Fence shall be three feet or more in height.

2. The owner of a property shall be responsible to protect and clean up lower properties of silt and debris washing from his property as a result of the regrading of his property.

3. Measures used to control erosion and reduce sedimentation shall as a minimum meet the standards and specifications of the Chester County Soil and Water Conservation District and the Specifications contained herein. The Township Engineer shall ensure compliance with the appropriate specifications, copies of which are available from the District or the Municipal Building of Honey Brook Township.

4. Wood cribbing shall not be permitted except upon expressed approval by the Township Engineer.

E. Performance Principles. The following measures are effective in minimizing erosion and sedimentation and shall be included where applicable in the sedimentation control plan:

1. Stripping of vegetation, regrading or other development shall be done in such a way that will minimize erosion.

2. Development plans shall preserve salient natural features, keep cut-fill operations to a minimum, and ensure conformity with topography so as to create the least erosion potential and adequately handle the volume and velocity of surface runoff.

3. Whenever feasible, natural vegetation shall be retained, protected and supplemented.

4. The disturbed area and the duration of exposure shall be kept to a practical minimum.

5. Disturbed soil shall be stabilized as quickly as practicable.

6. Temporary vegetation and/or mulching shall be used to protect exposed critical areas during development.

7. The permanent (final) vegetation, structural erosion control and drainage measures shall be installed as soon as practical in the development.

8. Provisions shall be made to effectively accommodate the increased runoff caused by changed soil and surface conditions during and after development. Where necessary the rate of surface water runoff will be structurally retarded.

9. Sediment in the runoff water shall be trapped until the distributed area is stabilized by the use of debris basins, sediment basins, silt traps, or similar measures. Sediment shall be removed by the developer as required by the Township Engineer. The capacity of the basin shall be approved by the Township Engineer.

F. Grading for Drainage. In order to provide more suitable sites for building and other uses, improve surface drainage, and control erosion, the following requirements shall be met:

1. All lots, tracts, or parcels shall be graded to provide proper drainage away from buildings and dispose of it without ponding, and all land within a development shall be graded to drain and dispose of surface water without ponding, except where approved by the Board of Supervisors.

2. All drainage provisions shall be of such design to adequately handle the surface runoff and carry it to the nearest suitable outlet such as a curbed street, storm drain, or natural watercourse. Where drainage swales are used to direct surface waters away from buildings, they shall be sodded or planted as required and shall be of such slope, shape and size as to preclude and minimize erosion.

3. Concentration of surface water runoff shall only be permitted in properly designed and maintained swales or watercourses.

4. No increased surface runoff will be permitted to leave the property being subdivided or developed by way of natural watercourses or storm drainage pipes, without first being suitably retained in such a way as to maintain runoff volume existing on the site previous to subdivision or development.

G. Responsibility.

1. Whenever sedimentation is caused by stripping vegetation, regrading or other development, it shall be the responsibility of the person, corporation or other entity causing such sedi-

mentation to remove it from all adjoining surfaces, drainage systems and watercourses and to repair any damage at his expense as quickly as possible.

2. It is the responsibility of any person, corporation or other entity doing any act on or across a communal stream, watercourse or swale or upon the flood plain or right-of-way thereof, to maintain as nearly as possible in its present state the stream, watercourse, swale, flood plain or right-of-way during the pendency of the activity and to return it to its original or equal condition after such activity is completed.

3. Maintenance of drainage facilities or watercourses originating and completely on private property is the responsibility of the owner to their point of open discharge at the property line or at a communal watercourse within the property.

4. No person, corporation or other entity shall block, impede the flow of, alter, construct any structure, or deposit any material or thing, or commit any act which will affect normal or flood flow in any communal stream or watercourse without having obtained prior approval from the Township Supervisors or Department of Environmental Resources, whichever is applicable.

5. Where a land development and/or subdivision is traversed by a watercourse, there shall be provided a drainage easement or right-of-way conforming substantially with the line of such watercourse, and of such width as will be adequate to preserve natural drainage.

6. Each person, corporation or other entity which makes any surface changes shall be required to:

   (a) Handle existing and potential off-site runoff through his development by designing to adequately handle storm runoff from a fully developed area upstream.

   (b) Provide and install at his own expense, in accordance with Township or State requirements, all drainage and erosion control improvements (temporary and permanent) as required.

H. Compliance with Regulations and Procedures.

1. The Board of Supervisors in its consideration of all preliminary plans of subdivision and land development shall condition its approval upon the execution of erosion and sedimentation control measures as required by this Ordinance and other Township ordinances.

2. The installation and design of the required erosion and sediment control measures shall be in accordance with the standards and specifications of Honey Brook Township, as set forth below:

(a) Temporary Cover on Critical Areas	SPEC.No.ESC-1
(b) Permanent Grass and Legume Cover on Critical Areas on Prepared Seedbed	SPEC.NO.ESC-2
(c) Permanent Grass and Legume Cover on Critical Areas on Unprepared Seedbed	SPEC.NO.ESC-3
(d) Sodding	SPEC.NO.ESC-4
(e) Mulching	SPEC.NO.ESC-5
(f) Temporary Diversion	SPEC.NO.ESC-6
(g) Permanent Diversion	SPEC.NO.ESC-7
(h) Grassed Waterway or Outlet	SPEC.NO.ESC-8
(i) Grade Stabilization Structure	SPEC.NO.ESC-9
(j) Debris Basin	SPEC.NO.ESC-10
(k) Drain	SPEC.NO.ESC-11
(l) Drainage-Main or Lateral	SPEC.NO.ESC-12
(m) Seed	SPEC.NO.ESC-13

Stream channel construction on watersheds with areas in excess of 320 acres, or in those cases where downstream hazards exist, will conform to criteria established by the Pennsylvania Department of Environmental Resources.

SPECIFICATION NO. ESC-1

TEMPORARY COVER FOR CRITICAL AREAS

Definition: Stabilizing sediment producing and severely eroded areas by establishing temporary annual grasses or small grains.

Purpose: To provide short term rapid cover for the control of surface runoff and erosion until permanent vegetation or other stabilization materials can be established.

Where Applicable: On all sediment producing areas where the period of exposure will be more than two (2) months, but less than twelve (12) months; such as construction sites, eroding areas within urban and industrial areas, and certain cut and fill slopes.

SPECIFICATIONS

1. Site Preparation
   a. Install needed surface water control measures.
   b. Perform all cultural operations at right angles to the slope.
   c. Apply uniformly 2 tons of ground limestone per acre (100 lbs. per 1,000 sq. ft.) or according to soil test.
   d. Apply uniformly a 10-10-10 fertilizer, or equivalent, according to soil test or at the rate of 400 lbs. per acre (10 lbs. per 1,000 sq. ft.).
   e. Work in lime and fertilizer to a depth of 4 inches using any suitable equipment.

2. Establishment
   a. Select species according to recommended seeding dates from table, Page 65A.
   b. Apply seed uniformly according to the rate indicated in the table, by broadcasting, drilling or hydraulic application.
   c. Cover ryegrass and field bromegrass seeds with 1/4 inch of soil, with suitable equipment. Cover rye or oats with about 2 inches of soil. Cover sudangrass with about 1 inch of soil.

SPECIFICATION NO. ESC-2

PERMANENT GRASS & LEGUME COVER FOR CRITICAL AREAS ON PREPARED SEEDBED

Definition: Stabilizing sediment producing and severely eroded areas by establishing permanent grass and/or legume cover.

Purpose: To provide permanent vegetative cover to control surface runoff and erosion.

Where Applicable: On all sediment producing areas where it is feasible to prepare seedbed and where the period of exposure will be more than twelve (12) months; such as construction sites, and eroding areas within urban and industrial areas.

SPECIFICATIONS

1. Site Preparation
   a. Install needed surface water control measures.
   b. Perform all cultural operations at right angles to the slope.
   c. Apply lime according to soil test or at the rate of 3 tons ground limestone per acre (150 lbs. per 1,000 sq. ft.).
   d. Apply fertilizer according to soil test or work in deeply 1,000 lbs. of 0-20-20 or equivalent per acre (25 lbs. per 1,000 sq. ft) and at the time of seeding, work into the surface 1,000 lbs. of 10-10-10 or equivalent per acre (25 lbs. per 1,000 sq. ft.).

