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Division of Oil, Gas & Mining

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UTAH DIVISION OF OIL, GAS AND MINING
FACSIMILE COVER SHEET

DATE: 6/20/05

FAX#: (435) 637-8860

ATTN: Mike Glasson

COMPANY: Andalex Resources, Inc.

NUMBER OF PAGES (INCLUDING THIS ONE): 11

FROM: Priscilla Burton

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MESSAGES: Mike - Soil Description Form is from NRCS. If you need a more ledgible copy - try them. I've also sent some pages from the "Field Book for Describing and Sampling Soils." This book is available on line and I'll email you the website.

Priscilla.

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SCS-SOILS-232G
REV. 12-70
FILE CODE SOILS-11

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL DESCRIPTION

Soil type | File No.

Date | Stop No.

Classification

Location

N. veg. (or crop) | Climate

Parent material

Physiography

Relief | Drainage | Salt or alkali

Elevation | Gr. water | Stoniness

Slope | Moisture

Aspect | Root distrib. | % Clay *

Erosion | % Coarse fragments * | % Coarser than V.F.S. *

Permeability

Additional notes

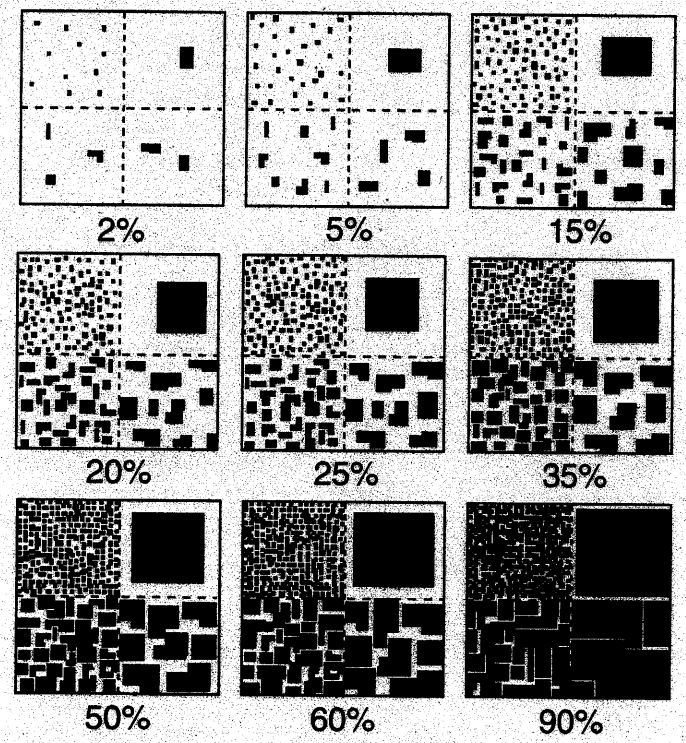
* Control section average

Horizon	Depth	Color		Texture	Structure	Consistence			Reaction	Boundary				
		Dry	Moist			Dry	Moist	Wet						

Compiled by: P.J. Schoeneberger, D.A. Wysocki, E.C. Benham, and H. LaGarry, NRCS, Lincoln, NE.

EXAMPLES OF PERCENT OF AREA COVERED

The following graphic can be used for various data elements to convey "Amount" or "Quantity". ***NOTE***: Within any given box, each quadrant contains the same total area covered, just different sized objects.



PORES DISCUSSION

Pores are the air or water filled voids in soil. Historically, description of soil pores, called "nonmatrix" pores in the Soil Survey Manual (Soil Survey Staff, 1993), excluded inter-structural voids, cracks, and in some schemes, interstitial pores. *Inter-structural voids* (i.e., the sub-planar fractures between peds; also called interpedal or structural faces/planes), which can be inferred from soil structure descriptions, are not recorded directly. *Cracks* can be assessed independently (Soil Survey Staff, 1993). *Interstitial pores* (i.e. visible, primary packing voids) may be visually estimated, especially for fragmental soils, or can be inferred from soil porosity, bulk density, and particle size distribution. Clearly, one cannot assess the smallest interstitial pores (e.g., < 0.05 mm) in the field. Field observations are limited to those that can be seen through a 10X hands lens, or larger. Field estimates of interstitial pores are considered to be somewhat tenuous, but useful.

PORES

Record **Quantity** and **Size** of pores for each horizon. Description of soil pore **Shape** and **Vertical Continuity** is optional. A complete example for pores is: *common, medium, tubular pores, throughout* or *c, m, TU (pores), T.*

PORES - QUANTITY - See and use **Quantity (Roots and Pores)**.

PORES - SIZE - See and use **Size (Roots and Pores)**.

PORES - SHAPE (or Type) - Record the dominant form (or "type") of pores discernible with a 10X hand lens and by the unaided eye. [See following graphic.]

