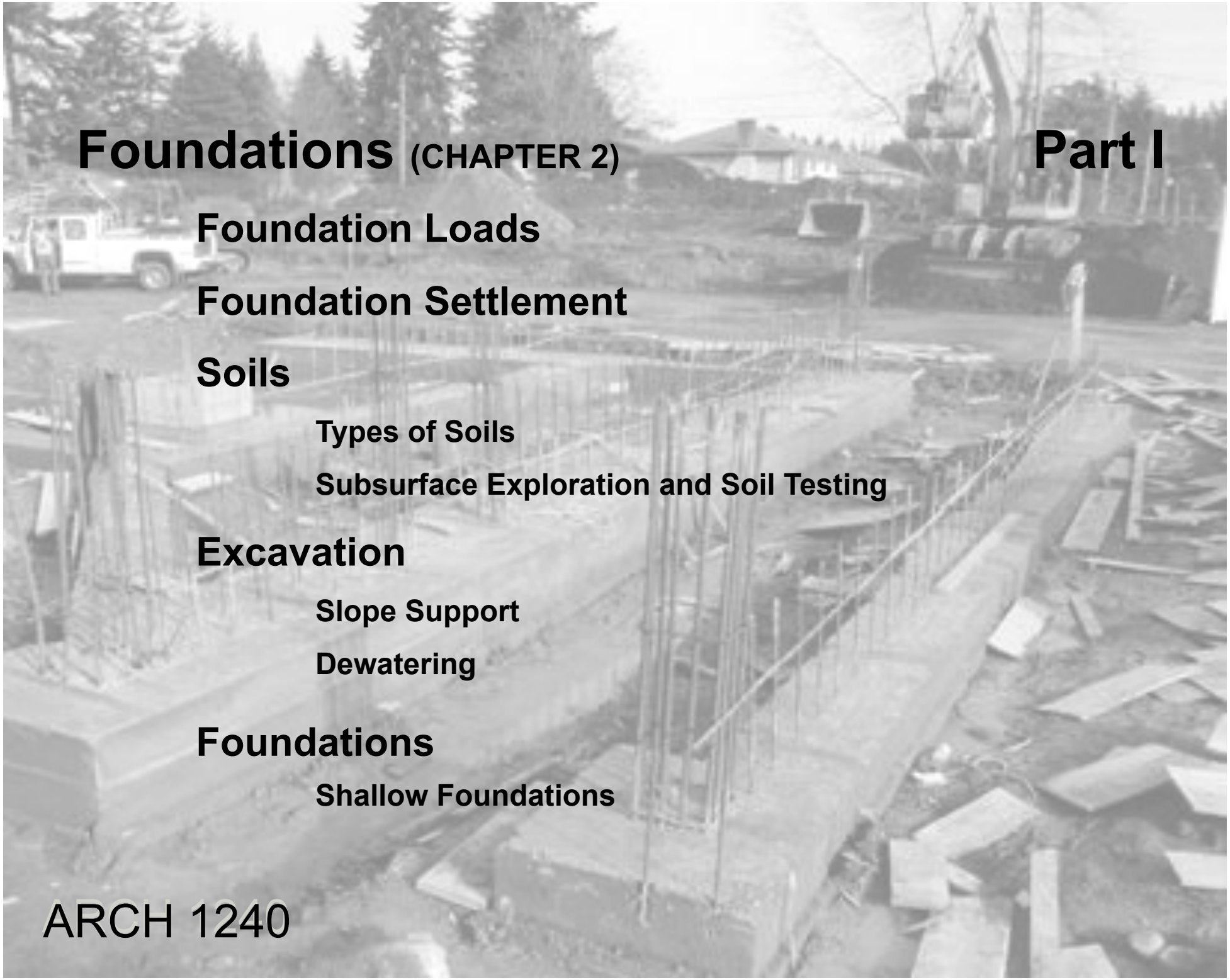
Arch 1240 Methods of Construction in Architecture

Professor Jason Montgomery



Foundations (CHAPTER 2) Part I

Foundation Loads

Foundation Settlement

Soils

Types of Soils

Subsurface Exploration and Soil Testing

Excavation

Slope Support

Dewatering

Foundations

Shallow Foundations

ARCH 1240

Foundation Loading

Dead Loads:

Structure (Weight, Thrust), Floors, Walls, Equipment, Foundations

Live Loads:

People, Furnishings, Snow, Ice, Rain Water

Wind Loads:

Lateral, Downward, Upward

Soil and Hydrostatic Pressure

Seismic Forces:

Horizontal, Vertical Motion of the Ground

Foundation Loading

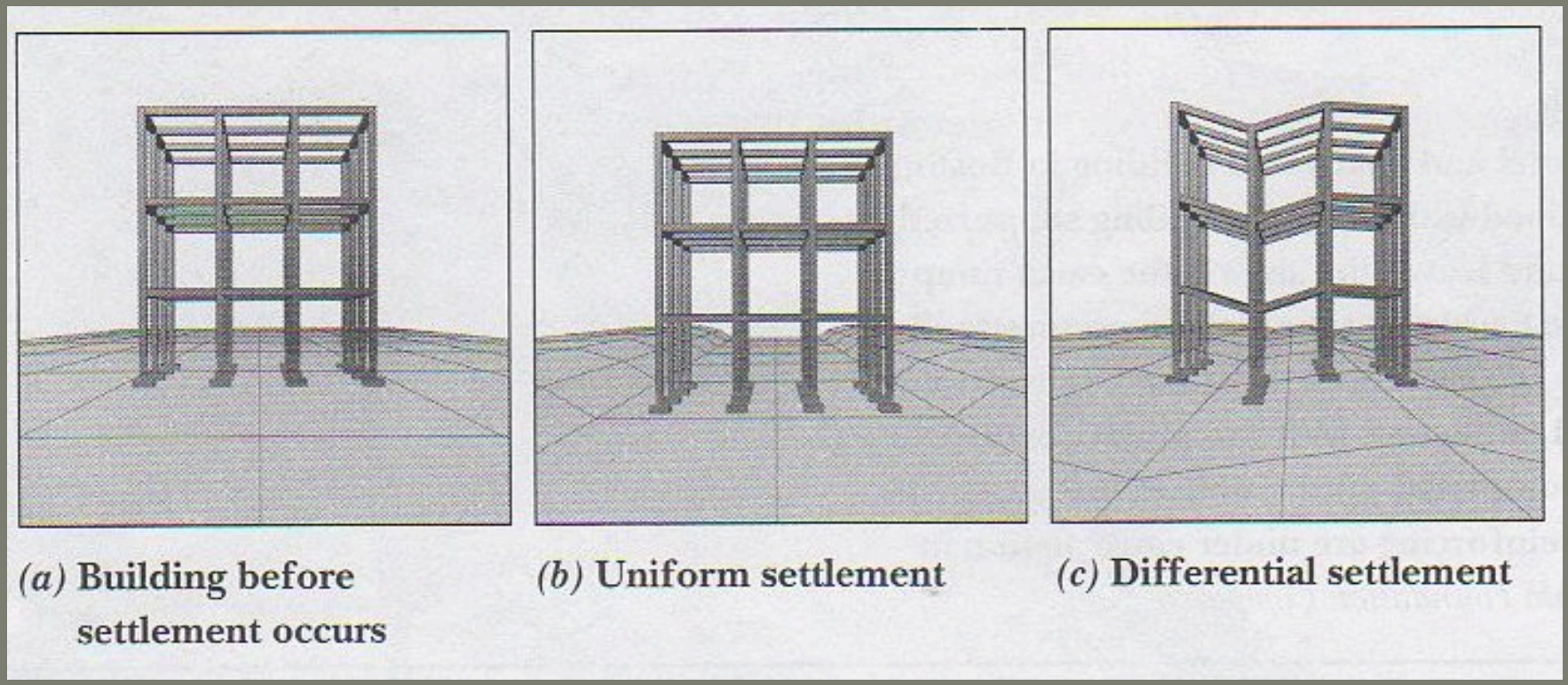
Must Meet Three Requirements:

1. The foundation, underlying soil, and rock must be safe against a structural failure that could result in collapse.

2. During the life the building, the foundation must not settle in such a way as to damage the structure or impair its function.

3. The foundation must be feasible both technically and economically and practical to build without adverse effects to surrounding property.

