Land Grading and Shaping

Definition: This practice alters the surface of the ground to provide for better utilization, improvement of drainage, and erosion control. Large areas with steep slopes are easily graded with modern construction equipment. Land grading and shaping is common to virtually every construction site in West Virginia. This practice requires a well developed plan utilizing engineering surveys and investigations.

Purpose: To permit effective use of the land area for residential and industrial development, other related urban uses, improve surface drainage, and/or control erosion.

Conditions Where Practice Applies: On sites where surface irregularities, slopes, kinds of soil, obstructions, or wetness interfere with planned use; or where such use requires designed land surfaces. Facility sites requiring land grading or shaping may include building areas, playgrounds, parking areas, campsites, etc., and may include areas to be stabilized by surfacing or establishment of vegetation.

Special attention shall be given to maintaining or improving habitat for fish and wildlife where applicable.

Planning Considerations

Water Quantity: Effects of grading on quantity of runoff and surface storage must be considered. Yield of runoff will be increased by removal of vegetation and removal of surface storage areas.

Water Quality

1. Water quality will be effected by an increased rate of erosion during construction. The sediment yield will vary with changes in runoff. Factors to consider are the slope of the land before and after grading, the results caused by the construction process, and the amount of vegetation reestablished on the graded or shaped site.

2. Ground water quality will be affected by decreased loading of dissolved pollutants, particularly the dissolved nutrients from decaying surface residues.

3. Increased land usage and/or activities will have an effect on the quality of both surface and ground water.

Design Criteria

The grading plan shall be based on adequate surveys and investigations. The plan shall show location, slope, and elevation of surfaces to be graded and drainage practices and diversions required. It shall include location and magnitude of 'cuts' and 'fills' where exact finished grades are required. Practices where land grading and shaping are typically required include waterways, lined ditches, diversions, sediment basins, grade stabilization structures, retaining walls, and surface and subsurface drainage.

Shaping: If only shaping is required, the cuts and fills may be estimated by observation or by a minimum amount of work with engineer's level.

Grading: If grading to uniform surfaces is required, the design shall be based on a complete topographic or grid survey.

Earthwork: Side slopes of fills and cuts to be vegetated shall be no steeper than 2h:1v. Design slopes should vary in accordance with the stability of the soil. Side slopes of cuts in rock or unerodible material may be at the angle of repose for the material.

All fills shall be compacted in accordance with the requirements of the facility.

The finished grade will be in accordance with the requirements of the facility. On most areas, the surface shall have a continuous slope without grade reversals to an outlet to facilitate drainage. The length and degree of designed slope shall be within limits suitable to the soil type without causing erosion or ponding.

Depth of grading shall be controlled to prevent undue exposure of, or cuts into, parent material.

Erosion control and drainage: The requirements for erosion control and surface and subsurface drainage shall be included in the erosion and sediment control plan.

Surface drainage, waterways, diversions, subsurface drains, and underground outlets shall meet the applicable federal, state, or local requirements for design and installation.

Safety and environmental considerations: Features to protect land users shall be planned, if appropriate. Excavations shall be far enough from adjacent properties to protect from erosion, sliding, settling, or cracking. No fill shall be placed where it can slide, wash, or flow onto adjacent properties. Neither shall fill be placed that would cause a channel bank to fail from loading, or create a blockage in the channel.

Vegetation: Disturbed areas shall be vegetated as soon as practicable after grading.

Operation and Maintenance

An operation and maintenance plan shall be developed for the area treated. The plan shall be provided to, and discussed with, the land operator. Items that should be considered in the plan are:

1. Periodic inspections.
2. Maintenance of the area by mowing or chemical weed control, where appropriate.
3. Repair of eroding areas.
4. Repair of settlement areas where stump holes were filled or buried vegetative waste has deteriorated.
5. Maintenance of vegetation, where required, by fertilization, liming, or reseeding.

