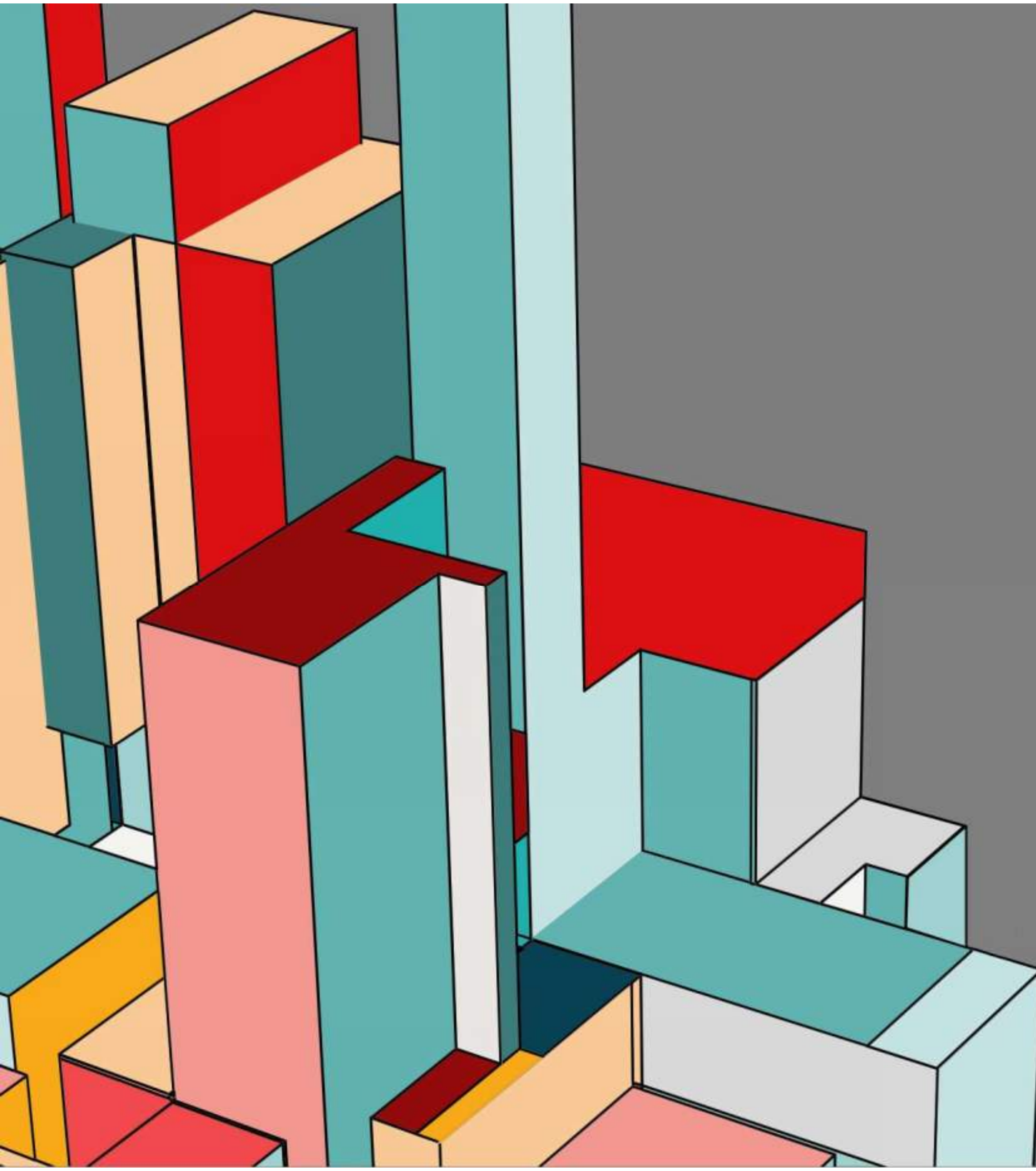


THE FOUNDATION OF ARCHITECTURE

Why does our structure cost so much?

CB0

INTRODUCTIONS

Owner

Easy Foster, RTSBA, AIC, CPC, LEED AP BD+C

Executive Director of Planning and Construction

Conroe Independent School District

B.S. in Construction Science, Texas A&M University

Masters of Science in Management, West Governors University

Architect

Cody Boyd, AIA

Principal // Client Executive

PBK Architects

B.S. of Architecture, The University of Texas at San Antonio

Masters of Architecture, University of Houston

Engineer

John Kubala, P.E.

President & CEO

Kubala Engineers

B.S. Architectural Engineering
The University of Texas at Austin

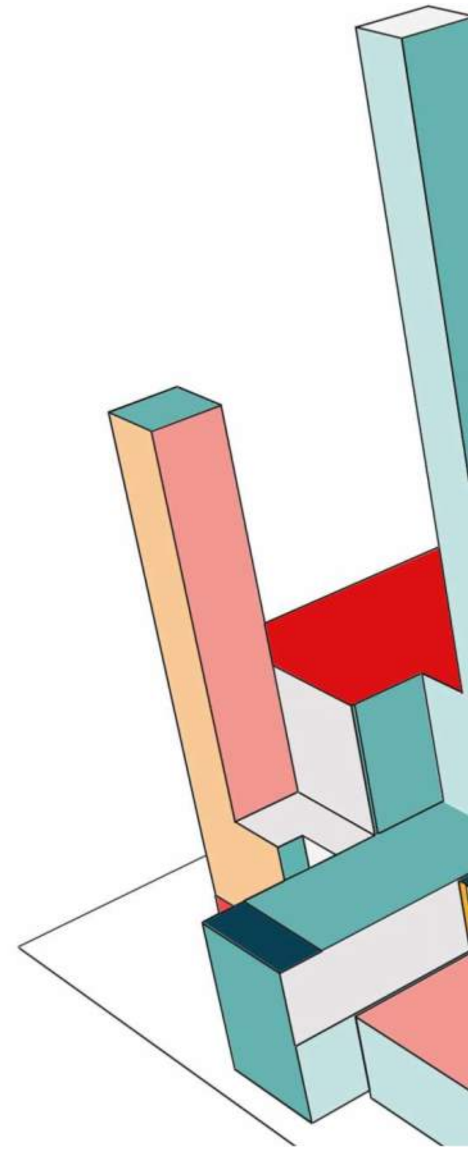
Slide 2

CB0 All introduce our selves

Boyd, Cody, 2024-05-08T13:11:40.031

AGENDA

- Identification
- Historic Data and Trends
- Steel Example:
  - Window Example Scenarios / Case Study
- Concrete Example:
  - Geology & Site, Foundation Example Scenarios
- Rules of Thumb



ABSTRACT

Designing schools that support modern learning and proactively anticipate future needs presents a fundamental change in educational architecture. Creating dynamic, flexible, and sustainable spaces that foster creativity, collaboration, and learning, coupled with new code requirements, unique geological challenges, strict site requirements, and architectural complexity, demands a reevaluation of structural engineering practices to ensure that these innovative spaces are not only visually striking but also safe, resilient, functional, and fiscally responsible.

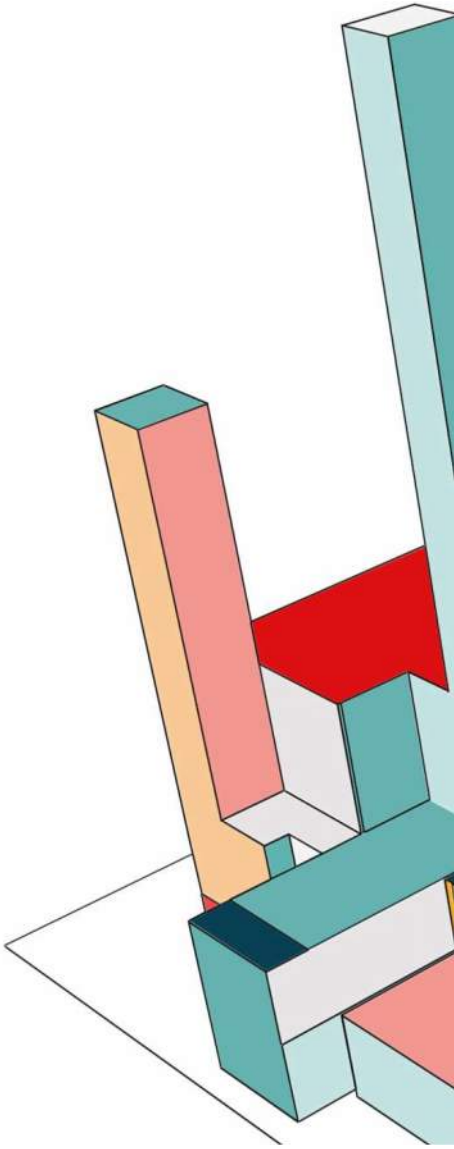
In response to this challenge, owners, architects, and structural engineers are developing advanced strategies that integrate cutting-edge technologies, materials, and methodologies into their designs. These strategies encompass a wide range of considerations, including but not limited to:

Impacts on our structural design due to site conditions:

Taking the appropriate time to study and understand each project site is imperative to the overall design of a building. We must utilize our resources to their utmost potential to prevent over-engineering and excessive strategies or techniques. One of our best tools is the collaboration and inclusion of our Structural, Civil, and Geotechnical Engineers. Understanding the geology, characteristics, soil conditions, and additional factors impacts our structural designs and, inevitably, our project budgets.

Architectural configuration and relation to building size compared to project budget:

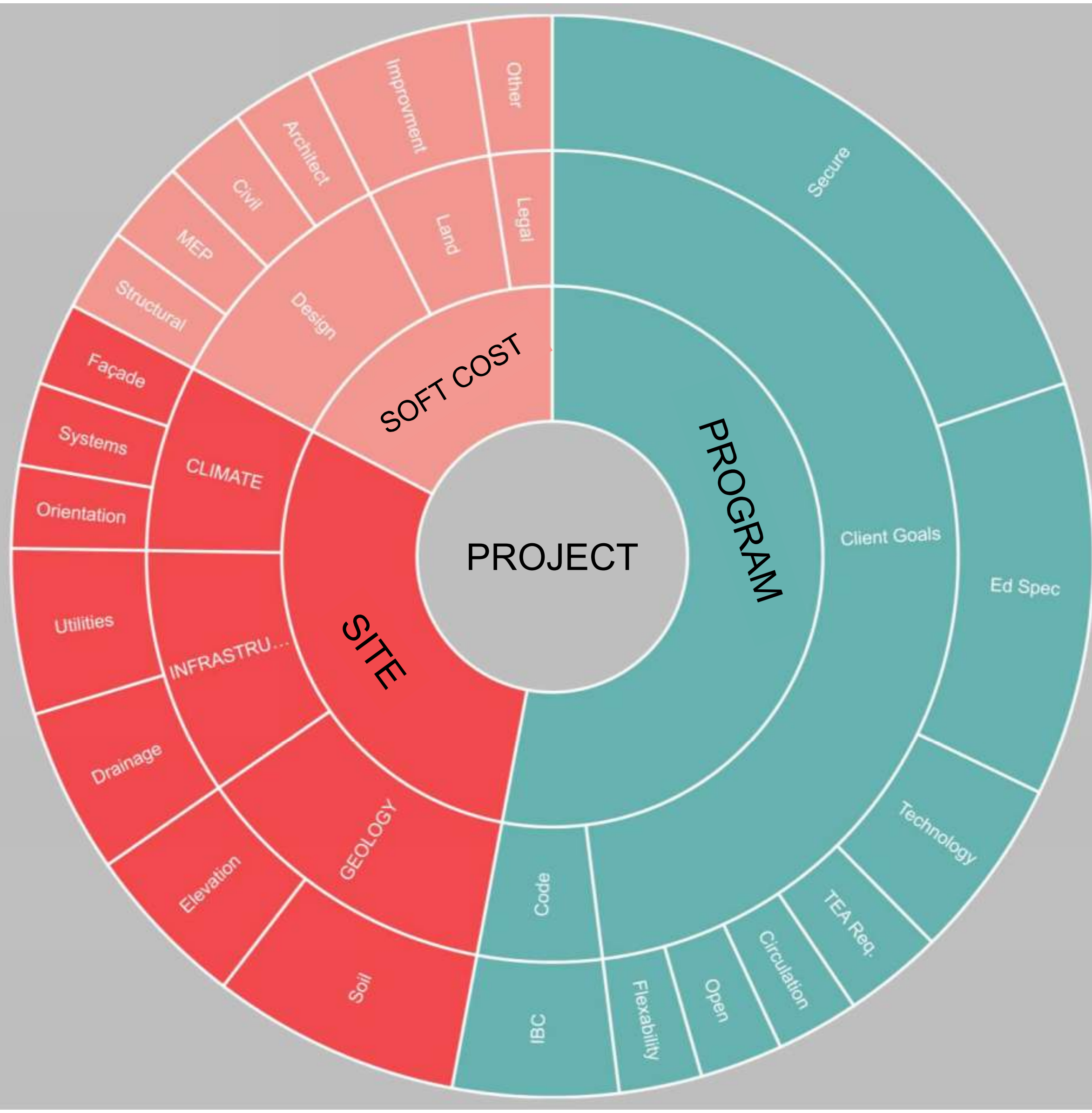
The facilities we are designing today and for the future continue to grow in scale. With the increased square footage and the desire for more expansive, open, and flexible spaces, structural engineers face added challenges when designing structural systems and foundations that meet architectural needs and the client's budget.

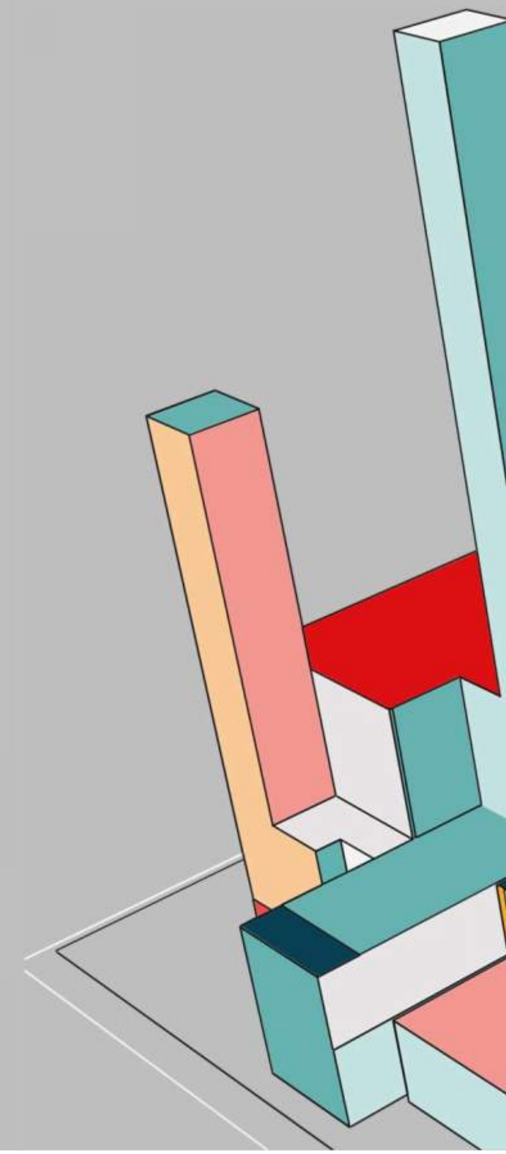


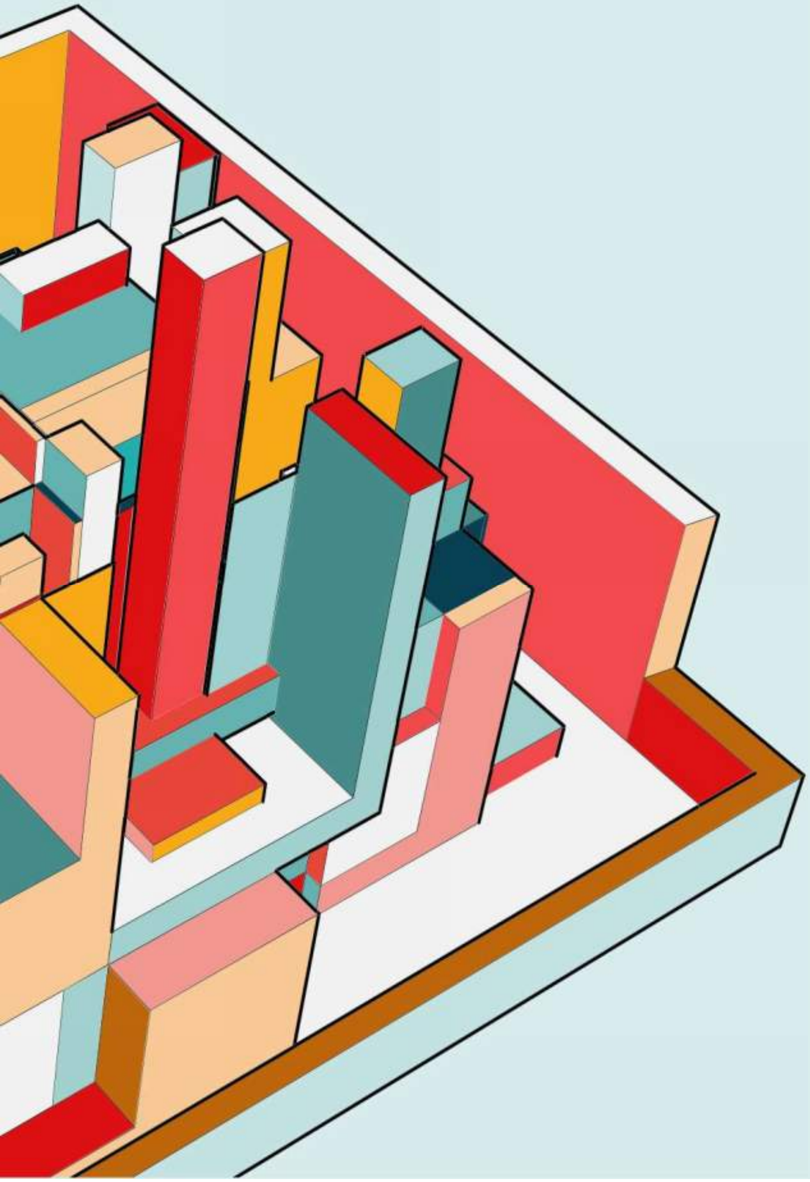
WHAT PROBLEM ARE WE HIGHLIGHTING?