2. Establishment
   a. Smooth and firm seedbed with cultipacker, or other similar equipment, prior to seeding.
   b. Select species according to recommended seeding data from table, Page 66A.
   c. Apply seed uniformly according to rate indicated in the table, by broadcasting, drilling, or hydraulic application.
   d. Cover grass and legume seeds with 1/4 inch of soil, with suitable equipment.
   e. Use sodding, suitable mats, netting, or mulch anchoring methods where there is a heavy concentration of water and it is important to get a quick vegetative cover to prevent gullying.

3. Maintenance
   a. Lime according to soil test every 5 years.
   b. Where grasses predominate, broadcast annually, or as needed, 600 lbs. of 10-10-10 or equivalent per acre (14 lbs. per 1,000 sq. ft.).
   c. Where legumes predominate, broadcast every 3 years, or as needed, 300 lbs. of 0-20-20 or equivalent per acre (7 lbs. per 1,000 sq. ft.).

4. Management
   a. For forage, harvest the first crop when the grass is in the boot stage or the legume is in early bloom. Harvest successive crops before grass begins jointing or when grass is in the boot stage.
   b. For wildlife, delay mowing until nesting period ends (about July 15). Remove heavy concentrations of residue after mowing to prevent smothering.
   c. For all other uses, mow as needed to control weeds, improve appearance, or to maintain stand of desired vegetation.

SPECIFICATION NO. ESC-3

PERMANENT GRASS & LEGUME COVER FOR CRITICAL AREAS ON UNPREPARED SEEDBED

Definition: Stabilizing sediment producing and severely eroded areas by establishing permanent grass and/or legume cover.

Purpose: To provide permanent vegetative cover to control surface runoff and erosion.

Where Applicable: On all sediment producing areas where the period of exposure will be more than twelve (12) months, and a prepared seedbed cannot or will not be made; such as construction sites, and eroding areas within urban and industrial areas.

SPECIFICATIONS

1. Site Preparation
   a. Install needed water control measures.
   b. Where practical, loosen surface by dragging heavy chain or other suitable implement over area to be seeded.
   c. Apply ground limestone according to soil test or at the rate of 3 tons per acre (150 lbs. per 1,000 sq. ft.).
   d. Apply fertilizer according to soil test or at the rate of 800 lbs. of 10-20-20 or equivalent per acre (20 lbs. per 1,000 sq. ft.) at the time of seeding.

2. Establishment
   a. Seed by using one of the mixtures listed in table, Page 68A.
   b. Lime, fertilizer, seed, and mulch may be applied by any method that will give uniform distribution of the materials. Hydraulic application is an approved method.
   c. Apply mulch according to Standard and Specifications for mulching.

3. Maintenance
   a. Lime according to soil test every five years or apply 2 tons of ground limestone per acre every 3 to 5 years as needed (100 lbs. per 1,000 sq. ft.).
   b. Where grasses predominate, broadcast annually or as needed 600 lbs. of 10-10-10 or equivalent per acre (14 lbs. per 1,000 sq. ft.).
   c. Where legumes predominate, broadcast every 3 years or as needed 300 lbs. of 0-20-20 or equivalent per acre (7 lbs. per 1,000 sq. ft.).
   d. Mow sufficiently often to control weeds and rank growth of grasses.

SPECIFICATION NO. ESC-4

SODDING

Definition: Stabilizing sediment producing and severly eroded areas by establishing vegetative cover.

Purpose: To stabilize the area to reduce damages from sediment and surface runoff where there is a heavy concentration of water and it is important to get quick vegetative cover to prevent gullying.

Where Applicable: On all sediment producing areas such as gullied areas, cut and fill slopes, eroding areas within urban, industrial or agricultural areas.

SPECIFICATIONS

1. Site Preparation
   a. Install needed water control measures.
   b. Apply lime according to soil test or at the rate of 3 tons of ground limestone per acre (150 lbs. per 1,000 sq. ft.).
   c. Apply fertilizer according to soil test or work in deeply 1,000 lbs. of 0-20-20 (35 lbs. per 1,000 sq. ft.). Apply and work in to a depth of 1 inch 1,000 lbs. of 10-10-10 per acre (25 lbs. per 1,000 sq. ft.).
   d. Loosen soil surface to a depth of 1 inch with a shallow tillage tool and dampen before laying sod.

2. Selection
   a. Select sod grown from certified seed of adapted varieties and under cultural practices conducive to high quality sod that will be free of any serious thatch, weeds, insects, diseases, and other pest problems.
   b. Select species and varieties best suited for the sites to be planted and purpose for which turf is to be used. Use only varieties tested and approved by State Experiment Stations.
   c. Select sod at least one year old and no older than three years. Cultivated turfgrass is usually considered ready for harvest when a cut portion of sod 3 feet in length and about 1-1/2 feet in width will support its own weight. The most common age of sod when cut is 15 to 24 months.
   d. Select sod cuts of a width and length suited to the equipment and job. Generally, sod cuts are from 12 to 24 inches wide with 12 inches being the most common width. Length of cuts vary from 4 to 8 feet. Sod may be cut and rolled or folded in the middle and stacked on pallets. Folded sod is cut

shorter than rolled sod - about 3 to 4 feet in length. Sod should be cut with a 1/2 to 1 inch layer of soil. About 80% of all rhizomes are in the top 3/4 inch of soil. The thinner sod is cut (1/2 to 3/4 inch), the more quickly it will knit to the site soil.

e. Deliver sod to the site as soon as practical after lifting. During hot weather, delivery should be made within 6 hours and may be extended to 48 hours during cool seasons. It is generally unwise to move sod during July and August. If moved during this period, sod may need to be cut 1-1/4 inches thick and it will require intensive care.

3. Establishment
   a. Lay strips of sod at right angles to direction of slope or flow of water starting at the lowest elevation. Wedge the edges and ends of the sod strips together and tamp or roll. Stagger joints. Make the top of the sod strips flush with the top of the undisturbed ground.
   b. Use wire staples, fine mesh wire, or wood pins and binder twine on very steep slopes to hold sod in place until secured by plant growth.
   c. Irrigate sodded area if unfavorable weather or other conditions prevail It may also be desirable to irrigate area from which sod is to be removed prior to lifting.

4. Management and Maintenance
   a. Lime according to soil test every 5 years.
   b. Topdress annually or as needed with a 10-10-10 fertilizer at the rate of 600 lbs. per acre (14 lbs. per 1,000 sq. ft.).
   c. Mow once or twice a year to reduce undesirable growth.

SPECIFICATION NO. ESC-5

MULCHING

Definition: Applying plant residues or other suitable materials, not produced on the site, to the surface of the soil.

Purpose: To reduce surface runoff and erosion, prevent surface compaction or crusting, conserve moisture, aid in establishing plant cover, and control weeds.

Where Applicable: On any area subject to erosion or which has unfavorable conditions for plant establishment and growth. The practice may be used alone or in conjunction with other structural and vegetative conservation practices such as waterways, ponds, or critical area planting.

SPECIFICATIONS

1. Application
   a. For areas subject to critical erosion install temporary erosion control devices such as furrows, diversions, etc., within or adjacent to area to be mulched.
   b. Select the type of mulch and application rate from Table 1, which will best meet the use and performance requirements.
   c. Determine anchoring requirements if needed and select a method of anchoring from Table 2 which will best meet the specific job requirements.

SPECIFICATION NO. ESC-6

TEMPORARY DIVERSION

Definition: A channel with a supporting ridge on the lower side constructed across a slope. Diversions are installed as an interim measure to protect or facilitate some phase of construction. They usually have a life expectancy of one year or less.

Purpose: To divert water from areas where it is in excess to sites where it can be used or disposed of safely.

Where Applicable: This standard applies to the installation of diversions on urban land, developing areas, and critical areas, where runoff from higher areas is damaging property, causing erosion, contributing to pollution, or preventing the establishment of vegetation on lower areas.

Design Criteria

Compliance with Laws and Regulations:
Design and construction shall be in compliance with state and local laws and regulations.

Capacity:
Peak runoff values used in determining the capacity requirements shall be determined as outlined in Chapter 2, Estimating Runoff, "Engineering Field Manual for Conservation Practices", available in the Soil Conservation Service office, or by other accepted methods. The minimum design 24-hour storm frequencies shall comply with the following table:

Diversion Type	Typical Areas of Protection	Minimum Design Frequency	Freeboard Required
Temporary	Construction roads, land areas, etc.	2 yr.	0.0
	Building sites	5 yr.	0.0

In all cases, the design storm frequency should be chosen to provide protection which is compatible with the hazard or damage that would occur if the diversion should overtop.