Description	Code		Criteria
	PDP	NASIS	
SOIL PORES [1]			
Dendritic Tubular	TE	DT	Cylindrical, elongated, branching voids; e.g., *empty root channels.*
Irregular	—	IG	Non-connected cavities, chambers; e.g., *vughs*; various shapes.
Tubular	TU	TU	Cylindrical and elongated voids; e.g., *worm tunnels.*
Vesicular	VS	VE	Ovoid to spherical voids; e.g., *solidified pseudomorphs of entrapped, gas bubbles concentrated below a crust*; most common in arid to semi-arid environments.
PRIMARY PACKING VOIDS [2]			
Interstitial	IR	IR	Voids between sand grains or rock fragments.

ROOTS

Record the **Quantity**, **Size**, and **Location** of roots in each horizon. ***NOTE***: Describe **Pores** using the same **Quantity** and **Size** classes and criteria as **Roots** (use the combined tables). A complete example for roots is: *Many, fine, roots In Mat at Top of Horizon* or *3, f (roots), M.*

ROOTS - QUANTITY (Roots and Pores) - Describe the quantity (number) of roots for each size class in a horizontal plane. (***NOTE***: Typically, this is done across a vertical plane, such as a pit face.) Record the average quantity from 3 to 5 representative unit areas. ***CAUTION***: The unit area that is evaluated varies with the *Size Class* of the roots being considered. Use the appropriate unit area stated in the *Soil Area Observed* column of the "Size (Roots and Pores) Table". In NASIS and PDP, record the actual number of roots/unit area (which outputs the appropriate class). Use class names in narrative description.

Quantity Class [1]	Code		Average Count [2] (per unit area)
	Conv	NASIS	
Few	1	#	< 1 per area
Very Few [1]	—	#	< 0.2 per area
Moderately Few [1]	—	#	0.2 to < 1 per area
Common	2	#	1 to < 5 per area
Many	3	#	≥ 5 per area

[1] The *Very Few* and *Moderately Few* sub-classes can be described for roots (optional) but do not apply to pores.

[2] The applicable area for appraisal varies with the size of roots or pores. Use the appropriate area stated in the *Soil Area Assessed* column of the "Size (Roots and Pores) Table" or use the following graphic.

ROOTS - SIZE (Roots and Pores) - See the following graphic for size.

Size Class	Code		Diameter	Soil Area [1] Assessed
	Conv	NASIS		
Very Fine	vf	VF	< 1 mm	1 cm^2
Fine	f	F	1 to < 2 mm	1 cm^2
Medium	m	M	2 to < 5 mm	1 dm^2
Coarse	co	C	5 to < 10 mm	1 dm^2
Very Coarse	vc	VC	≥ 10 mm	1 m^2

[1] One dm^2 = a square that is 10 cm on a side, or 100 cm^2.

(SOIL) TEXTURE

This is the numerical proportion (percent by weight) of sand, silt, and clay in a soil. Sand, silt, and clay content is estimated in the field by hand (or quantitatively measured in the office/lab by hydrometer or pipette) and then placed within the texture triangle to determine **Texture Class**. Estimate the **Texture Class**; e.g., *sandy loam*; or **Subclass**; e.g., *fine sandy loam* of the fine earth (< 2 mm) fraction, or choose a **Term in Lieu of Texture**; e.g., *gravel*. If appropriate, use a **Textural Class Modifier**; e.g., *gravelly silt loam*.

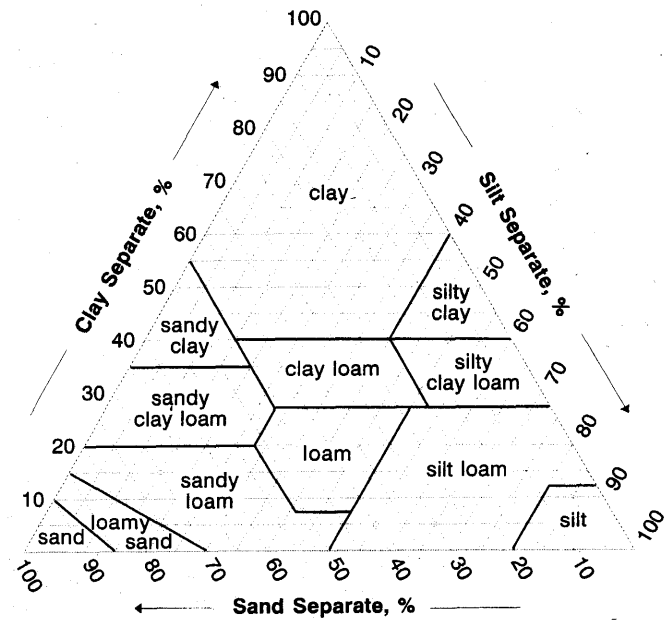
NOTE: **Soil Texture** encompasses only the fine earth fraction (< 2 mm). **Particle Size Distribution** (PSD) encompasses the whole soil, including both the fine earth fraction (< 2 mm) and rock fragments (> 2 mm).

