

Foundation Performance Association

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June 14, 2017

A. Case Study 1: Structural Roof Collapse of 100,000 sq ft former “Kmart” due to Hurricane Ike, Analysis of parameters that contributed to collapse, Aftermath Structural Repair Options Considered, Remedies implemented

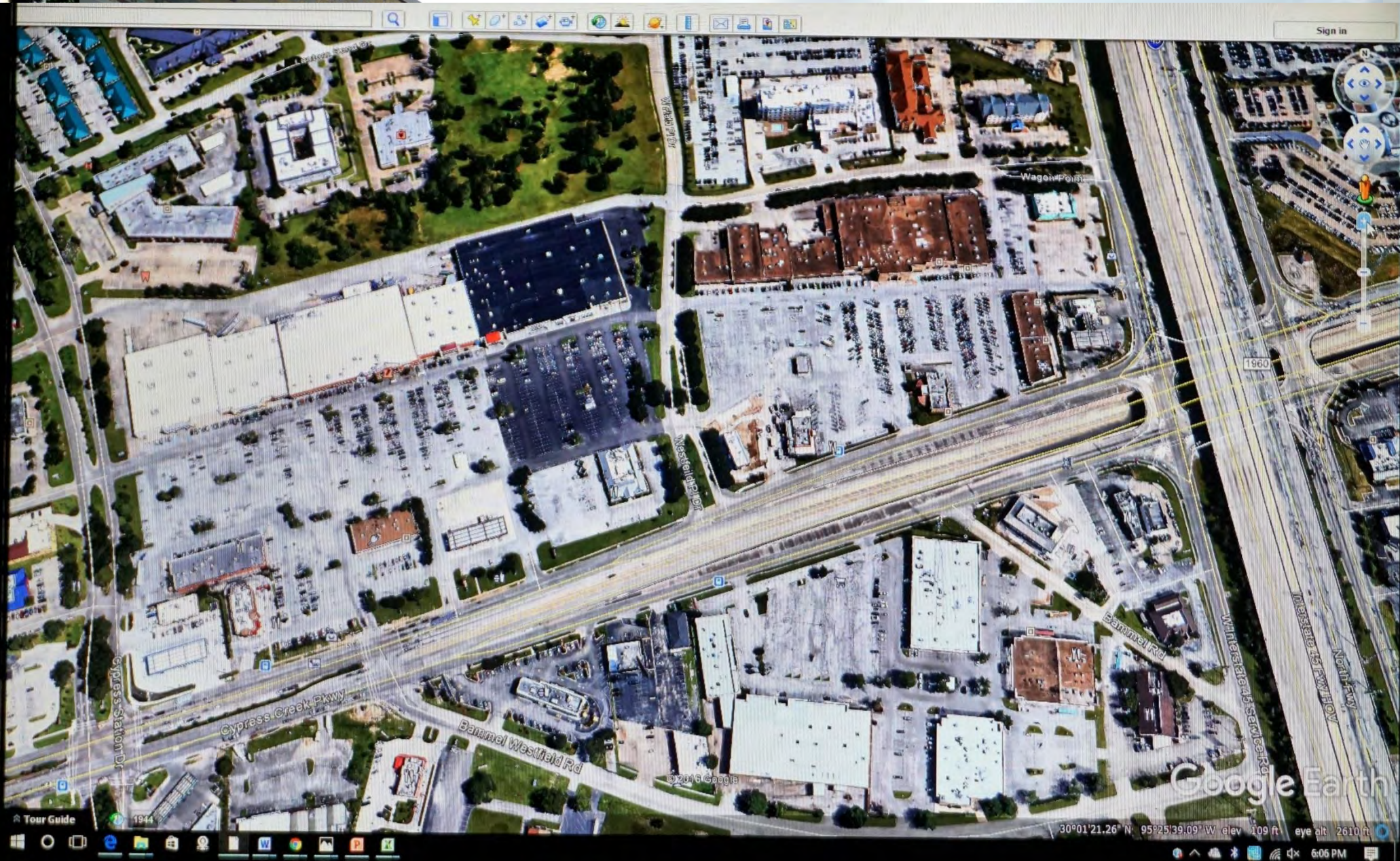
B. Case Study 2: Waterfront House Elevated on wood piers in the path of Hurricane Ike, Analysis of damage, Repair or Tear Down, Insurance issues, Long Term Considerations