Cross Section:
The channel may be parabolic, V-shaped, or trapezoidal. In no case will the side slopes on the channel or ridge be steeper than 1:1. In determining the cross section on temporary diversions, consideration should be given to the frequency of crossing and type of equipment that is anticipated crossing the diversion.

Location:
Diversion location shall be determined by considering outlet conditions, topography, land use, soil type, length of slope and the development layout.

Channel Grade:
The grade may vary from a minimum of 0.55% to a maximum of 1.0% for soils with erosive subsoils (K = 0.37-0.49). The maximum grade may be increased to 2.0% for soils with erosion resistant subsoils (K = 0.17-0.32). (K is the soil erodibility factor used in the Universal Soil Loss Formula).

Velocity:
Permissible design velocities shall be determined by use of the following tables:

Selection of Vegetal Retardance

Average Length of Vegetation-Inches	Retardance Good Stand	Fair Stand
11-24	B (n = .09 - .15)	C (n = .0555 - .085)
6-10	C (n = .055 - .085)	D (n = .045 - .060)
Bare earth (n = .025)	D (n = .045 - .060)	D (n = .045 - .060)

Soil Texture	Bare Channel	Retardance	Permissible Velocities (fps) Channel Vegetation Poor	Fair	Good
Sand, silt, sandy loam, silty loam	1.5	B	1.5	3.0	4.0
		C	1.5	2.5	3.5
		D	1.5	2.0	3.0
silty clay loam sandy clay loam	2.0	B	2.5	4.0	5.0
		C	2.5	3.5	4.5
		D	2.5	3.0	4.0
Clay	3.0	B	3.0	5.0	6.0
		C	3.0	4.5	5.5
		D	3.0	4.0	5.0
Shale or firm rock	5.0	-	--	--	--

Design velocities and channel capacities will be determined by the method outlined in Chapter 9, Diversions, "Engineering Field Manual for Conservation Practices", SCS TP-61 "Handbook of Channel Design for Soil and Water Conservation," Parabolic Channel Design Slide Rule, available in the Soil Conservation Service office, or other accepted methods. In all cases, the design will be based upon the type of channel vegetation expected.

Outlets:
Each diversion shall have an adequate and suitable outlet. The outlet may be a constructed or natural waterway, vegetated area, or other suitable structure.

In all cases, the outlet must convey runoff to a point where overflow will not cause damage. The elevation of the water surface in the diversion shall be equal to or greater than the water surface elevation at the outlet junction when both are flowing at design depth.

CONSTRUCTION SPECIFICATIONS

1. Site Preparation
All trees, brush, stumps and other objectionable material shall be removed and disposed of so they will not interfere with construction or proper functioning of the diversion. All ditches or gullies which must be crossed will be filled prior to or as part of the construction.

2. Diversion Construction
The constructed cross section shall meet the specified dimensions. All sections of the channel shall be free draining. Reverse grades will not be permitted. The top elevation of the ridge shall be the design elevation plus 10% for settlement.

3. Vegetation
The channel and ridge shall be protected against erosion as soon as possible after construction. Erosion protection shall be accomplished by seeding, sodding, or other suitable channel lining. Sodding, seeding, fertilizing and mulching shall conform to the recommendations in the current Pennsylvania Agronomy Guide, available in Chester County Agricultural Extension Service, or the Soil Conservation Service offices.

4. Maintenance
If there is no sediment protection provided on temporary diversions, it should be anticipated that periodic cleanout will be required.

5. Erosion Control
Construction operations shall be carried out in such a manner so that erosion and air and water pollution will be minimized. State and local laws concerning pollution abatement location shall be followed.

SPECIFICATION NO. ESC-7

PERMANENT DIVERSION

Definition: A channel with a supporting ridge on the lower side constructed across a slope. Diversions are installed as an integral part of an overall water disposal system and remain for protection of property.

Purpose: To divert water from areas where it is in excess to sites where it can be used or disposed of safely.

Where Applicable: This standard applies to the installation of diversions on urban land, developing areas, and critical areas where runoff from higher areas is damaging property, causing erosion, contributing to pollution, or preventing the establishment of vegetation on lower areas.

Design Criteria
Compliance with Laws and Regulations:
Design and construction shall be in compliance with state and local laws and regulations.

Capacity:
Peak runoff values used in determining the capacity requirements shall be determined as outlined in Chapter 2, Estimating Runoff, "Engineering Field Manual for Conservation Practices", available in the Soil Conservation Service office, or by other accepted methods. The minimum design 24-hour frequencies and freeboard shall comply with the following table:

Diversion Type	Typical Areas of Protection	Minimum Design Frequency	Freeboard Required
Permanent	Land areas, playfields, recreation areas, etc.	50 yr.	0.3 ft.
	Homes, schools, industrial buildings, etc.	50 yr.	0.5 ft.

In all cases, the design storm frequency should be chosen to provide protection which is compatible with the hazard or damage that would occur if the diversion should overtop.

Cross Section:
The channel may be parabolic, V-shaped or trapezoidal. The side slopes will be flat enough to permit mowing and/or proper maintenance of vegetation.

Location:
Diversion location shall be determined by considering outlet conditions, topography, land use, soil type, length of slope, and the development layout.

Protection Against Sedimentation:
As a minimum, a filter strip of close growing grass shall be maintained above the channel. The width of the filter, measured from the center of the channel, shall be one-half the channel width plus 15 feet.

Channel Grade:
The grade may vary from a minimum of 0.5% to a maximum of 1.0% for soils with erosive subsoils (K = 0.37-0.49). The maximum grade may be increased to 2.0% for soils with erosion resistant subsoils (K = 0.17-0.32). (K is the soil erodibility factor in the Universal Soil Loss Formula).

Velocity:
Permissible design velocities shall be determined by use of the following tables:

Design velocities and channel capacities will be determined by the method outlined in Chapter 9, Diversions "Engineering Field Manual for Conservation Practices", SCS TP-61 "Handbook of Channel Design for Soil and Water Conservation", Parabolic Channel Design Slide Rule, available in the Soil Conservation Service office, or other accepted methods. In all cases, the design will be based upon the type of channel vegetation expected.

Outlets:
Each diversion shall have an adequate and suitable outlet. The outlet may be a constructed or natural waterway, vegetated area, or other suitable structure. In all cases, the outlet must convey runoff to a point where overflow will not cause damage. The elevation of the water surface in the diversion shall be equal to or greater than the water surface elevation at the outlet junction when both are flowing at design depth.

CONSTRUCTION SPECIFICATIONS

1. Site Preparation
All trees, brush, stumps and other objectionable material shall be removed and disposed of so they will not interfere with construction or proper functioning of the diversion. All ditches or gullies which must be crossed will be filled prior to or as part of the construction.

2. Diversion Construction
The constructed cross section shall meet the specified dimensions. All sections of the channel shall be free draining. Reverse grades will not be permitted. The top elevation of the ridge shall be the design elevation plus 10% f4r settlement.

3. Vegetation
The channel and ridge shall be protected against erosion as soon as possible after construction. Erosion protection shall be accomplished by seeding, sodding, or other suitable channel lining. Sodding, seeding, fertilizing and mulching shall conform to the recommendations of the Soil Conservation Service, or the current Pennsylvania Agronomy Guide, available in the Chester County Agricultural Extension Service or the Soil Conservation Service offices.

4. Erosion Control
Construction operations shall be carried out in such a manner so that erosion, air and water pollution will be minimized. State and local laws concerning pollution abatement shall be followed.

SPECIFICATION NO. ESC-8

GRASSED WATERWAY OR OUTLET

Definition: A natural or constructed waterway or outlet shaped or graded and established in suitable vegetation as needed for the safe disposal of runoff from a field, diversion, terrace, or other structure.

Purpose: Grassed waterways or outlets are to provide for the disposal of excess surface water from terraces, diversions, or from natural or other concentrations, without damage by erosion or flooding.

Where Applicable: These practices apply to all sites where added capacity or vegetative protection, or both, are required to control erosion resulting from concentrated runoff where such control can be achieved by these practices alone or in combination with others.

Design Criteria
Compliance with Laws and Regulations:
Design, installation, and/or construction shall comply with state and local laws and regulations.

Capacity:
The minimum capacity shall be that required to confine the peak runoff expected from a 24-hour duration storm of 50-year frequency, except that on slopes of less than one percent out of bank flow may be permitted where such flow will not cause erosion or flooding damage.

Velocities:
Design velocities shall not exceed those in the following table for seeding mixtures.