Foundation Settlement



(a) **Building before settlement occurs**

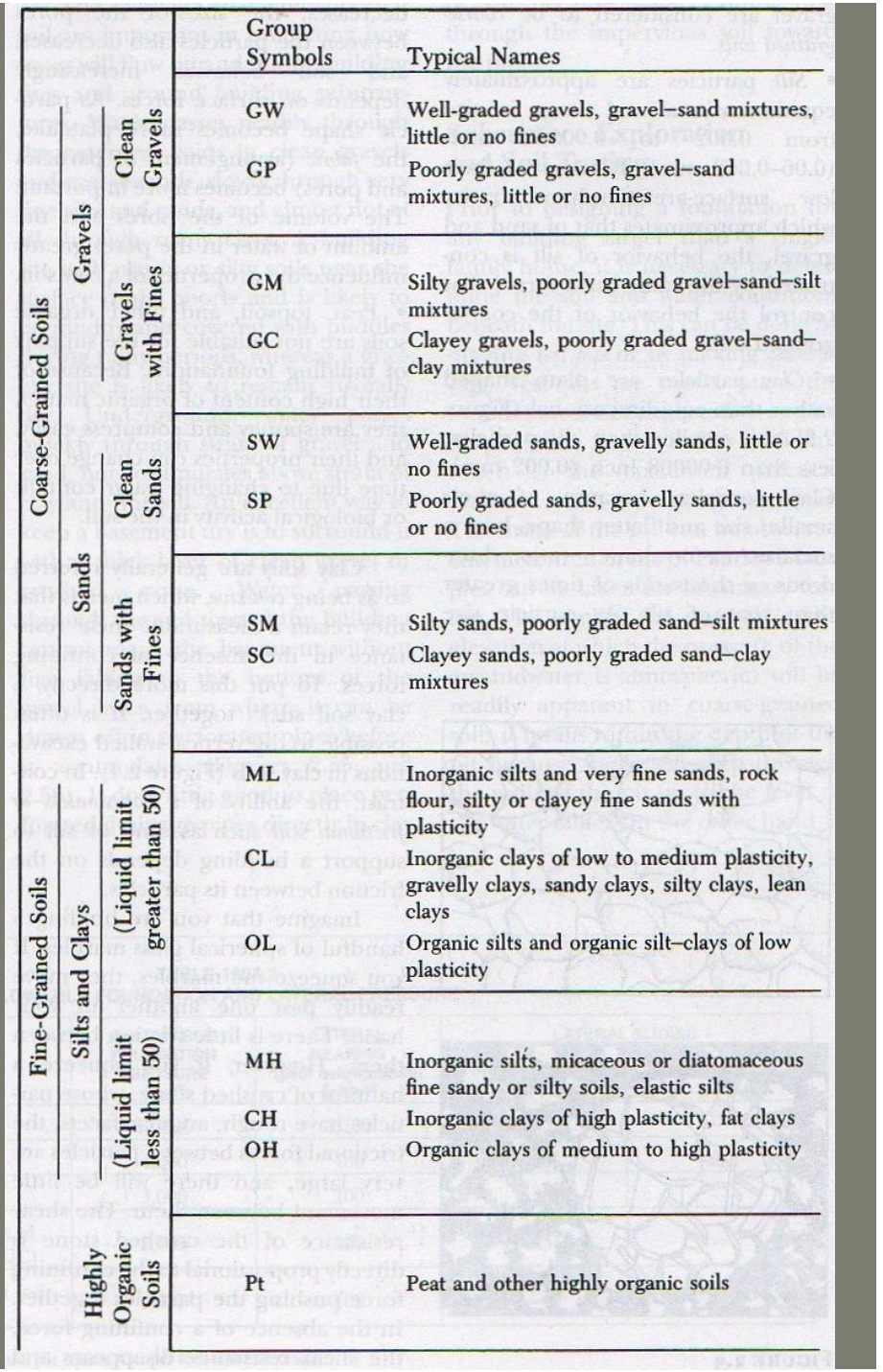
(b) **Uniform settlement**

(c) **Differential settlement**

Soils

Types of Soils

Rock
Soil
Boulder
Cobble
Gravel
Sand
Silt
Clay
Organic Soils
(Peat, Topsoil)



			Group Symbols	Typical Names
Coarse-Grained Soils	Gravels	Clean Gravels	GW	Well-graded gravels, gravel–sand mixtures, little or no fines
			GP	Poorly graded gravels, gravel–sand mixtures, little or no fines
		Gravels with Fines	GM	Silty gravels, poorly graded gravel–sand–silt mixtures
			GC	Clayey gravels, poorly graded gravel–sand–clay mixtures
	Sands	Clean Sands	SW	Well-graded sands, gravelly sands, little or no fines
			SP	Poorly graded sands, gravelly sands, little or no fines
		Sands with Fines	SM	Silty sands, poorly graded sand–silt mixtures
			SC	Clayey sands, poorly graded sand–clay mixtures
Fine-Grained Soils	Silts and Clays	(Liquid limit greater than 50)	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silt–clays of low plasticity
		(Liquid limit less than 50)	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
	Highly Organic Soils		Pt	Peat and other highly organic soils