Plans and Specifications

Plans and specifications for land grading and shaping shall describe, in detail, the requirements for applying the practice to achieve its intended purpose.

Specifications may be developed from the following construction specification guide.

Specifications

The land to be graded shall be cleared of excess vegetative matter and trash.

Surface soil shall be removed from the area to the depth shown on the drawings and stockpiled on the outer perimeter of the work area.

If required, the ground surface shall be plowed or disked prior to the grading or shaping operation.
Lift thickness, compaction, overfill allowance, and moisture content of the fill material shall be as described on the drawings.

All grading and shaping operations shall be done to the neat lines and grades shown on the drawings.

Construction shall be done in such a way that chemicals, fuels, lubricants, and waste materials will not pollute air and water. Erosion, air pollution, and water pollution shall be minimized and held within legal limits.

Construction methods and vegetative measures that prevent erosion and control sediment shall be used.

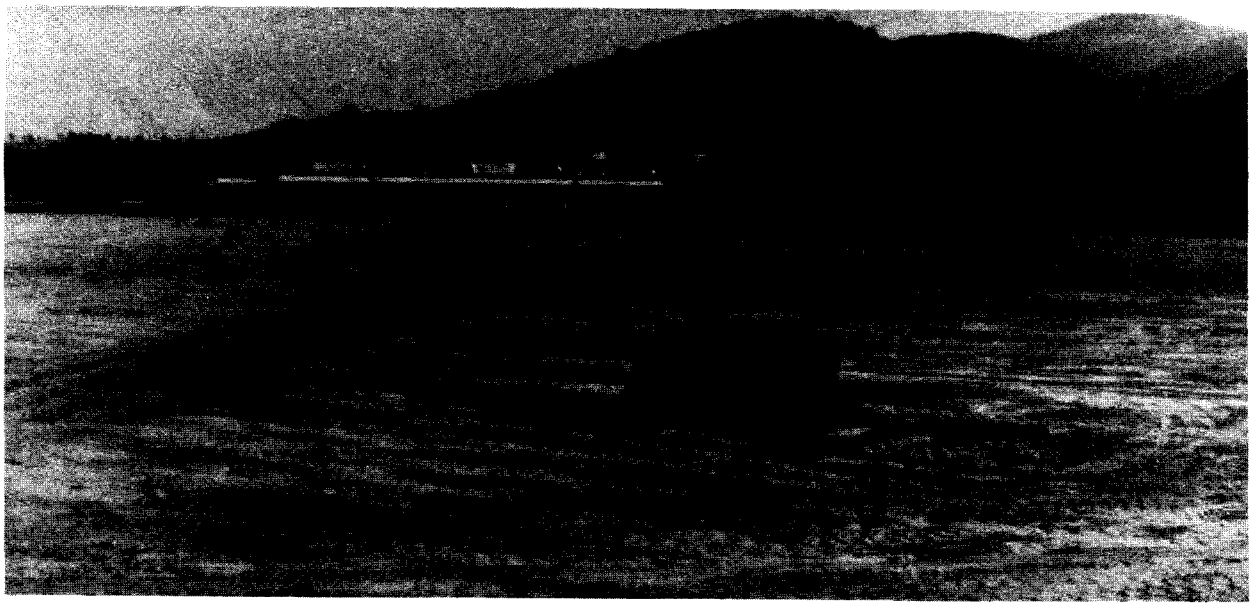
A protective cover of vegetation shall be established on all exposed surfaces where soil and climatic conditions permit. Lime and fertilizer shall be spread at the specified rate and shall be disked into the soil to a depth of 4 inches to prepare a seedbed. Seed and mulch shall be applied at the specified rate. In some cases, temporary vegetation may be used for protection until conditions are suitable for establishment of permanent vegetation.

Where soil or climatic conditions do not permit the establishment of vegetation, and protection is needed, nonvegetative means such as mulches or gravel may be used.

All work shall be done such that the installed practice gives a completed and finished appearance.