Slope Range	Permissible Velocities	
	Erosion Resistant Soils	Easily Eroded Soils
%	(K = 0.17-0.32)	(K = 0.37-0.49)
0 - 5	7 fps	5 fps
5 - 10	6 fps	4 fps
Over 10	5 fps	3 fps

K is the soil erodibility factor used in the Universal Soil Loss Formula.

Design procedures and "n" values shall be those contained in Chapter 7, "Engineering Field Manual for Conservation Practices," SCS TP-61 "Handbook of Channel Design for Soil and Water Conservation," or the Slide Rule for Parabolic Channel Design. Generally, a channel should be designed for stability using vegetative retardance D, and for capacity using vegetative retardance C. Design procedures and "n" values are available in the Soil Conservation Service office.

Channel Cross-Section:
The channel may be parabolic or trapezoidal with sufficient area to handle the design runoff at safe velocity. The bottom width of trapezoidal waterways or outlets shall not exceed 100 ft. unless multiple or divided waterways or other means are provided to control meandering of low flows.

Depth:
The minimum depth of a waterway or outlet receiving water from a terrace, diversion, or other channel shall be that depth required to keep the design water surface elevation in the waterway or outlet at, or below, the design water surface elevation in the terrace, diversion, or other channel when both are flowing at design depth. To provide for loss in channel capacity due to the accumulation of vegetal matter, sedimentation, and normal seedbed preparation, the channel depth and width should be increased proportionally in order that the hydraulic properties of the waterway will not be changed.

In parabolic channels this may be accomplished by adding 0.3 ft. to the depth and 4.0 ft. to the top width of the channel, or by using Figure 12 on Page 24 of SCS TP-61. This is not required on waterways located in natural water courses or on slopes of one percent or less where overflow is permissible. SCS TP-61 is available in the Soil Conservation Service office.

Drainage:
Stone centers, tile, or other suitable drainage measures shall be provided in the design for sites having a high water table or where prolonged seepage into the channel is expected to be a problem. The stone center should normally be 18 inches thick in the center of the channel and extend for two-thirds of the top width of the waterway.

Outlet:
A grassed waterway or outlet must empty into an area where the flow will not cause damage by erosion or flooding.

CONSTRUCTION SPECIFICATIONS

1. Site Preparation
   All trees, brush, stumps, and other objectionable material shall be removed and disposed of so they will not interfere with construction or proper functioning of the waterway or outlet.

2. Shaping
   The waterway or outlet shall be shaped or constructed to the specified dimensions. Fills will be compacted as needed to prevent unequal settlement that would cause damage in the completed waterway or outlet. All earth removed and not needed in the construction of the waterway or outlet shall be spread or disposed of so that the resulting fill is free draining. Where soil conditions are unfavorable to the growth of vegetation, topsoil should be stockpiled and respread on the waterway or outlet to establish a condition favorable to growth and maintenance of vegetation. All spoil areas will be stabilized to prevent erosion.

3. Outlet
The waterway or outlet will empty into a stabilized area where the water can be released on a non-erosive grade. The outletting area will be free and clear of restrictions which will cause ponding or impede flows within the waterway or outlet.

4. Vegetation
Waterways or outlets shall be protected against erosion by vegetative means as soon as practical after construction and before diversion or other channels are outletted into them. In urban and developing areas, consideration should be given to sodding of the channel to provide erosion protection as soon after construction as possible.

Sodding, seeding, fertilizing, and mulching shall conform to the recommendations in the Pennsylvania Agronomy Guide, available in the County Agricultural Extension Service or the Soil Conservation Service offices.

5. Erosion and Pollution Control
Construction operations shall be carried out in such a manner so that erosion and air and water pollution will be minimized.

State and local laws concerning pollution abatement shall be followed.

SPECIFICATION NO. ESC-9

GRADE STABILIZATION STRUCTURE

Definition: A structure to stabilize the grade or to control head cutting in natural or artificial channels.

Scope: This standard applies to all types of grade stabilization structures. It does not apply to storm sewers or their component parts.

Purpose: Grade stabilization structures are used to reduce or prevent excessive erosion by reduction of velocities in the watercourse or by providing channel linings or structures that can withstand the higher velocities.

Where Applicable: This practice applies to sites where the capability of earth and vegetative measures is exceeded in the safe handling of water at permissible velocities, where excessive grades or overfall conditions are encountered, or where water is to be lowered structurally from one elevation to another. These structures should generally be planned and installed along with, or as part of, other conservation practices in an overall surface water disposal system.

Design Criteria

Compliance with Laws and Regulations:
Design and construction shall be in compliance with state and local laws and regulations.

General:
Designs and specifications shall be prepared for each structure on an individual job basis depending on its purpose, site conditions, and the basic criteria of the conservation practice with which the structure is planned. Typical structures are as follows:

1. Channel linings of concrete, asphalt, half-round metal pipe or other suitable lining materials - These linings should generally be used where channel velocities exceed the safe velocities for vegetated channels due to increased grade or a change in channel cross section. Adequate protection will be provided to prevent erosion or scour of both ends of the channel lining.

2. Overfall structures of concrete, metal, rock riprap or other suitable material - These structures are used to lower water from one elevation to another. They are applicable where it is desirable to drop the watercourse elevation over a very short horizontal distance. Adequate protection will be provided to prevent erosion or scour at both upstream and downstream ends of overfall structures.

3. Pipe drops of metal pipe with suitable inlet and outlet structures - The inlet structure may consist of a vertical section of pipe or similar material, an embankment or a combination of both. The outlet structure will provide adequate protection against erosion or scouring at the pipe outlet.

Capacity:
Structures which are designed to operate in conjunction with other erosion control practices will have, as a minimum, sufficient capacity to handle the runoff from a storm of the same frequency as that used to design the other practice. However, in selecting a design capacity for structures, consideration should be given to using a storm of greater frequency because of the damage that could be done to the structure if it were to overtop. The minimum design capacity for structures that are not designed to perform in conjunction with other practices shall be that required to handle the runoff from a 24-hour duration storm of 50-year frequency.

Peak runoff values used in determining the capacity requirements shall be determined as outlined in Chapter 2, Estimating Runoff, "Engineering Field Manual for Conservation Practices", available in the Soil Conservation Service office, or by other accepted methods.

Design velocities and capacities shall be determined by using Manning's formula for open channel flow or other appropriate and accepted procedures. Design velocity computations will be based upon a roughness coefficient "n" commensurate with the type of channel lining to be used (see Table following). Design velocities will be the safe range for the type of channel linings used. Structures which involve the retarding of floodwater or the impoundment of water shall be designed using the criteria set forth in the standards and specifications for Ponds or Floodwater Retarding Structures, available in the Soil Conservation Service office, whichever is applicable.

VALUES OF "n" TO BE USED WITH MANNING FORMULA*

Surface	Best	Good
Cast Iron Pipe	.011	.012
Wrought Iron Pipe (Galvanized)	.013	.014
Riveted and Spiral Steel Pipe	.013	.015
Vitrified Sewer Pipe	.010	.013
Clay Drain Tile	.011	.012
Brick in Cement Mortar	.012	.013
Concrete Pipe	.012	.013
Concrete Lined Channels	.012	.014
Semi-Circular Metal Flumes, Smooth	.011	.012
Semi-Circular Metal Flumes, Corrugated	.0225	.025

*From King's Handbook of Hydraulics

SPECIFICATION NO. ESC-10

DEBRIS BASIN

Definition: A barrier or dam constructed across a waterway or at other suitable locations to form a silt or sediment basin.

Scope: This standard covers the installation of debris basins on sites where: (1) Failure of the structure would not result in loss of life, or interruption of use or service of public utilities; and (2) the drainage area does not exceed 150 acres. For the purpose of this standard, debris basins are classified according to the following table:

Type	Max. Drainage Area (Acres)	Max. Height 1/ of Dam (ft.)	Emerg. Spillway	Minimum Design Storm Frequency
1 2/	20	5	Over embankment	50 yr.
2	20	10	In undisturbed ground	50 yr.
3	150	20	In undisturbed ground	50 yr.

1/ Height is measured from the low point of original ground along the centerline of dam to emergency spillway crest.

2/ Type 1 Basins are to be used only where site conditions are such that it is impractical to construct an emergency spillway in undisturbed ground.

Where the site exceeds the above criteria, design will be on an individual basis.

Purpose: To trap and store sediment from eroding areas in order to protect properties or stream channels below the installation from damage by excessive sedimentation.