- Project Cost
- Limited Funding
  - Tangible elements to address
    - Project Design (structure)
    - Ego


KB46279860I
B2
UNITED STATES
OF AMERICA
100


PROJECT
PROGRAM
SITE
SOFT COST
Client Goals
Code
Secure
Ed Spec
Technology
TEA Req.
Circulation
Open
Flexability
IBC
CLIMATE
INFRASTRU...
GEOLOGY
Façade
Systems
Orientation
Utilities
Drainage
Elevation
Soil
Design
Land
Legal
Structural
MEP
Civil
Architect
Improvment
Other

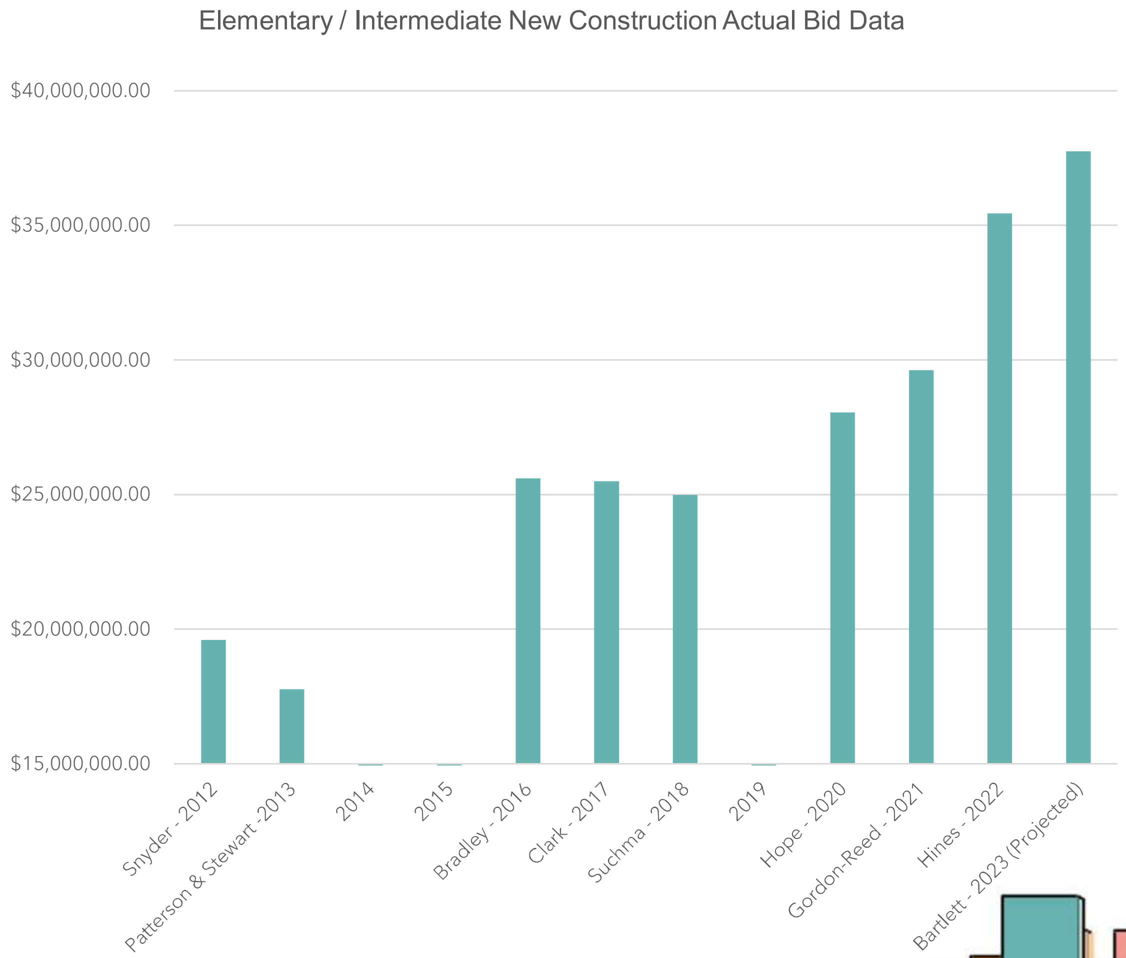




HISTORICAL DATA

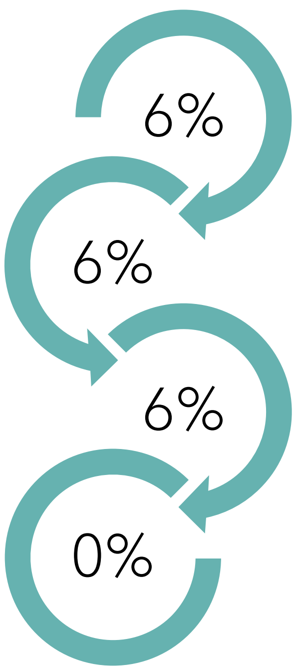
HISTORICAL DATA

Prototype design w/ 9 iterations over the past 12 years

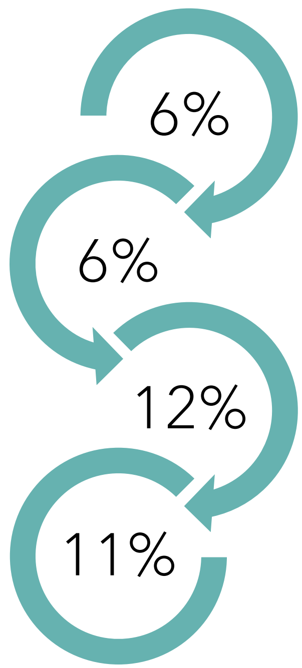


INFLATION, POJECTION, AND PLANNING

Last Planning Cycle



Actuals



If we Overestimate Inflation – we don't spend and/or potentially extend the overall bond cycle (Ex: 2008 Bond extended to 2015)

If we underestimate…

We carry/create Contingency Budget

If we run out of Contingency Budget

we must either Cut Scope

Supplement with General Funds from the M&O Budget

Current Forecast 12%

PLANNING

Bids Received 12% Increase

January 2023 - $100

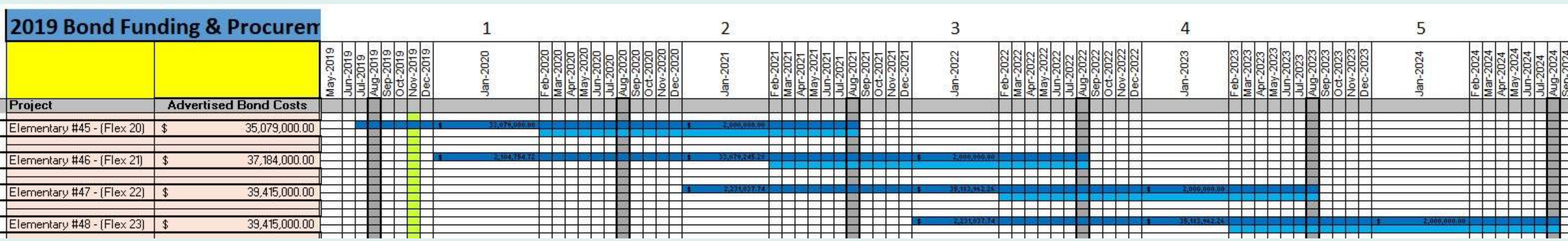
January 2024 - $112

January 2025 - $125.44

January 2026 - $140.49

January 2027 - $157.35

January 2028 - $176.23



NEW DESIGN CHALLENGES:

- Fenestration & Design Trends
- Revisions in Design Codes & Laws
- Material Cost and Availability
- Population Growth
- Site Constraints

ALTEREGO

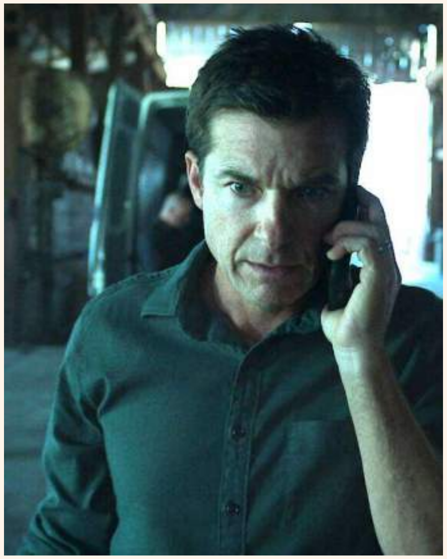
Owner

The Boss

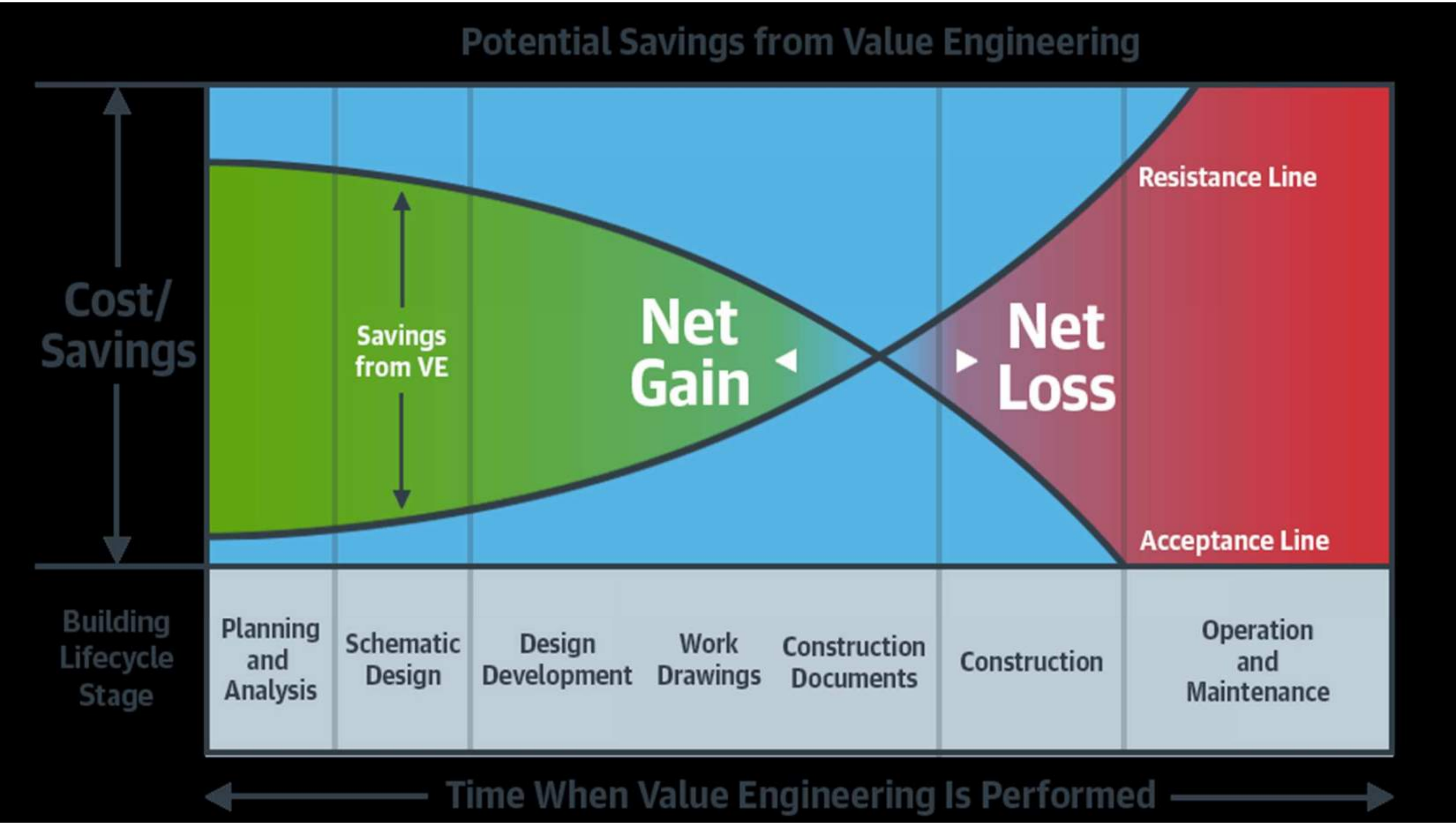
Architect

The Hero

Engineer



The Problem Solver


Potential Savings from Value Engineering
Cost/ Savings
Savings from VE
Net Gain
Net Loss
Resistance Line
Acceptance Line
Building Lifecycle Stage
Planning and Analysis
Schematic Design
Design Development
Work Drawings
Construction Documents
Construction
Operation and Maintenance
Time When Value Engineering Is Performed

INFORMATION OVERLOAD:

THE SCIENCE BEHIND BAD DECISIONS

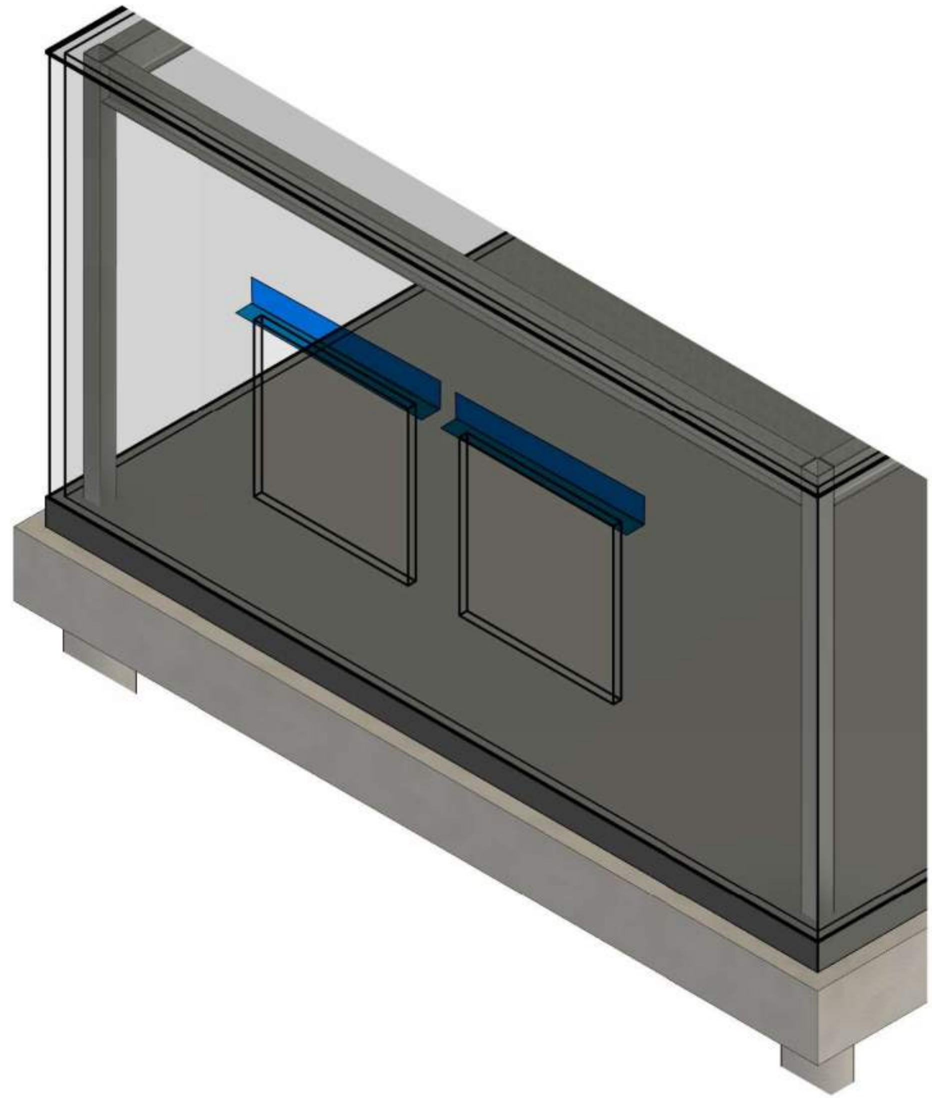
the[brief]lab®

16

EXAMPLE SCENARIOS

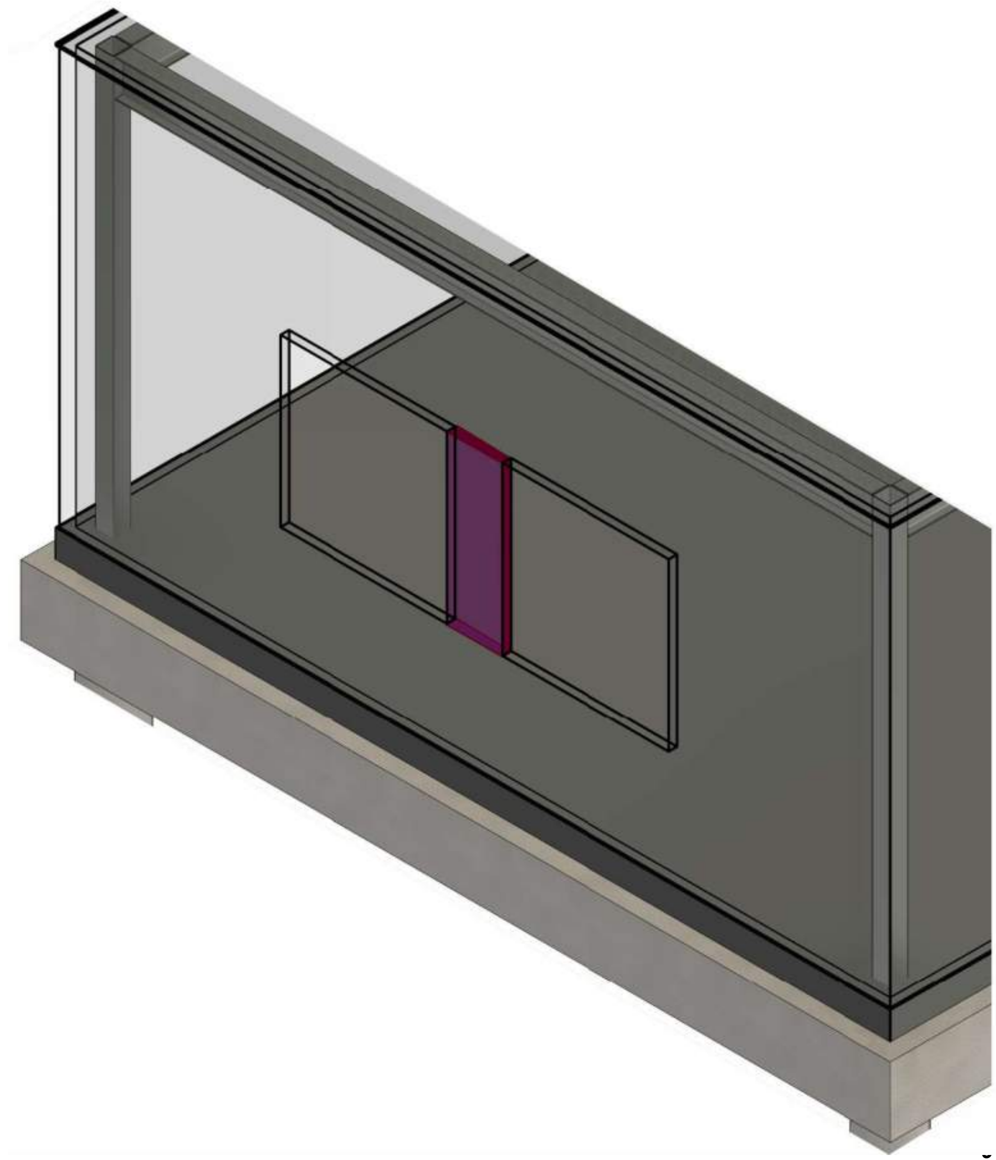
LOOSE LINTEL:

- 250 lbs of steel
  - Steel = $650
  - Galv. = $100
  - Erection = $0.00
  - **Total Cost = $750**



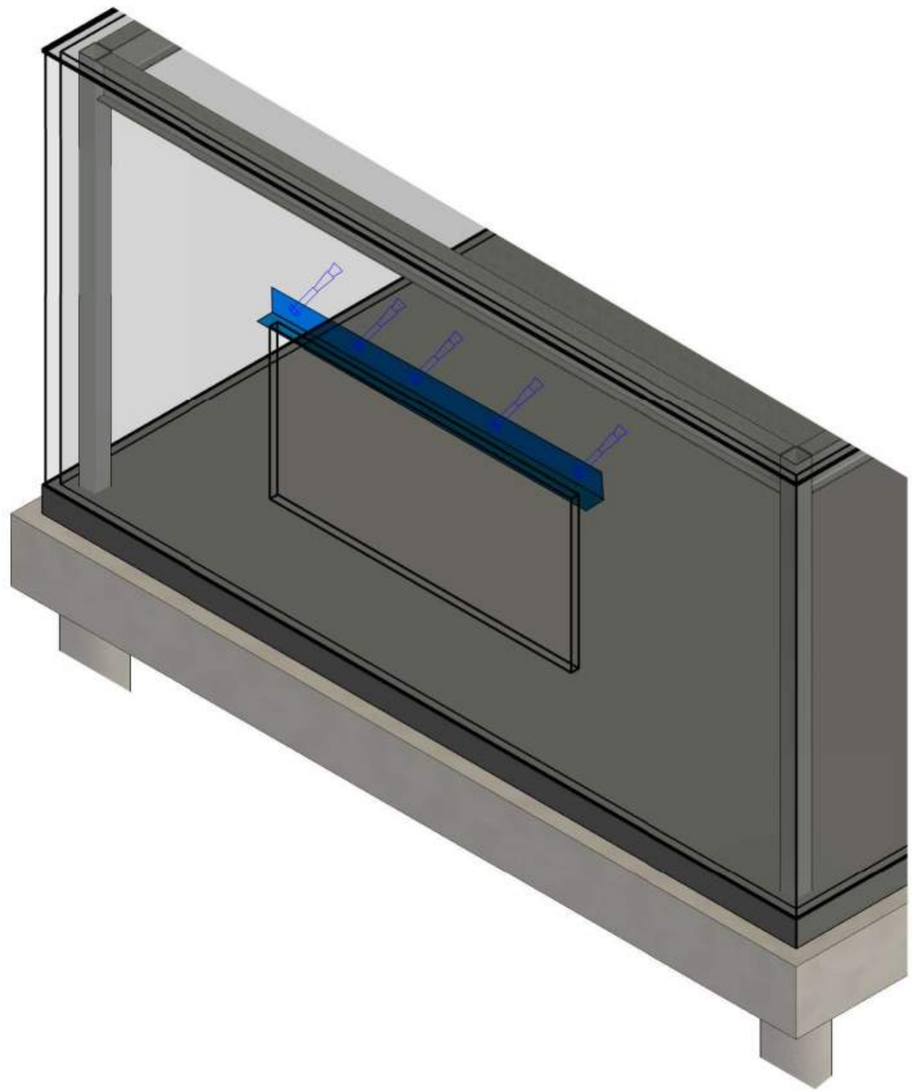
CHANGE IN MATERIAL

- Loose lintel condition no longer valid



BOLTED SHELF ANGLE:

- 250 lbs of steel
  - Steel = $650
  - Galv. = $100
  - Erection = $300
  - **Total Cost = $1,050**
- Requires CMU back-up with lintel beam
- Limited to 15'+/-
- Requires good CMU jambs
- Give attention to masonry joint locations



HORIZONTAL TUBES

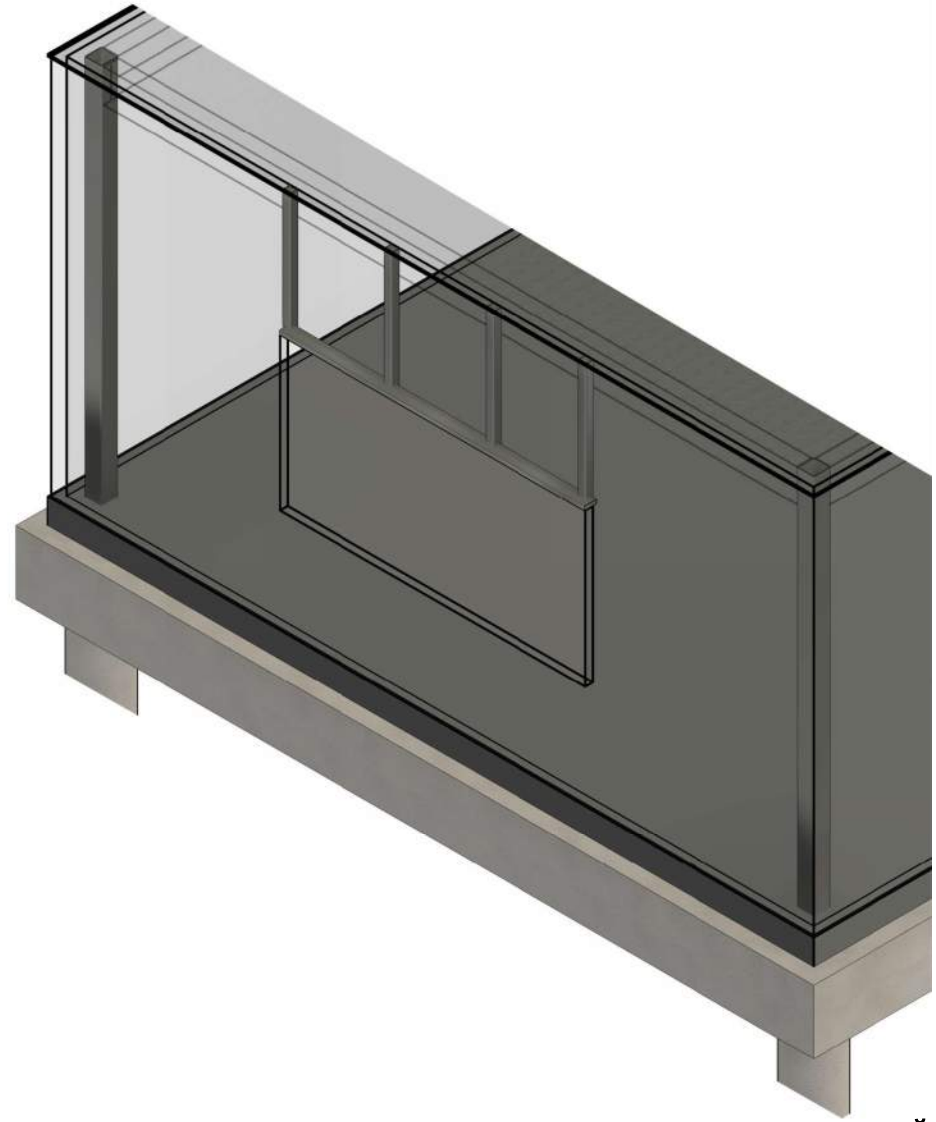
- 3,750 lbs of steel
    - HSS16x8x3/8” + HSS12x8x3/8”
    - Column size increase
    - Steel = $10,000
    - Galv. = $100
    - Erection = $5,000
    - **Total Cost = $15,100**
- Unlimited horizontally
- Vertical alignment recommended

FRAMED OPENINGS

- 2,000 lbs of steel
- HSS8x6x3/8” + HSS6x6x3/8”
- Steel = $5,400
- Galv. = $100
- Erection = $3,500
- **Total Cost = $9,000**

HANG-DOWN ONLY

- 1,000 lbs of steel
  - Tube steel horizontal
  - Channel hang-downs
  - Roof beam size increase
    - Less increase at composite floors
  - Steel = $3,400
  - Galv. = $100
  - Erection = $5,000
  - **Total Cost = $8,500**
- Requires CMU for sill support
- Requires drywall infill over opening

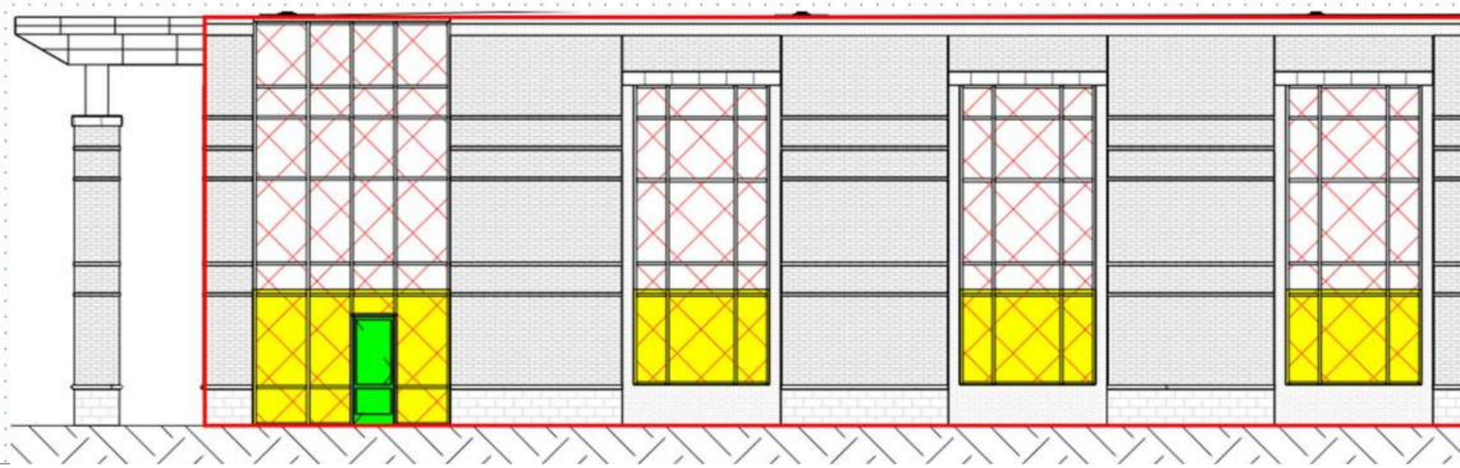


HANG-DOWN & POST-UPS

- 1,500 lbs of steel
  - Tube steel horizontal
  - Channel hang-downs
  - Roof beam size increase
    - Less increase at composite floors
  - Steel = $4,650
  - Galv. = $100
  - Erection = $5,600
  - **Total Cost = $10,350**
- Assuming full height drywall