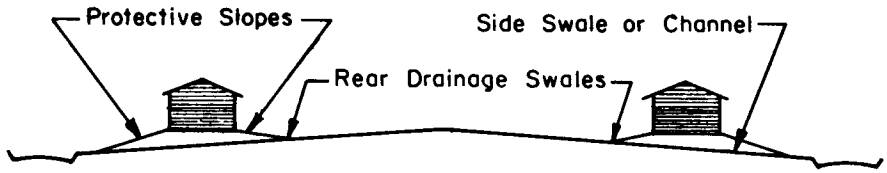
Design Aids

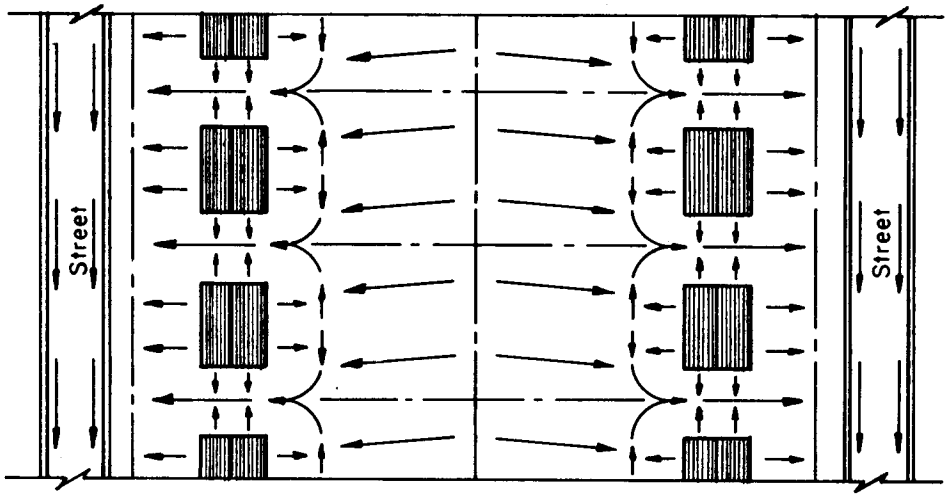
Figures 1 through 4 show examples of four types of grading for a block area under different topographic conditions.