Where Applicable: This practice applies to areas where land grading or earth moving operations are planned or are underway. It is usually a temporary measure used until the disturbed area is permanently protected against erosion.

Design Criteria

Compliance with Laws and Regulations:
Design, installation, and/or construction shall comply with state and local laws and regulations.

Storage:
The site should provide sediment storage of not less than 0.60 watershed inches (the volume equal to the depth of runoff of 0.60 inches over the entire watershed). Debris basins will be cleaned out when the storage is reduced by sediment to a point where 0.25 watershed inches of storage remain. A basin with less than 0.60 watershed inches storage capacity should be considered only if the site conditions make it impossible or highly impractical to obtain 0.60 watershed inches of storage. In these cases, more frequent clean-out will be required. Storage volume is the volume below the emergency spillway crest. The elevation corresponding to 0.25 watershed inches of storage shall be determined and expressed as a distance below the riser crest.

Spillway Design:
Runoff will be computed by the method outlined in Chapter 2, Estimating Runoff, "Engineering Field Manual for Conservation Practices", available in the Soil Conservation Service office, or other accepted methods. Runoff computations should be based upon the soil cover conditions expected to prevail during the anticipated effective life of the structure.

The combined capacities of the principal and emergency spillways will be sufficient to pass the peak rate of runoff from a 24-hour duration 50-year frequency storm.

1. Pipe spillways - The pipe spillway will consist of a vertical pipe or box type riser joined to a pipe (barrel) which will extend through the embankment and outlet beyond the downstream toe of the fill. The minimum size of the barrel will be 6 inches in diameter. The riser will be perforated to provide for a gradual drawdown after each storm event. The minimum average capacity of the principal spillway will be sufficient to discharge 5 inches of runoff from the drainage area in 24 hours (0.21 c.f.s. per acre of drainage area). See Table 1. and Table 2. on Pages 86A and 86B for capacities of specific pipe combinations for corrugated metal pipe. For other types of metal or concrete pipe, appropriate values shall be used. The riser of the principal spillway shall have a cross-sectional area at least 1.5 times that of the barrel.

a. Crest elevation - The crest elevation of the riser shall be at least 3 ft. below the top elevation of the embankment.
b. Perforated riser - The riser shall be perforated with 1-1/2 inch diameter holes spaced 8 inches vertically and 10 - 12 inches horizontally around the pipe or some other means shall be provided for complete drainage of the pool during times of low inflow.
c. Anti-vortex device - An anti-vortex device will be installed on the top of the riser. The anti-vortex device shall be a thin vertical plate firmly attached to the pipe normal to the centerline of dam. The plate dimensions shall be: length = diameter of the riser plus 12 inches; height = diameter of the barrel.

d. Base - The riser shall have a base attached with a watertight connection. The base shall have sufficient weight to prevent flotation of the riser.

e. Trash rack - An approved trash rack shall be firmly attached to the top of the riser if the pipe spillway conveys 5% or more of the peak rate of runoff from the design storm.

f. Anti-seep collars - Anti-seep collars shall be installed around the pipe conduit within the normal saturation zone when any of the following conditions exist:

1. The settled height of dam exceeds 15 feet.
2. The conduit is of smooth pipe larger than 8 inches in diameter.
3. The conduit is of corrugated metal pipe larger than 12 inches in diameter.

The anti-seep collars and their connections to the pipe shall be watertight. The maximum spacing shall be approximately 14 times the minimum projection of the collar measured perpendicular to the pipe.

2. Emergency spillways - Type 2 and 3 Basins - An emergency spillway will be excavated in undisturbed ground. The emergency spillway cross section shall be trapezoidal with a minimum bottom width of 8 feet.
Type 1 Basins - The embankment may be used as an emergency spillway. In these cases, the downstream slope of the embankment shall be 5: 1 or flatter and the embankment must be immediately protected against erosion by means such as sodding, rock riprap, asphalt coating or other approved methods.

a. Capacity - The minimum capacity of the emergency spillway will be that required to pass the peak rate of runoff from the design storm, less any reduction due to flow in the pipe spillway. Emergency spillway dimensions

can be determined by using Table 3, on Page 88A, or the method outlined in Chapter 11 of "Engineering Field Manual for Conservation Practices," available in the Soil Conservation Service Office.

b. Velocities - The maximum allowable velocity of flow in the exit channel shall be 6 ft. per second for vegetated channels. For channels with erosion protection other than vegetation, velocities shall be in the safe range for the type of protection used.

c. Erosion Protection - Provide for erosion protection by vegetation as prescribed by the Soil Conservation Service Office, or by other suitable means such as rock riprap, asphalt, concrete, etc.

d. Freeboard - Freeboard is the difference between the design flow elevation in the emergency spillway and the top of the settled embankment. The minimum freeboard for Type 2 and Type 3 Basins shall be one foot. Freeboard not required on Type 1 Basins.

3. Embankment (Earth Fill) - Type 1 Basins - The minimum top width shall be 10 feet. The upstream slope shall be no steeper than 3:1. The downstream slope shall be no steeper than 5:1.
Type 2 Basins - The minimum top width shall be 8 feet. The combined upstream and downstream side slopes shall not be less than 5:1 with neither slope steeper than 2:1.
Type 3 Basins - The minimum top width shall be 10 feet. Side slopes shall be no steeper than 2-1/2:1.

4. Embankment (other than Earth Fill) - Type 1 Basins only - The embankment may be constructed of the following materials:

a. Pressure creosoted timber crib - rock filled.

b. Precast reinforced concrete crib - rock filled.

c. Gabions.

When the above material is used for the embankment, a principal spillway is not required; however, the dam shall be pervious to allow for drainage during times of low inflow.

Basins constructed of the above materials should be used only when the sediment to be trapped is coarse grained material such as GW and GP material (Unified Soil Classification System).

CONSTRUCTION SPECIFICATIONS

1. Site Preparation

Areas under the embankment and any structural works shall be cleared, grubbed, and the topsoil stripped to remove trees, vegetation, roots, or other objectionable material. In order to facilitate cleanout and restoration, the pool area will be cleared of all brush and excess trees.

2. Cut-off Trench

A cut-off trench will be excavated along the centerline of dam on earth fill embankments. The minimum depth shall be 2 feet. The cut-off trench shall extend up both abutments to the riser crest elevation. The minimum bottom width shall be 4 ft. but wide enough to permit operation of compaction equipment. The side slopes shall be no steeper than 1:1. Compaction requirements shall be the same as those for embankment. The trench shall be kept free from standing water during the backfill operations.

3. Embankment
The fill material shall be taken from selected borrow areas. It shall be free of roots, woody vegetation, oversize stones, rocks, or other objectionable material. Areas on which fill is to be placed shall be scarified prior to placement of fill. The fill material should contain sufficient moisture so that it can be formed by hand into a ball without crumbling. If water can be squeezed out of the ball, it is too wet for proper compaction. Fill material will be placed in 6 to 8 inch layers and shall be continuous over the entire length of the fill. Compaction will be obtained by routing the hauling equipment over the fill so that the entire surface of the fill is traversed by at least one tread track of the equipment, or compaction shall be achieved by the use of a compactor. The embankment shall be constructed to an elevation 10% higher than the design height to allow for settlement if compaction is obtained with hauling equipment. If compactors are used for compaction, the overbuild may be reduced to 5%.

4. Pipe Spillways
The riser shall be solidly attached to the barrel and all connections shall be watertight. The barrel and riser shall be placed on a firm foundation. The fill material around the pipe spillway will be placed in 4 inch layers and compacted to at least the same density as the adjacent embankment.

5. Emergency Spillway (Type 2 and 3 Basins)
The emergency spillway must be installed in undisturbed earth. The lines and grades must conform to those shown on the plans as nearly as skillful operation of the excavating equipment will permit.

6. Embankment (Other than Earth Fill)
The rock used to fill cribbing or gabions will be hard and durable and of a specified size and gradation.

7. Seeding
Sodding, seeding, fertilizing, and mulching shall conform to the recommendations for permanent seeding in the Pennsylvania Agronomy Guide, available in the Chester County Agricultrual Extension Service or Soil Conservation Service offices.

8. Erosion and Pollution Control
Construction operations will be carried out in such a manner so that erosion and air and water pollution will be minimized. State and local laws concerning pollution abatement shall be followed.

SPECIFICATION NO. ESC-11

DRAIN

Definition: A conduit such as tile, pipe, or tubing installed beneath the ground surface and which collects and/or conveys drainage water.