Soils

Characteristics of Soils

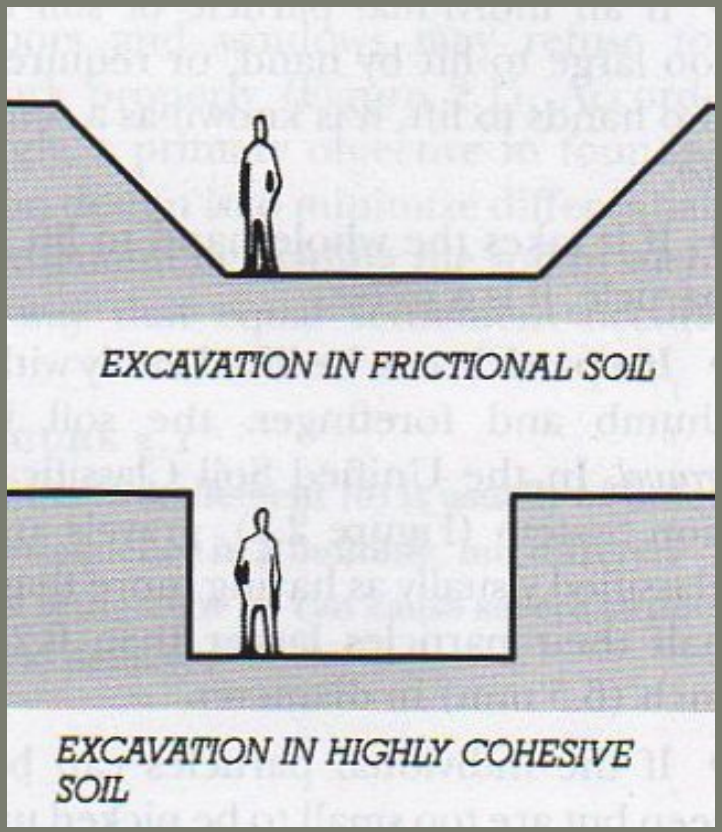
Cohesive Soil

Cohesionless/Frictional Soil

Strata of Soil

Stability

Drainage Characteristics



Soils

Subsurface Exploration & Soil Testing

Test Pits

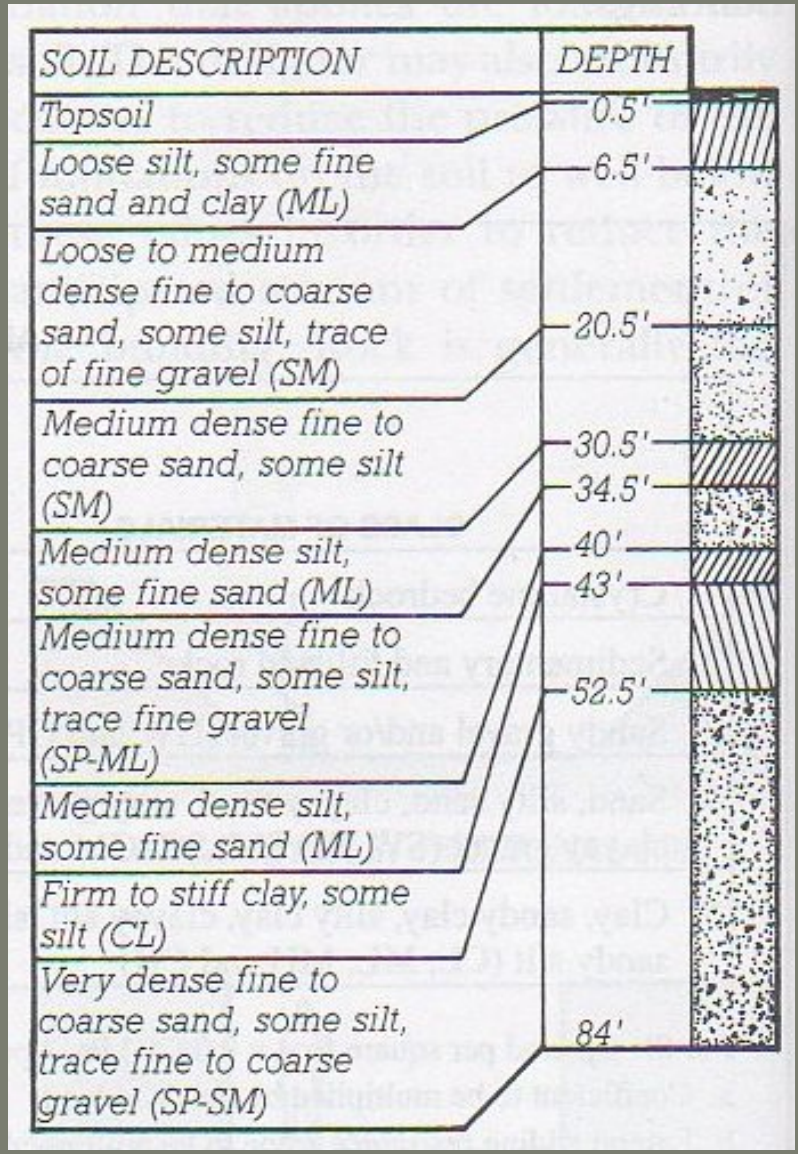
up to 8’ deep max

Test Borings

Water Table

Standard Penetration Test

Laboratory Testing



Soils

Subsurface Exploration & Soil Testing

Allowable Bearing Pressure

TABLE 1804.2
ALLOWABLE FOUNDATION AND LATERAL PRESSURE

CLASS OF MATERIALS	ALLOWABLE FOUNDATION PRESSURE (psf)[d]	LATERAL BEARING (psf/f below natural grade)[d]	LATERAL SLIDING	
			Coefficient of friction[a]	Resistance (psf)[b]
1. Crystalline bedrock	12,000	1,200	0.70	—
2. Sedimentary and foliated rock	4,000	400	0.35	—
3. Sandy gravel and/or gravel (GW and GP)	3,000	200	0.35	—
4. Sand, silty sand, clayey sand, silty gravel and clayey gravel (SW, SP, SM, SC, GM and GC)	2,000	150	0.25	—
5. Clay, sandy clay, silty clay, clayey silt, silt and sandy silt (CL, ML, MH and CH)	1,500[c]	100	—	130

For SI: 1 pound per square foot = 0.0479 kPa, 1 pound per square foot per foot = 0.157 kPa/m.

a. Coefficient to be multiplied by the dead load.

b. Lateral sliding resistance value to be multiplied by the contact area, as limited by Section 1804.3.

c. Where the building official determines that in-place soils with an allowable bearing capacity of less than 1,500 psf are likely to be present at the site, the allowable bearing capacity shall be determined by a soils investigation.

d. An increase of one-third is permitted when considering load combinations, including wind or earthquake loads, as permitted by Section 1605.3.2.

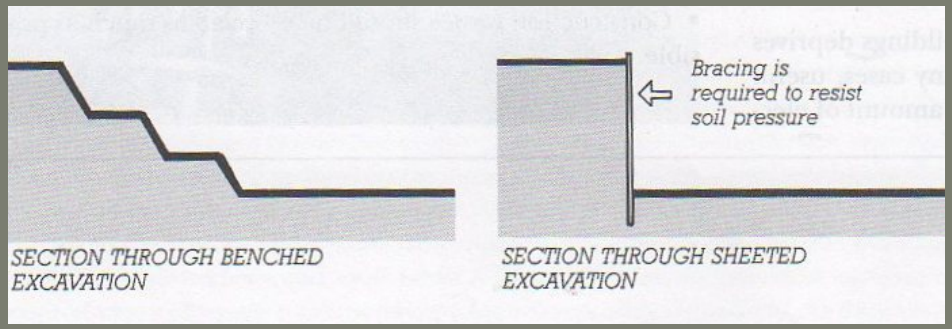
Excavations

Slope Support

Sheeting

Soldier Beams

Lagging



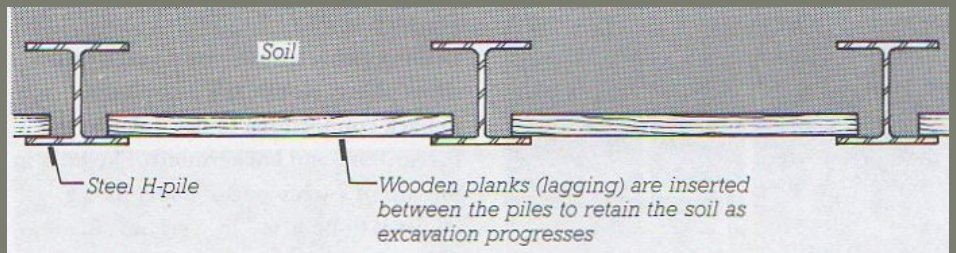
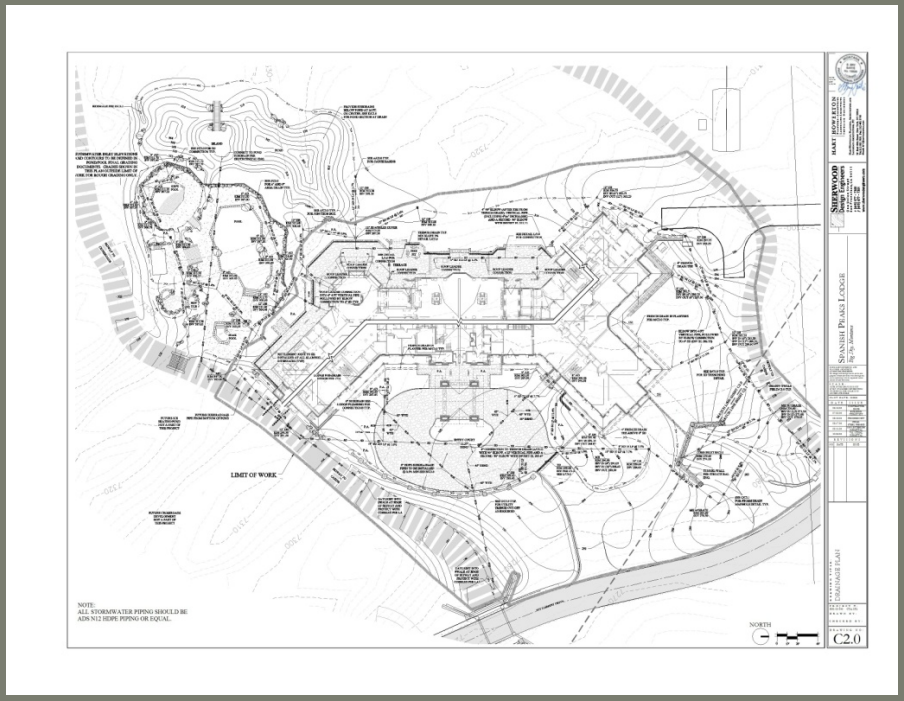
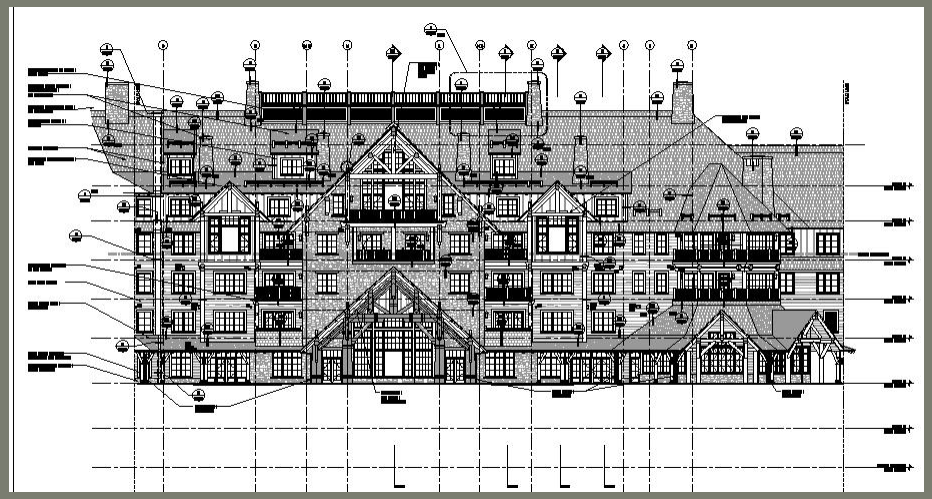


FIGURE 2.10
Soldier beams and lagging, seen in horizontal section.