TEXTURE CLASS -

Texture Class	Code	
	Conv.	NASIS
Coarse Sand	cos	COS
Sand	s	S
Fine Sand	fs	FS
Very Fine Sand	vfs	VFS
Loamy Coarse Sand	lcos	LCOS
Loamy Sand	ls	LS
Loamy Fine Sand	lfs	LFS
Loamy Very Fine Sand	lvfs	LVFS
Coarse Sandy Loam	cosl	COSL
Sandy Loam	sl	SL
Fine Sandy Loam	fsl	FSL
Very Fine Sandy Loam	vfsl	VFSL
Loam	l	L
Silt Loam	sil	SIL
Silt	si	SI
Sandy Clay Loam	scl	SCL
Clay Loam	cl	CL
Silty Clay Loam	sicl	SICL
Sandy Clay	sc	SC
Silty Clay	sic	SIC
Clay	c	C

Texture

Texture Triangle:
Fine Earth Texture Classes (——)



TEXTURE MODIFIERS - Conventions for using "Rock Fragment Texture Modifiers" and for using textural adjectives that convey the "% volume" ranges for **Rock Fragments - Size & Quantity**.

Fragment Content % By Volume	Rock Fragment Modifier Usage
< 15	No texture adjective is used (noun only; e.g., *loam*).
15 to < 35	Use adjective for appropriate size; e.g., *gravelly*.
35 to < 60	Use "very" with the appropriate size adjective; e.g., *very gravelly*.
60 to < 90	Use "extremely" with the appropriate size adjective; e.g., *extremely gravelly*.
≥ 90	No adjective or modifier. If ≤ 10% fine earth, use the appropriate noun for the dominant size class; e.g., *gravel*. Use **Terms in Lieu of Texture**.

(SOIL) STRUCTURE

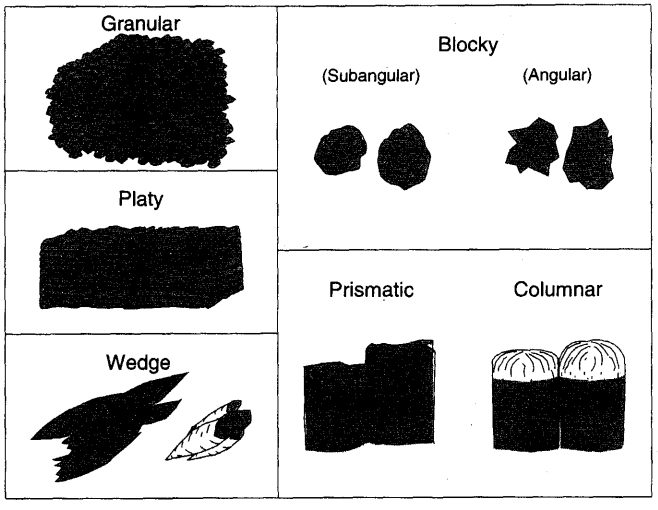
(Soil) Structure is the naturally occurring arrangement of soil particles into aggregates that results from pedogenic processes. Record **Grade**, **Size**, and **Type**. For compound structure, list each **Size** and **Type**; e.g., *medium and coarse SBK parting to fine GR*. Up to ten entries (per horizon) are permitted in PDP. (For PDP only, estimate the percent of each type.) Lack of structure (structureless) has two end members: *massive (MA)* or *single grain (SG)*. A complete example is: *weak, fine, subangular blocky* or *1, f, sbk*.

(SOIL) STRUCTURE - TYPE (formerly **Shape**) -

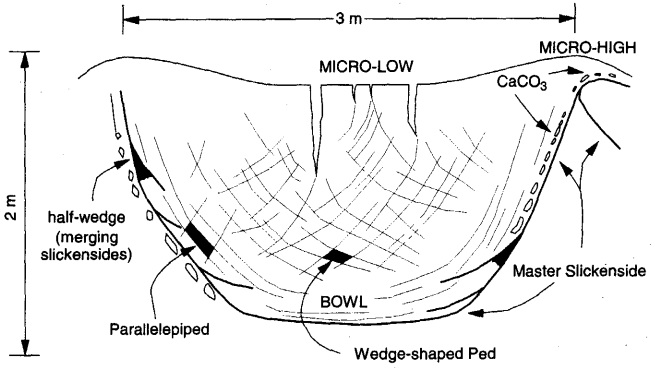
Type	Code		Criteria: (definition)
	Conv	NASIS	
NATURAL SOIL STRUCTURAL UNITS (pedogenic structure)			
Granular	gr	GR	Small polyhedrals, with curved or very irregular faces.
Angular Blocky	abk	ABK	Polyhedrals with faces that intersect at sharp angles (planes).
Subangular Blocky	sbk	SBK	Polyhedrals with sub-rounded and planar faces, lack sharp angles.
Platy	pl	PL	Flat and tabular-like units.
Wedge	—	WEG	Elliptical, interlocking lenses that terminate in acute angles, bounded by slickensides; not limited to vertic materials.
Prismatic	pr	PR	Vertically elongated units with flat tops.
Columnar	cpr	COL	Vertically elongated units with rounded tops which commonly are "bleached".
STRUCTURELESS			
Single Grain	sg	SGR	No structural units; entirely noncoherent; e.g., loose sand.
Massive	m	MA	No structural units; material is a coherent mass (not necessarily cemented).
ARTIFICIAL EARTHY FRAGMENTS OR CLODS [1] (non-pedogenic structure)			
Cloddy [1]	—	CDY	Irregular blocks created by artificial disturbance; e.g., tillage or compaction.