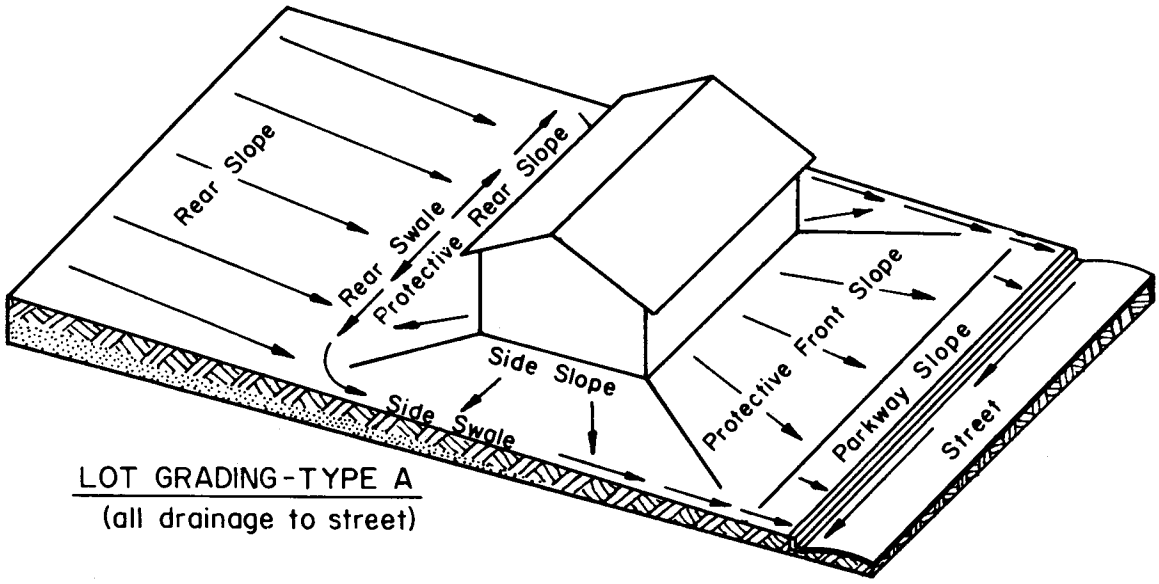


A land-grading project for an elementary school is pictured near the completion stage.

LAND GRADING—URBAN AREAS





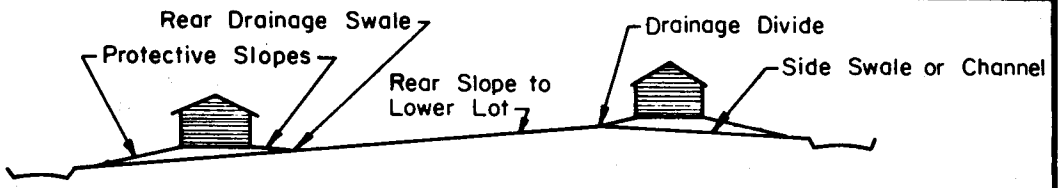


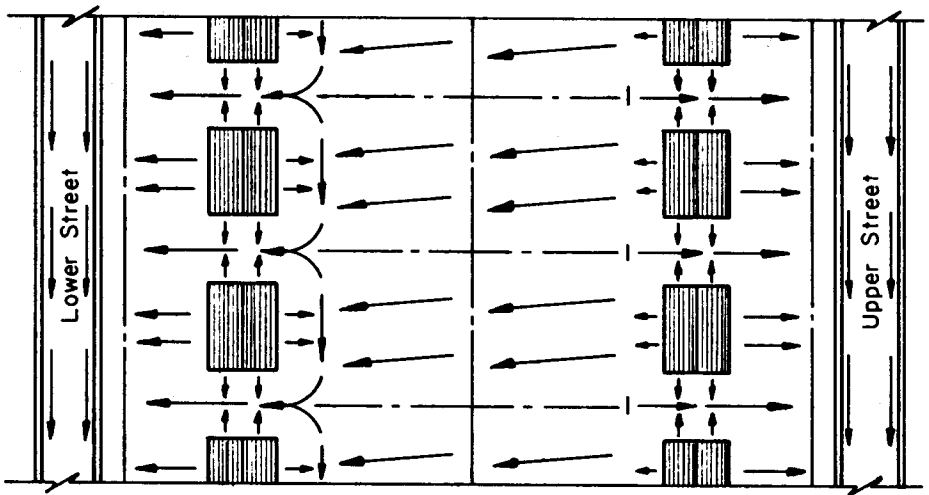
EXAMPLE: BLOCK GRADING TYPE I

Ridge Along Rear Lot Lines

REFERENCE		
"Minimum Property Standards for One and Two Living Units" HUD-FHA November 1966 FHA No. 300	US DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE WEST VIRGINIA	***Figure 1***