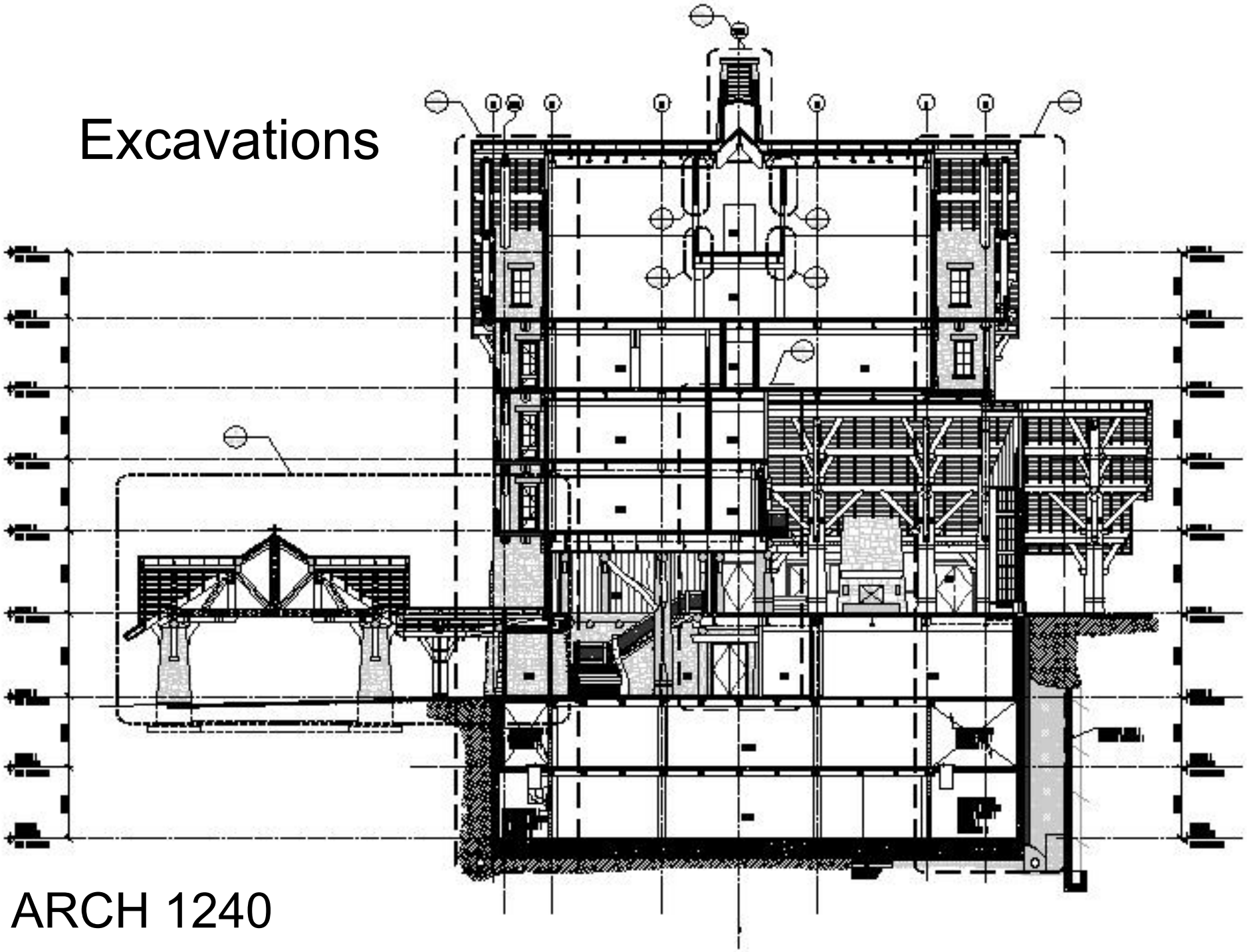
Excavations

Slope Support





Excavations

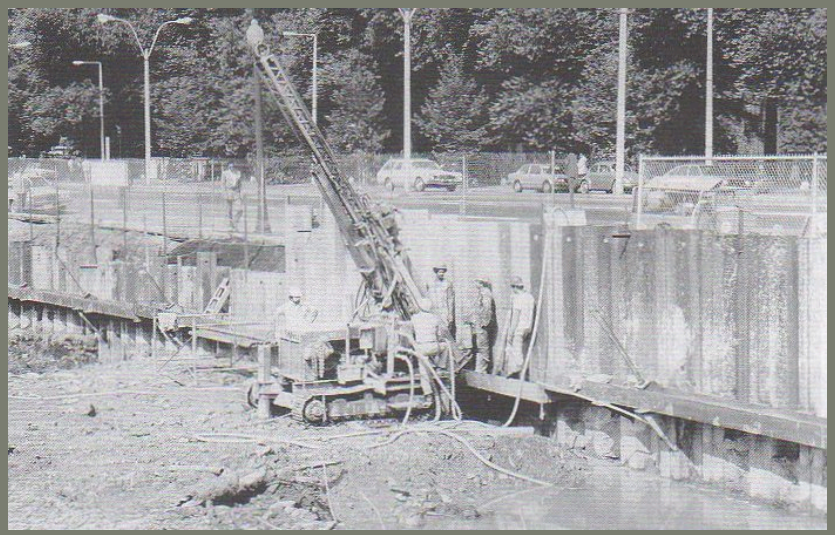


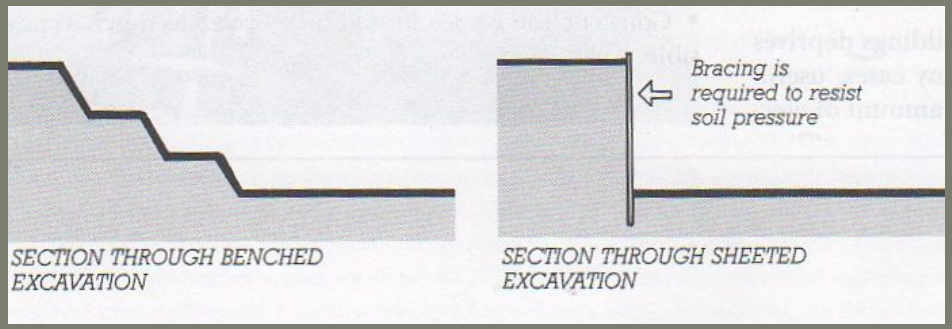
ARCH 1240

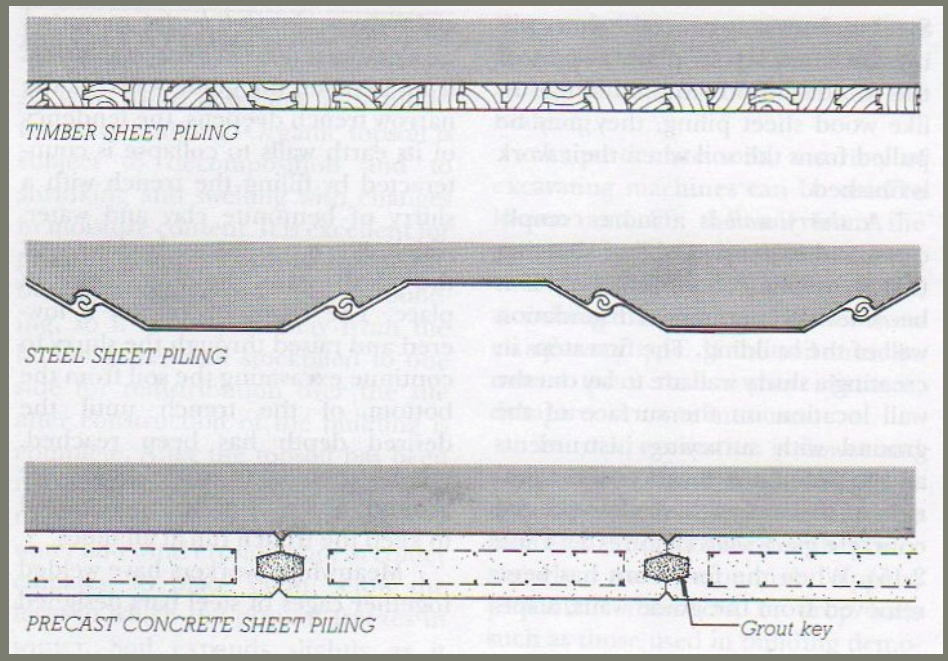
Excavations

Slope Support

Sheet Piling



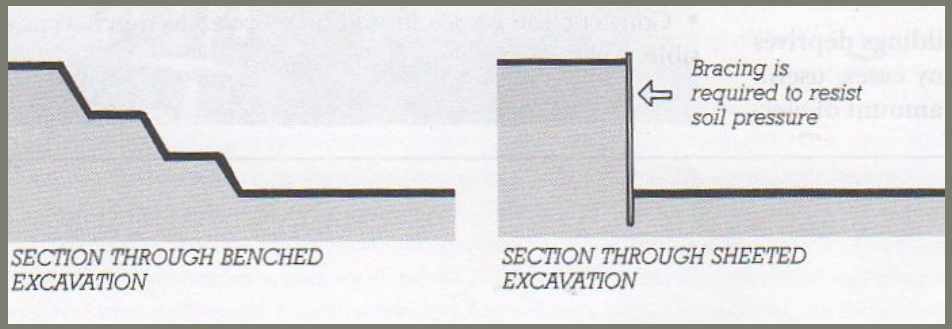


