Part 3

EMERGENCE OF EXCAVATION AND GRADING CODES 1952-75

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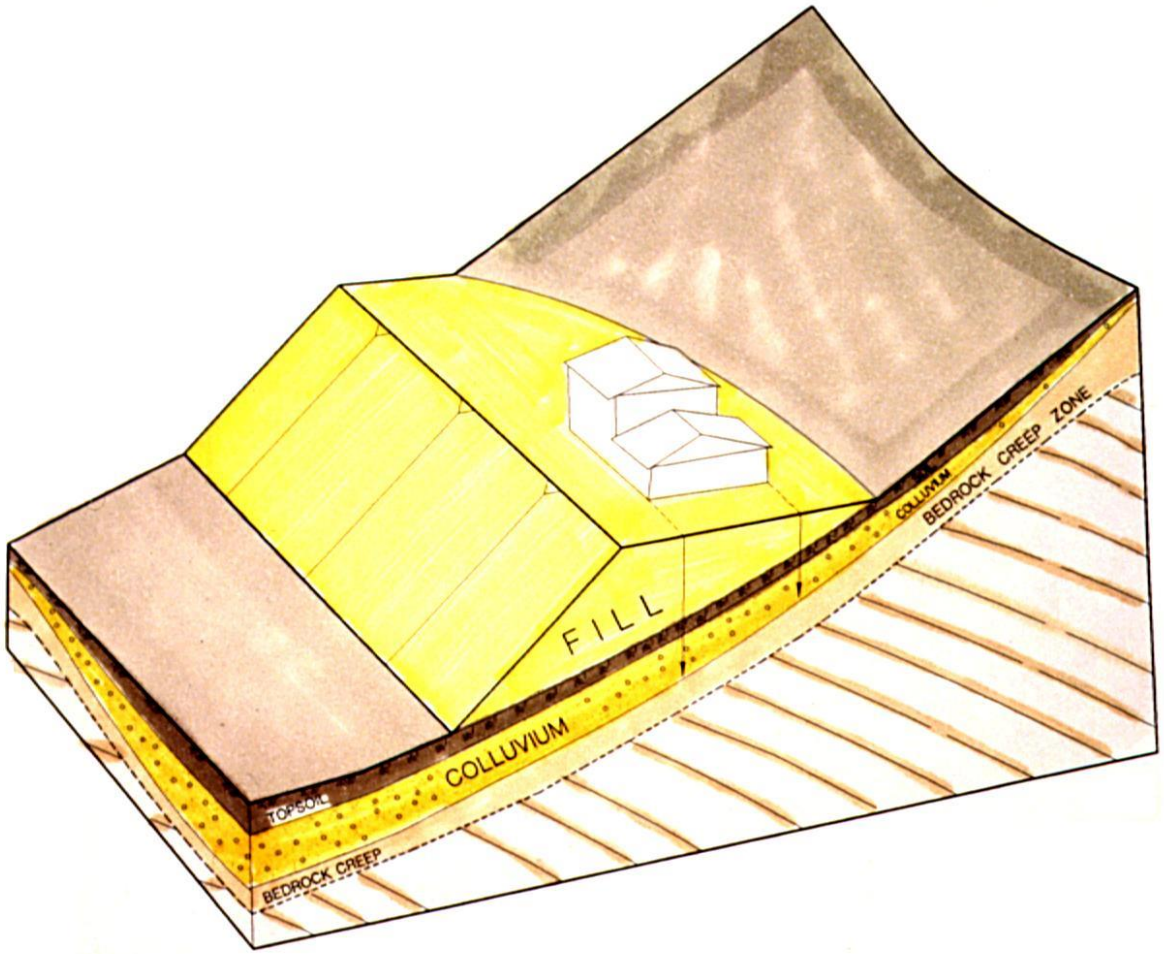

- **Early hillside lots were constructed on “sliver fills,” or “wedge embankments,” without keying or benching, like that shown above.**

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- **Heavy rains of January 1952 caused $7.5 million in damage to hundreds of recently-built hillside homes in Los Angeles, like the one shown here, on a sliver fill.**

