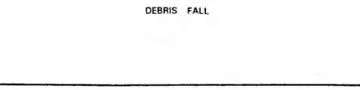
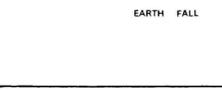
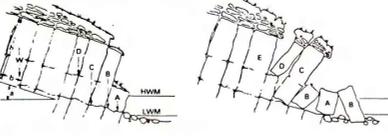
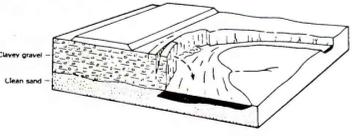
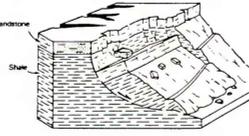
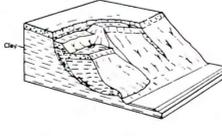
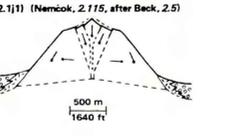
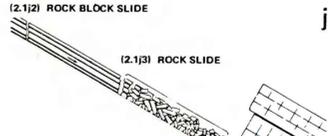
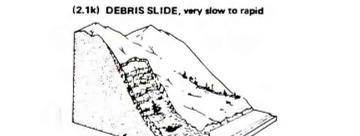
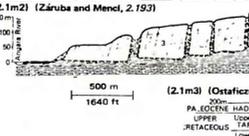
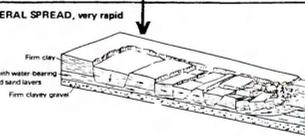
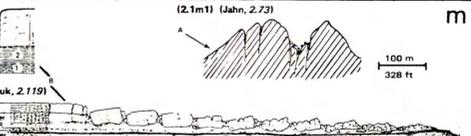
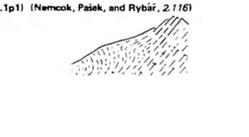
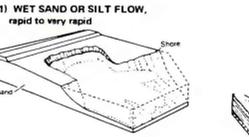
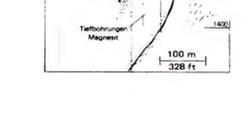
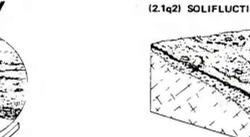
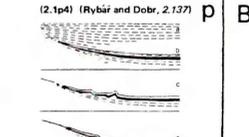
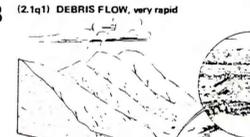
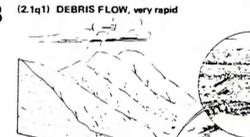
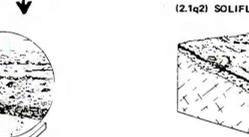
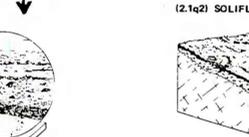
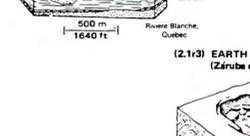
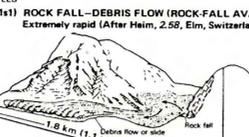
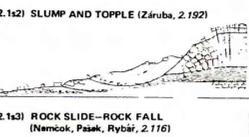
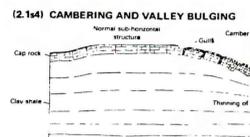
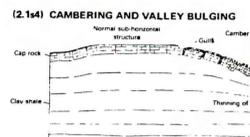
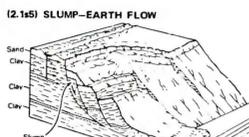
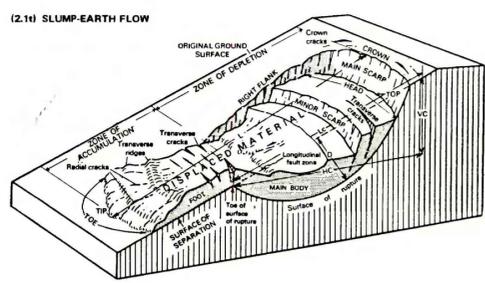