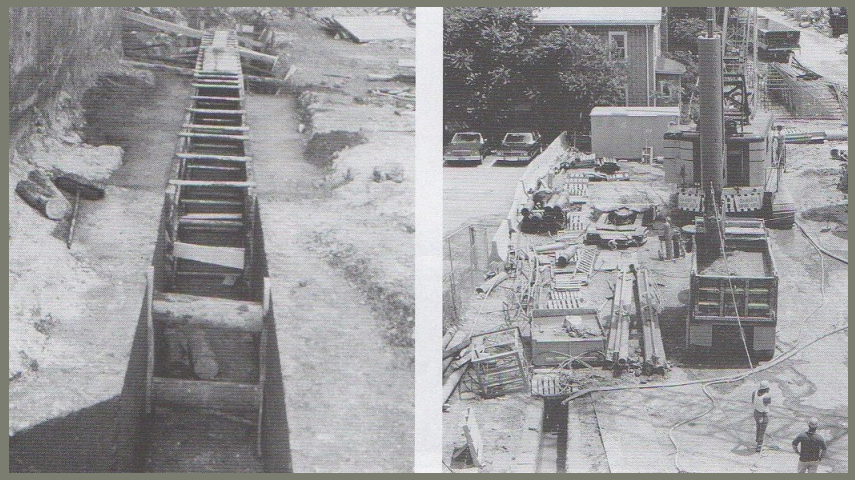


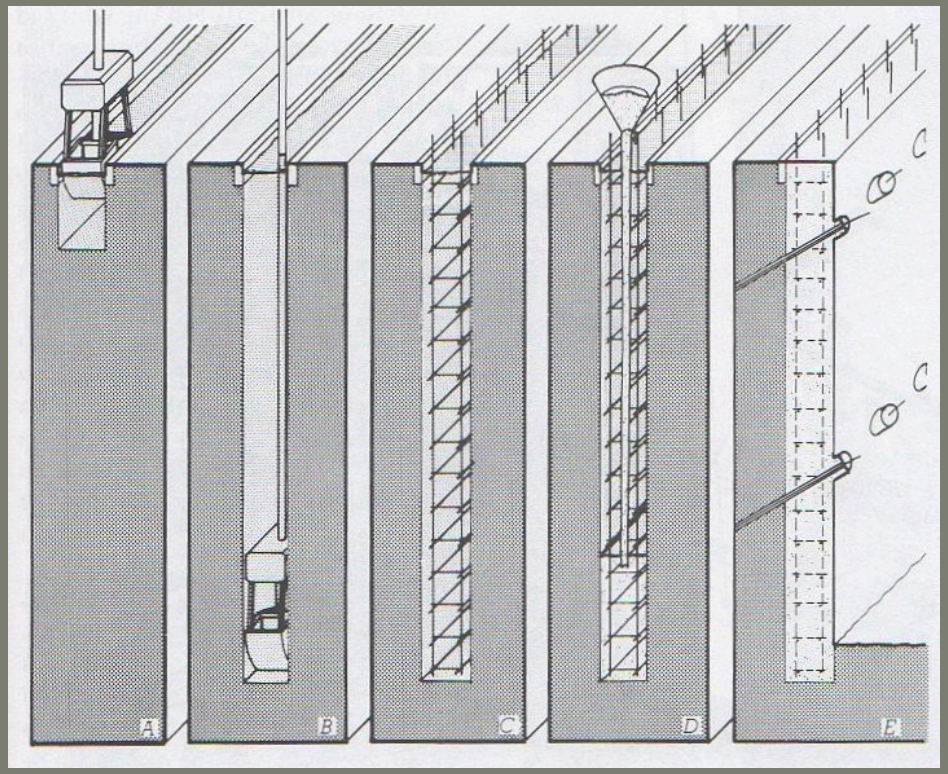
Excavations

Slope Support

Slurry Wall







Excavations

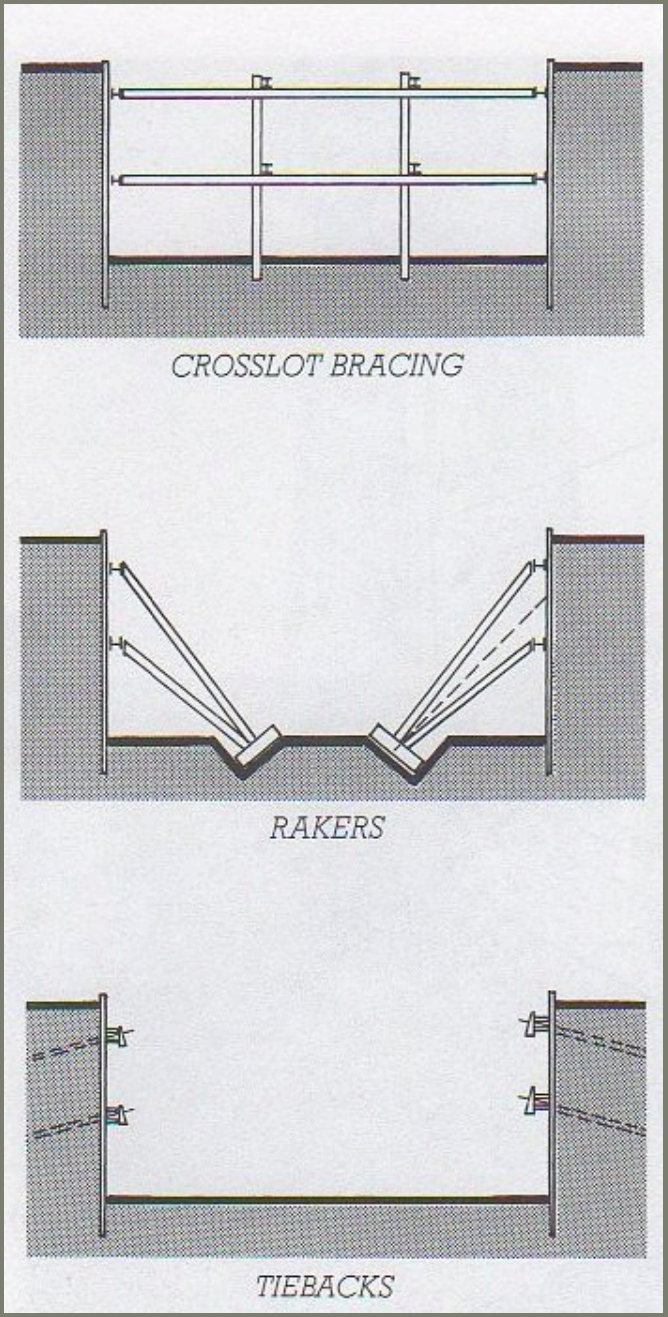
Slope Support

Bracing

Crosslot

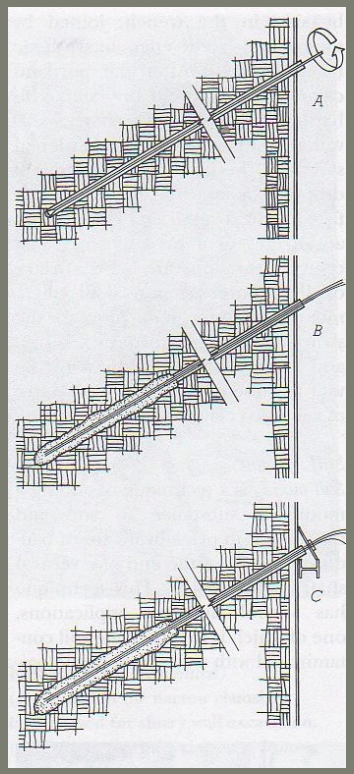
Rakers

Tiebacks