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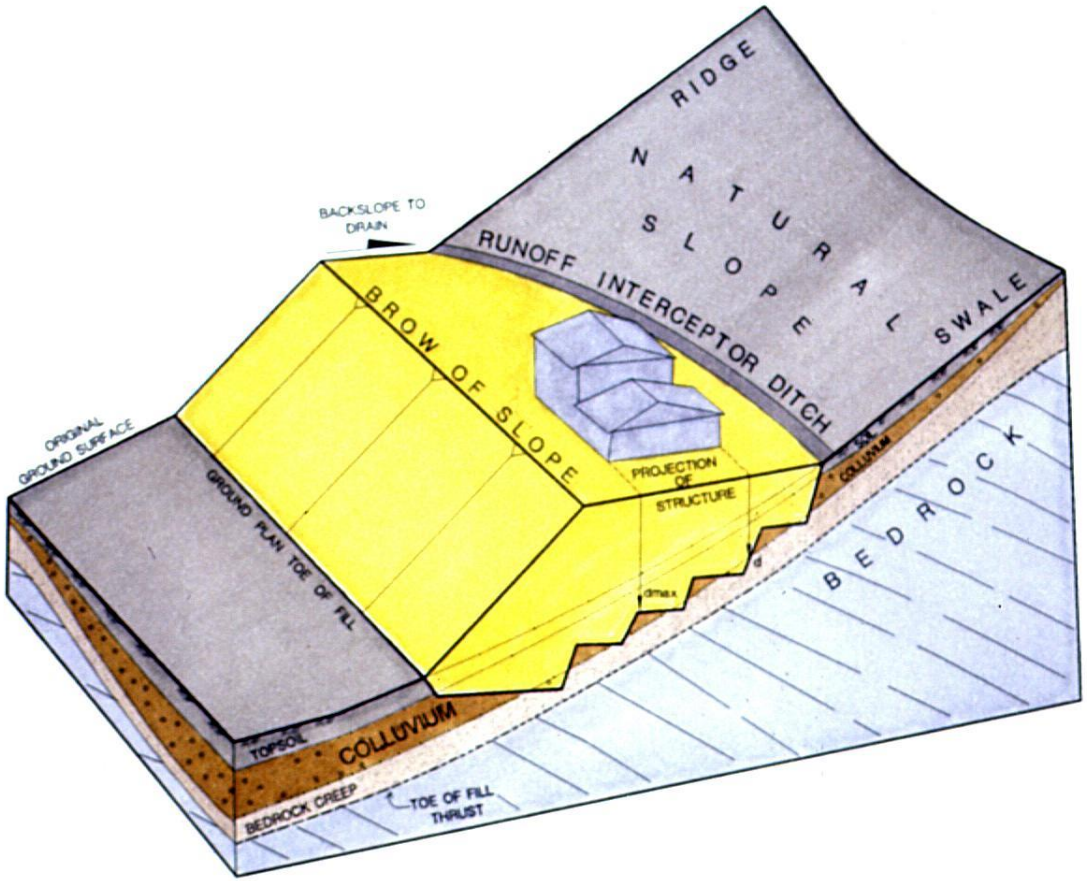

- **The 1952 Los Angeles grading ordinance required keying and benching of fill embankments, as depicted here. Other agencies in southern California adopted similar statutes soon thereafter.**

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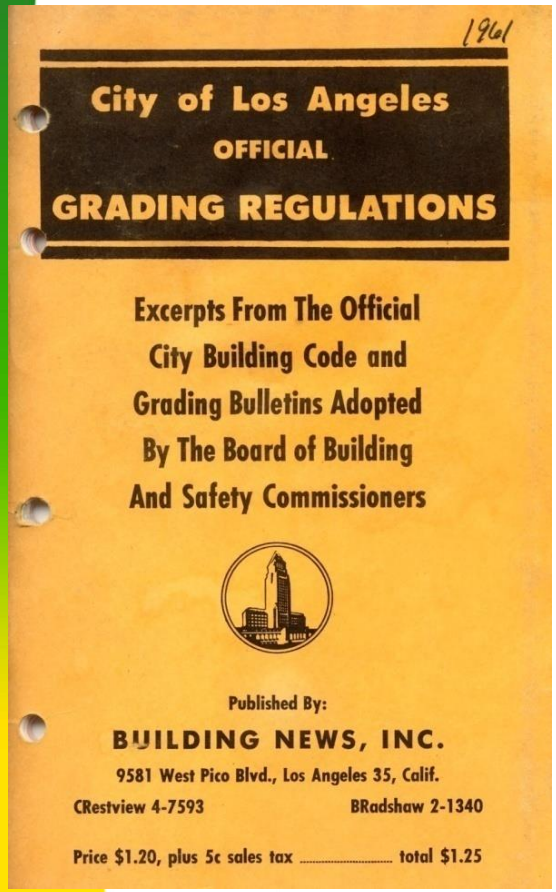
Agencies that adopted Grading Ordinances between 1952-64



- Los Angeles and Beverly Hills (1952)
- Pasadena (1953) and Glendale (1954)
- Burbank (1954) and San Francisco (1956)
- Los Angeles County (1957)
- San Diego (1960)
- Orange County (1962)
- Adoption of *Appendix Chapter 70 - Excavation and Grading* into the Uniform Building Code (1964)