(DOMINANT) TYPE OF MOVEMENT	TYPE OF MATERIAL (BEFORE MOVEMENT)*		
	BEDROCK	DEBRIS	ENGINEERING SOILS
<b>I. FALLS</b> Mass in motion travels most of the distance through the air. Includes free fall, movement by leaps and bounds, and rolling of fragments of bedrock or soil.	(2.1a) ROCK FALL, extremely rapid 	DEBRIS FALL 	EARTH FALL 
<b>II. TOPPLES</b> Movement due to forces that cause an overturning moment about a pivot point below the center of gravity of the unit. If unchecked, will result in a fall or slide.	(2.1d1) ROCK TOPPLE (de Freitas and Watters, 2.37). 	(2.1e) DEBRIS TOPPLE 	EARTH TOPPLE 
<b>III. SLIDES</b> Movement involves shear displacement along one or several surfaces, or within a relatively narrow zone, which are visible or may reasonably be inferred.	<b>A. ROTATIONAL</b> Movement due to forces that cause a turning moment about a point above the center of gravity of the unit. Surface of rupture concaves upward. 	DEBRIS SLUMP 	(2.1i) EARTH SLUMP 
	<b>B. TRANSLATIONAL</b> Movement predominantly along more or less planar or gently undulatory surfaces. Movement frequently is structurally controlled by surfaces of weakness, such as faults, joints, bedding planes, and variations in shear strength between layers of bedded deposits, or by the contact between firm bedrock and overlying detritus. 	(2.1j2) ROCK BLOCK SLIDE (2.1j3) ROCK SLIDE 	(2.1k) DEBRIS SLIDE, very slow to rapid 
<b>IV. LATERAL SPREADS</b> Distributed lateral extension movements in a fractured mass. A. Without a well-defined controlling basal shear surface or zone of plastic flow (predominantly in bedrock). B. In which extension of rock or soil results from liquefaction or plastic flow or subjacent material.	(2.1m2) (Záruba and Mencl, 2.193) 	(2.1n) EARTH LATERAL SPREAD, very rapid 	
	(2.1m3) (Ostafizuk, 2.119) 		
<b>V. FLOWS</b> <b>A. IN BEDROCK</b> Includes spatially continuous deformation and surficial as well as deep creep. Involves extremely slow and generally nonaccelerating differential movements among relatively intact units. Movements may: 1. Be along many shear surfaces that are apparently not connected; 2. Result in folding, bending, or bulging; or 3. Roughly simulate those of viscous fluids in distribution of velocities. <b>B. IN SOIL</b> Movement within displaced mass such that the form taken by moving material or the apparent distribution of velocities and displacements resemble those of viscous fluids. Slip surfaces within moving material are usually not visible or are short-lived. Boundary between moving mass and material in place may be a sharp surface of differential movement or a zone of distributed shear. Movement ranges from extremely rapid to extremely slow.	(2.1p1) (Nemcok, Pasak, and Rybár, 2.116) 	(2.1q1) DEBRIS FLOW, very rapid 	(2.1r) WET SAND OR SILT FLOW, rapid to very rapid 
	(2.1p2) (Zischinsky, 2.194) 	(2.1p3) (Zischinsky, 2.194) 	(2.1q2) SOLIFLUCTION 
	(2.1p4) (Rybár and Dobr, 2.137) 	(2.1q3) DEBRIS AVALANCHE, very rapid to extremely rapid 	(2.1r2) EARTH FLOW, very slow to rapid (Záruba and Mencl, 2.193) 
	(2.1p5) (Zischinsky, 2.194) 	(2.1q4) SOIL CREEP, extremely slow 	(2.1r3) LOESS FLOW (dry, caused by earthquakes), extremely rapid also most or wet 
	(2.1p6) (Zischinsky, 2.194) 	(2.1q5) BLOCK STREAM 	(2.1r4) DRY SAND FLOW, rapid to very rapid 
<b>VI. COMPLEX</b> Movement is by a combination of one or more of the five principal types of movement described above. Many landslides are complex, although one type of movement generally dominates over the others at certain areas within a slide or at a particular time.	<b>EXAMPLES</b> (2.1s1) ROCK FALL—DEBRIS FLOW (ROCK-FALL AVALANCHE). Extremely rapid (After Heim, 2.58, Elm, Switzerland, 1881) 	(2.1s2) SLUMP AND TOPPLE (Záruba, 2.192) 	(2.1s3) ROCK SLIDE—ROCK FALL (Nemcok, Pasak, Rybár, 2.116) 
	(2.1s4) CAMBERING AND VALLEY BULGING 	(2.1s5) SLUMP—EARTH FLOW 	