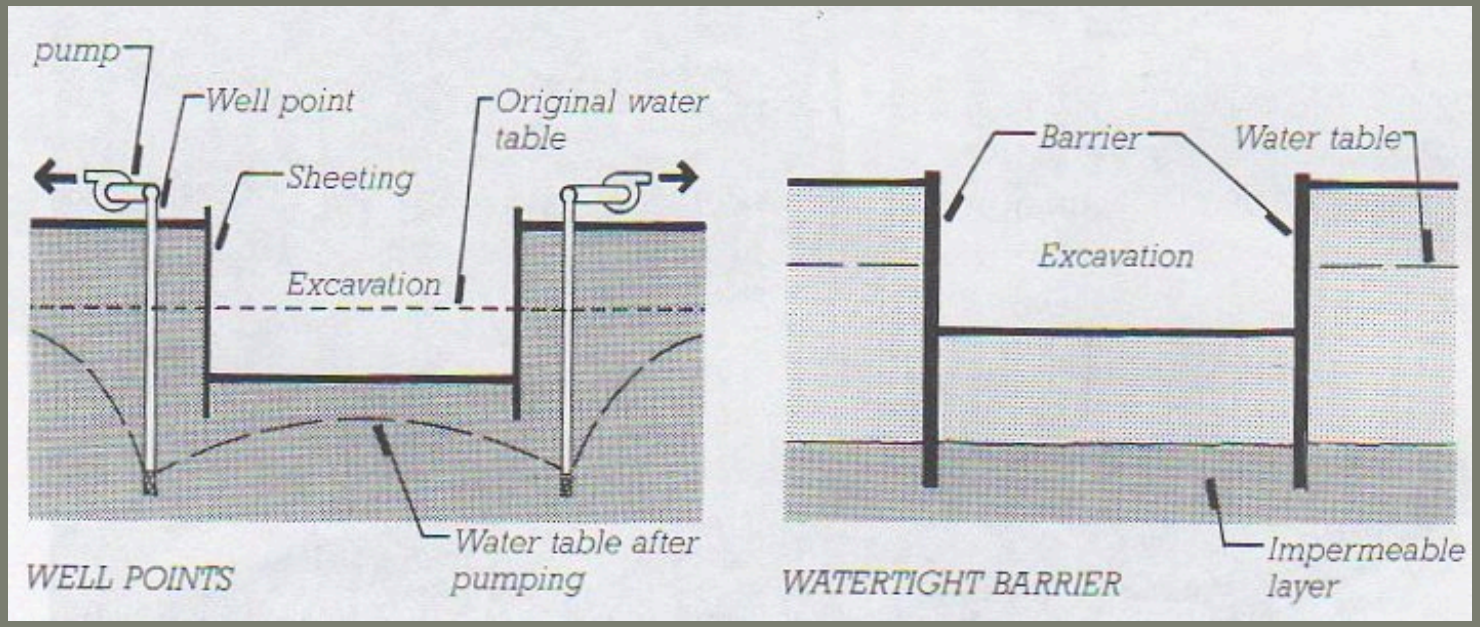
Excavations

Slope Support Bracing Tiebacks

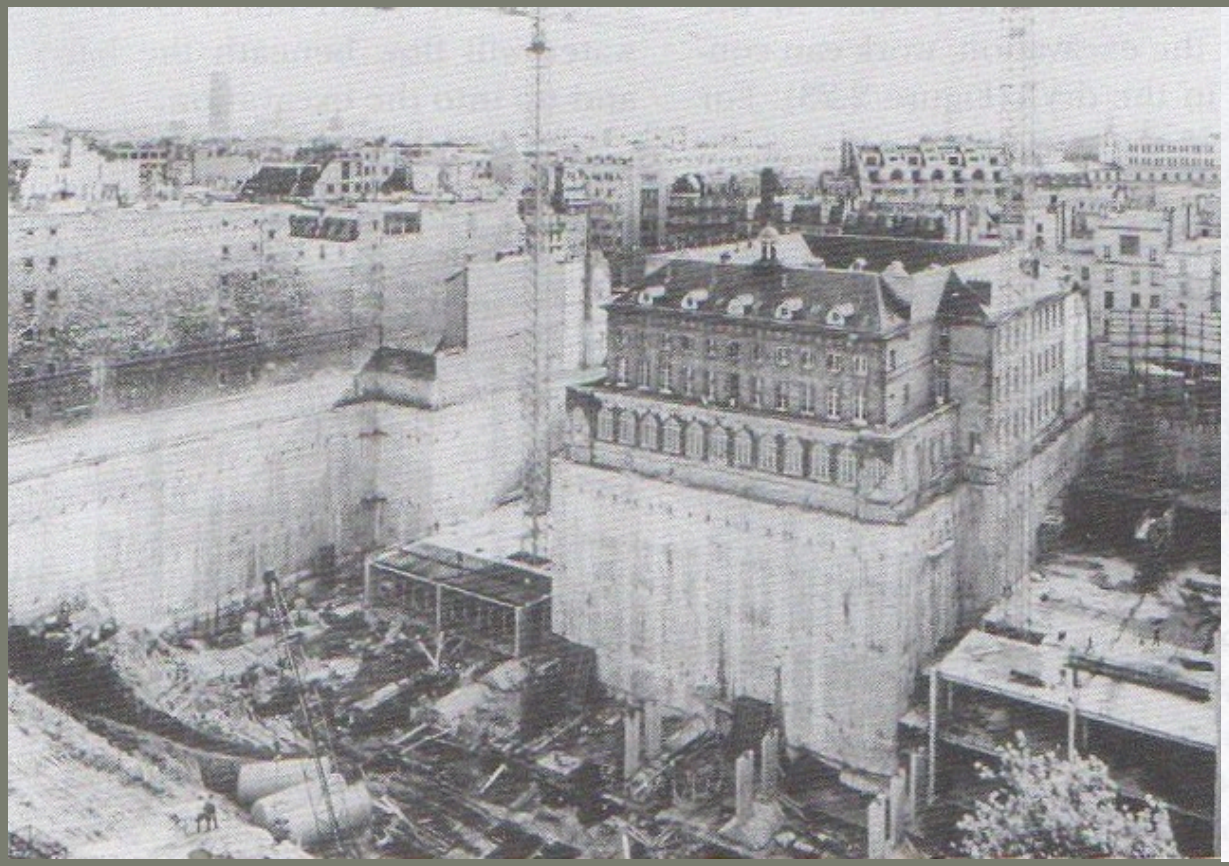


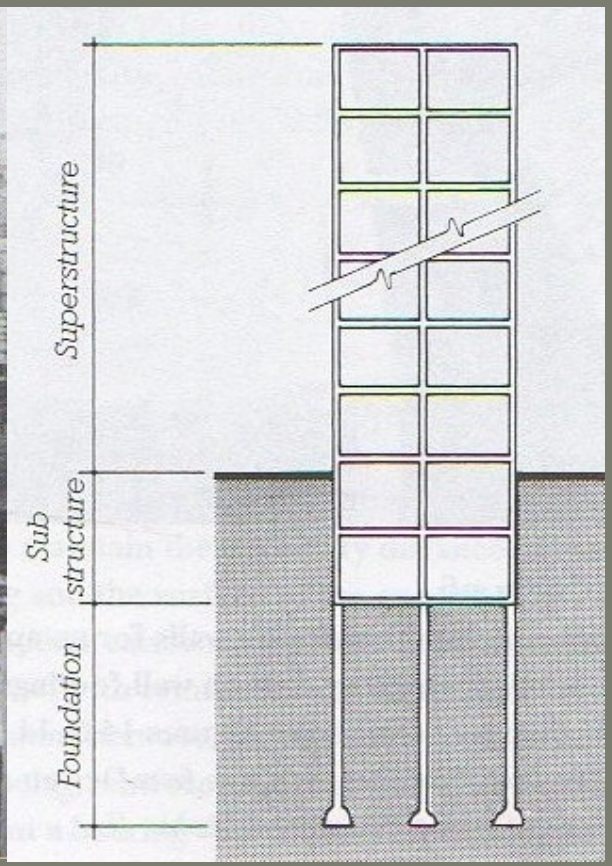
Excavations Dewatering

Well Point, Sump Pumps, Watertight Barrier

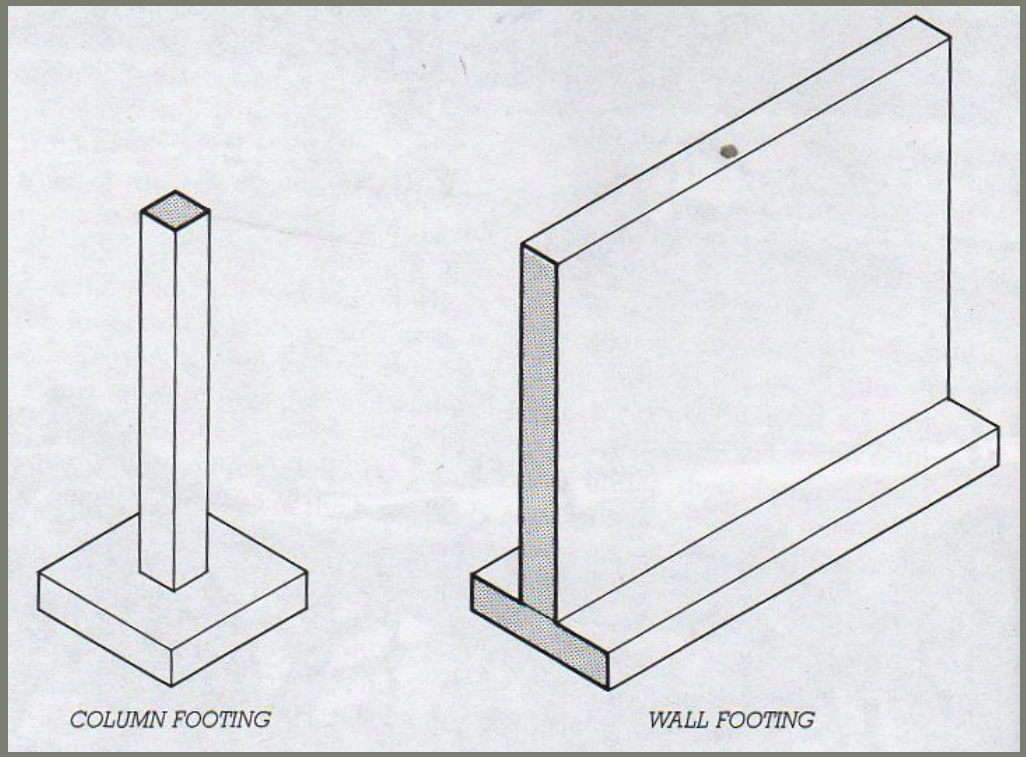


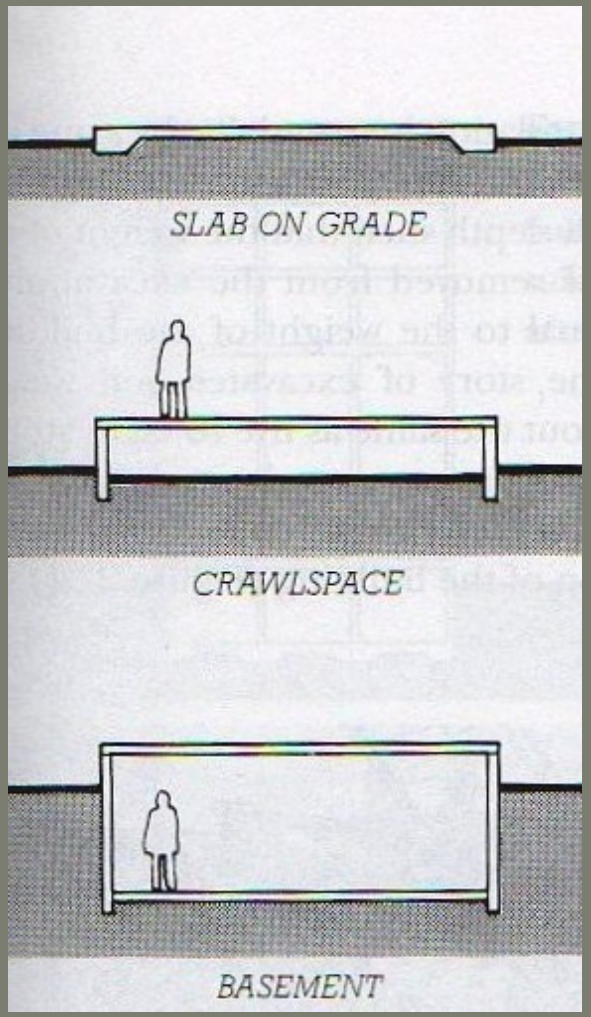