Scope: This standard covers the installation of subsurface drains in urban or development areas. It does not apply to the installation of foundation drainage systems for buildings.

Purpose: A drain may serve one or more of the following:

1. Improve vegetation in grassed or lawn areas by lowering the ground water.
2. Intercept and prevent water movement into a wet area.
3. Relieve artesian pressure.
4. Remove surface runoff.
5. Serve as an outlet for other drains.
6. To replace natural subsurfacing drainage patterns that are interrupted due to construction operations.

Where Applicable: Drains are used in areas having a high water table where benefits of lowering or controlling ground water or surface runoff justify the installation of such a system.
The soil shall have enough depth and permeability to permit installation of an effective and economically feasible system.

An outlet for the drainage system shall be available, either by gravity flow or by pumping. The outlet shall be adequate for the quantity and quality of discharge to be disposed of, with consideration of possible damages above or below the point of discharge that might involve legal actions under state or local laws.

Design Criteria

The design and installation shall be based on adequate surveys and investigations.

Compliance with Laws and Regulations:

Design, installation and/or construction shall comply with state and local laws and regulations.

Required Capacity of Drains:

To be determined by one or more of the following:

1. Measurement of the rate of subsurface flow at the site.
2. The application of Darcy's law to lateral or artesian subsurface flow.
3. Surveys and comparison of the site with other similar sites where subsurface drainage yields have been measured.
4. The use of inflow rates from the following table:

Soil Texture	Unified Soil Classification	Inflow rate per 1000 ft. of line in c.f.s. 1/
Coarse sand and gravel	GP, GW, SP, SW	0.15 to 1.00
Sandy loam	SM, SC, GM, GC	0.07 to 0.25
Silt loam	CL, ML	0.04 to 0.10
Clay and clay loam	CL, CH, MH	0.02 to 0.20

1/ Required inflow rates for interceptor lines on sloping land should be increased by 10% for slopes 2% to 5%; 20% for slopes 5% to 12%; and 30% for slopes over 12%.

Where surface inlets are used, the design flow from the inlet must be added to the expected inflow to determine the required capacity.

SIZE OF DRAIN

The minimum size of drain shall be equivalent to a 4-inch diameter pipe. The size of drain required shall be computed by applying Manning's formula. The size of drain shall be computed on one of the following assumptions:

1. Hydraulic grade line parallel to the bottom grade of the drain with the drain flowing full at design flow.
2. The drain flowing part full where a steep grade or other condition required excess capacity.
3. Simple interceptor or random drains may be designed without calculating "Q" if the total length of drain above the point of minimum grade does not exceed the following maximum lengths, and surface water or heavy spring flows are not added to the drain.

Minimum Grade of Drain-Percent	Maximum Length 4-Inch Drain	Maximum Length 6-Inch Drain
0.1	300 Feet	800 Feet
0.2	400 Feet	1,200 Feet
0.3	500 Feet	1,500 Feet
0.4	600 Feet	1,700 Feet
0.5	700 Feet	1,900 Feet
1.0	900 Feet	2,700 Feet
1.5	1,100 Feet	3,300 Feet
2.0	1,300 Feet	3,800 Feet
2.5	1,500 Feet	4,200 Feet
3.0	1,600 Feet	4,600 Feet
4.0	1,800 Feet	5,400 Feet
5.0	2,000 Feet	5,800 Feet

4. Use of the Tile Drainage Chart ES-714, found in Soil Conservation Service National Practice Standard Specification #606 available in the Soil Conservation Service office.

Depth, Spacing and Location:
Depth, spacing and location of drain shall be based on site conditions including soil, topography, ground water conditions, and outlets.

Minimum Velocity and Grade:
A minimum velocity of 1.4 feet per second shall be used to establish the minimum grades if site conditions permit. Otherwise, provisions shall be made for prevention of siltation by the use of filters or collection and removal of silt by the use of silt traps.

Maximum Grade and Protection:
On sites where topographic conditions require the use of drains on grades steeper than 2 percent or where design velocities will be greater than indicated in the table which follows, special measures will be used to protect the drain. These measures will be specified for each job based on the particular site conditions. The protective measures shall include one or more of the following:

1. Lay the drains so as to secure tight fit with the inside of one section matching that of the adjoining section.
2. Wrap open joints with tar impregnated paper, burlap or special filter material such as plastic or fiberglass fabrics.
3. Select the least erodible soils for blinding.
4. Tamp blinding material around the drain before backfilling.
5. For continuous pipe or tubing with perforations, completely enclose the pipe with filter material of plastic, fiberglass or properly graded sand and gravel.
6. Install relief wells at abrupt changes in grade.

Maximum Permissible Velocities in Drains Without Protective Measures

Soil Texture	Velocity - Feet Per Second
Sand and Sandy Loam	3.5
Silt and Silt Loam	5.0
Silty Clay Loam	6.0
Clay and Clay Loam	7.0
Coarse Sand and Gravel	9.0

Materials for Drains:

"Drains" include conduits of clay, concrete, bituminized fiber, metal, plastic, or other materials of acceptable quality.

The conduit shall meet strength and durability requirements of the site.

Current specifications as listed below shall be used in determining the quality of the conduit.

The following specifications cover the products currently acceptable for use as drains or for use in determining quality of materials used in drainage installations:

Type	Specification 1/
Clay drain tile	ASTM C 4
Clay drain tile, perforated	ASTM C 498
Clay sewer pipe, standard strength	ASTM C 13
Clay pipe, extra strength	ASTM C 200
Clay pipe, perforated, standard and extra strength	ASTM C 211
Clay pipe, testing	ASTM C 301
Concrete drain tile	ASTM C 412
Concrete pipe for irrigation or drainage	ASTM C 118
Concrete pipe or tile, determining physical properties of	ASTM C 497
Concrete sewer, storm drain, and culvert pipe	ASTM C 14
Reinforced concrete culvert, storm drain, and sewer pipe	ASTM C 76
Perforated concrete pipe	ASTM C 444
Portland Cement	ASTM C 150
Asbestos-cement perforated underdrain pipe	ASTM C 508
Asbestos-cement pipe, testing	ASTM C 500
Bituminized fiber, perforated drainage pipe	Federal Spec. 2/ SS-P-358a
Homogeneous perforated bituminized fiber pipe for general drainage	ASTM D 2311
Homogeneous bituminized fiber pipe, testing	ASTM D 2314
Laminated-wall bituminized fiber perforated pipe for agricultural, land, and general drainage	ASTM D 2417
Laminated-wall bituminized fiber pipe, physical testing of	ASTM D 2315

1/ American Society for Testing and Materials 1916 Race Street, Philadelphia, Pa. 19103

2/ Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402

Type	Specification
Plastic drain and sewer pipe, styrene rubber	Commercial Standards
Perforations, if needed, are to be as specified in Fed. Spec. SS-P-358a	
Plastic drainage tubing, corrugated	
Asbestos-cement non-pressure sewer pipe	ASTM C 248
Pipe, corrugated, Aluminum alloy	Federal Spec. WW-P-402a
Pipe, corrugated, iron or steel, zinc coated	Federal Spec. WW-P-00405

Clay Tile - These specifications may be modified as follows:

Where clay tile will not be subject to freezing and thawing hazards, before or during installation, and where the average frost depth is less than 18 inches, the freezing and thawing and absorption tests may be modified or waived.

Loading:
The allowable loads on drain conduits shall be based on the trench and bedding conditions specified for the job. A factor of safety of not less than 1.5 shall be used in computing the maximum allowable depth of cover for a particular type of conduit.

The table found on page 93A may be used to determine the maximum allowable depth for varying trench widths.

Filters and Filter Material:
Suitable filters shall be used around drains where required by site conditions to prevent sediment accumulation in the conduit. The need for a filter shall be determined by the characteristics of the soil materials at drain depth and the velocity of flow in the conduit.

Not less than 3 inches of filter material shall be used for sand-gravel filters. A recommended method of installation is to place filter material to a depth of 3 inches under the drain, and cover the drain and filter with a sheet of plastic. The filter shall be designed to prevent the material in which the installation is made from entering the drain. Not more than 10 percent of the filter shall pass the No. 60 sieve.

Where fiberglass filter material is used, it shall be manufactured from borosilicate type glass and the manufacturer of the material shall certify that it is suitable for underground use. The fibers shall be of variable size, with some larger fibers intertwined in the mat in a random manner. The material shall cover all open joints and perforations.