[1] Used only to describe oversized, "artificial" earthy units that are not pedogenically derived soil structural units; e.g., the direct result of mechanical alteration; use **Blocky Structure Size** criteria.

Examples of Soil Structure Types



Example of Wedge Structure, Gilgai Microfeatures, & Microrelief



Modified from: Lynn and Williams, Soil Survey Horizons, 1992.

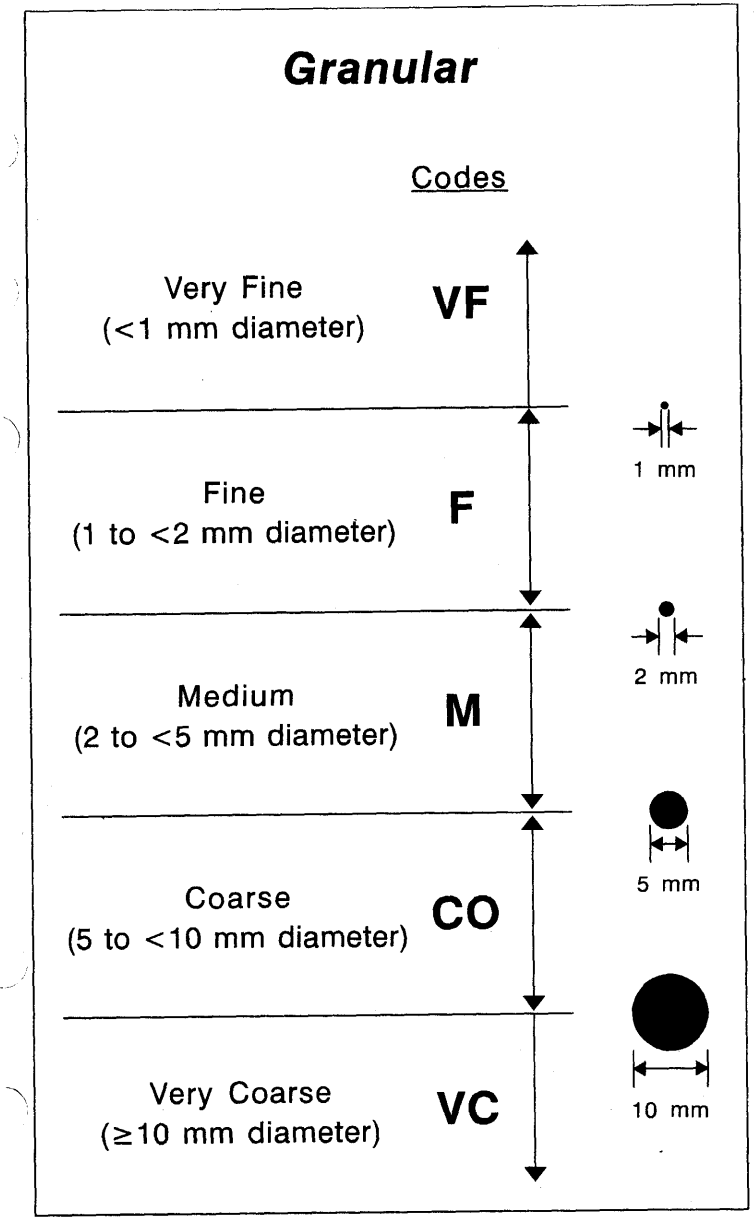
(SOIL) STRUCTURE - GRADE -

Grade	Code	Criteria
Structureless	0	No discrete units observable in place or in hand sample.
Weak	1	Units are barely observable in place or in a hand sample.
Moderate	2	Units well-formed and evident in place or in a hand sample.
Strong	3	Units are distinct in place (undisturbed soil), and separate cleanly when disturbed.