Foundations





Foundations Shallow Foundations





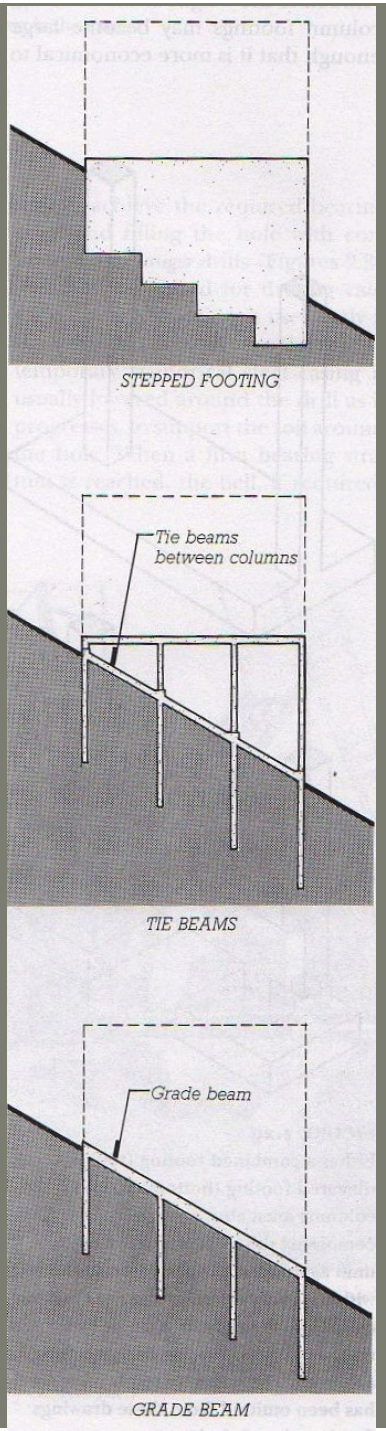
Foundations

Shallow Foundations on Slopes

Stepped Foundation

Tie Beams

Grade Beams



Foundations

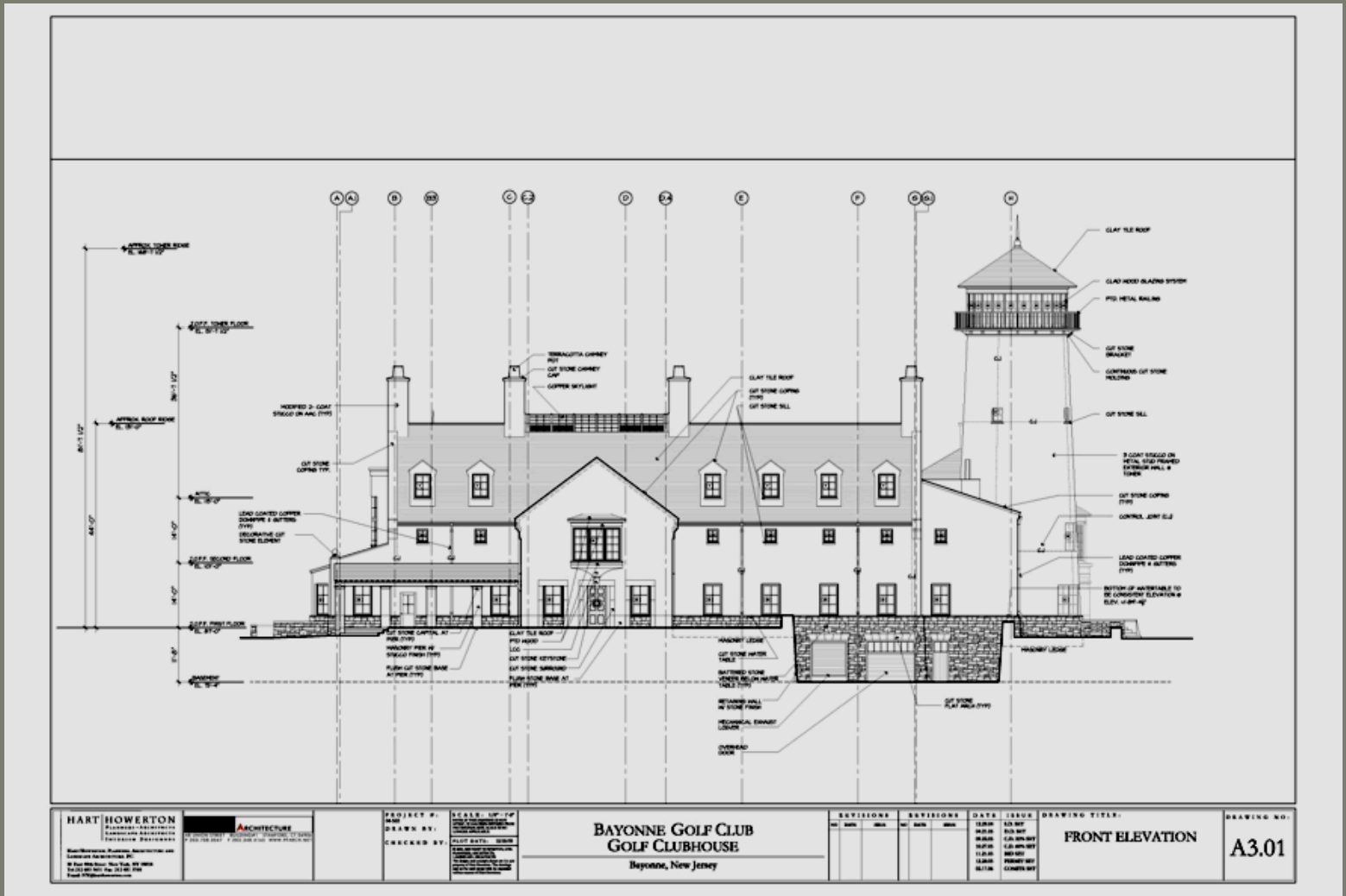
Shallow Foundations on Soil w/ Low Bearing Capacity