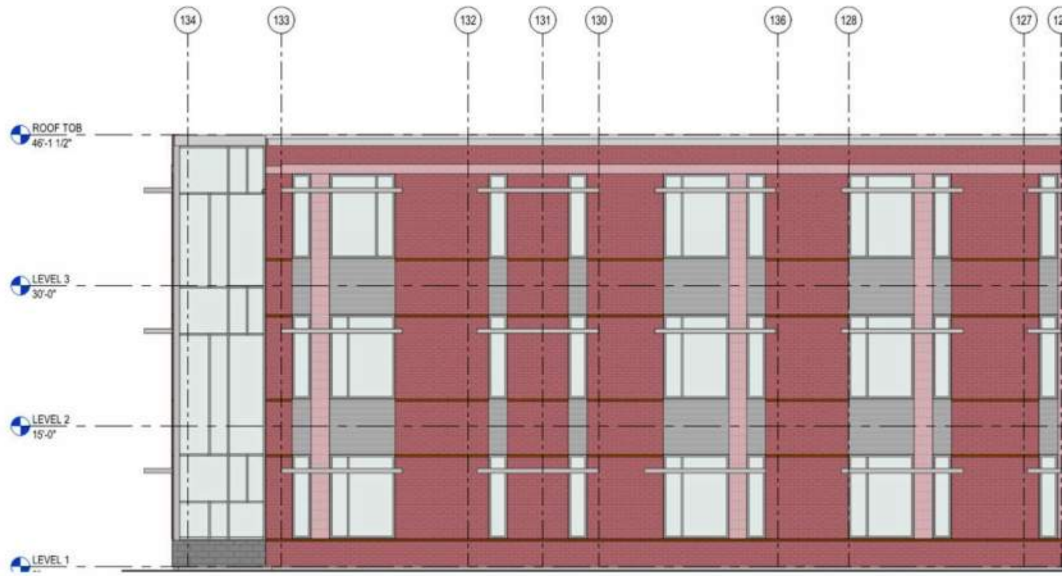
CASE STUDY

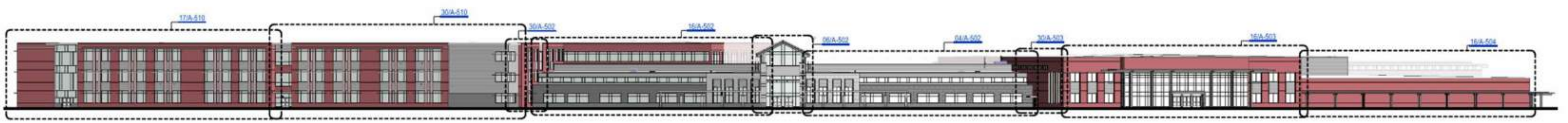
- 1,200 to 1,600 Student Junior High Schools surveyed
- Overall Glazing to Solid Façade 28%
- Academic Wing Glazing to Solid Façade 32%
- 750sf Classroom 24’x32’ Glazing Ratio 10%



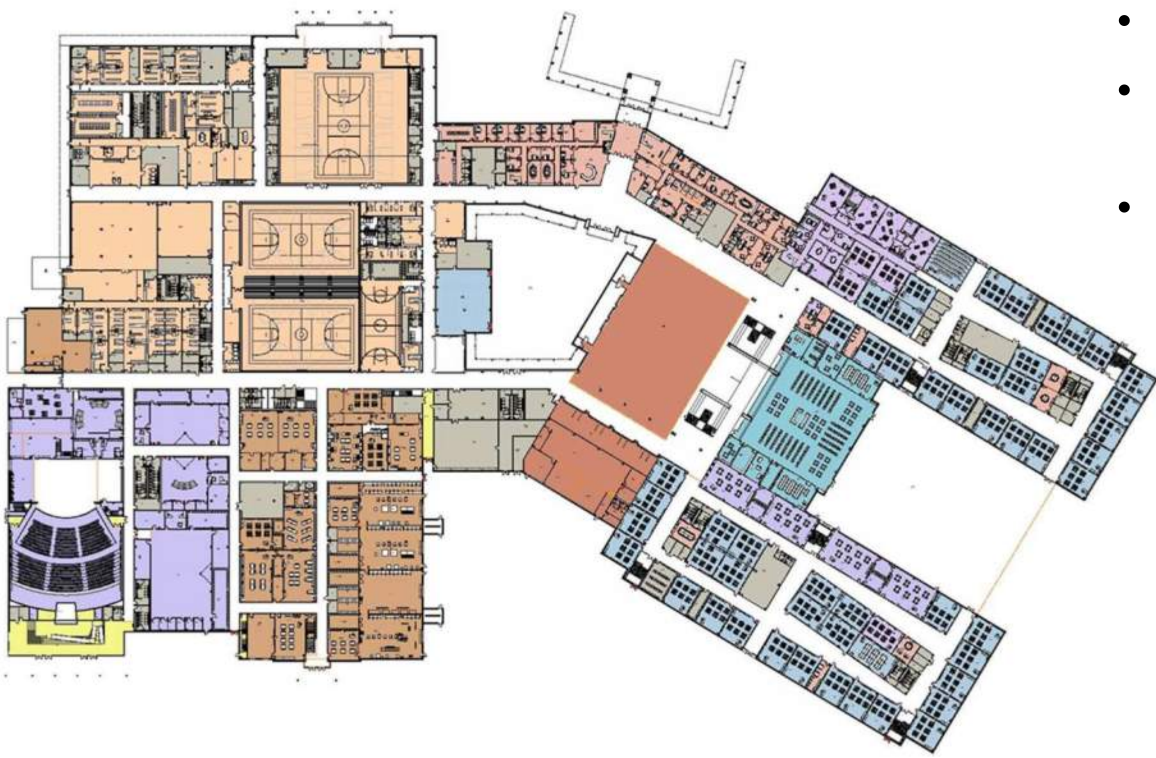
CASE STUDY

- 3,800 Student High School
- Overall Glazing to Solid Façade 30%
- 800sf Classroom 26’x31’ Glazing Ratio 10%
- Utilized winddowns no wider than 7’
- Utilized masonry between glazing units





CASE STUDY - RESULT



- 40 Learning Spaces with 3 levels
- 120 individual rooms requiring 10% daylighting
- Cost for two units vs one large window unit
  - Original Wider Openings: $16,000 per grid spacing
  - Savings per unit: $15,250 (2 windows per Unit)
  - **Total savings for academic wing: $915,000**

GEOLOGY & SITE

U.S. DEPARTMENT OF AGRICULTURE

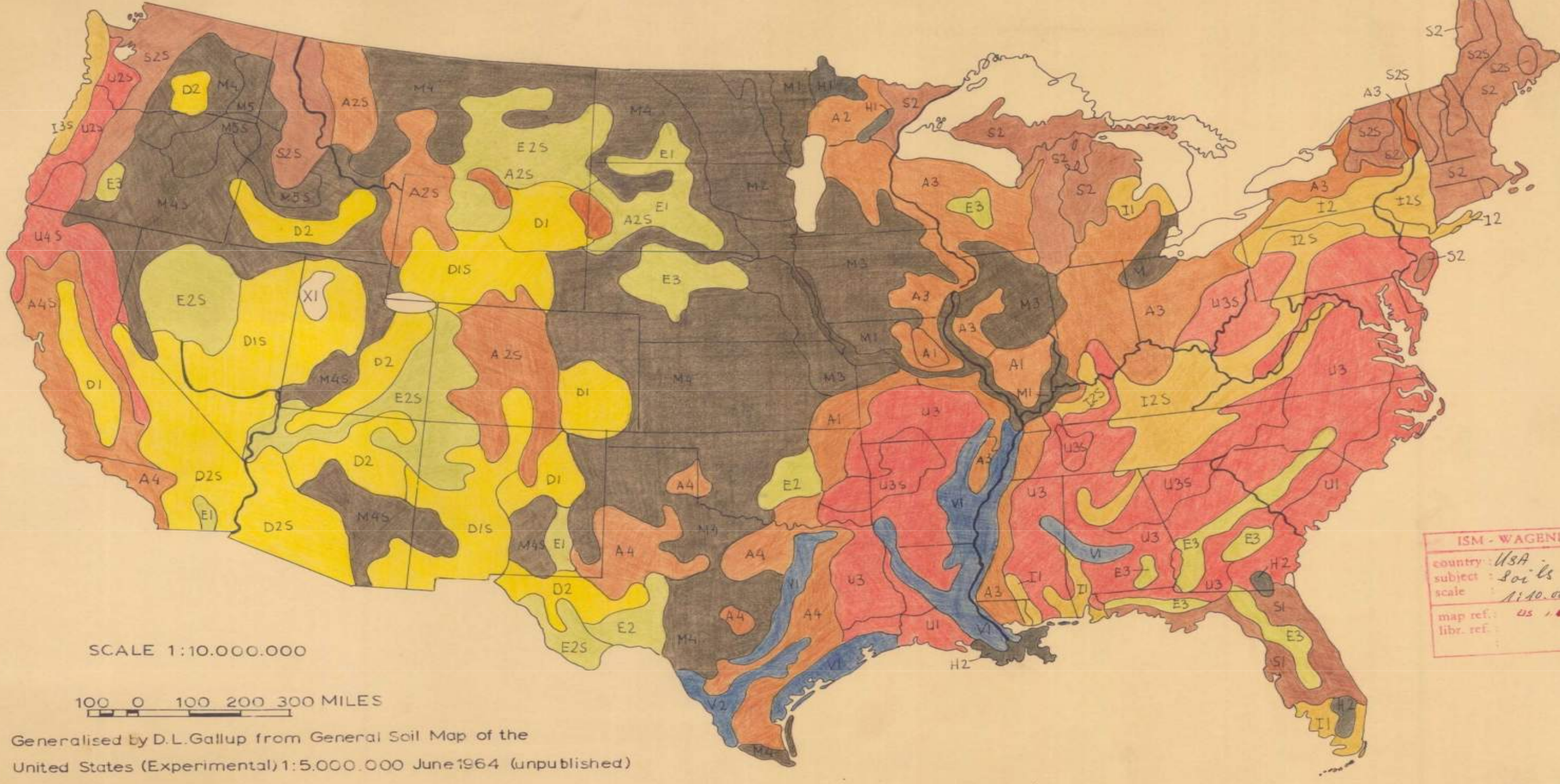
Soil conservation service

GENERAL SOIL MAP OF THE UNITED STATES

COTERMINOUS 48 STATES

BY DOMINANT ORDERS AND SUBORDERS OF THE NEW SOIL CLASSIFICATION SYSTEM

The classification of some soils is tentative



SCALE 1:10.000.000

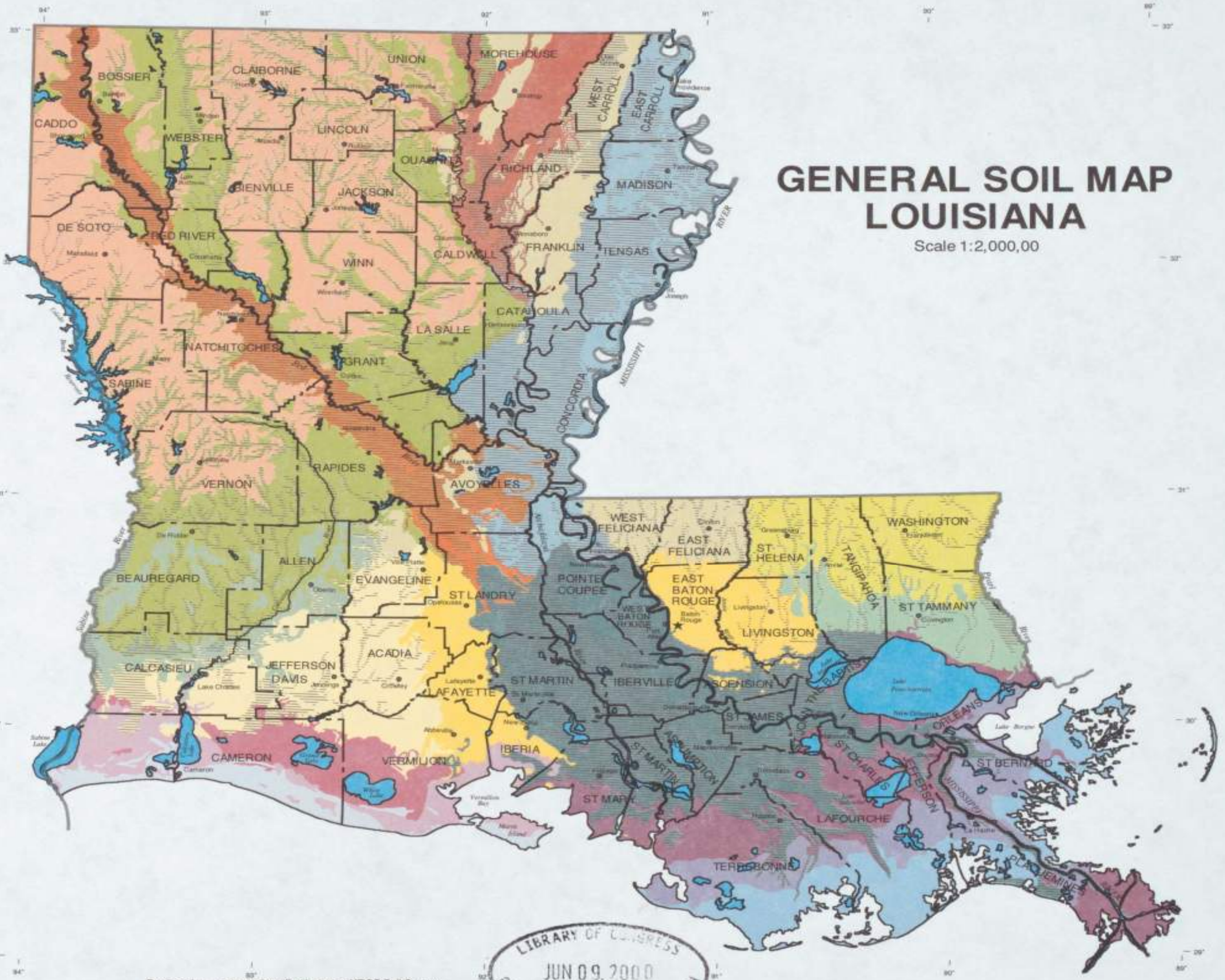
100 0 100 200 300 MILES

Generalised by D.L.Gallup from General Soil Map of the United States (Experimental) 1:5.000.000 June 1964 (unpublished)

december 1964

GENERAL SOIL MAP LOUISIANA

Scale 1:2,000,00



LEGEND

Uplands and Terraces

Western Tertiary Uplands

- Soils on loamy, Clayey and Shaley Fluvial Deposits: *(Sacul, Darley, Eastwood)*
- Soils on Sandy and Loamy Alluvial Low Terraces and Floodplains: *(Luka, Guyton, Mantachie)*

Eastern Pleistocene Terraces

- Soils on Loamy Fluvial Deposits: *(Savannah, Rushton, Tangi)*
- Soils on Loamy and Sandy Alluvial Low Terraces and Floodplains: *(Ouachita, Ochlockonee, Guyton)*

Western Pleistocene Terraces

- Soils on Loamy Fluvial Deposits: *(Ruston, Malbis, Gore)*
- Soils on Loamy and Sandy Alluvial Low Terraces and Floodplains: *(Guyton, Luka, Ouachita)*

Flatwoods

Eastern Gulf Coast Flatwoods

- Soils on Loamy and Silty Deposits: *(Stough, Myatt, Abita)*
- Soils on Loamy and Silty Alluvial Low Terraces and Floodplains: *(Ouachita, Rosebloom, Bibb)*

Western Gulf Coast Flatlands

- Soils on Loamy and Silty Deposits: *(Messer, Kinder, Caddo)*
- Soils on Loamy and Silty Alluvial Low Terraces and Floodplains: *(Guyton, Brimestone, Estes)*

Loess Uplands and Terraces

Southern Mississippi Valley Silty Uplands

- Soils on Thick Loess Deposits: *(Memphis, Calhoun, Loring)*
- Soils on Mixed Loess and Loamy Low Terraces and Floodplains: *(Calhoun, Grenada, Gilbert)*

Subtropical Mississippi Valley Silty Uplands

- Soils on Thick Loess Deposits: *(Patoutville, Jeanerette, Frost)*
- Soils on Mixed Loess and Loamy Low Terraces and Floodplains: *(Ochlockonee, Ouachita, Guyton)*

Coastal Prairies

Gulf Coast Prairies

- Soils on Clayey and Loamy Alluvial Deposits: *(Crowley, Mowata, Vidrine)*
- Soils on Loamy and Clayey Alluvial and Outwash Deposits: *(Morey, Basile, Midland)*

Recent Alluvium

Southern Mississippi Valley Alluvium

- Soils on Loamy and Clayey Alluvial Natural Levees and Low Terraces: *(Commerce, Sharkey, Tensas)*
- Soils on Loamy and Clayey Low Terraces and Floodplains: *(Sharkey, Tensas, Dundee)*

Subtropical Mississippi Valley Alluvium

- Soils on Sandy and Loamy Alluvial Natural Levees and Low Terraces: *(Concienne, Convent, Schriever)*
- Soils on Loamy and Clayey Low Terraces and Floodplains: *(Schriever, Barbary, Fausse)*

Red River Valley Alluvium

- Soils on Sandy and Loamy Alluvial Natural Levees and Low Terraces: *(Gallion, Coushatta, Latanier)*
- Soils on Loamy and Clayey Low Terraces and Floodplains: *(Moreland, Latanier, Roxana)*