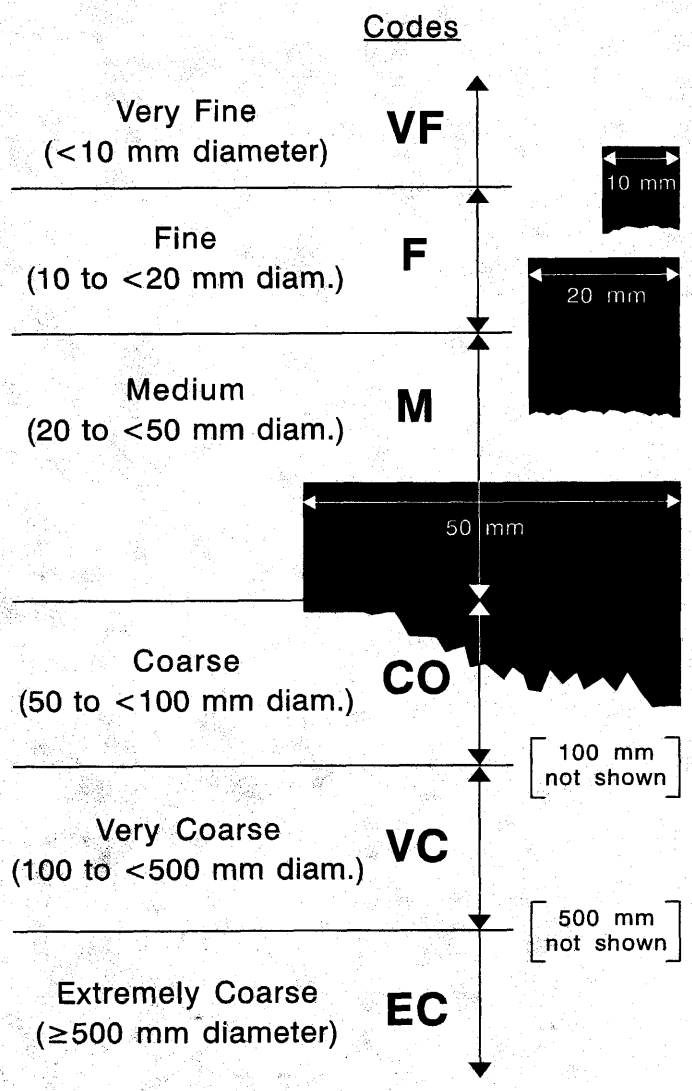
(SOIL) STRUCTURE - SIZE -

Size Class	Code		Criteria: structural unit size [1] (mm)		
	Conv	NASIS	Granular Platy [2] Thickness	Columnar, Prismatic, Wedge [3]	Angular & Subangular Blocky
Very Fine (Very Thin [2])	vf (vn [1])	VF (VN [1])	<1	<10	<5
Fine (Thin [1])	f (tn [1])	F (TN [1])	1 to <2	10 to <20	5 to <10
Medium	m	M	2 to <5	20 to <50	10 to <20
Coarse (Thick [2])	co (tk [2])	CO (TK [2])	5 to <10	50 to <100	20 to <50
Very Coarse (Very Thick)	vc (vk [2])	VC (VK [2])	≥10	100 to <500	≥50
Extr. Coarse	ec	EC	—	≥500	—

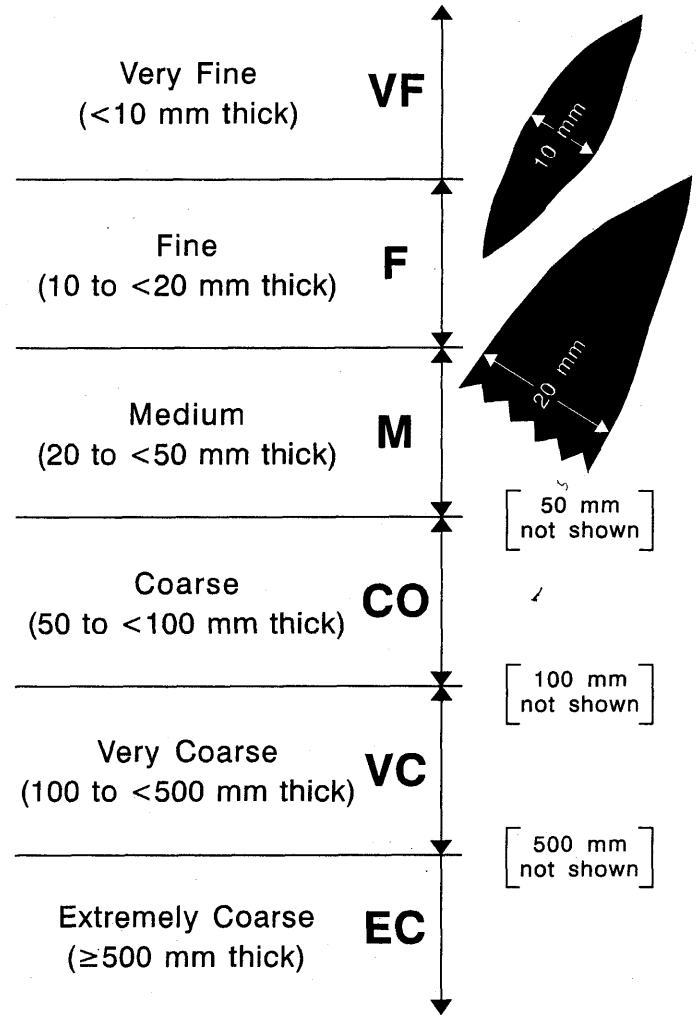
[1] Size limits always denote the smallest dimension of the structural units.
[2] For platy structure only, substitute *thin* for *fine* and *thick* for *coarse* in the size class names.
[3] Wedge structure is generally associated with Vertisols (for which it is a requirement) or related soils with high amounts of smectitic clays.