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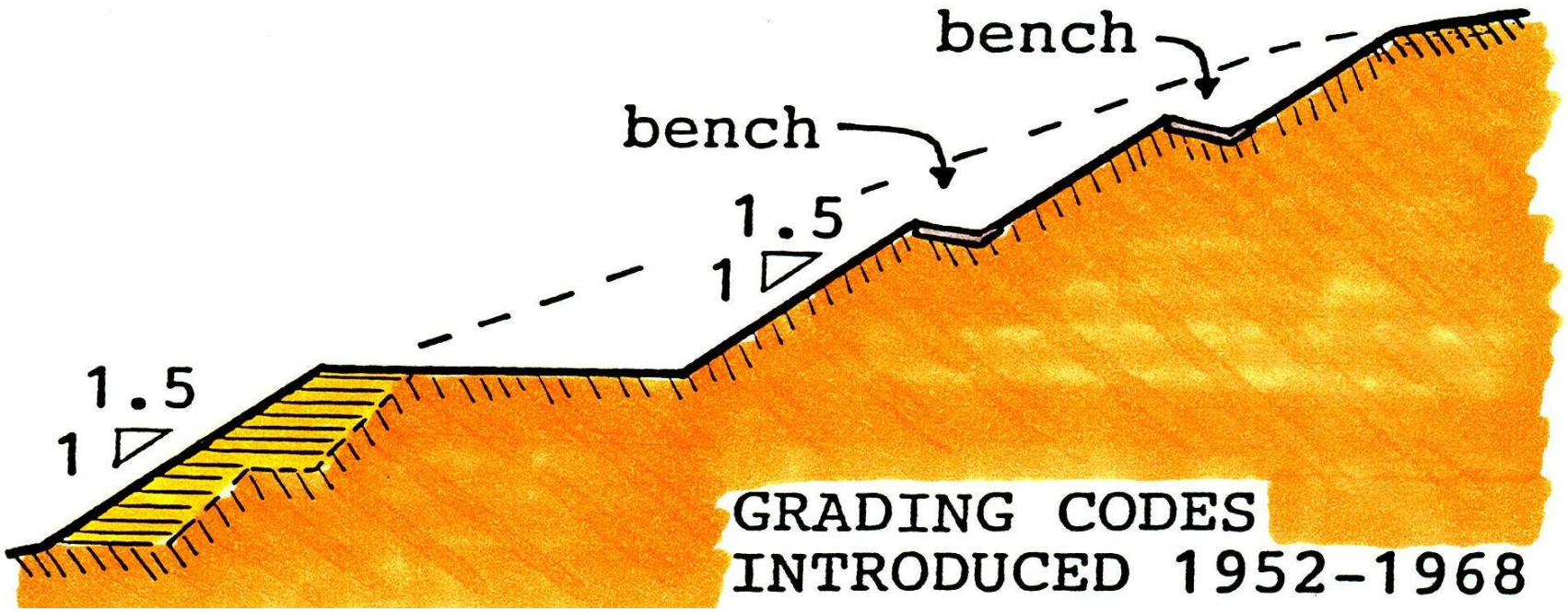
Evolution of Grading Standards



- Most state highway departments established uniform standards for highway cuts and fills beginning in 1955, with the introduction of the Interstate and Defense Highway Program

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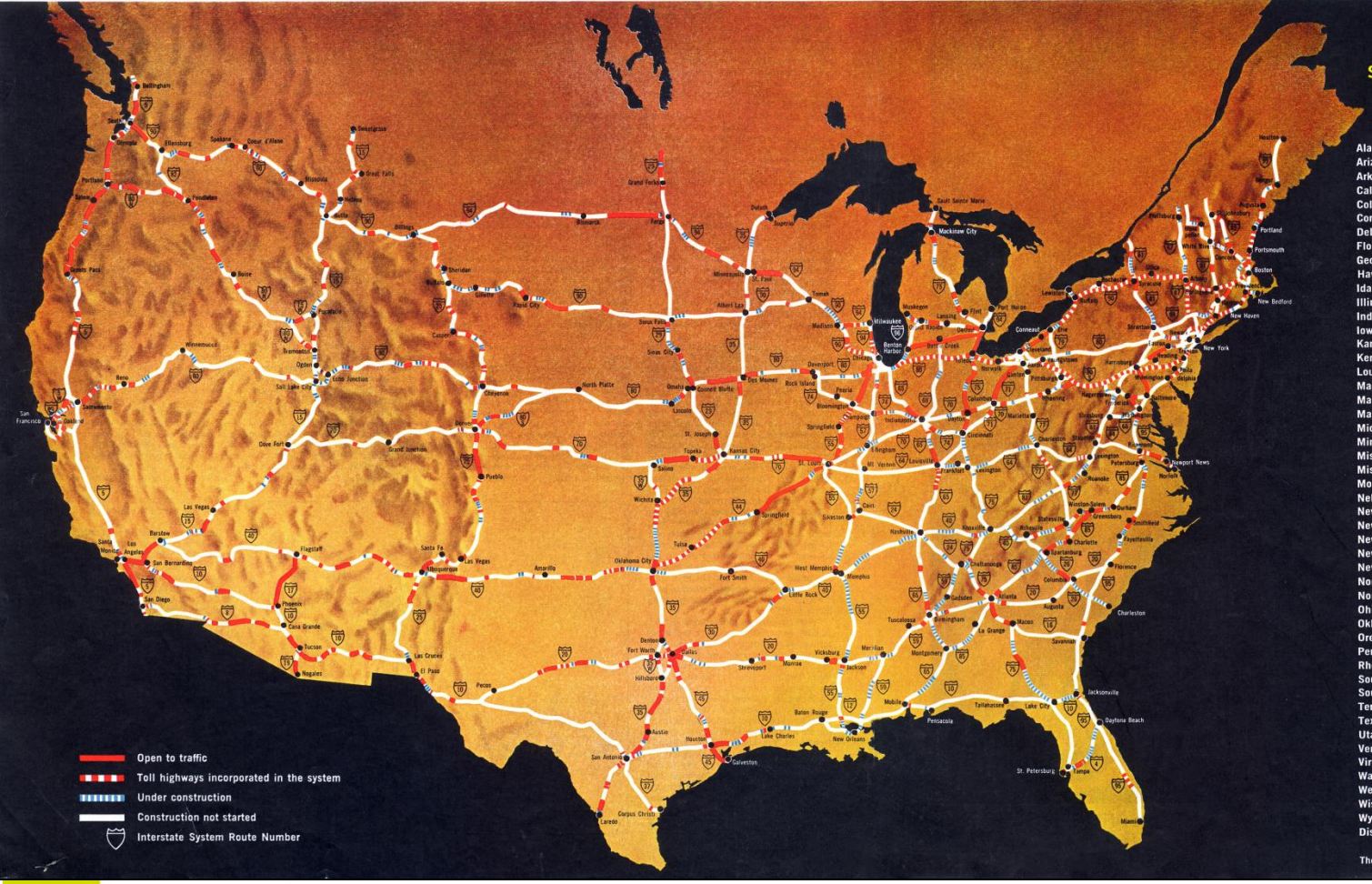