C. Construction Methods and Practices to minimize litigation and avert Lawsuits
Construction Documents, Coordination, Field Issues

D. Considerations when building for your own, General Contractor relationship, profit and loss versus sound practices, Banking Relations and how to protect your interest

A. **Case Study 1:** Structural Roof Collapse of 100,000 sq ft former “Kmart” due to Hurricane Ike

Analysis of parameters that contributed to collapse, Aftermath Structural Repair Options Considered, Remedies implemented



Sign in



1960

Google Earth

Tour Guide

1944

30°01'21.26" N, 95°25'39.09" W elev 109 ft eye alt 2610 ft

6:06 PM



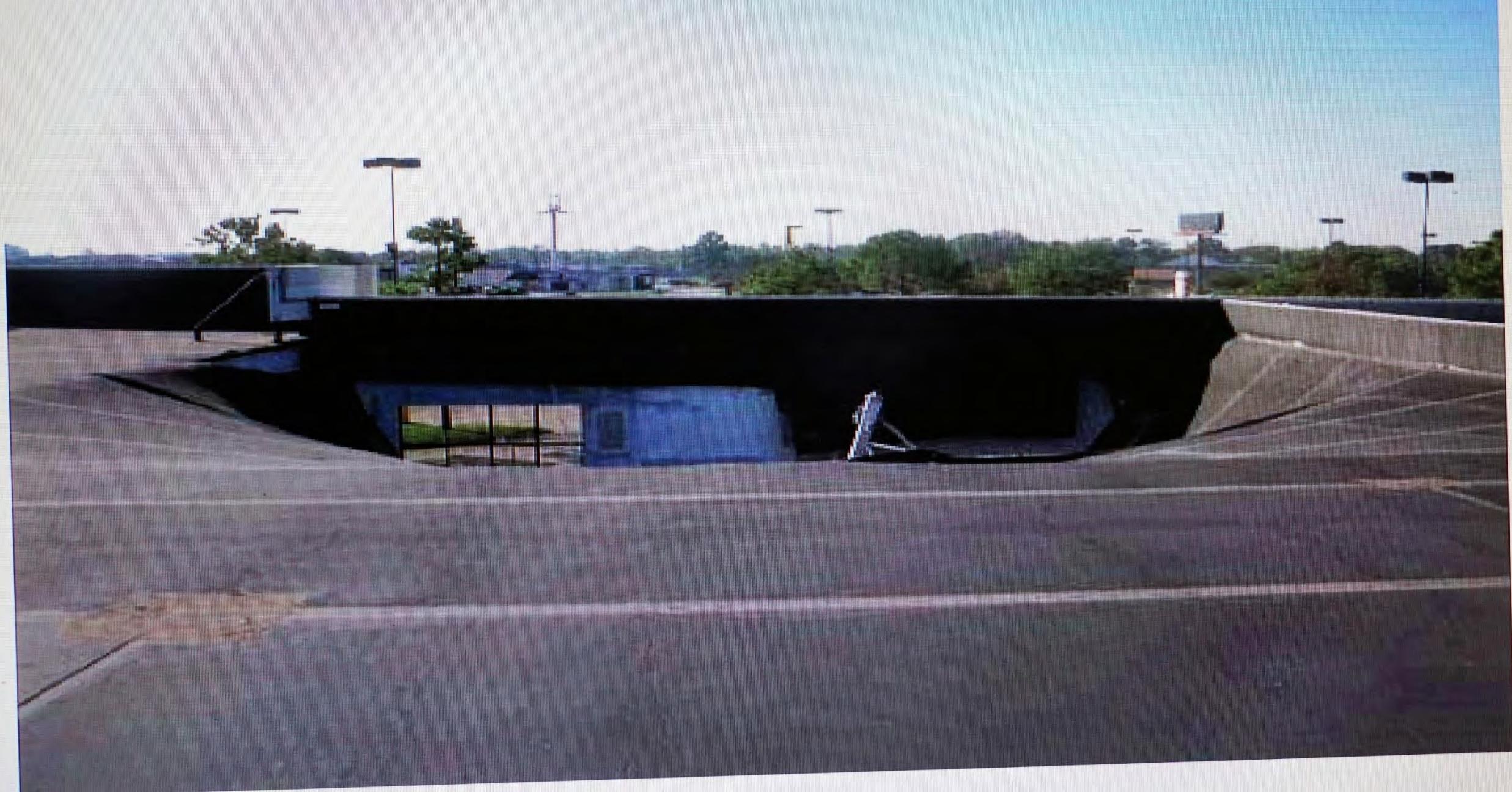
Tour Guide

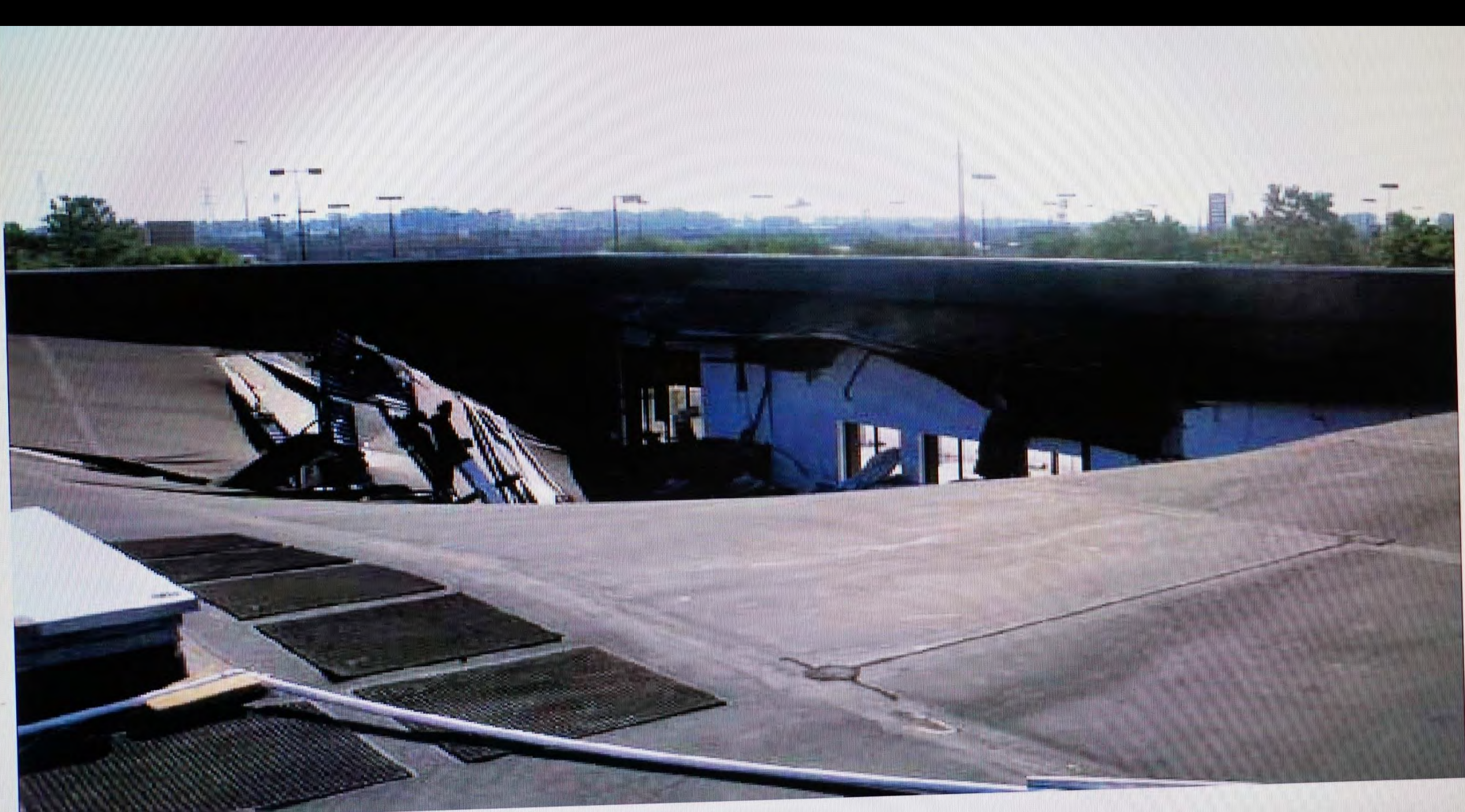
1944



30°01'19.14" N 9





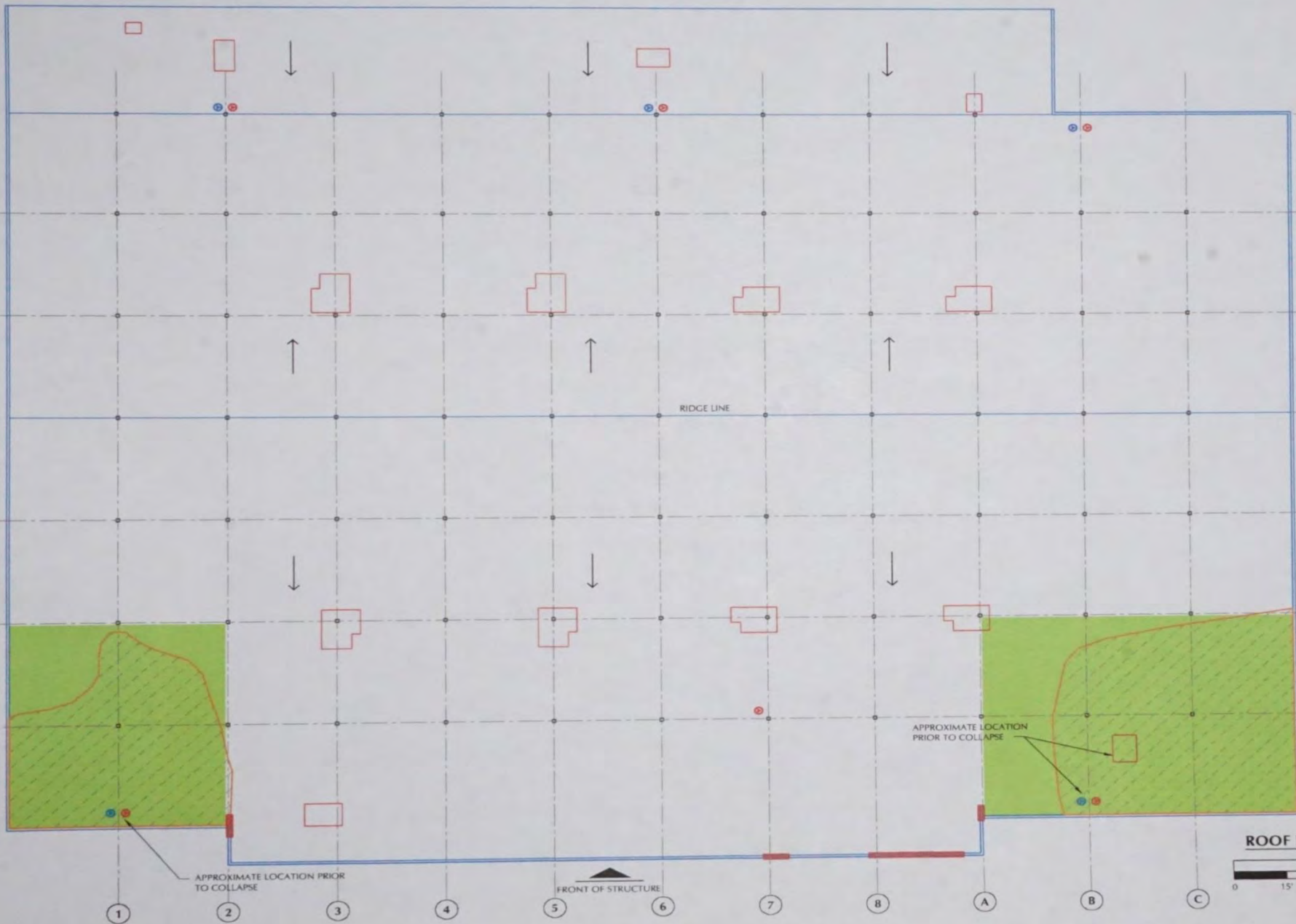












LEGEND

- PRIMARY ROOF DRAIN
- EMERGENCY ROOF DRAIN
- ROOF SLOPE
- ROOF LINE
- ROOF TOP A/C UNIT
- APPROXIMATE COLLUMN LOCATION
- APPROXIMATE AREA OF COLLAPSE
- BAY
- COLLUMN GRID LINE
- ▨ PARAPET DISTRESS
- AREA OF REMOVED ROOF AND FRAMING

ARCHITECTURAL ENGINEERS, INC.
FORENSICS + DESIGN
Offices in Texas & Florida

