

ARC 211 handout 11/3/2006

Recommended Grading Standards and Critical Grades

Based on information from the book:

Principles and Practices of Grading, Drainage and Road Alignment: An Ecologic Approach

Except where noted with a *. This information is from the Center for Universal Design at NCSU or the NC Building Code.

Except where marked with**. This information from the American with Disabilities Act (ADA)

FEATURE	IDEAL GRADIENT		ALLOWABLE GRADIENT	
	Maximum	Minimum	Maximum	Minimum
Lawn Areas	Maximum	Minimum	Maximum	Minimum
Recreational, games	3%	2%	5%	1%
Mowed Banks w/grass	33%	--	33%	--
Unmowed banks w/cover, vines, etc.	50%, varies w/soil type	--	50%, varies w/soil type	--
Accessible Lawns	5%*	--	8.33% (1:12)	--
Concrete Walks	Maximum	Minimum	Maximum	Minimum
Approaches, platforms	5%	0.5% (1:200) with cross pitch of 2%	8%	0.5% with cross pitch of 2%
Service Areas	8%	0.5% with cross pitch of 2%	10%	0.5% with cross pitch of 2%
Accessible Ramps**	6.25% (1:16) (landings 0.5%)**	5% (1:20) (1:16 to 1:20) (landings 0.5%)**	8.33% (1:12) (landings 0.5%)**	6.25% (1:16) (landings 0.5%)**
Terraces, Sitting Areas	Maximum	Minimum	Maximum	Minimum
Concrete	2%	0.5%	3%	0.5%
Flagstone, brick, slate	2%	1%	3%	1%
Streets	Maximum	Minimum	Maximum	Minimum
Concrete crowned w/curb and gutter	5%	1%	11%	0.5%
Asphalt crowned w/curb and gutter	5%	1%	11%	0.5%
Highways				
Slope becomes obvious, heavy trucks slow down				3%
Most cars can go up w/o gears or down w/o brakes, ideal maximum for city				5%
Maximum grade recommended by American Assoc. of State Highway Officials				7%
Grade allowable if justified by topography; steeper grades need special features such as truck runoffs for runaway vehicles.				10%

Accessible/Universal Design in a home:

http://www.design.ncsu.edu/cud/pubs_p/docs/UDinHousing.pdf

Unified Soil Classification System

Based on information from the book:

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MAJOR SOIL CLASSES	BASIC CHARACTER	ABBREV	DESCRIPTION	VALUE AS FOUNDATION	VALUE AS BASE UNDER PAVEMENT	COMPRESSIBILITY & EXPANSION	DRAINAGE CHARACTER
Coarse Grained Soils	Gravel and gravelly soils	GW	Well graded gravels, or gravel sands, little or no fines	Excellent	Good	Almost none	Excellent
		GP	Poorly graded gravels or gravel-sands mixtures, little or no fines	Good to excellent	Poor to fair	Almost none	Excellent
		GM	Silty gravels, gravel-sand, silt mixtures	Good to excellent	Fair to good	Very slight	Fair to poor
		CC	Clayey gravels, gravel-sand-clay mixtures	Good	Poor	Slight	Poor
	Sand and sandy soils	SW	Well-graded sands or gravelly sands, little or no fines	Good	Poor	Almost none	Excellent
		SP	Poorly graded sands or gravelly sands, little or no fines	Fair to good	Poor to not suitable	Almost none	Excellent
		SM	Silty sands, sand-silt mixtures	Fair to good	Poor	Very slight	Fair to poor
		CC	Clayey sands, sand clay mixtures	Poor to fair	Not suitable	Slight to medium	Poor
Fine Grained Soils	Silts and Clays	ML	Inorganic silts and very fine sands, rock, flour, silts or clays, fine sands or clayey silts with slight plasticity.	Fair to poor	Not suitable	Slight to medium	Fair to poor
		CL	Inorganic clays of low to medium elasticity, gravelly clays, sandy clays, silty clays, clays	Fair to poor	Not suitable	Medium	Practically impervious
		OL	Organic silts and organic silt-clays or non-plasticity	Poor	Not suitable	Medium to high	Poor
	Silts and Clays	MN	Inorganic silts, micaceous, or diatomaceous fine sandy or silty soils, elastic silts	Poor	Not suitable	High	Poor to fair
		CH	Inorganic clays of high elasticity, fat clays	Poor to very poor	Not suitable	High	Practically impervious
		CH	Organic clays of high plasticity, organic silts	Poor to very poor	Not suitable	High	Practically impervious
Highly Organic Soils		PT	Peat and other highly organic soils	Not suitable	Not suitable	Very high	Fair to poor