See the progress your state is making

(as of Dec. 31, 1960)

STATE	OPEN TO TRAFFIC (miles)	WORK UNDER WAY (miles)	WORK TO BE DONE (miles)
Alabama	59.5	360.6	453.8
Arizona	514.3	167.5	479.2
Arkansas	43.5	458.2	16.1
California	527.8	1,200.9	453.2
Colorado	228.7	175.2	544.1
Connecticut	138.6	136.8	21.8
Delaware	3.5	27.9	9.1
Florida	86.8	264.3	768.9
Georgia	169.4	269.2	670.9
Hawaii	4.6	00	43.5
Idaho	142.3	232	237.8
Illinois	492.2	622.9	471.4
Indiana	262.6	366.9	489.3
Iowa	213.2	258.9	236.6
Kansas	390.7	103.5	306.9
Kentucky	71	260.2	364.9
Louisiana	41.8	324.6	316.2
Maine	103.6	42.3	166.1
Maryland	120.3	199.9	33.5
Massachusetts	197.2	119.4	145.8
Michigan	382.1	370.5	327.1
Minnesota	79.8	367.1	451.2
Mississippi	43.2	305.5	329.5
Missouri	367.9	691.4	45.4
Montana	92.5	444.8	641.7
Nebraska	41.1	226.2	222.2
Nevada	56.2	158.6	319.2
New Hampshire	78.6	28.1	107.1
New Jersey	93.1	115.4	163
New Mexico	291.3	104.5	607.1
New York	668.1	317	242.1
North Carolina	285.3	145.2	338.4
North Dakota	197	50.8	320.1
Ohio	565.5	435.9	482.5
Oklahoma	303.8	258.8	233
Oregon	425.9	132.5	173.5
Pennsylvania	596.4	341.2	603.7
Rhode Island	20.7	15.6	34.6
South Carolina	126	241.3	311.9
South Dakota	115.8	279.4	282.4
Tennessee	15.4	518.2	514
Texas	879.4	1,426.1	717.9
Utah	69.3	183.5	681.5
Vermont	23.1	129.2	171.3
Virginia	158.1	342.1	552.9
Washington	297.6	287.6	140.1
West Virginia	89.2	106.5	188.9
Wisconsin	146	306.5	000
Wyoming	119.4	225.3	572.1
Dist. of Col.	0.5	11.7	16
	10,439.9	14,157.7	16,019.5

There are no Interstate Highways in Alaska.

1961 map illustrating the initial Interstate and Defense Highway Network, which revolutionized commercial truck transportation and introduced federal standards for excavation, grading, and pavement design.