Envelopes and Envelope Material:
Envelopes shall be used around drains where required for proper bedding of the conduit, or where necessary to improve the characteristics or flow of groundwater into the conduit.

Materials used for envelopes do not need to meet the gradation requirements of filters, but they shall not contain materials which will cause an accumulation of sediment in the conduit or render the envelopes unsuitable for bedding of the conduit.

Auxiliary Structures and Drain Protection:
The outlet shall be protected against erosion and undermining of the drain, against damaging periods of submergence and against entry of rodents or other animals into the drain. A continuous section of pipe without open joints or perforations shall be used at the outlet end of the line and shall outlet above the normal elevation of low flow in the outlet ditch.

The outlet pipe and its installation shall conform to the following requirements:

1. The minimum length of pipe shall be 8 feet. Two-thirds of the pipe shall be buried in the ditch bank and the cantilevered section shall extend beyond the toe of the ditch side slope or the side slope shall be protected from erosion.

2. Where ice or floating debris may damage the outlet pipe, the outlet shall be recessed to the extent that the cantilevered portion of the pipe will be protected from the current in the ditch.
3. Headwalls which are used for drain outlets shall be adequate in strength and design to avoid washouts and the other failures.
4. Where surface inlets are used in a drain the outlet shall be equipped with a flap gate animal guard.

Watertight conduit strong enough to withstand the loads upon it shall be used where subsurface drains cross under irrigation canals or other ditches. Conduits under roadways shall be designed to withstand the expected loads. Shallow drains through depressional areas and near outlets shall be protected against hazards of farm and other equipment, and freezing and thawing. Junction boxes shall be used where more than two main lines join. Where surface water is to be admitted to drains, inlets shall be designed to exclude debris and prevent sediment from entering the conduit. Drain lines flowing under pressure shall be designed to withstand the resulting pressures and velocity of flow.

Material Specification:
All currently acceptable materials for drains and the applicable specifications are listed on Pages 92 and 93, with the exception of corrugated plastic drainage tubing.

Specifications for corrugated plastic drainage tubing can be found in the Soil Conservation Service National Practice Standard Specification #606, available in the Soil Conservation Service office.

Construction Specifications:
All drains shall be laid to line and grade and covered with approved blinding, envelope, or filter material to a depth of not less than 3 inches over the top of the drain. The upper end of all drain lines will be closed with concrete or other durable material unless connected to a structure.

Earth backfill material will be placed in the trench in such a manner that displacement of the drain will not occur, and so that the filter material, after backfilling, will meet the requirements of the design. The gap between drain pipe joints shall not exceed 1/4-inch for mineral soils or 1/2-inch for organic soils. Openings wider than these shall be covered with fiberglass, or other suitable material.

Where the conduit is to be placed in a rock trench, or where rock is exposed in the bottom of the trench, the rock shall be removed below grade deep enough so that the trench may be backfilled, compacted, and bedded so that the conduit is not less than 2 inches from rock.

Where soft or yielding foundations are encountered in the trench bottom, the foundation shall be stabilized with gravel or other suitable backfill before installing the drain.

Where corrugated plastic drainage tubing is used for the drain conduit, one of the following methods of bedding the tubing shall be used in addition to the above requirements:

1. No filter required
    a. Specially shaped trench bottom - base material suitable for proper bedding. For this material to be suitable, it must not contain hard clods, rocks, or fine material which will cause a silting hazard to the drain.
    The trench bottom shall be shaped to form a semi-circular groove in its center. This groove shall conform to the full width of the tubing and shall have a depth equal to one-half its diameter. After the tube is placed in the excavated groove, friable material from the sides of the trench shall be placed around the tubing, completely filling the trench to a depth of not less than 3 inches over the top of the tube.

b. Conventional trench bottom - flat or slightly concave bottom, no special shaping.
After the trench is excavated, the tube shall be placed and centered in the bottom of the trench. Envelope material shall be placed around the tubing, completely filling the trench flush with the top of the tube. Envelope material for this method shall be sand-gravel material all of which shall pass the 1-1/2 inch sieve, 90 to 100 percent shall pass the 3/4-inch sieve, and not more than 10 percent shall pass the No. 60 sieve.

2. Filter required
   a. Sand-gravel filter to be used - conventional trench. The trench shall be over-excavated to a depth of 3 inches and a 3-inch layer of sand-gravel filter material shall be placed in the bottom of the trench. The tube shall be placed and centered on this layer of filter material while additional filter material is placed around the tubing, completely filling the trench to a depth of 3 inches over the top of the tube; OR a sheet of plastic, which will not seal the perforations in the tube, shall be placed over the tube and filter and the trench completely filled with friable material to a depth of 3 inches over the top of the tube. In narrow trenches the latter method may be needed to meet the minimum requirements for thickness of sand-gravel filters of 3 inches.
   Filter material shall be sand-gravel mixture within the graduation required by the base material in the trench. All of the filter material shall pass the 1-1/2 inch sieve, 90 to 100 percent shall pass the 3/4-inch sieve, and not more than 10 percent shall pass the No. 60 sieve.

b. Fiber glass or plastic cloth or mats to be used.
A semi-circular groove shall be shaped in the bottom of the trench as specified in Item I, a., and a sheet or mat of filter material shall be centered over the groove. After the filter is in place, the tube shall be placed in the groove, pressing the filter into the groove between the tube and the base material. After the tubing is in place, a sheet of filter material or of plastic shall be placed over the top of the tube and the trench completely filled with friable material to a depth of not less than 3 inches over the top of the tube.

Construction operations shall be carried out in such a manner so that erosion and air and water pollution will be minimized. State and local laws concerning pollution abatement shall be complied with.

SPECIFICATION NO. ESC-12

DRAINAGE - MAIN OR LATERAL

Definition: An open drainage ditch constructed to a designed size and grade.

Scope: This Standard covers open ditches for disposal of drainage water primarily collected by surface and subsurface drainage systems in urban and development areas.

Purpose: The purpose of mains and laterals is to dispose of excess surface or subsurface water, intercept ground water, or control ground water levels as a combination of these objectives.

Where Applicable: This practice applies to sites in urban and development areas where surface drainage is desired, or where an outlet is required for subsurface drainage systems.

An outlet for the open drainage system shall be available either by gravity flow or by pumping. The outlet shall provide for the quantity and quality of water to be disposed of, with consideration of possible damages above or below the point of discharge.

Design Criteria

The design and installation shall be based on adequate surveys and investigations.

Compliance with Laws and Regulations:

Design, installation and/or construction shall comply with state and local laws and regulations.

Capacity:

Design capacity shall be based upon an evaluation of the damages that would occur if the drainage ditch should overflow. As a minimum, sufficient capacity shall be provided to safely handle the peak rate of runoff from a 24-hour duration, 50-year frequency storm. Peak runoff rates shall be computed by the method outlined in Chapter 2, Estimating Runoff, "Engineering Field Manual for Conservation Practices," available in the Soil Conservation Service office or by other accepted methods. Capacity will be determined by using Manning's formula for open channel flow. The value of "n" used in Manning's formula shall be that contained in the following table:

Hydraulic Radius	"n"
Less than 2.5	0.040 - 0.045
2.5 - 4.0	.035 - .040
4.1 - 5.0	.030 - .035
More than 5.0	.025 - .030

Velocity:

The minimum velocity of flow should be 1.5 feet per second to eliminate sediment accumulation. On flat grades where the design velocity is below 1.5 feet per second, the cross section shall be adjusted to obtain the highest velocity that depth and maintenance limits permit. The maximum design velocity shall conform to the values in the following table:

Soil Texture	Maximum Velocity Ft./Sec.
Sandy and Sandy Loam	2.5
Silt loam	3.0
Sandy clay loam	3.5
Clay loam	4.0
Stiff clay, fine gravel, graded loam to gravel	5.0
Graded silt to cobbles	5.5
Shale, hardpan and coarse gravel	6.0

Cross Section:
The cross section may be V-shaped or trapezoidal and shall meet the combined requirements of capacity, limiting velocity and depth. Sideslopes shall be stable, meet maintenance requirements, and be designed based on site conditions.

Related Structures and Ditch Protection:
Mains and laterals shall be protected against erosion by grade stabilization structures, grassed waterways, or other suitable structures.

Structures in conjunction with a main or lateral will be designed and constructed according to Soil Conservation Service standards and specifications for the type of structure.

When spoil material is to be placed in banks along the ditch rather than spread over adjacent areas, the spoil bank shall have stable sideslopes. Provisions must be made to channel water through the spoil and into the ditch without causing serious erosion.