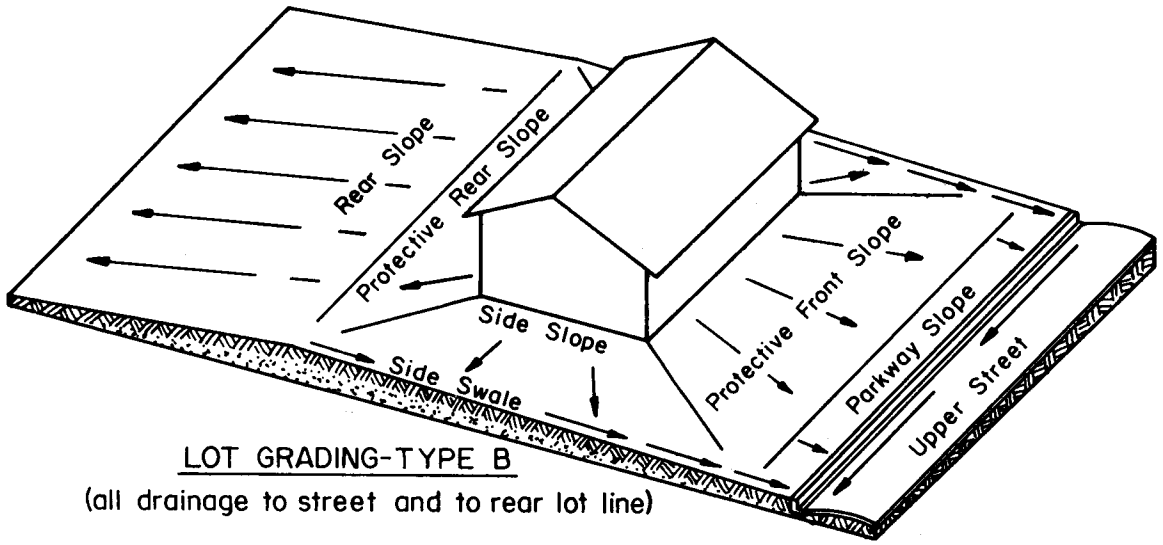
LAND GRADING - URBAN AREAS





LOT GRADING - TYPE A

LOT GRADING - TYPE B



LOT GRADING-TYPE B

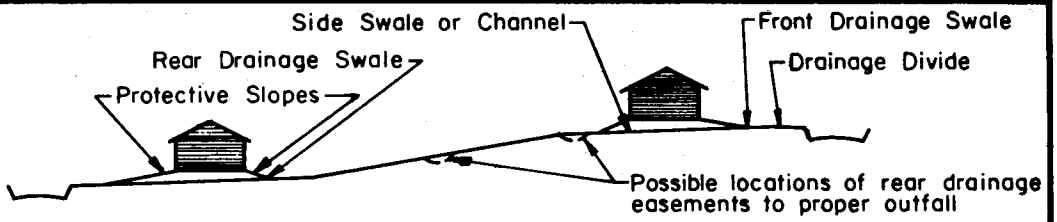
(all drainage to street and to rear lot line)