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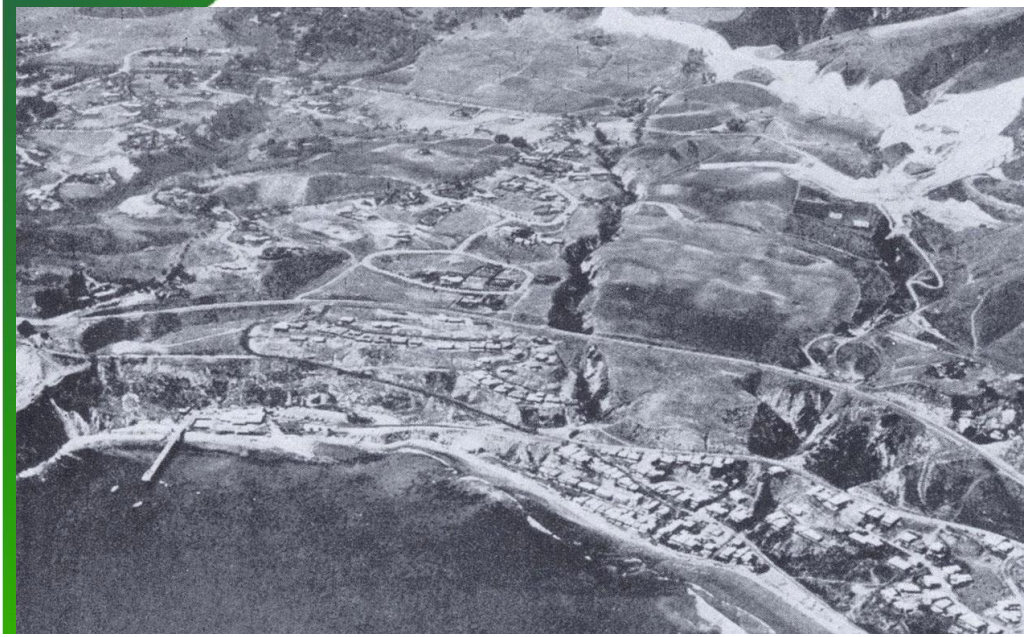