TEXAS CERTIFICATE OF
REGISTRATION NO. F-000950
EXPIRATION 9/30/2009

FLORIDA CERTIFICATE OF
AUTHORIZATION NO. 00008255
EXPIRATION 2/28/2011

STATE OF TEXAS
MATTHEW D. OESTRIKE
87847
LICENSED PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by MATTHEW D. OESTRIKE, P.E. 87847 on 12/05/2008 (Δ). This document is released only for the purpose of EVALUATION.

STRUCTURE IDENTIFICATION:
ATLANTIC PEARL INVESTMENTS
310 FM 1960 WEST
HOUSTON, TEXAS 77090

THIS DRAWING WAS PREPARED IN COLOR. THIS NOTE SHOULD BE IN RED. IF THIS NOTE IS NOT IN RED, THE DRAWING SHALL NOT BE USED.

SURVEY DATE:
SEPTEMBER 30, 2008

NAE FILE NUMBER: 6261H
CADI: GC

SHEET NUMBER: RE-1

ROOF DISTRESS SURVEY

SCALE: 1" = 30'

0 15' 30' 45' 60'

Δ REVISED 03/12/2009







NELSON ARCHITECTURAL ENGINEERS, INC.

Pro
File











STRUCTURAL ENGINEERS, INC.

Pr

- REASONS FOR COLLAPSE
- VERY LARGE BUILDING
- SLOPE FRONT TO REAR OR SIDE WOULD ADD 2 TO 3' OF HEIGHT
- BUILDING SLOPED FROM MIDDLE TO FRONT AND TO REAR
- ALL ROOF DRAINS ARE INTERNAL
- ROOF DRAINS OF 5" MAY HAVE BEEN SIZED RIGHT BUT DID NOT ACCOUNT FOR PLASTIC BAGS AND DEBRIS
- NO SCUPPERS