Prismatic & Columnar



Wedge

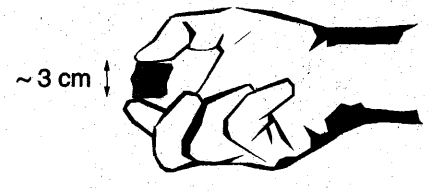


CONSISTENCE

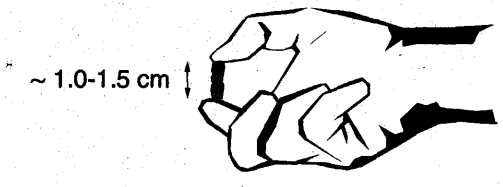
Consistence is the degree and kind of cohesion and adhesion that soil exhibits, and/ or the resistance of soil to deformation or rupture under an applied stress. Soil-water state strongly influences consistence. Field evaluations of consistence include: **Rupture Resistance** (Blocks, Peds, and Clods; or Surface Crusts and Plates), **Resistance to Penetration, Plasticity, Stickiness,** and **Manner of Failure.** Historically, consistence applied to dry, moist, or wet soil as observed in the field. Wet consistence evaluated Stickiness and Plasticity. **Rupture Resistance** now applies to dry soils and to soils in a water state from moist through wet. **Stickiness** and **Plasticity** of soil are independent evaluations.

RUPTURE RESISTANCE - A measure of the strength of soil to withstand an applied stress. Separate estimates of **Rupture Resistance** are for made **Blocks/ Peds/Clods** and for **Surface Crusts and Plates** of soil. Block-shaped specimens should be approximately 2.8 cm across. If 2.8 cm cubes (e.g., ≈ 2.5 - 3.1 cm) are not obtainable, use the following equation and the table below to calculate the stress at failure: [(2.8 cm / cube length cm)^2 X estimated stress (N) at failure)]; e.g., *for a 5.6 cm cube [(2.8/5.6)^2 X 20 N = 5 N ⇒ Soft Class.* Plate-shaped specimens (surface crusts or platy structure) should be approximately 1.0 - 1.5 cm long by 0.5 cm thick (or the thickness of occurrence, if < 0.5 cm thick).

Blocks/Peds



Crusts/Plates



RUPTURE RESISTANCE:

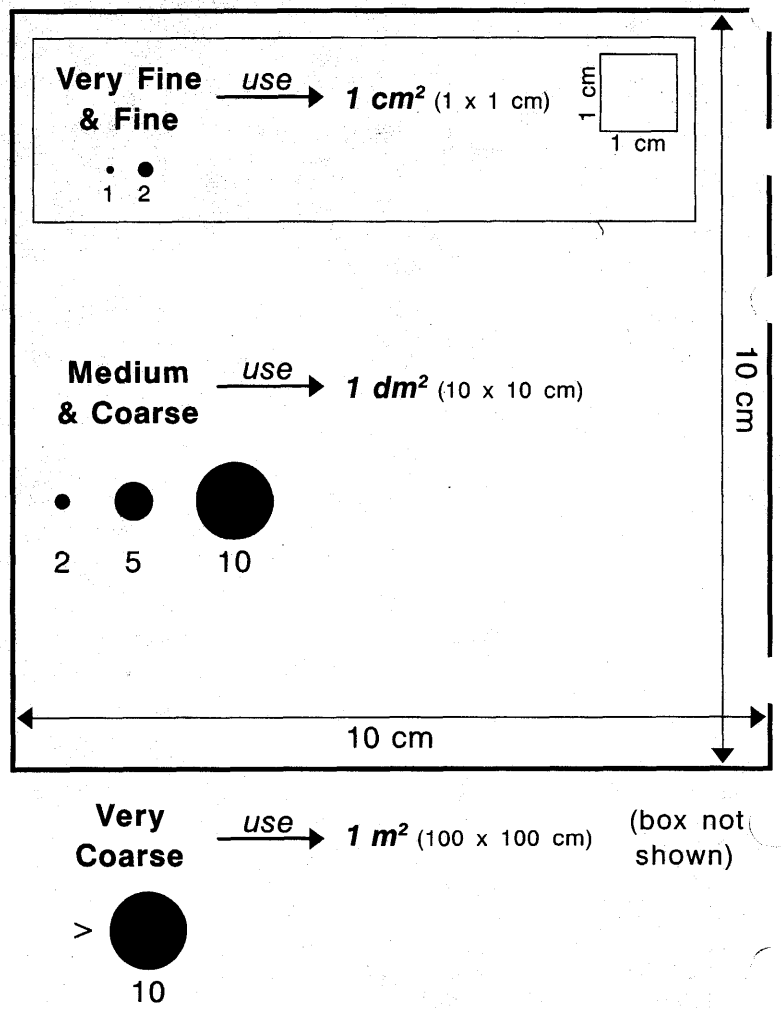
Blocks, Peds, and Clods - Estimate the class by the force required to rupture (break) a soil unit. Select the column for the appropriate soil moisture condition (*dry* vs. *moist*) and / or the *Cementation* column, if applicable.