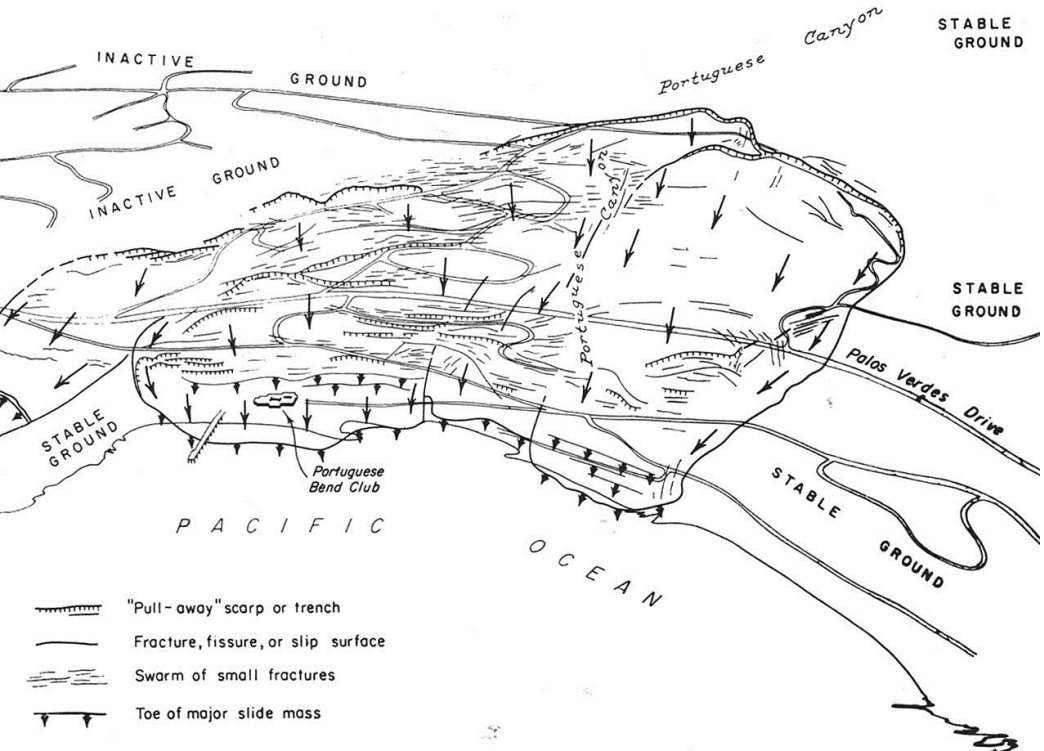
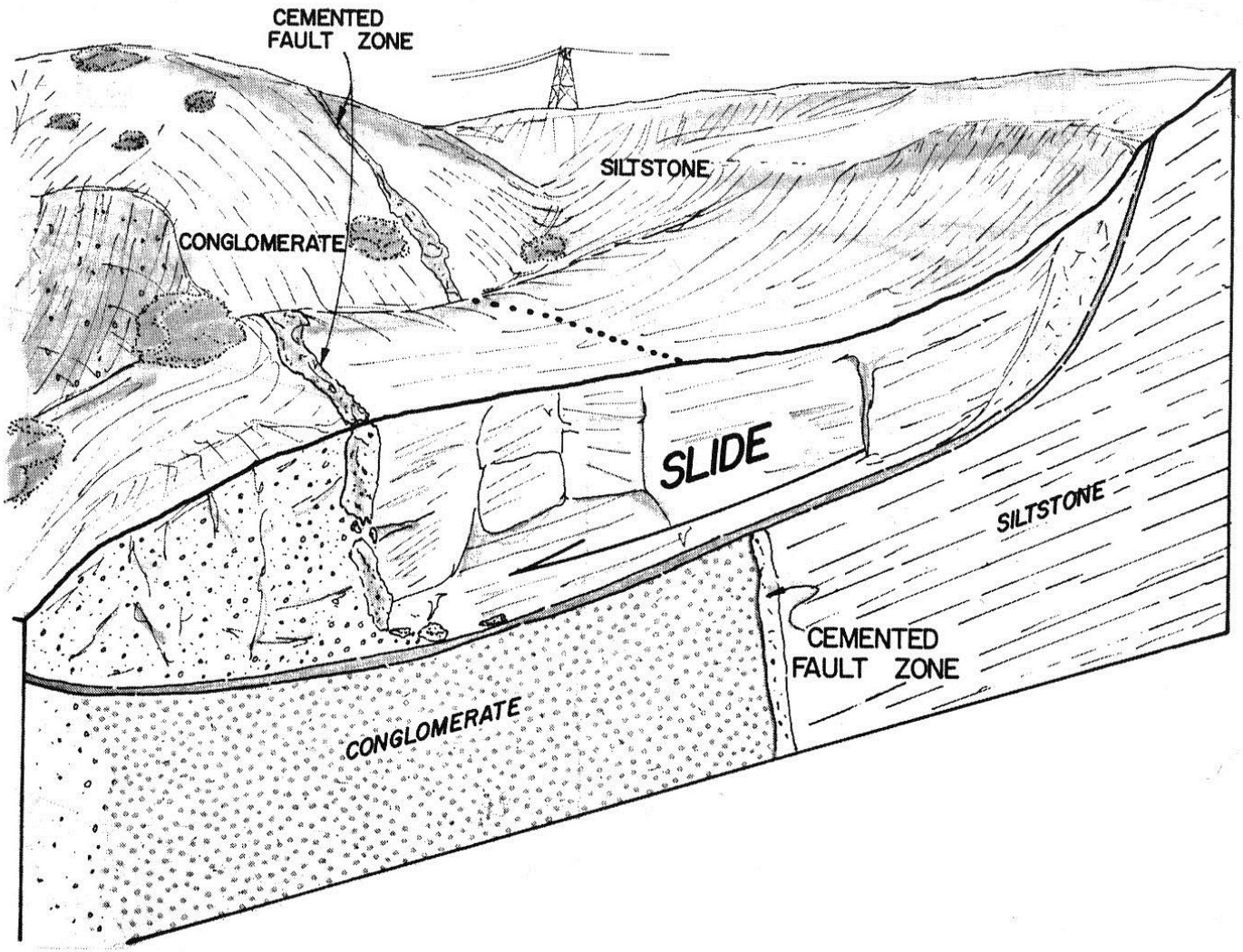
1956 PORTUGUESE BEND LANDSLIDE