Ouachita River Valley Alluvium

- Soils on Sandy and Loamy Alluvial Natural Levees and Low Terraces: *(Hebert, Rilla, Sterlington)*
- Soils on Loamy and Clayey Low Terraces and Floodplains: *(Perry, Portland, Forestdale)*

Gulf Coast Marsh

Gulf Coast Chenier Marsh

- Soils on Fresh Organic and Mineral Coastal Deposits: *(Allemands, Kenner, Ged)*
- Soils on Brackish Organic and Mineral Coastal Deposits: *(Bancker, Clovelly, Lafitte)*
- Soils on Saline Organic and Mineral Coastal Deposits: *(Scatlake, Mermentau, Creole)*

Gulf Coast Deltaic Marsh

- Soils on Fresh Organic and Mineral Deltaic Deposits: *(Allemands, Kenner, Larose)*
- Soils on Brackish Organic and Mineral Deltaic Deposits: *(Clovelly, Lafitte, Bancker)*
- Soils on Saline Organic and Mineral Deltaic Deposits: *(Scatlake, Timbalier, Bellpass)*

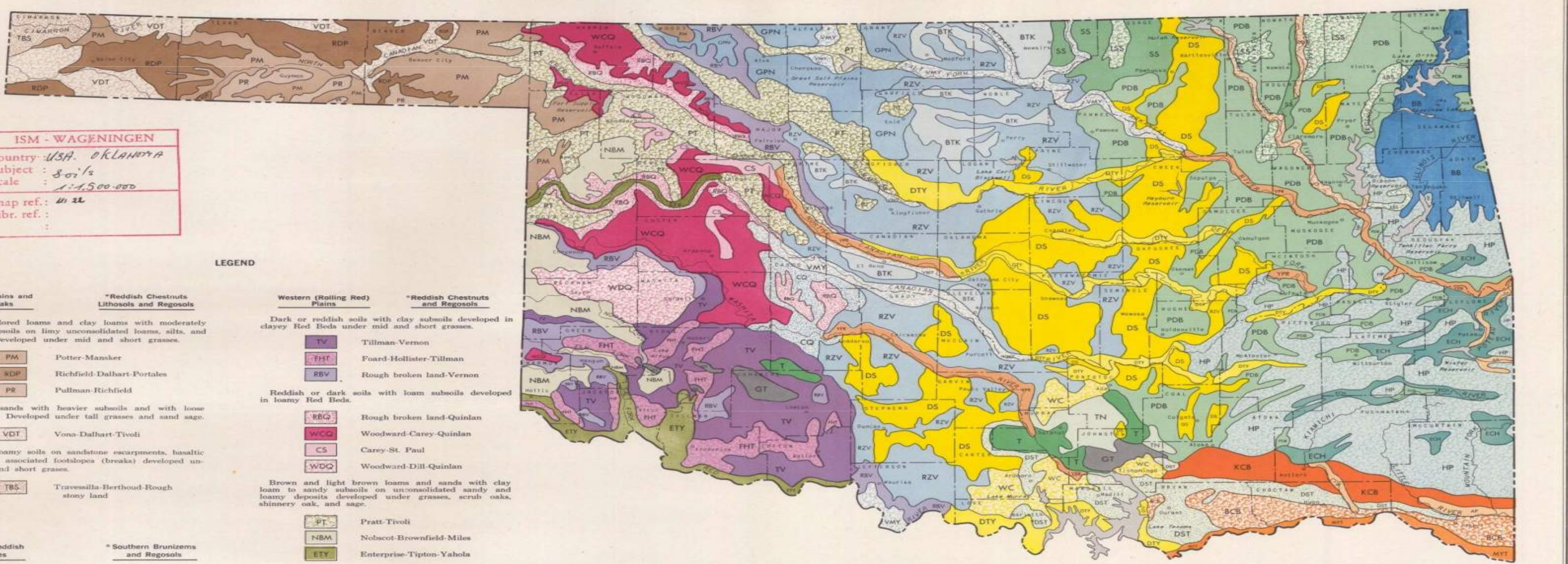
Source:
DMA Operational Navigation Chart (ONC) 1:1,000,000 series and State Soil Geographic (STATSGO) Database.
Albers Equal Area Projection, 96°W & 23°N, NAD27.

Produced as a cooperative effort between NRCS Soil Survey Staff, Louisiana Department of Agriculture and Forestry, Louisiana State University and Agricultural and Mechanical College, Louisiana Agricultural Experiment Station.

Revised June 1998 1008431

USDA-NRCS National Cartography & Geospatial Center, Fort Worth, TX, 1998.

SOIL MAP (Generalized) OF OKLAHOMA



LEGEND

High Plains and Breaks — *Reddish Chestnuts Lithosols and Regosols

Dark-colored loams and clay loams with moderately clayey subsoils on limy unconsolidated loams, silts, and caliche. Developed under mid and short grasses.

- PM — Potter-Mansker
- RDP — Richfield-Dalhart-Portales
- PR — Pullman-Richfield

Loamy sands with heavier subsoils and with loose deep sand. Developed under tall grasses and sand sage.

- VDT — Vona-Dalhart-Tivoli

Brown loamy soils on sandstone escarpments, basaltic mesas and associated footslopes (breaks) developed under mid and short grases.

- TBS — Travessilla-Berthoud-Rough stony land

Central Reddish Prairies — *Southern Brunizems and Regosols

Dark soils with clayey subsoils developed under tall grass mostly in clayey Red Beds.

- RZV — Renfrow-Zaneis-Vernon
- BTK — Bethany-Tabler-Kirkland

Loamy soils with loamy subsoils developed under tall grass in loamy Red Beds or alluvium.

- GPN — Grant-Pond Creek-Nash
- CQ — Cobb-Quinlan
- VMY — Vanoss-Minco-Yahola

Grand Prairies — *Southern Brunizems Lithosols and Grumusols

Dark loamy and clayey soils with clay subsoils developed in marine clay and limestones under tall grasses.

- DST — Durant-San Saba-Tarrant
- T — Tarrant
- TN — Tarrant-Newtonia

Western (Rolling Red) Plains — *Reddish Chestnuts and Regosols

Dark or reddish soils with clay subsoils developed in clayey Red Beds under mid and short grasses.

- TV — Tillman-Vernon
- FHT — Foard-Hollister-Tillman
- RBV — Rough broken land-Vernon

Reddish or dark soils with loam subsoils developed in loamy Red Beds.

- RBQ — Rough broken land-Quinlan
- WCQ — Woodward-Carey-Quinlan
- CS — Carey-St. Paul
- WDQ — Woodward-Dill-Quinlan

Brown and light brown loams and sands with clay loam to sandy subsoils on unconsolidated sandy and loamy deposits developed under grasses, scrub oaks, shinnery oak, and sage.

- PT — Pratt-Tivoli
- NBM — Nobscot-Brownfield-Miles
- ETY — Enterprise-Tipton-Yahola

Cross Timbers — *Red-Yellow Podzolics Lithosols

Light-colored sandy soils with reddish subsoils on various sandy materials developed under oak-hickory forests with prairie openings (savannah).

- DS — Darnell-Stephenville
- WC — Windthorst-Chigley
- DTY — Dougherty-Teller-Yahola

Eastern (Cherokee) Prairies — *Brunizems Planosols, Lithosols

Dark-colored soils mostly with clayey subsoils developed on shales, sandstones, and limestones under tall grasses.

- LSS — Labette-Summit-Sogn
- SS — Sogn-Summit
- PDB — Parsons-Dennis-Bates

Forested Coastal Plain — *Red-Yellow Podzolics

Light-colored acid sandy soils with sandy clay loams to clay subsoils developed in Coastal Plain sediments under forest (pine-oak in eastern part; oak-hickory in western).

- KCB — Kirvin-Cuthbert-Bowie
- BCB — Bowie-Caddo-Boswell

Ouachita Highlands — *Red-Yellow Podzolics and Lithosols

Light-colored acid sandy to loamy soils with heavier subsoils and shallow soils developed on sandstones and shales under oak-hickory-pine forests.

- HP — Hector-Pottsville
- ECH — Enders-Conway-Hector

Ozark Highlands — *Red-Yellow Podzolics

Brown and light brown silty soils with reddish clay loam subsoils on cherty limestone developed under oak-hickory-pine forests and tall grasses.

- BB — Bodine-Baxter

Bottomlands — *Alluvial soils

Nearly level, deep sandy to clayey bottomland soils. Some areas flood frequently; most flood occasionally, and some rarely. Soils are developed under lowland hardwoods which decrease in density from east to west.

- MYT — Miller-Yahola-Teller
- AP — Atkins-Pope
- VO — Verdigris-Osage
- YPR — Yahola-Port-Reinach

Granitic Soils — *Lithosols

Granitic Mountain area and brown, thin stony granitic soils developed under mid grasses, cedars and shrubs.

- GT — Granitic Mountains-Tishomingo soils

**Dominant Great Soil Group(s) of the area.*

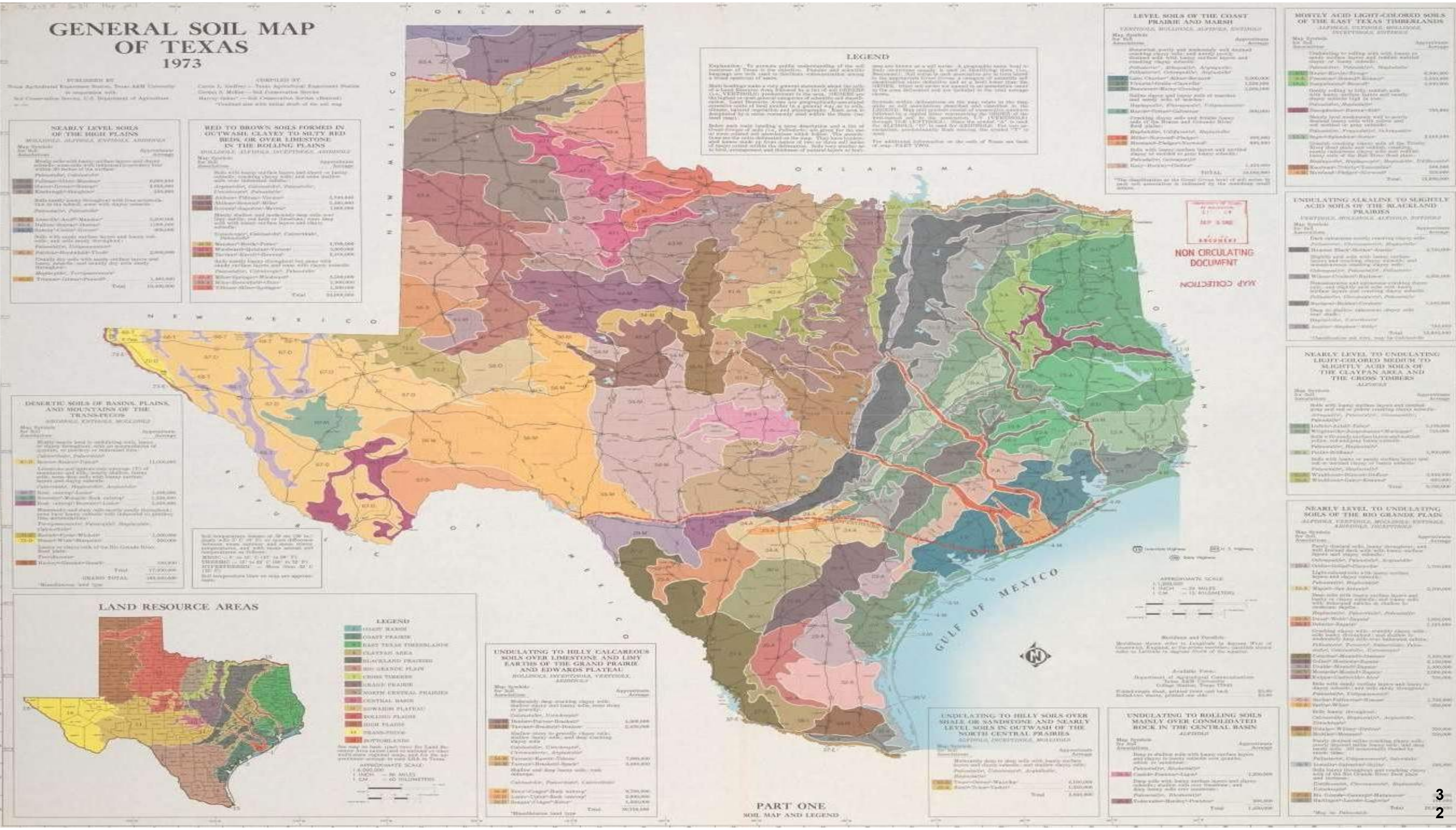
SOIL MAP OF OKLAHOMA
(GENERALIZED)

PUBLISHED BY THE
OKLAHOMA AGRICULTURAL EXPERIMENT STATION
STILLWATER, OKLAHOMA
1959

Under the Supervision of
DR. FENTON GRAY
Based on surveys by the
SOIL SURVEY STAFF
of the
SOIL CONSERVATION SERVICE, U.S.D.A.
and the
AGRONOMY DEPARTMENT, O.S.U.
(Project 567) of Agronomy Department

10 0 10 20 30 40 50 Miles

Printed By Universal Map & Drafting Co.

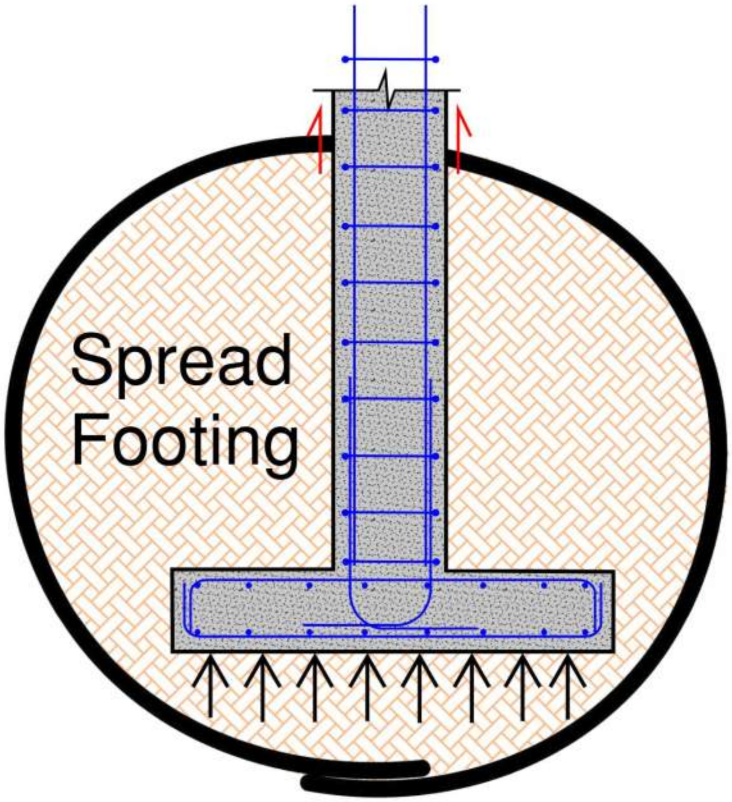

GENERAL SOIL MAP OF TEXAS
1973
NEARLY LEVEL SOILS OF THE HIGH PLAINS
RED TO BROWN SOILS FORMED IN OUTWASH, CLAYEY TO SILTY RED BEDS, OR OVER LIMESTONE IN THE ROLLING PLAINS
LEGEND
LEVEL SOILS OF THE COAST PRAIRIE AND MARSH
MOSTLY ACID LIGHT-COLORED SOILS OF THE EAST TEXAS TIMBERLANDS
UNDULATING ALKALINE TO SLIGHTLY ACID SOILS OF THE BLACKLAND PRAIRIES
NEARLY LEVEL TO UNDULATING LIGHT-COLORED MEDIUM TO SLIGHTLY ACID SOILS OF THE CLAYPAN AREA AND THE CROSS TIMBERS
NEARLY LEVEL TO UNDULATING SOILS OF THE RIO GRANDE PLAIN
DESERTIC SOILS OF BASINS, PLAINS, AND MOUNTAINS OF THE TRANS-PECOS
NON CIRCULATING DOCUMENT
MAP COLLECTION
OKLAHOMA
NEW MEXICO
GULF OF MEXICO
LAND RESOURCE AREAS
UNDULATING TO HILLY CALCAREOUS SOILS OVER LIMESTONE AND LIMY EARTHS OF THE GRAND PRAIRIE AND EDWARDS PLATEAU
UNDULATING TO HILLY SOILS OVER SHALE OR SANDSTONE AND NEARLY LEVEL SOILS IN OUTWASH OF THE NORTH CENTRAL PRAIRIES
UNDULATING TO ROLLING SOILS MAINLY OVER CONSOLIDATED ROCK IN THE CENTRAL BASIN
PART ONE
SOIL MAP AND LEGEND