Note: Most, if not all slow earth flows in cohesive materials are complex in that finite shear occurs along the flanks and basal surface, although the distribution of velocities within the displaced material may indicate plastic flow.



**(2.1s) SLUMP-EARTH FLOW**

**NOMENCLATURE**

**MAIN SCARP**—A steep surface on the undisturbed ground around the periphery of the slide, caused by the movement of slide material away from undisturbed ground. The projection of the scarp surface under the displaced material becomes the surface of rupture.

**MINOR SCARP**—A steep surface on the displaced material produced by differential movements within the sliding mass.

**HEAD**—The upper parts of the slide material along the contact between the displaced material and the main scarp.

**TOP**—The highest point of contact between the displaced material and the main scarp.

**TOE OF SURFACE OF RUPTURE**—The intersection (sometimes buried) between the lower part of the surface of rupture and the original ground surface.

**TOE**—The margin of displaced material most distant from the main scarp.

**TIP**—The point on the toe most distant from the top of the slide.

**FOOT**—That portion of the displaced material that lies downslope from the toe of the surface of rupture.

**MAIN BODY**—That part of the displaced material that overlies the surface of rupture between the main scarp and toe of the surface of rupture.

**FLANK**—The side of the landslide.

**CROWN**—The material that is still in place, practically undisplaced and adjacent to the highest parts of the main scarp.

**ORIGINAL GROUND SURFACE**—The slope that existed before the movement which is being considered took place. If this is the surface of an older landslide, that fact should be stated.

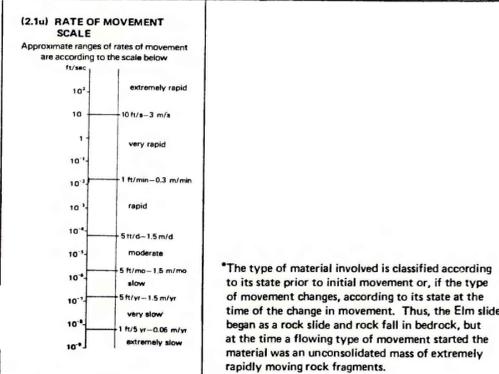
**LEFT AND RIGHT**—Compass directions are preferable in describing a slide, but if right and left are used they refer to the slide as viewed from the crown.

**SURFACE OF SEPARATION**—The surface separating displaced material from stable material but not known to have been a surface on which failure occurred.

**DISPLACED MATERIAL**—The material that has moved away from its original position on the slope. It may be in a deformed or undeformed state.

**ZONE OF DEPLETION**—The area within which the displaced material lies below the original ground surface.

**ZONE OF ACCUMULATION**—The area within which the displaced material lies above the original ground surface.



**Figure 2.1. Types of slope movement.**

David J. Varnes. Slope Movement and Types and Processes. In *Landslides: Analysis and Control*, Transportation Research Board, National Academy of Sciences, Washington, D.C., Special Report 176, Chapter 2, 1978.

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