Portuguese Bend Landslide

- The Portuguese Bend Landslide developed on volcanic ash (tuff) beds that were altered to montmorillonite, dipping 6 to 13 degrees, towards the ocean
- Note grading at upper right portion of photo, for extension of Crenshaw Boulevard.





- **A major problem in southern California were the countless dormant ancient landslides that mantled the region's slopes, which were not properly identified or respected by many the engineers who drafted grading plans, who focused solely on balancing cut and fill quantities.**

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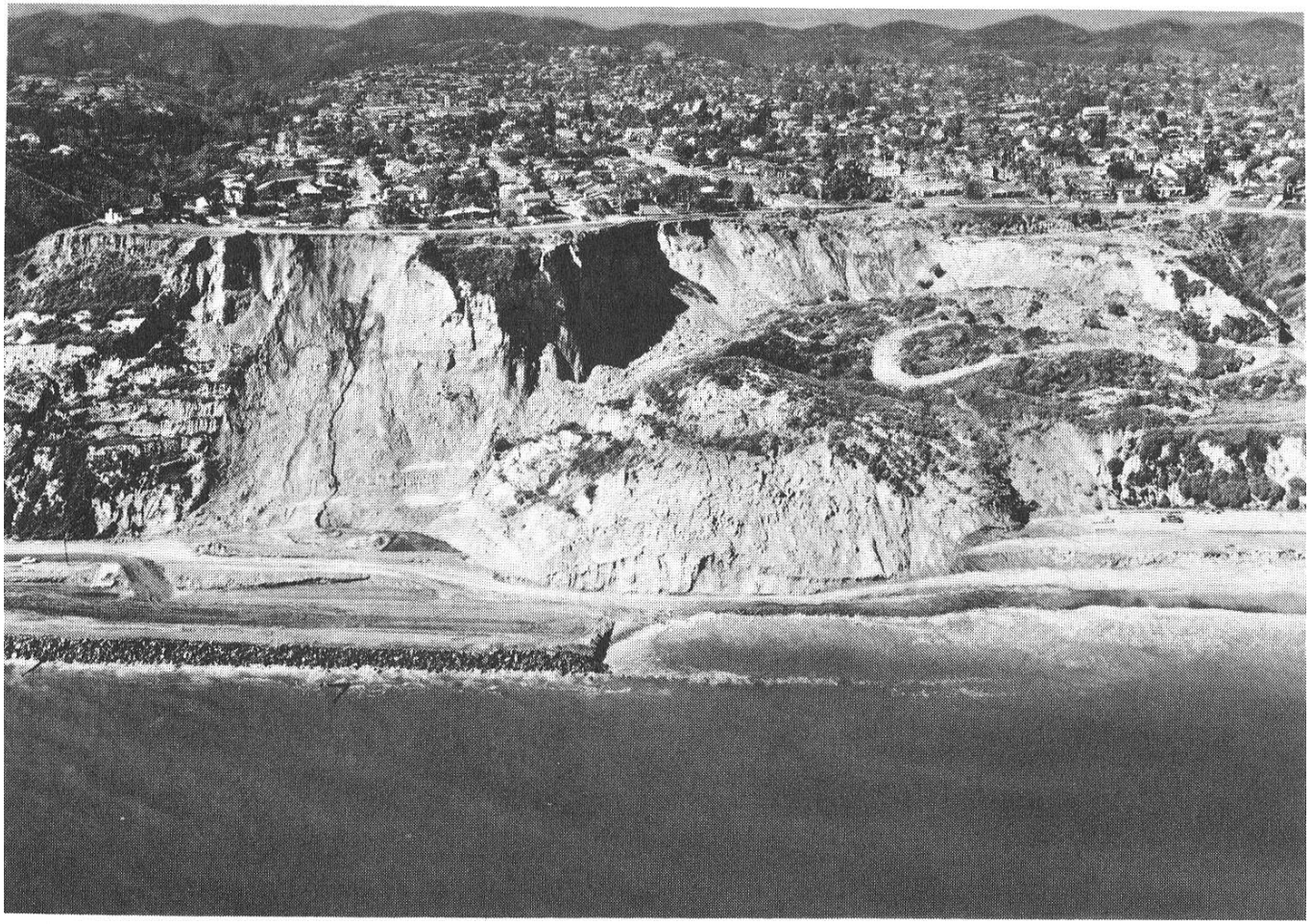

- **The Via de las Ojas Landlide in Pacific Palisades in 1958 shut down the coast highway, bringing the problem of landslippage into the consciousness of every Los Angeles resident.**

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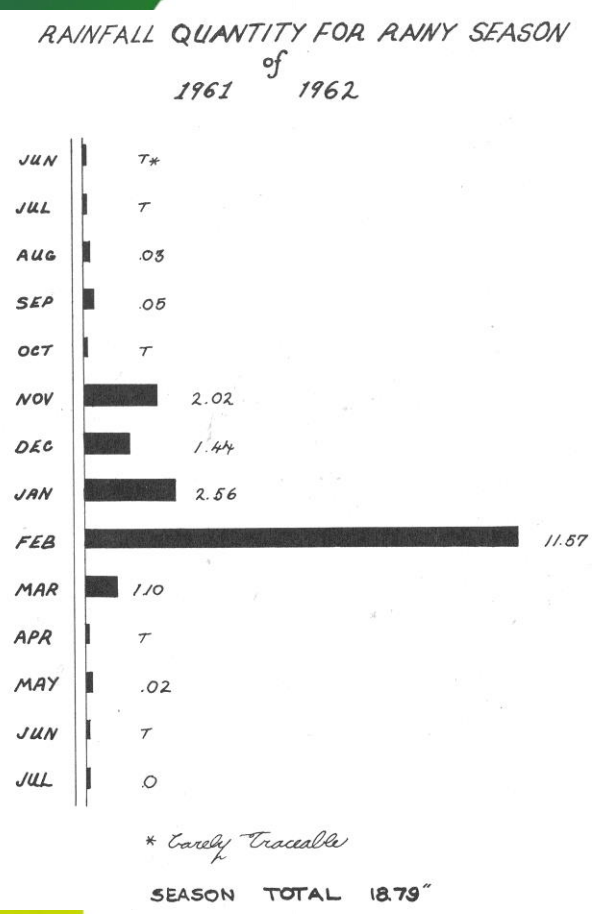

- **In 1962 a series of destructive storms struck Los Angeles County causing widespread damage, triggering development of so-called “Modern Grading Codes;” subsequently adopted by the City of Los Angeles, as well as Los Angeles and Orange Counties.**

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The Second Generation: "Modern Grading Codes" (1962)

- City of Los Angeles took lead in developing a more restrictive grading code following poor performance of slopes during 1962 storms
- Much public attention was focused on the problem by the reactivation of the Portuguese Bend Landslide in 1956, which damaged or destroyed more than 130 homes
- Los Angeles County adopted a more restrictive grading ordinance after losing an inverse condemnation lawsuit in 1961,which alleged that the extension of Crenshaw Blvd triggered the 1956 Portuguese Bend Landslide. The County had to pay for 130 homes!

