

SITE GRADING AND DRAINAGE GUIDELINES

Construction complaints and structural defect claims continue to be numerous due to inadequate grading and drainage of the sites. The following guidelines, applicable to all newly constructed properties, should be monitored by each field office when performing required review of construction exhibits as they relate to the builder certification program and compliance inspections (both HUD processed and Direct Endorsement. This guideline should also be reviewed in training sessions with fee and staff inspectors.

Building codes accepted under 24 CFR 200.926a do not cover all site grading and drainage conditions. However, 200.926d(b)(3) Site Conditions, requires the property to be free of those foreseeable hazards and adverse conditions which may affect the health and safety of the occupants or the structural soundness of improvements, or which may impair customary use and enjoyment of the property. 200.926d(c)(2) and 200.926d(c)(4) include additional site design requirements.

I. OBJECTIVE.

A. Drainage of Surface Water should be provided away from all sides of all buildings and off the lot in a manner that will:

- 1) Minimize possibility of dampness in basements and crawl spaces;
- 2) Prevent adverse supporting soil behavior;
- 3) Prevent soil erosion; and
- 4) Prevent standing (or ponding) of water on site;

In arid areas, controlled ponding for irrigation is permitted if emergency overflows are provided to protect buildings. Walks, driveways, retaining walls and other improvements should be constructed so as not to interfere with drainage. Required walks should not be used as drainage channels.

(I.)

B. Site Grading and Drainage should:

- 1) Provide suitable access from abutting street to the dwelling and any accessory buildings;
- 2) Provide immediate diversion of water away from buildings and off the site;
- 3) Avoid concentrating runoff onto neighboring properties where erosion or other damage may be caused;
- 4) Provide usable outdoor space for occupants; and
- 5) Minimize erosion.

II. FINISH GRADING.

A. General. All unpaved lot areas, except those preserved in an appropriate natural condition, should be fine graded to provide smooth even surfaces conforming to elevations noted below. All visible rock and debris should be removed prior to fine grading.

B. Minimum Protective Slopes. All walls and foundations of buildings and any water-supply well should be provided with protective slopes to assure immediate drainage and diversion of surface water away from these structures and off the site.

- 1) Provide minimum fall of 6 inches away from structure in 10 feet, except as restricted by side lot lines or other major considerations, without regard to soil type or ground frost conditions. The horizontal length of such slopes may be reduced as necessary at building corners and side yards.
- 2) Provide at least 6 inches in 25 feet (2% gradient) in all other unpaved areas subject to ground frost, expansive soils or collapsible soils, or at least 3 inches in 25 feet (1% gradient) in unpaved areas not

subject to such conditions.

If minimum slopes cannot be attained, paved gutters or other drainage structures may be installed as acceptable to the Director of Housing (or designee) or DE Underwriter.

- a. All unpaved areas should slope continuously at the above gradients to lower elevations off the site, or to a drainage structure on the lot.
- b. Drainage swales or valleys formed by intersecting slopes should have adequate depth, width and longitudinal gradient to carry away the maximum predictable volume of storm water runoff.
 1. Gradients of unpaved swales should not be less than that required above for other unpaved areas.
 2. Surface erosion protection should be in place to prevent accumulation of water in critical drainage swales.
- c. Where catch basins or inlets are installed, other than at required basement areaways, finish grade elevations of adjoining areas should provide for emergency surface overflow so that, in event of failure of catch basins or inlets, buildings and window wells (or areaways) will be protected against flooding.
- d. Areaways for basement windows, entrances, and garage entrances should be provided with effective drainage facilities. Catchment area should be as small as possible and must be protected from overflow of stormwater from adjacent areas.
- e. Roof drainage should discharge at least 5 feet away from building walls when expansive, collapsible or erodible soils are present.

(II.)

- C. Maximum Slopes. Height and steepness of slopes and maximum gradients of unpaved drainage channels should be

such as can be satisfactorily maintained without erosion or land slippage and should provide satisfactory access to and around the structure.

- 1) For access around buildings and for maintenance of building and lot improvements, provide an area generally at least 4 feet wide with a gradient away from building no steeper than 1 in 10 (10% gradient).
 - 2) Where considered necessary by Director of Housing (or designee) or DE Underwriter, precautionary measures should be taken (i.e., retaining walls, sodding or planting, etc.) to stabilize the soil.
- D. Suitable Drainage Structures such as paved gutters, drain inlets and subsurface drain lines should be installed where necessary to protect against dampness, flooding, erosion or other damage by surface water or ground water. Drainage structures should be properly connected to adequate outlets that are protected, where necessary, by recorded permanent easements.

Perimeter foundation drains are necessary on all houses with basements or potentially habitable living space below finish exterior earth grade or in other situations where water and/or soil conditions warrant their use. Outlets must not permit backflow into subsurface drains.

III. WALKS, STEPS AND DRIVEWAYS.

- A. General. A walk and any necessary step(s) should provide safe and convenient use from house directly to the street or to a driveway connected to a street. Walk and step construction should be of durable and appropriate material, on stable, adequately drained subgrade or bed.
- B. Walk Design.
- 1) Gradient should not be steeper than 1 in 20 (5%) in areas subject to frequent freezing or 1 in 10 (10%) in other areas.

(III.B.)

- 2) Cross-slope should be adequate for immediate drainage of surface water off the walk; required walk must not be used as a drainage channel.

- 3) Walk surfaces should be at or below adjacent ground elevations.

C. Step Design.

- 1) Width should not be less than width of walk that is served.
- 2) A single step in a walk and any flight of steps of more than 5 feet total rise should be avoided wherever practical; substantial handrail of durable construction must be provided if more than a 30-inch rise in a single flight.

- D. Driveway should be provided from street or alley to the garage or carport, if any; if no garage or carport, a driveway will generally extend to rear line of dwelling. In case of unusual difficulty or hardship, other parking space acceptable to Director of Housing (or designee) or DE Underwriter may be provided.

Construction should be with suitable subgrade, base, drainage and surfacing so as to be durable under the use and maintenance contemplated.

- 1) Longitudinal gradient should not be less than one percent nor steeper than permitted for walks if driveway is also used as a required walk. If used only as a driveway, no less than one percent (1%) and no steeper than 1 in 7 (14%), except that in areas of heavy snow fall or ice build-up, longitudinal gradient should not be steeper than 7%. Crown, or cross slope, should not be greater than 5%.
- 2) Grade transitions should be provided at top and bottom of a steep driveway to prevent dragging of vehicle undercarriage or bumper guards.
- 3) Gradient of a required parking space should not be steeper than 1 in 20 (5%) nor less than one percent.