Mat Slab

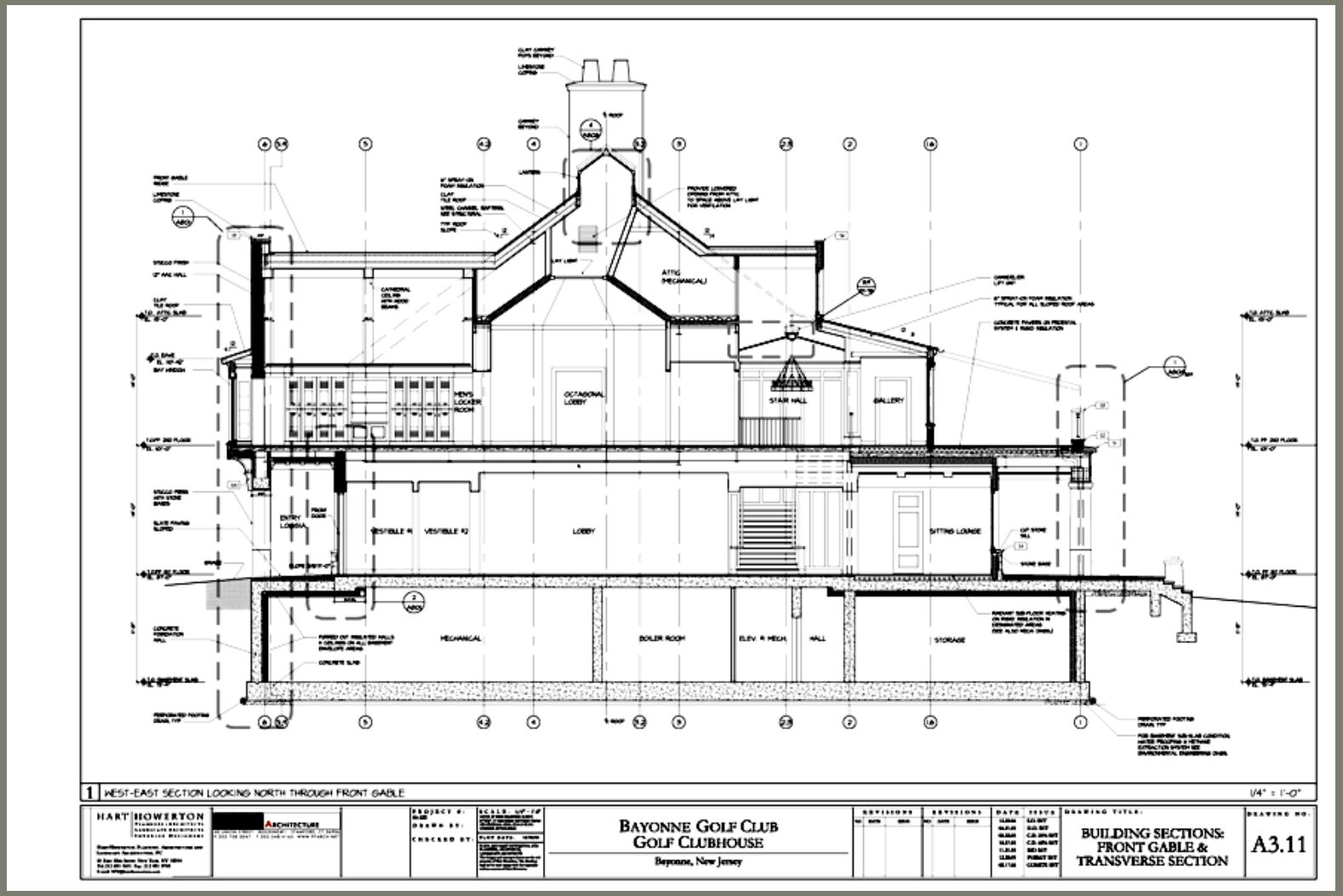
Raft Foundation

Floating Foundation

Foundations



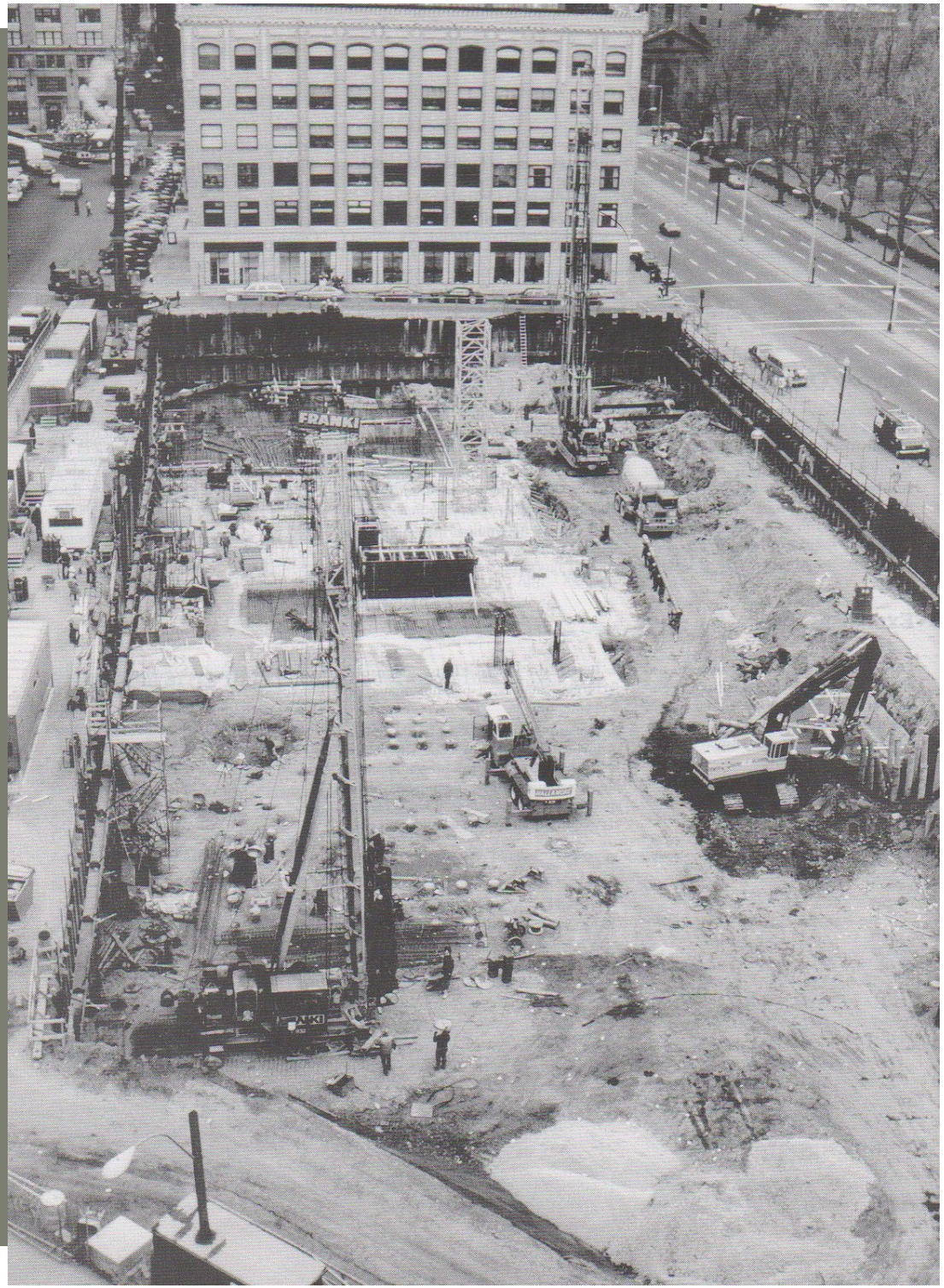
Foundations



Foundations

ARCH 1240

Foundations



ARCH 1240