Claim No. 175906











- REMEDIES
- STABILIZE THE STRUCTURE, SHORE UP TILT-UP WALLS
- REPLACE DAMAGED AREAS
- DEAL WITH MOLD AND MILDEW
- DESIGN A WORKABLE ROOF DRAINAGE SYSTEM
- ADD SCUPPERS
- ADD SIDEWALK SURFACE GRATE DRAINS IN CASE UNDERGROUND DRAINAGE GETS FULL TO CAPACITY





never were observed and the minor lateral displacement of the south wall panels at Grid 1 would indicate that the existing wall panels could be repaired and realigned. Collapsed joists, joist girders and interior columns have already been removed from the site. Additionally, certain remaining columns, joists and joist girders at the perimeter of the temporarily shored areas were damaged, deformed or distorted by the collapse events. The repair or replacement of these damaged components, along with the replacement of collapsed members previously cleared from the site, is related to Hurricane Ike.

At the remaining areas of the structure (away from the collapse areas), there were no signs of displacement, movement or distress to the existing structural members or connections that would indicate that the impact of the collapse or the wind contacting the remaining structural members weakened or diminished the structural integrity of the remaining structure. The primary load condition that caused the roof to fail at the two south corners of the building was an excessive live load due to ponding water on the roof related to an ineffective roof drainage system. This type of failure mechanism (i.e. gravity overload) typically does not affect the entire building. Additionally, there are no signs that once the collapse occurred and opened up the API building, that wind within the interior was severe enough to create lateral pressures strong enough to damage the remainder of the API structure. We evaluated the connections closely at numerous areas away from the collapse and found no distress or, more specifically, distress that could be correlated to Hurricane Ike.

It is NAE's professional opinion that the collapsed areas can be repaired to their pre-loss condition. There are no signs that the remainder of the building, outside the areas of the collapse, sustained any distress. In our experience of evaluating partial roof collapses, it is reasonable and typical to repair the collapse areas so that they are designed and

- Owner Position:
- Lives in Los Angeles
- Wants to fix the damaged two areas with insurance proceeds
- Sell the building afterwards
- My Concern:
- Engineers and Architects involved will be on the hook and liable longterm in case building was not fixed throughout and experienced future failure



Architect's Position to protect future liability

- The power of the collapse, the mingled steel trusses, the pull of major beams out of the tilt-up, the columns deformation, the gypsum wall cracks way in the middle imply a major shock to the whole building
- The shock could transcend all the way to the back 300' and could affect every weld in the building on any joist
- My recommendation was to check each and every weld and every connection whether steel to steel or steel to Tilt-up

Options Considered:

- Inspection of the structure as whole with visual inspection
I didn't think it was enough.
- Do Xray here and there to see if there is damage
I thought this would not be 100% safety
- By the time they were convinced to fix every weld, it was cheaper to reweld all in lieu of xray for each weld, and this was implemented

B. Case Study: 1502 Todville Road, Seabrook, Texas

Waterfront House Elevated on wood piers in the path of Hurricane Ike

Analysis of damage, Repair or Tear Down, Insurance issues, Long Term Considerations









































ISSUES OF CONCERN

STRUCTURAL INTEGRITY OF COLUMNS WITH TORQUE
CRACKS, FUTURE LIABILITY AS A SELLER

DID PLYWOOD FLOORING DECK LOSE MOMENT VALUE
SINCE IT WAS NOT MARINE PLYWOOD?

WHAT HAPPENS TO SOIL UNDER SLAB WHEN SO MUCH
WATER COMES IN, DOES IT PULVERIZE?

MAJOR CONSIDERATIONS

WOOD COLUMNS WERE SIZE 10X10 WHEREAS ONLY 6X6
AT BALCONY

WERE 6X6 UNDERSIZED SINCE IKE TORE UP BALCONY
AND THE WHOLE FRONT ON THE LAKE?