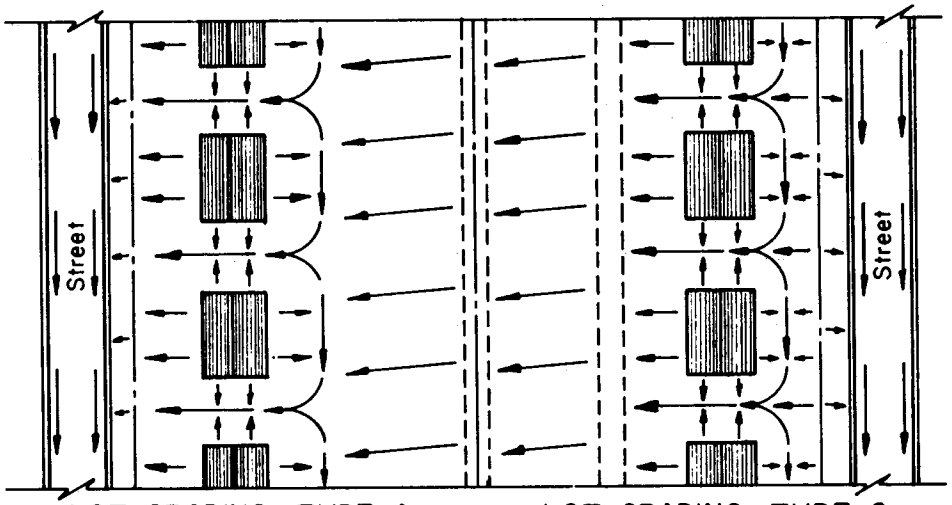
EXAMPLE: BLOCK GRADING TYPE 2

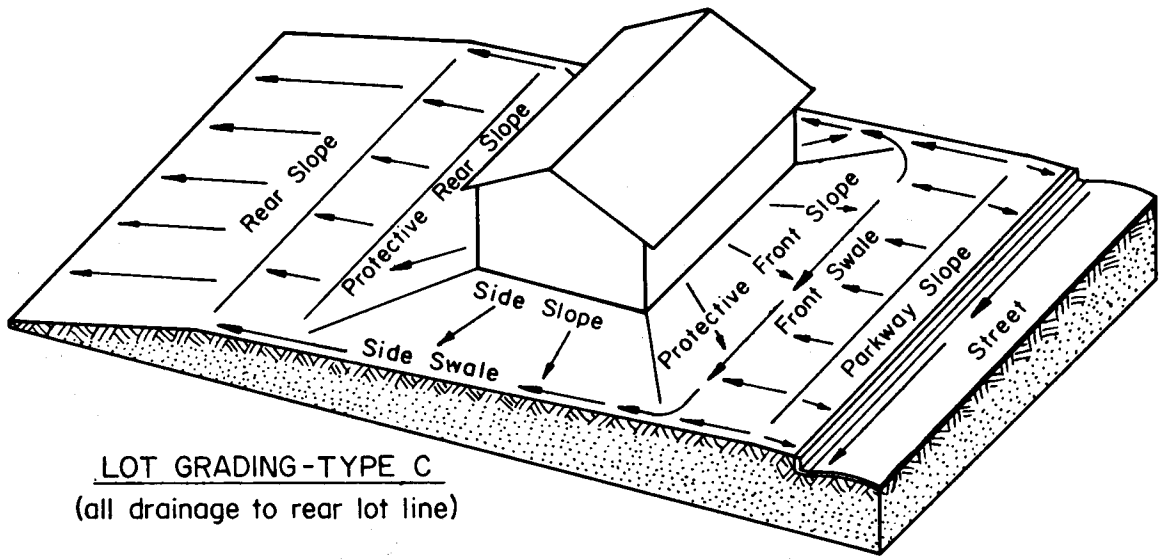
Gentle Cross Slope

REFERENCE		
"Minimum Property Standards for One and Two Living Units" HUD-FHA November 1966 FHA No. 300	US DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE WEST VIRGINIA	***Figure 2***