COMMON FOUNDATION SYSTEMS:

- Spread Footings
- Belled Piers
- Driven Piles
- Straight Shaft Piers
- Auger Cast Piles

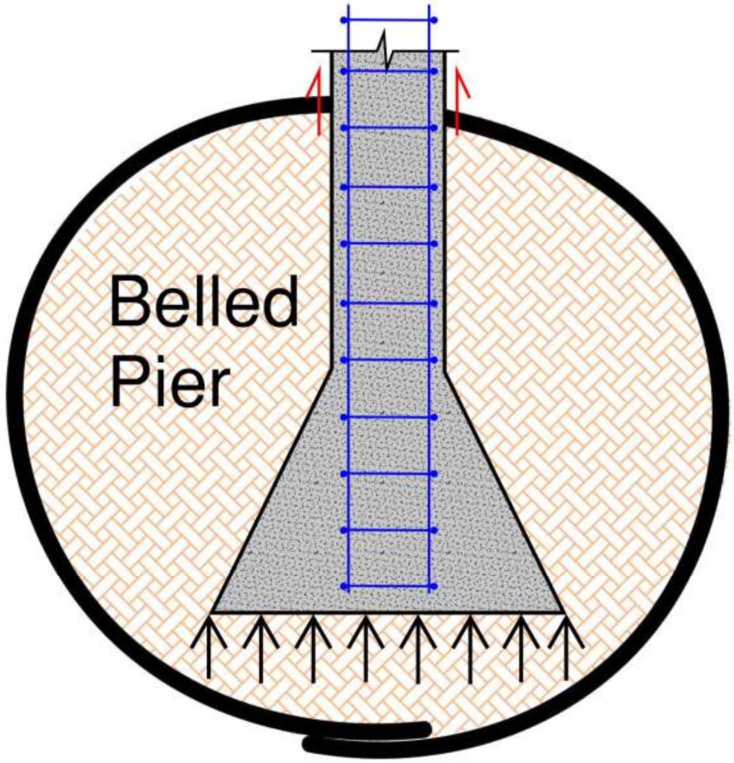
SPREAD FOOTINGS / STRIP FOOTINGS

- Generally low capacity:
  - Low = 1,500 to 4,000 psf
  - High = 2,000 to 6,000 psf
- Labor Intensive to construct:
  - Benching of the excavation
  - Pilaster construction/Forming required
  - Consider round footings



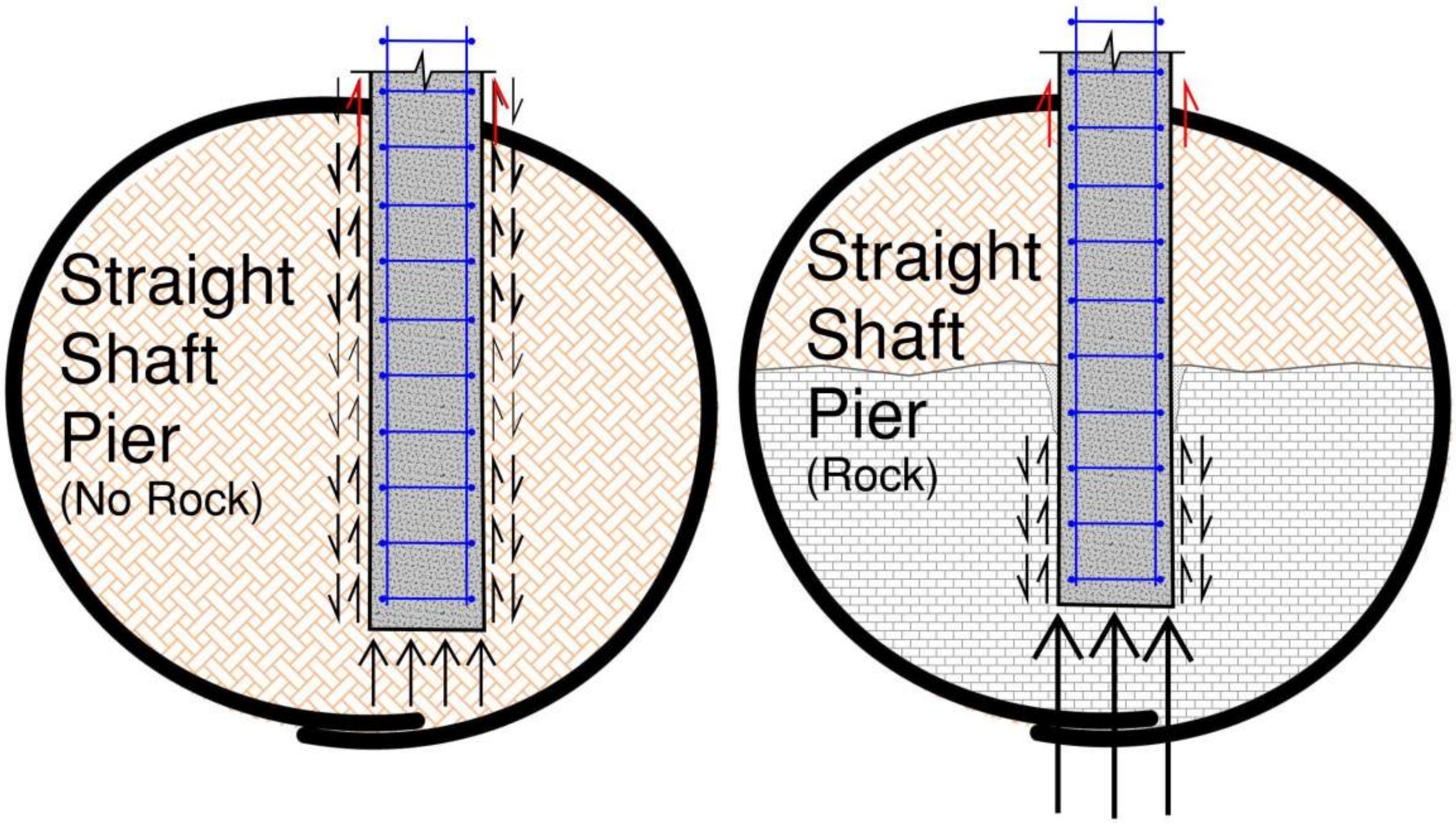
BELLED PIERS

- Generally medium capacity:
  - Low = 3,000 to 5,000 psf
  - High = 4,000 to 7,500 psf
- Easy to construct
- Water infiltration concerns



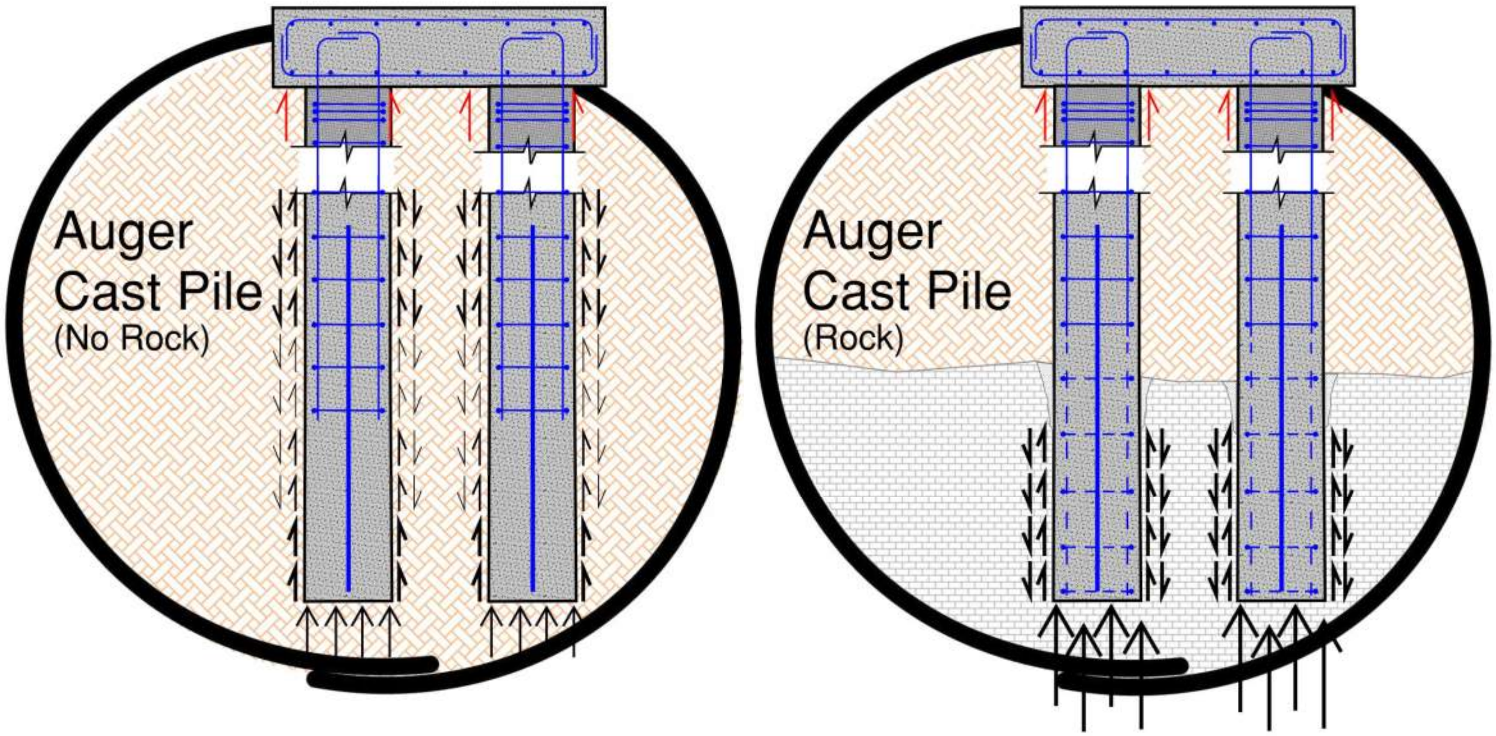
STRAIGHT SHAFT PIERS

- High capacity:
  - Skin Friction
    - 2,500 psf
  - End Bearing:
    - 20,000 psf
    - 40,000 psf
- Expensive
- Slurry Drilling
- Pier Casing



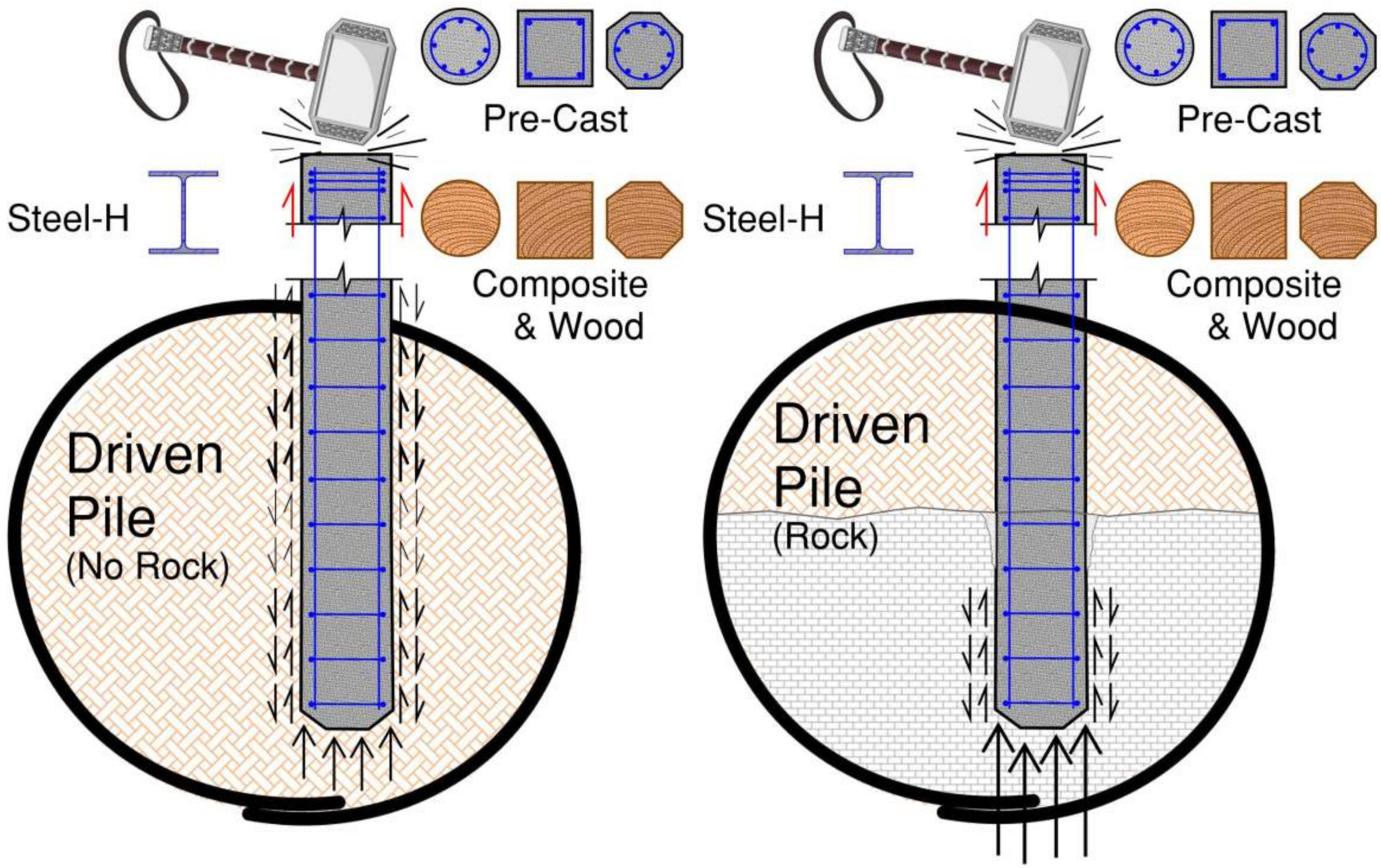
AUGER CAST PILES / PIERS

- High capacity:
  - Skin Friction
    - 2,500 psf
  - End Bearing:
    - 20,000 psf
    - 40,000 psf
- Expensive
- Slurry Drilling
- Pier Casing



DRIVEN PILES

- Capacity:
  - Varies by type



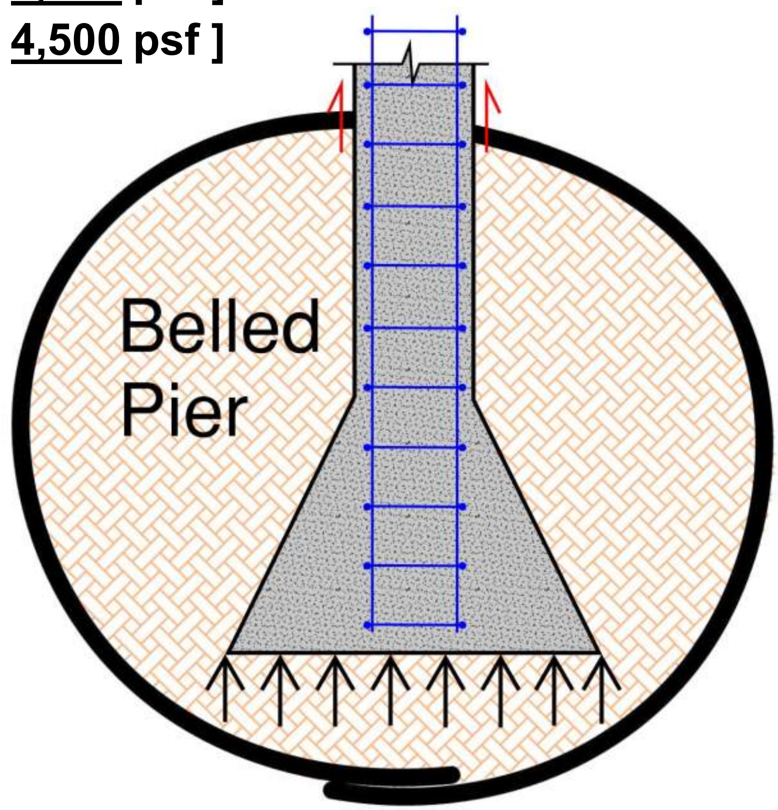
FOUNDATION SYSTEMS (CONT’D) :