Dry Class	Dry Code [2]	Moist Class	Moist Code [2]	Cementation [1] Class	Cementation Code [2]	Specimen Fails Under
Loose	L d(lo)	Loose	L m(lo)	*Not Applicable*		*Intact specimen not obtainable*
Soft	S d(so)	Very Friable	VFR m(vfr)	Non-Cemented	NC	Very slight force between fingers. <8 N
Slightly Hard	SH d(sh)	Friable	FR) m(fr	Extremely Weakly Cemented	EW	Slight force between fingers. 8 to < 20 N
Mod. Hard	MH d(h)	Firm	FI m(fi)	Very Weakly Cemented	VW	Moderate force between fingers. 20 to < 40 N
Hard	HA d(h)	Very Firm	VFI m(vfi)	Weakly Cemented	W c(w)	Strong force between fingers. 40 to < 80 N
Very Hard	VH d(vh)	Extr. Firm	EF m(efi)	Moderately Cemented	M	Moderate force between hands. 80 to < 160 N
Extremely Hard	EH d(eh)	Slightly Rigid	SR m(efi)	Strongly Cemented	ST c(s)	Foot pressure by full body weight. 160 to < 800 N
Rigid	R d(eh)	Rigid	R m(efi)	Very Strongly Cemented	VS	Blow of < 3 J but not body weight. 800 N to < 3 J
Very Rigid	VR d(eh)	Very Rigid	VR m(efi)	Indurated	I c(I)	Blow of ≥ 3 J. *(3 J = 2 kg weight dropped 15 cm).*

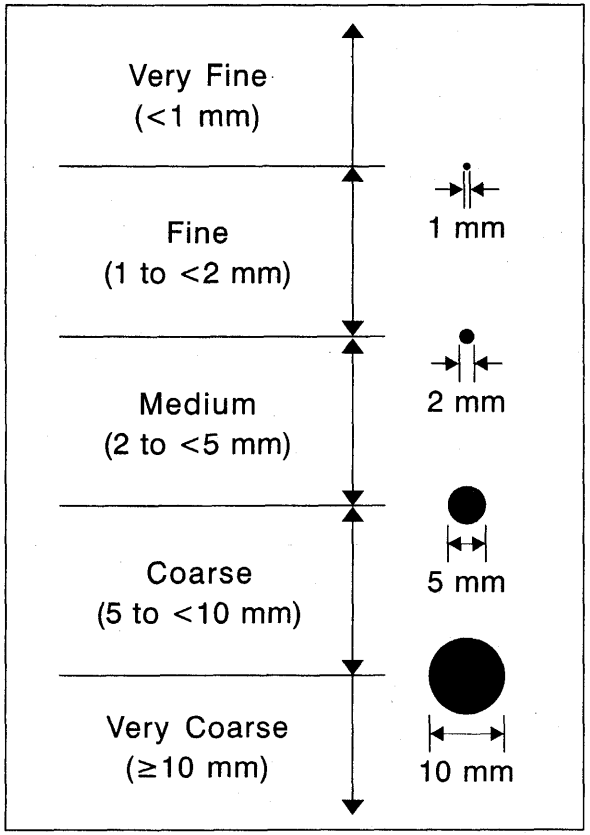
[1] This is not a field test; specimen must be air dried overnight and then submerged in water for a minimum of 1 hour prior to test.

[2] Codes in parentheses are obsolete criteria (Soil Survey Staff, 1951).

ROOTS - QUANTITY (Roots and Pores) - Soil area to be assessed.