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Storms of January and February 1969

- Numerous slope failures were triggered by near-record storms in early 1969 in southern California. Grading & Excavation standards were amended to limit cut and fill slopes to inclinations no more than 2:1 in the 1970 Uniform Building Code (UBC).

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STORMS OF JAN-MAR 1978

- Storms in early 1978 came on the heels of the worst 2-year drought in over 100 years, triggering countless debris flows and slope failures in southern California.

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Damage Associated with Destructive Storms of 1969 in Hillside Areas of Los Angeles

	Sites developed prior to 1952	Sites developed 1952-1962	Sites developed 1963-1969
Number of sites constructed	10,000	27,000	11,000
Total damage	$3,300,000	$2,767,000	$184,400
Average damage per site	$300	$100	$17
Percentage of sites damaged	10.4%	1.3%	0.15%

SOURCE: Slosson, 1969

Slope Failures in City of Los Angeles, 1978

	Sites developed prior to 1963	Sites developed after 1963
Number of sites constructed	37,000	30,000
Number of failures	2,790	210
Percentage of sites damaged	7.5%	0.7%

SOURCE: Slosson and Krohn, 1979

- **Statistical data of storm-inflicted damage to hillside areas of Los Angeles in 1969 and 1978 confirmed the societal benefits of grading and excavation codes.**

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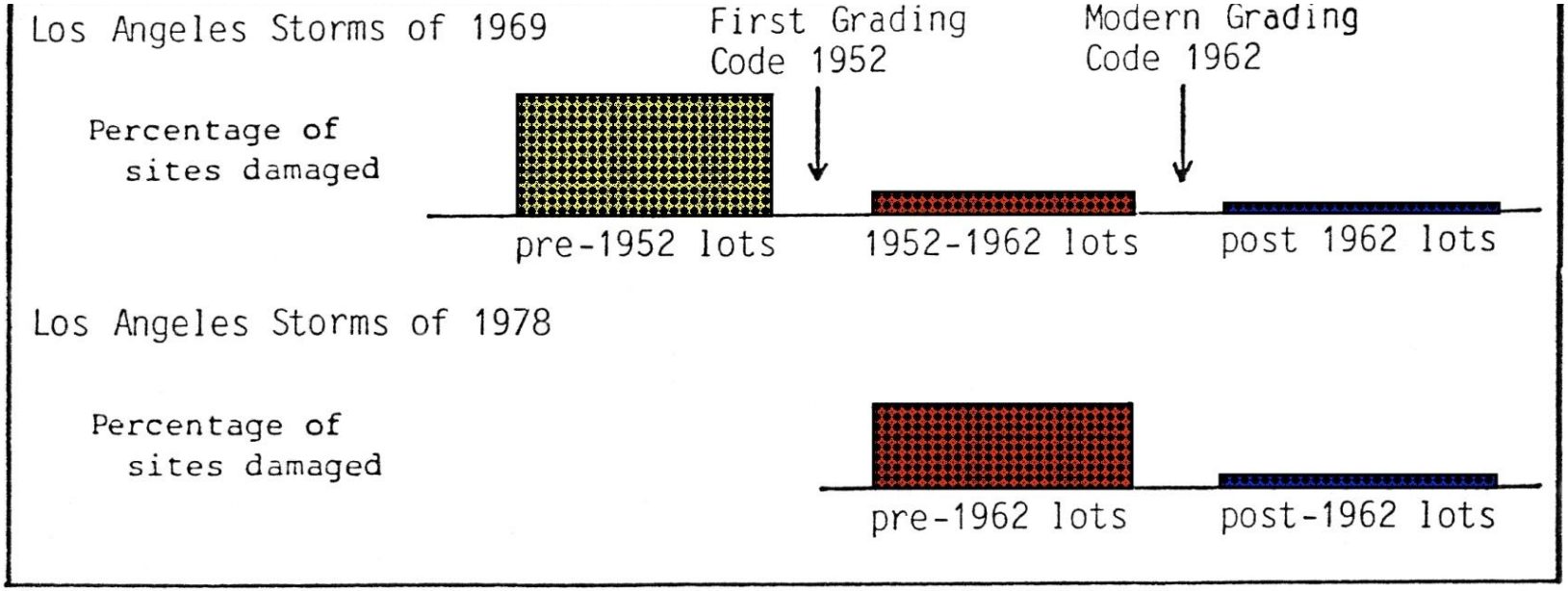
Grading Codes Work:

Grading codes, if thoroughly enforced by local government, have been shown to be very successful. The City of Los Angeles, which has the most comprehensive grading code in the world, has reduced slope failure problems by over 90%.



- **Modern grading codes were successful in reducing 90% of hillside slope problems**

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