LAND GRADING – URBAN AREAS





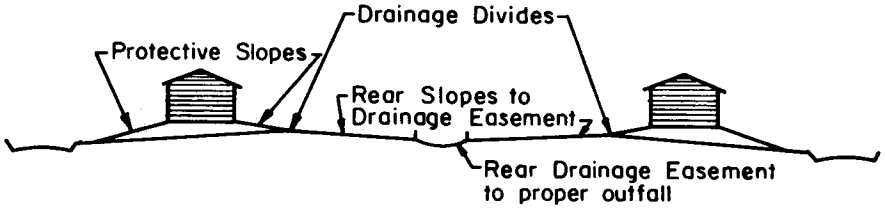


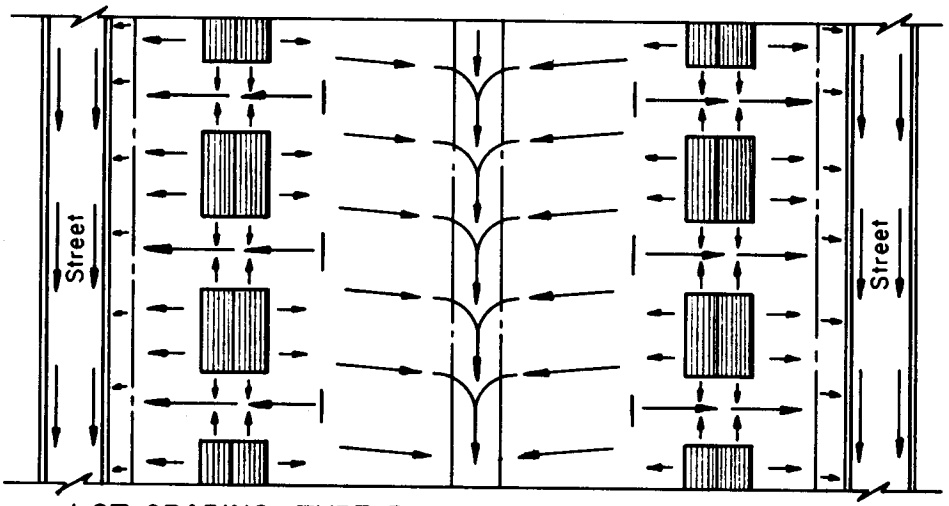
LOT GRADING - TYPE C
(all drainage to rear lot line)

EXAMPLE: BLOCK GRADING TYPE 3
Steep Cross-Slope

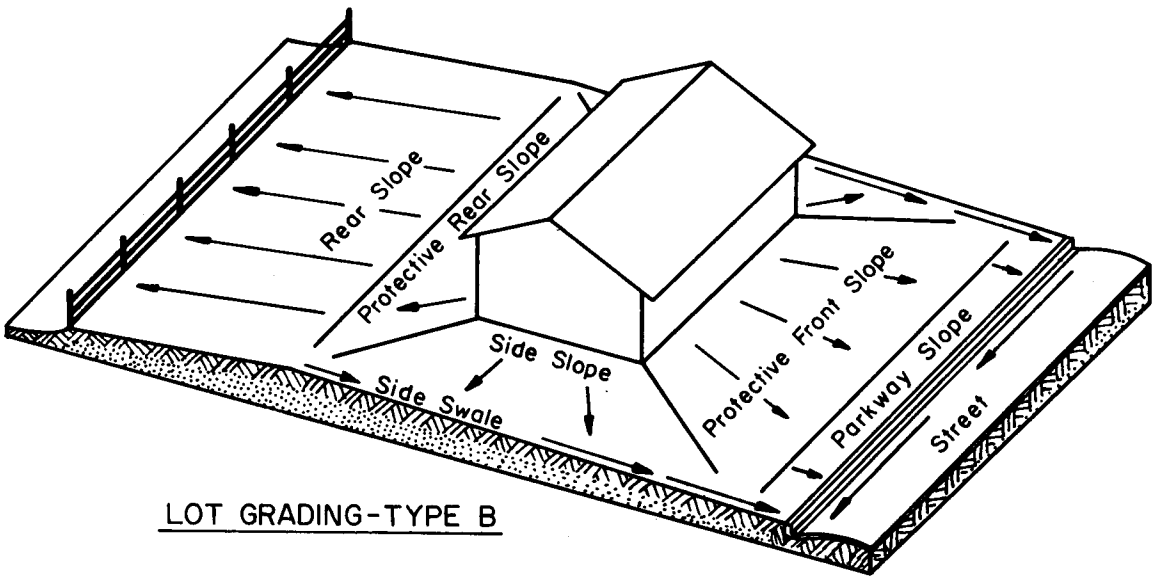
REFERENCE		
"Minimum Property Standards for One and Two Living Units" HUD-FHA November 1966 FHA No. 300	US DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE WEST VIRGINIA	***Figure 3***

LAND GRADING - URBAN AREAS





LOT GRADING - TYPE B LOT GRADING - TYPE B



LOT GRADING - TYPE B

EXAMPLE: BLOCK GRADING TYPE 4

Valley Along Rear Lot Lines

REFERENCE		
"Minimum Property Standards for One and Two Living Units" HUD-FHA November 1966 FHA No. 300	US DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE WEST VIRGINIA	*Figure 4*