Root and Pore Size Classes

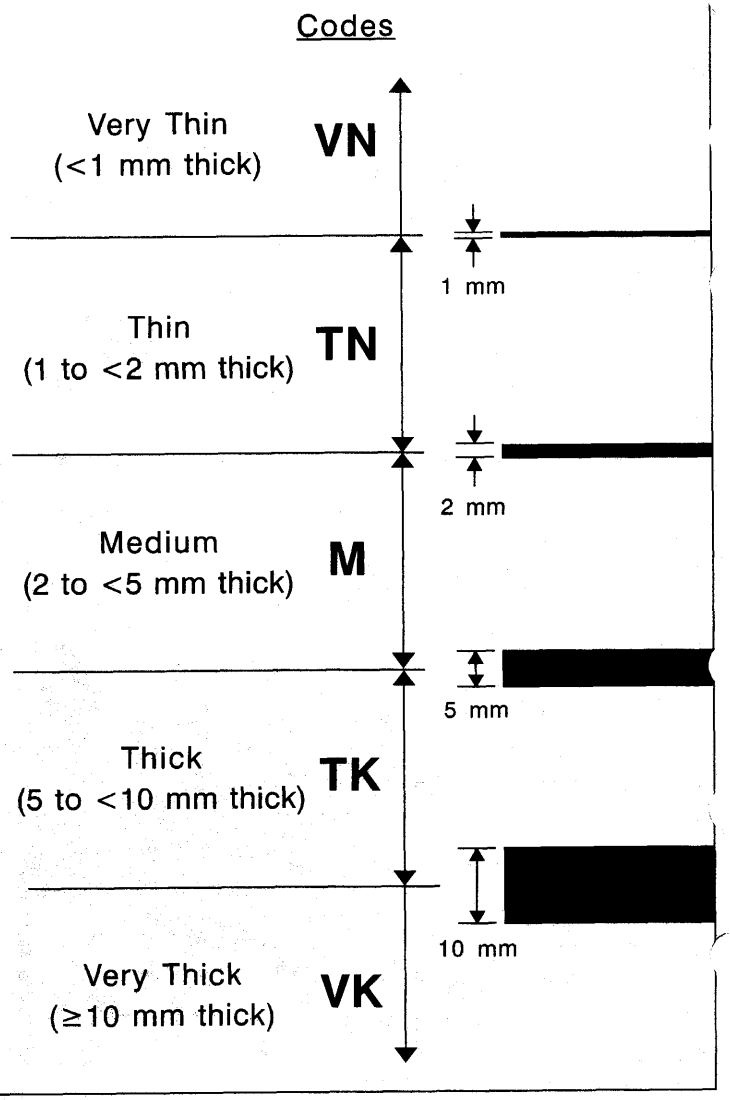


ROOTS - LOCATION (Roots) -

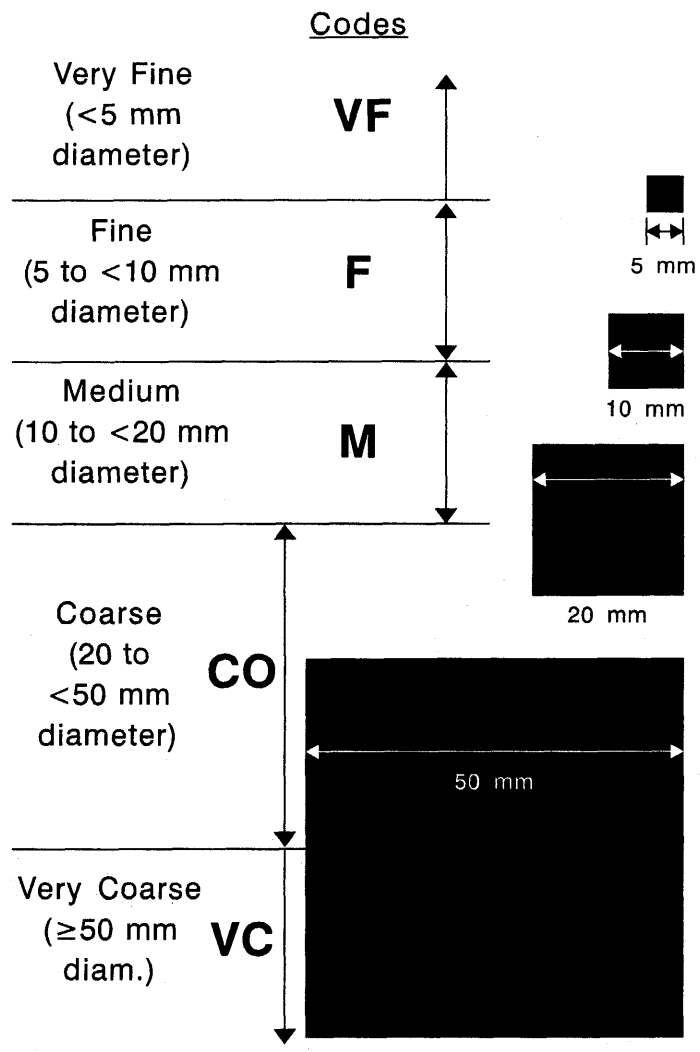
Location	Code
Between Peds	P
In Cracks	C
Throughout	T
In Mat at Top of Horizon [1]	M
Matted Around Rock Fragments	R

[1] Describing a root mat at the top of a horizon rather than at the bottom or within the horizon, flags the horizon that restricts root growth.

Platy



Angular & Subangular Blocky



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