CONSTRUCTION SPECIFICATIONS

1. Site Preparation
The areas to be excavated or occupied by spoil banks shall be cleared of trees, brush, and other debris so as not to interfere with construction or proper functioning of the main or lateral.

2. Shaping

The main or lateral will be constructed to the specified dimensions. All fills will be compacted as needed to prevent unequal settlement that would cause damage in the completed main or lateral. All earth removed and not needed in the construction of the main or lateral shall be spread or disposed of so it will not interfere with the functioning of the main or lateral.

Spoil should be placed in depressions or on eroded areas and be spread so that the resulting fill is free draining. Where soil conditions are unfavorable for the growth of vegetation, topsoil should be stockpiled and respread on disturbed areas to establish a condition favorable to growth and maintenance of vegetation. All spoil areas will be stabilized to prevent erosion.

3. Outlet

Mains and laterals will empty into a stabilized area where the water can be released on a nonerosive grade. The outlet area will be free and clear of restrictions which will cause ponding or impede flows within the main or lateral.

4. Vegetation

Mains and laterals will be protected against erosion by vegetative means as soon after construction as practical. Sodding, seeding, fertilizing, and mulching shall conform to the recommendations in the Pennsylvania Technical Guide, available in the Soil Conservation Service office, or the current Pennsylvania Agronomy Guide, available in Chester County Agricultural Extension Service or the Soil Conservation Service offices.

5. Erosion and Pollution Control

Construction operations will be carried out in such a manner that erosion and water and air pollution will be minimized. State and local laws concerning pollution abatement will be followed.

SPECIFICATION NO. ESC-13

SEED SPECIFICATIONS

1. The grading plan shall include the kind(s) of seed to be used and the seeding rates per unit of area.
2. All seeds used in vegetation work shall meet the following minimum requirements:
   a. Conform to the requirements of the Pennsylvania Seed Act current regulations of the Pennsylvania Department of Agriculture, Bureau of Plant Industry.
   b. Be of the latest seed crop available and shall have been tested not more than six months prior to the seeding operation.
   c. Furnished fully tagged or labeled. Labels or tags shall be submitted as proof of quality.
   d. Meet the minimum requirements for purity and germination shown on Table 1 below:

TABLE 1
Seed Quality 1/

Species 2/	Minimum Purity	Percent Germination
Legumes		
Alfalfa (Medicago sp.)	98	85*
Birdsfoot trefoil (Lotus corniculatus)	96	90*
Crownvetch (Cornilla varia)	95	70*
Grasses		
Bromegrass, field (Bromus arvenses)	98	80
Bromegrass, smooth (Bromus intermis)	97	80
Fescue, creeping red (Festuca rubra)	98	85
Fescue, tall (Festuca elatior var. Ky-31)	98	85
Redtop (Agrostis alba)	92	85
Reed Canarygrass (Phalaris arundinacea)	96	80
Ryegrass, annual (Lolium multiflorum)	98	90
Ryegrass, perennial (Lolium perenne)	98	90
Timothy (Phleum pratense)	99	90
Other Annuals		
Oats (Avena sativa)	98	90
Rye (Secale cerale)	97	85
Sudangrass (Sorghum vulgare var. sudanese)	98	80

1/ Seeds containing prohibited and noxious weed seeds are regulated by law. Total weed seed content should be less than 2.50 percent. When seed of the specified germination is not available, permission may be given to use seed of lower quality provided equivalent amounts of pure live seed are furnished. Pure live seed (PLS) is calculated by multiplying % Purity x % Germination x 100.

2/ Adapted varieties may be specified.

* Including hardseed.

3. Final plans for minimizing erosion and sedimentation as approved will be incorporated into the agreement and bond requirements as required under this Ordinance.
4. The approval of plans and specifications for the control of erosion and sedimentation shall be concurrent with the approval of the final plans of subdivision or land developments and become a part thereof.
5. At the time that a building permit is applied for, a review shall be conducted by the Township Engineer to insure conformance with the plan as approved. During the construction further consultative technical assistance will be furnished; if necessary, by the Township Engineer and the Chester County Soil and Water Conservation District. During this development phase, the Township Engineer shall inspect the development site and enforce compliance with the approved plans.
6. Permission for clearing and grading prior to recording of plats may be obtained under temporary easements or other conditions satisfactory to the Township.
7. In the event the developer proceeds to clear and grade prior to recording plats, without satisfactory conditions specified under subparagraph 6, the Board may revoke the approval of the preliminary plan.

Section 519. Sewage Treatment.

A. Standards. In any subdivision or land development in which the subdivider or developer proposes a community sewage treatment system, regardless of the land use or activity served, the following standards shall be applicable, provided, however, that should any such standard be less stringent than any law, ordinance or regulation of the Commonwealth of Pennsylvania or Chester County, the more stringent shall be applicable:

1. No effluent shall be discharged into any point of a watercourse having a drainage area at such point of one square mile or less, or having a seven-day ten-year low flow of 0.1 cubic feet per second, or less.

2. The maximum volume of effluent discharge into a watercourse from all sewage treatment facilities, including municipal treatment facilities, shall at no time exceed 50% of the volume of the watercourse, as measured by the seven-day ten-year low flow of the watercourse at each point of effluent discharge.

3. All discharges of effluent into a watercourse shall be treated to the highest degree of organic reduction as practicable, and in no case shall any effluent be so discharged which fails to meet the following standards:

   (a) The five-day biological oxygen demand (BOD) shall not exceed 5 mg per liter of discharge;

   (b) Ammonia shall not exceed 3 mg per liter of discharge as N;

   (c) Total suspended solids shall not exceed 20 mg per liter of discharge; and

   (d) Total phosphorus shall not exceed 0.5 mg per liter as P.

   All tests shall be conducted in accordance with procedures cited in "Standard Methods for the Examination of Water and Waste Water," 13th Edition (1971), American Public Health Assn., American Water Works Assn., Water Pollution Control Federation.

All treatment facilities shall be designed to meet the aforementioned standards and must be operated at all times at that level of efficiency.

The Township Supervisors may, upon application by the subdivider or developer, permit reasonable deviation from the standards set forth above, provided that the subdivider or developer proves to the satisfaction of the Township Supervisors and/or a qualified authority acceptable to the Supervisors by means of data based on scientifically valid study of the ambient water quality of the watercourse that the requested deviation will not result in a lessening of the ambient water quality of the watercourse or otherwise harm the watercourse. The burden of proving that such deviation shall not result in a lessening of the ambient water quality of the watercourse or otherwise harm the watercourse shall be on the subdivider or developer.

4. The volume of effluent discharge from a community sewage treatment system into any watercourse, whether direct or indirect, shall not exceed that portion of the total permissible volume of effluent discharge, based on the standards set forth in subsection 2 hereof, which the total land area of the development to be served bears to the total drainage area of the watercourse at the proposed point of discharge.

   The Township Supervisors may, upon application by the subdivider or developer, permit reasonable deviation from the standards set forth above, provided that the developer proves to the satisfaction of the Township Supervisors and/or a qualified authority acceptable to the Supervisors by means of data based on scientifically valid study of the ambient water quality of the watercourse that the requested deviation will not result in a lessening of the ambient water quality of the watercourse. The burden of proving that such deviation will not result in a lessening of the ambient water quality of the watercourse shall be on the subdivider or developer.

B. Protection of Natural Environment. Developers are encouraged to utilize, in sewage treatment systems, all available technology for treatment of sewage and/or industrial waste, and wherever possible, methods of effluent disposal alternative to that of discharge into watercourses, which leave the natural environment unharmed.

C. Required Submittals. In any case where the subdivider or developer proposes to utilize a community sewage treatment system, he shall submit as part of his preliminary and final applications the design, working drawings, specifications, operating procedures, and such additional information as may be necessary, which shall demonstrate to the Township Supervisors and/or qualified authority acceptable to the Supervisors that the proposed system, if approved and built, will comply with the standards set forth in subsection A. In addition, the subdivider or developer shall, prior to approval of a final application for subdivision or land development, post a bond in a form acceptable to the Township Solicitor, in an amount sufficient to cover for a period of five (5) years the cost of maintenance, repair and hiring of personnel qualified to operate the system in the event that the owner of the system fails properly to maintain and operate the system within the design standards. The bond shall remain in effect for the length of time that the system shall remain in operation. Operation of the system shall at all times be under the supervision of an operator who has been duly licensed as such by the Commonwealth of Pennsylvania.