- Mat Foundation
- Waffle Slab
- Ribbed Mat
- Micropiles
- Proprietary Solutions:
    - Geo Piers
    - Helical Piers
    - Stacked Cylinders

BUILDING EXAMPLE:

- Belled Piers (End-Bearing ONLY)
  - Dead Load Capacity = 2,000 to 4,000 psf **[<u>3,000</u> psf]**
  - Total Load Capacity = 3,000 to 6,000 psf **[<u>4,500</u> psf]**

  - Maximum Belled Pier Size
    = 12'-0" to 14'-0" diameter

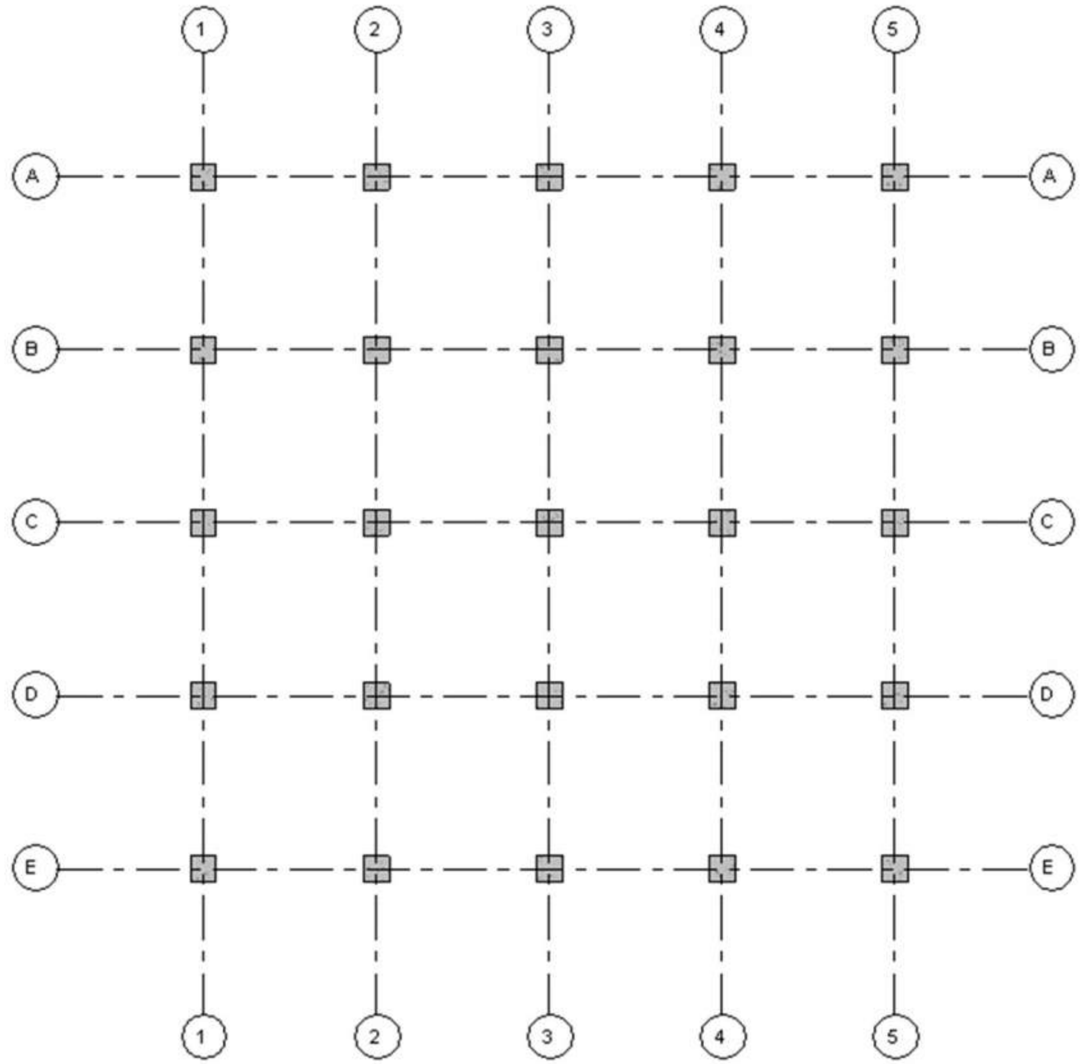


BAY SPACING

35' x 35'

- Belled Pier Spacing:
  3 Bell Diameters
- 35' bay spacing = 12' Belled Pier
- 12' Diam Pier Area = 113 SF
- Total Load Capacity = 113 SF x 4,500 psf

<u>= 508 Kips</u>



BUILDING EXAMPLE:

Story Height:	Bay Spacing:		Roof LL + DL:		Floor LL + DL:		Number of Floors:
Single-Story	35’ x 35’	**X**	(20 psf + 35 psf)	**+**	(N/A)	**X**	Zero
Two-Story	35’ x 35’	**X**	(20 psf + 35 psf)	**+**	(80 psf + 100 psf)	**X**	1
Three-Story	35’ x 35’	**X**	(20 psf + 35 psf)	**+**	(80 psf + 100 psf)	**X**	2

TOTAL LOAD (12’ DIAMETER BELLED PIER CAPACITY) = 508 KIPS

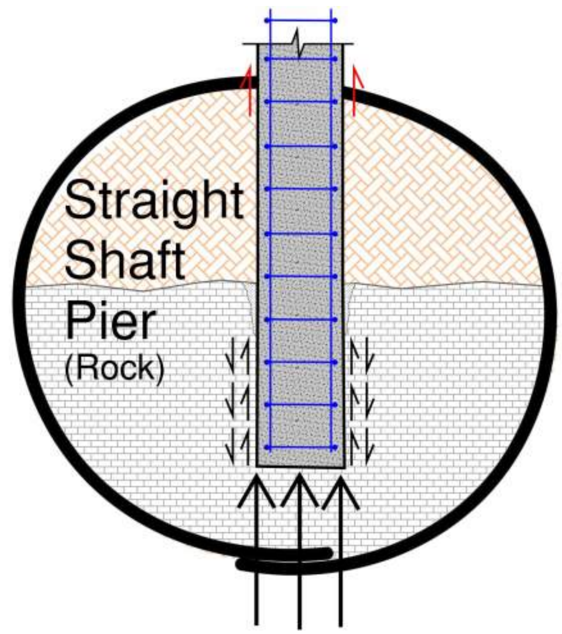
Story Height:	**Loading:**		**Total Load (Kips):**	
Single-Story	(35’x35’) X (20psf + 35 psf)	=	80 Kips	**OK**
Two-Story	(35’x35’) X (20psf + 35 psf + 80 psf + 100 psf)	=	300 Kips	**OK**
Three-Story	(35’x35’) X (20psf + 35 psf + (2) 80 psf + (2) 100 psf)	=	520 Kips	**N.G.**

BUILDING EXAMPLE:

- Straight Shaft Pier 36” Diameter

- Depth to rock Varies
- Embedment Varies

- Total Load Capacity @ 10’ Embed = **450 Kips**
- Total Load Capacity @ 20’ Embed = **700 Kips**
- Total Load Capacity @ 25’ Embed = **810 Kips**

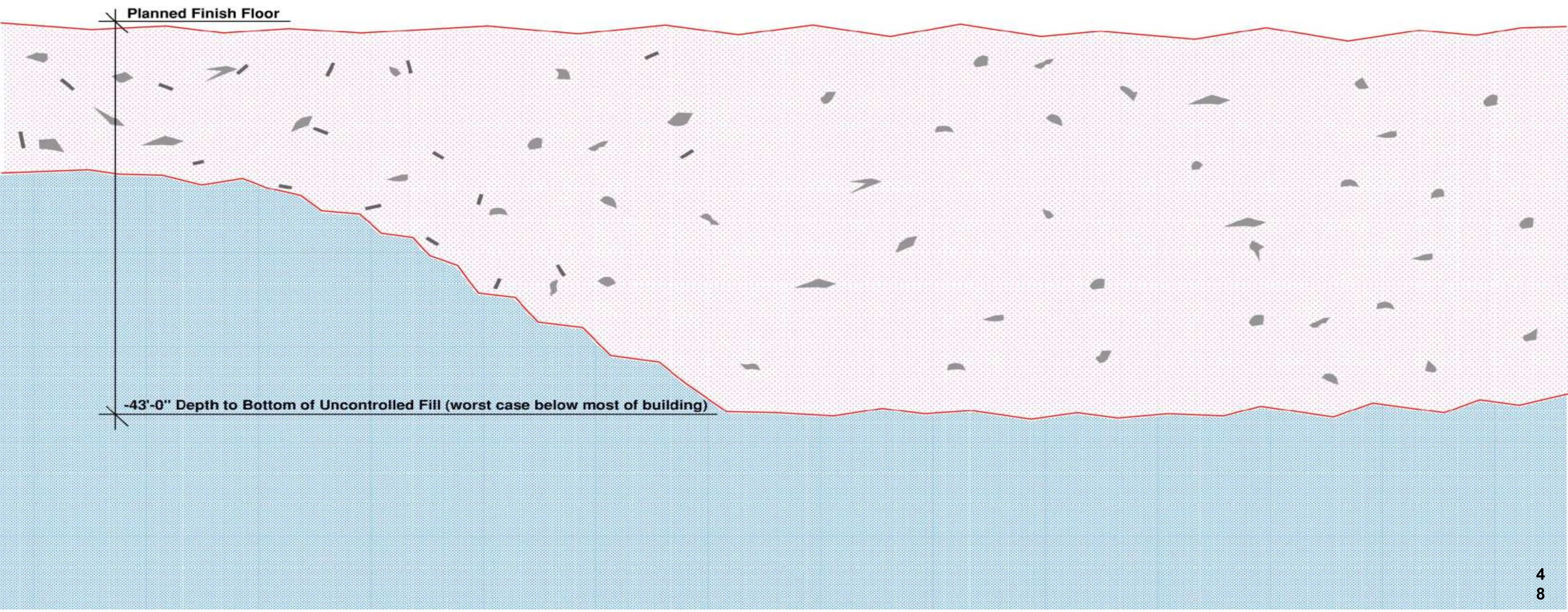


TOTAL LOAD (36" DIAMETER SS PIER) = 450 - 810 KIPS

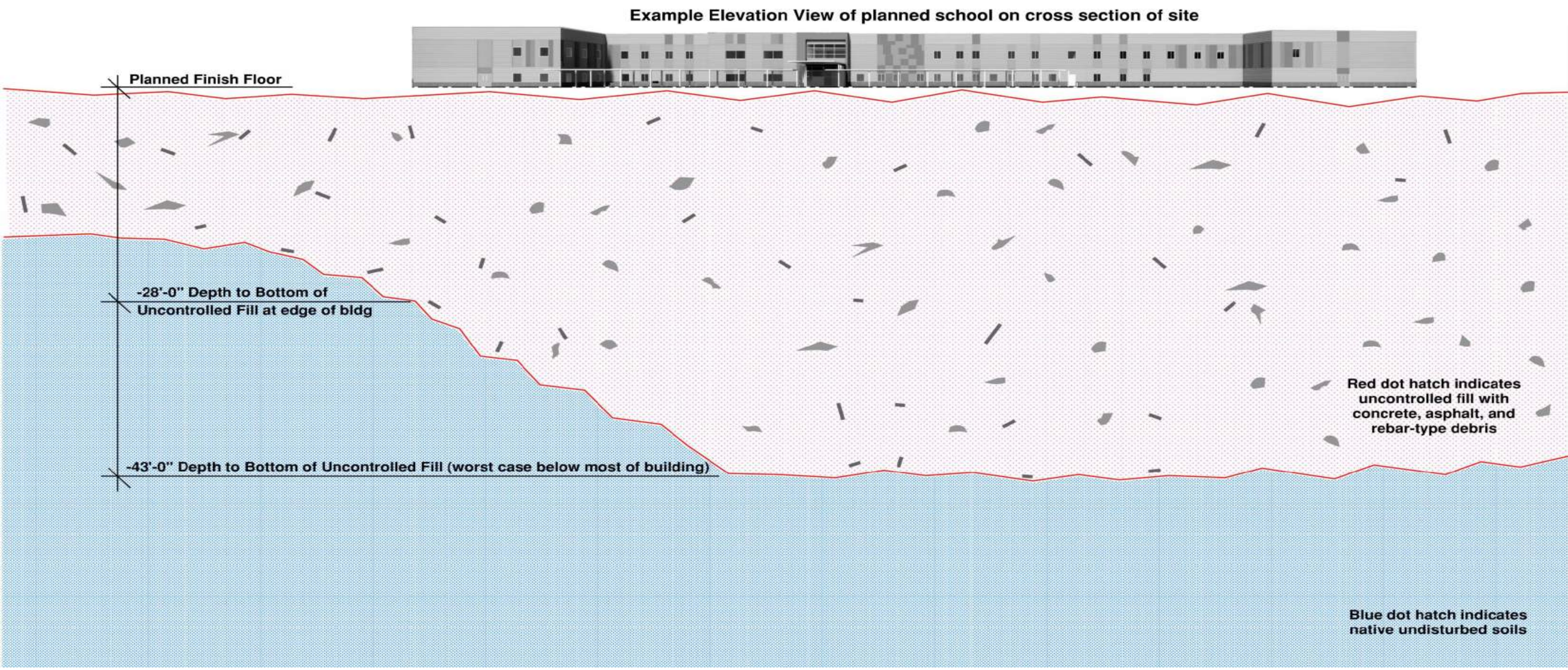
Story Height:	Loading:		Total Load (Kips):	
Single-Story	(35'x35') X (20psf + 35 psf)	=	80 Kips	OK
Two-Story	(35'x35') X (20psf + 35 psf + 80 psf + 100 psf)	=	300 Kips	OK
Three-Story	(35'x35') X (20psf + 35 psf + (2) 80 psf + (2) 100 psf)	=	520 Kips	OK
Four-Story	(35'x35') X (20psf + 35 psf + (3) 80 psf + (3) 100 psf)	=	740 Kips	OK

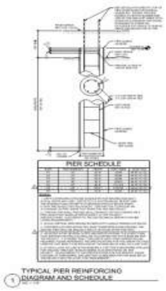
PROPRIETARY SOLUTIONS:

Existing Site Condition



Existing Site Condition w/ Building

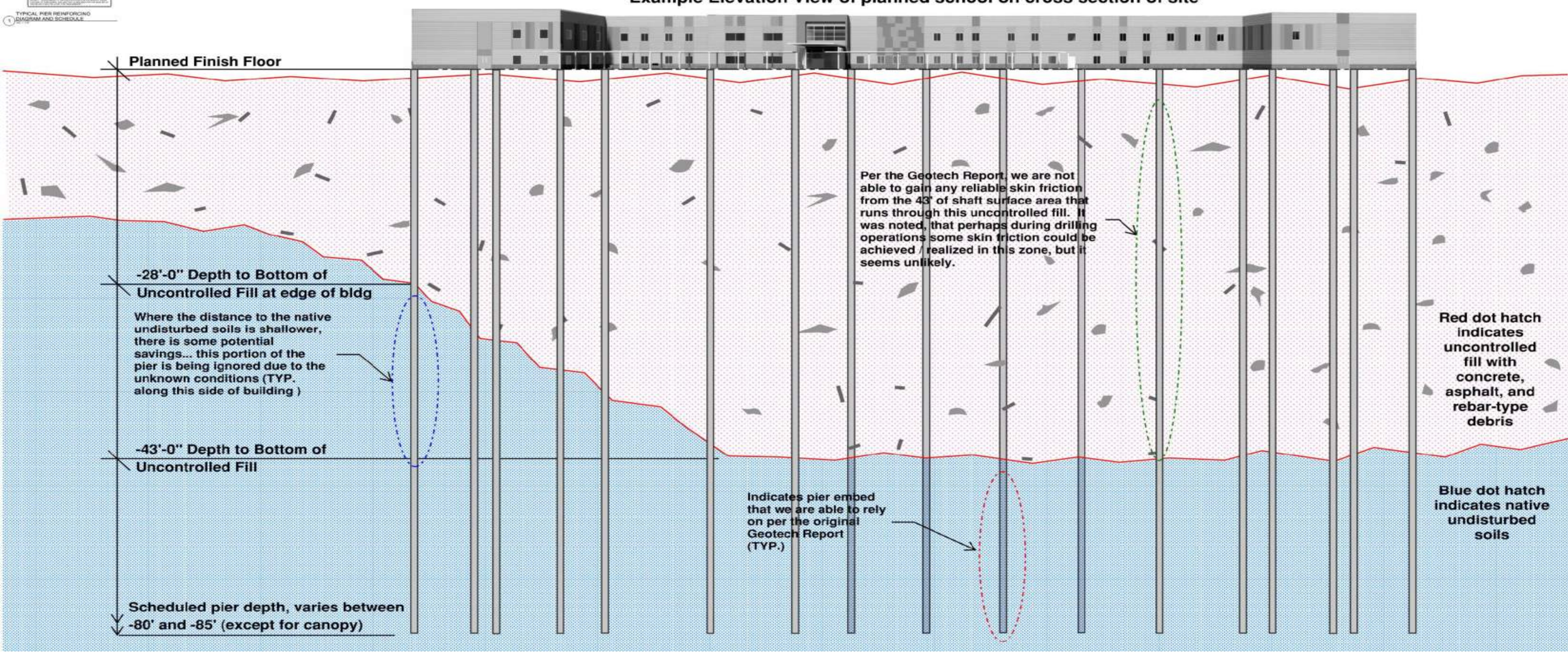




Existing Site Condition with Building and Foundation As-Designed

Deep Piers to roughly 85' below grade (max)
Grade Beams span pier to pier
Slab is Structurally suspended 2-way Flat Plate

Example Elevation View of planned school on cross section of site

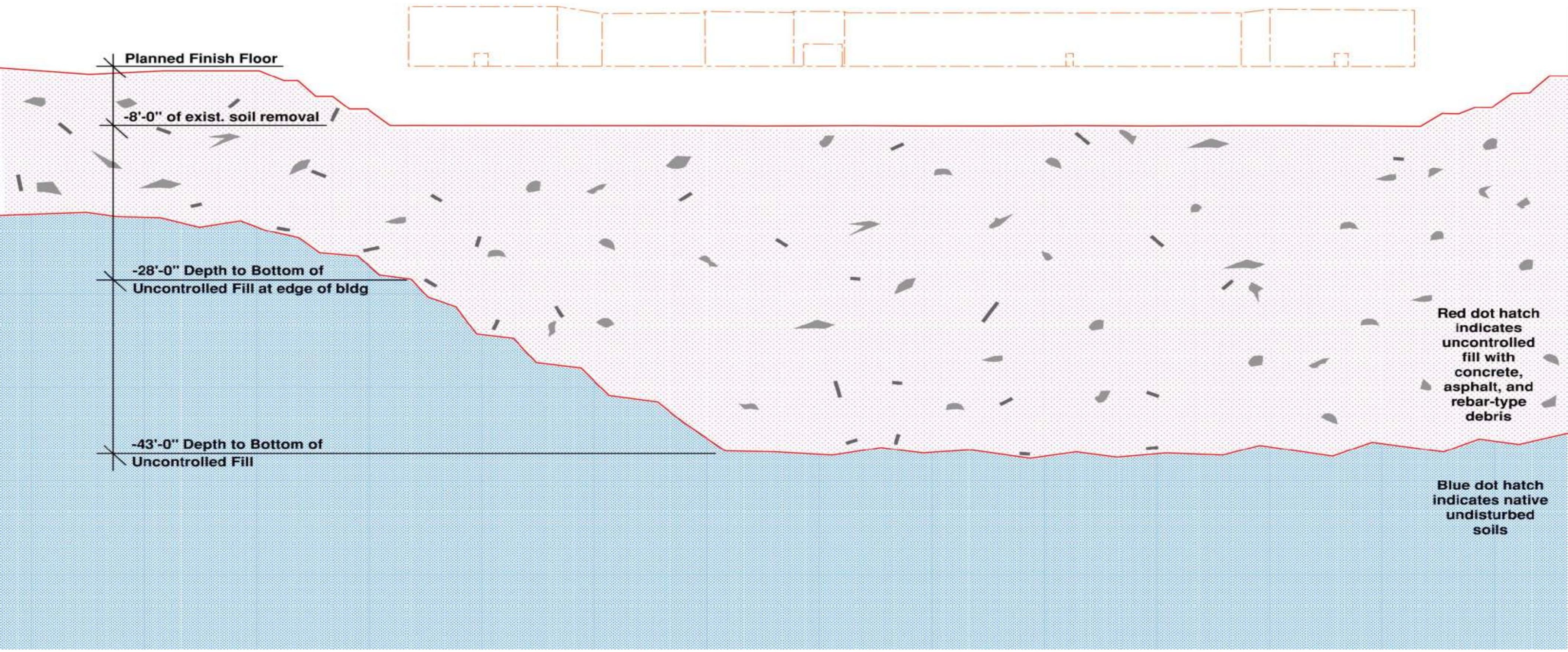


Existing Site Condition

Existing Site Condition w/ Building

Existing Site Condition with Alternate Foundation / Site Prep

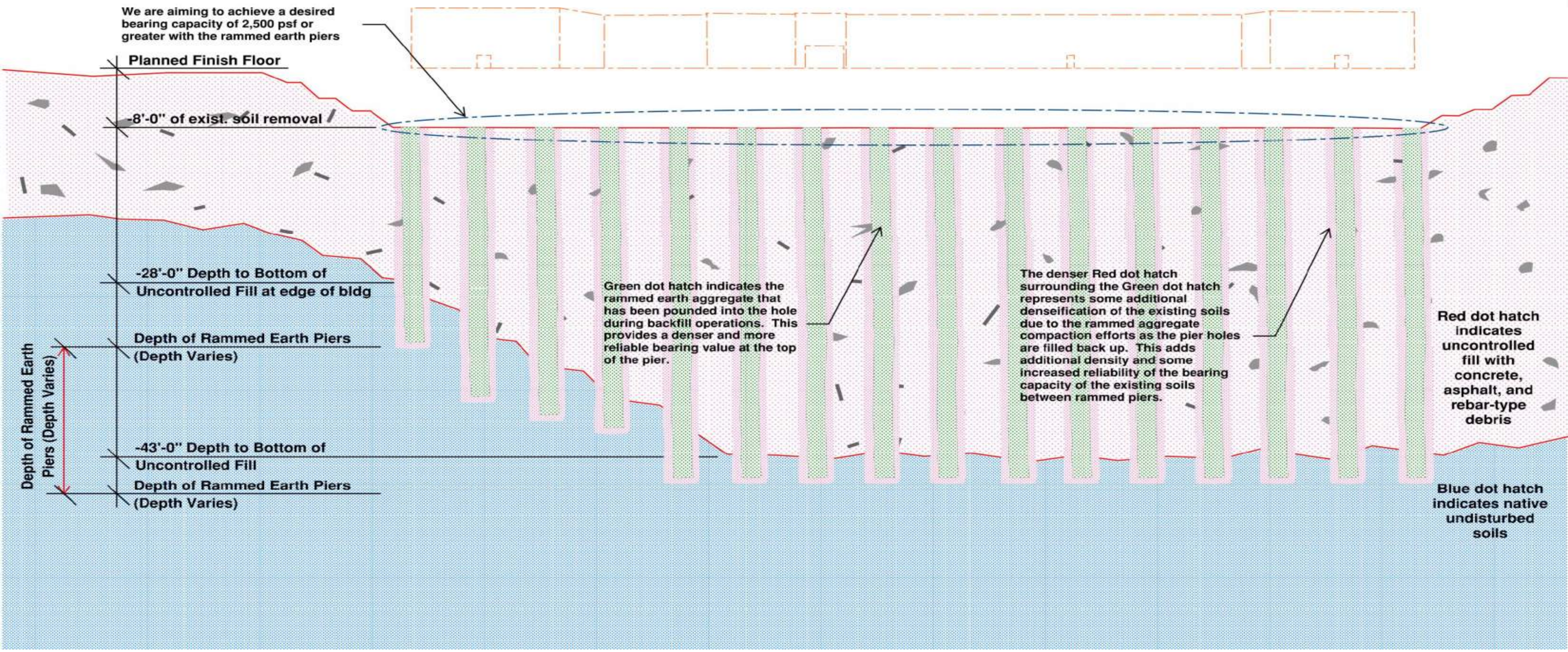
1.) Remove existing soils down to a predetermined depth = -8'-0" plus any additional grade change



Existing Site Condition with Alternate Foundation / Site Prep

1.) Remove existing soils down to a predetermined depth = -8'-0" plus any additional grade change

2.) Either provide a grid of rammed earth piers, or locate them strategically at pier/column locations. The depth of these piers would need to be determined by the rammed earth pier engineers (we are looking for 2,000 psf of bearing capacity for a Spread Footing Foundation Design)

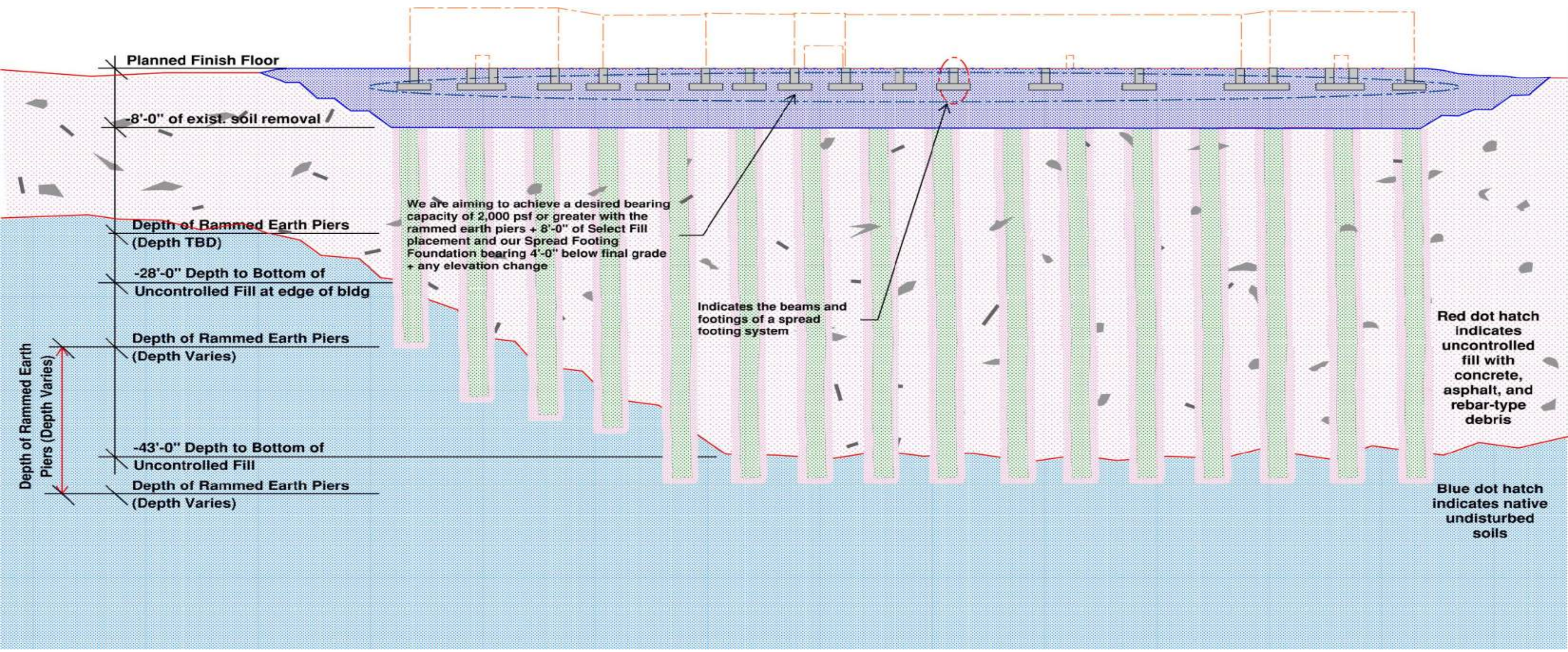


Existing Site Condition with Alternate Foundation / Site Prep

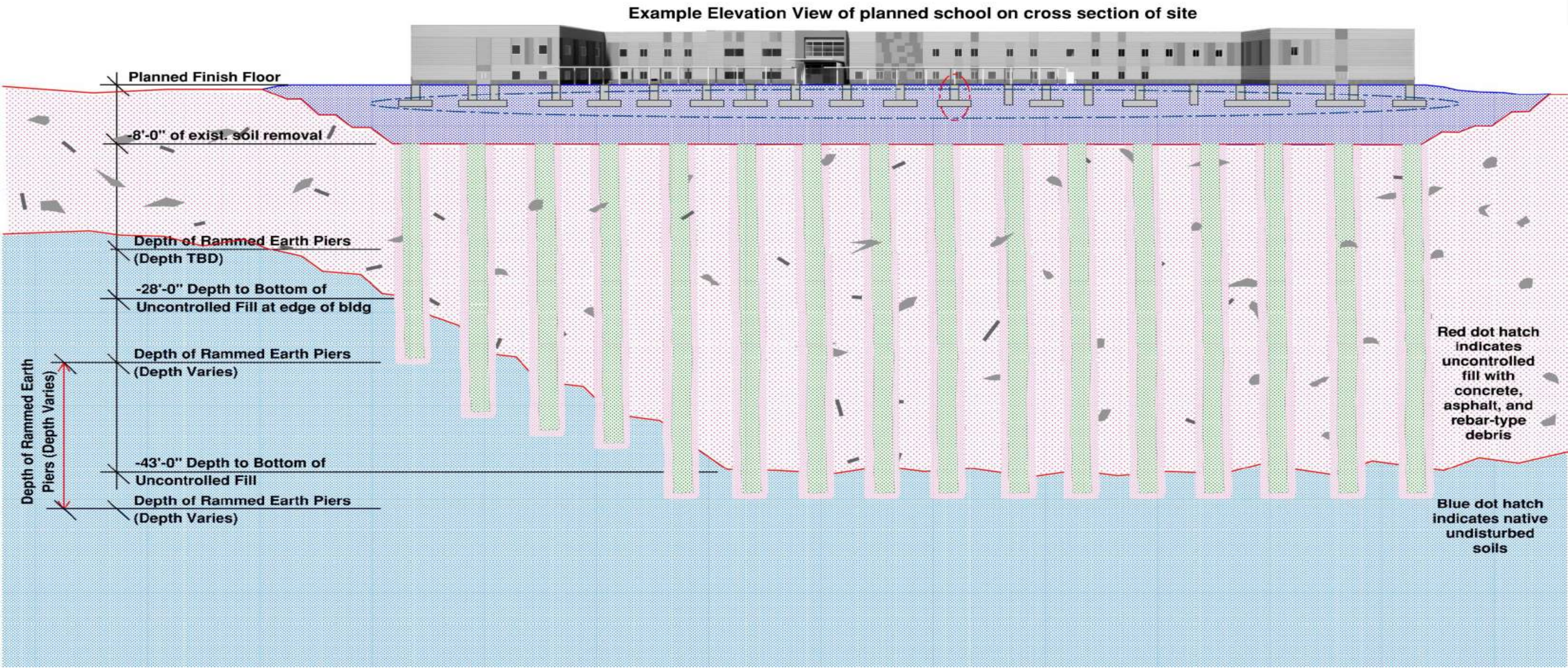
1.) Remove existing soils down to a predetermined depth = -8'-0" plus any additional grade change
2.) Either provide a grid of rammed earth piers, or locate them strategically at pier/column locations. The depth of these piers would need to be determined by the rammed earth pier engineers (we are looking for 2,000 psf of bearing capacity for a Spread Footing Foundation Design)
3.) Provide a minimum select fill pad of 8'-0" + whatever grade change is planned

Existing Site Condition with Alternate Foundation / Site Prep

1.) Remove existing soils down to a predetermined depth = -8'-0" plus any additional grade change
2.) Either provide a grid of rammed earth piers, or locate them strategically at pier/column locations. The depth of these piers would need to be determined by the rammed earth pier engineers (we are looking for 2,000 psf of bearing capacity for a Spread Footing Foundation Design)
3.) Provide a minimum select fill pad of 8'-0" + whatever grade change is planned
4.) Install the Spread Footing Foundation (Design In-Progress)



Building on modified sub-grade with Alternate Spread Footing Foundation Design



RULES OF THUMB

- Fast-Track / Early Issuances
- Geotech Report, Always & Always Early
- Window Width & Width between glazing units (8’-0” max, 2’ jambs)
- Economical Grid Spacing: 35’ x 35’ (Column Section: Wide Flange)
- Maintain material uniformity & Orientation
- Stacking of floors/levels
- Glazing VE Considerations

RULES OF THUMB

- CMU to Stud transitions
- Depending on Geology and Location: Sprawling vs Stacked
- Parapet Heights (Stud and CMU)
- CMU wall heights
- Studs wall heights
- PVR Considerations
- Windstorm Assemblies

THANK YOU

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