ELEVATION WAS 15' AT FLOOR LEVEL AND
13' TO BOTTOM OF LOWEST STRUCTURAL MEMBER

SEABROOK CODE

SEABROOK CURRENT ELEVATION IS 18' TO BOTTOM OF
LOWEST STRUCTURAL MEMBER AND COULD GO HIGHER

RENOVATION DRAWBACK

INSURANCE WOULD HAVE BEEN EXHORBITANT HAD ONE
TRIED TO REPAIR THE STRUCTURE

FINAL OUTCOME:

SETTLED WITH INSURANCE AFTER 3 YEARS, REMOVED EXISTING
STRUCTURE

LOT FOR SALE

CAN THERE BE RELIABLE ANSWERS TO THESE QUESTIONS
WITHOUT FUTURE LIABILITY OF ENGINEER AND OWNER?

C. Construction Methods and Practices to minimize litigation and avert Lawsuits

Construction Documents, Coordination, Field Issues

WOOD FRAMING FIELD ISSUES

- Framers want to get to the roof very fast to have cover. They frame with the minimum members and after they roof it they come back and fill in the double studs and the blocking
- Very Dangerous practice. At one time a two story open space had one stud on either side of a full height window and with roof load on a beam over the 2nd floor window header, no blocking



Residential Garage Framing

- It is customary to have a Steel Frame around garage doors for Lateral Moment connection
- When you have a wheel stop in garage and “Slope to drain”, the stud wall curb where the steel post sits becomes narrow and high (5” plus)
- A slight bump to the frame during construction and the curb breaks because of the steel anchor

SOLUTIONS

- Do not include wheel stop drop. Not necessary. Reduce the curb height at the doors
- On a 2 or 3-car garage: Add Column inside garage to cut span and allow roof load transfers, raise on concrete
- Use Glu-Lam or Prallam Beams. Eliminate Steel trade if can still get the necessary Moment
- Add intermediate grade beams in garage to prevent or reduce upheaval of 20' x 20' slab on grade

Second floor plywood during framing

- When it rains on it and puddles it is no longer a suitable base for tile or hardwood
- Framers sometimes drill holes in it for water to drain but it is haphazard.
- The cost of hardwood floor increases substantially since they have to spend a lot of time leveling
- Use 1 1/8 in lieu of 5/8 or 3/4 and as much as possible have the framers cover it from rain with total poly, can actually start on top of plywood and under base plate of second floor stud wall



Augusta Square, 1300 Augusta Drive

- Post Tension Slab
- First Cable from slab edge went through 8" concrete element creating vertical brick column
- When tension pressure was applied on cable, the 8" ledge exploded
- Expensive remediation



28





3023 Bissonnet

- Three story, garage in front, entrance from side due to a 6' fire access easement
- While in Framing stage, framer calls says: "it shakes"
- The moment for lateral stability at the garage frame was not factored in the design
- The solution was a flitch beam with ½ inch steel plate, staggered bolts at 8" through 3- 2x12's around the frame, and similar small beams at 45 degrees at the corner and posts tied together





POTENTIAL LEAKS

- Wind between buildings when a 3 story is next to two-story causes water to go up the wall and under the metal caps. Use 4" minimum metal cap, insert backer rod and seal
- Book-End walls: parapets cause roof shingles to buckle with heat. Water penetrates between flashing and shingles
- If there is no overhang, water running into gutter will roll back up and enter the building



- Maximizing space over 25' bldg. setback line: floor cantilevered 4' to add living space. Had to use 2x12's cantilevered out and going back twice as long inside garage to cross beam
- Intermediate column to cut the span. On raised concrete curb. Pour perimeter walk to cut water penetration





- Wine vaults or antique home look:
- No ceiling bricks glued to substrate
- If they fall: crisis and liability



1300 AUGUSTA

Chase Center
1300 AUGUSTA
Columbus, GA 31906

FDC

1220 AUGUSTA OFFICE BUILDING

- Architect wanted “Single Responsibility Contractor” on building skin to minimize conflicts on where a leak may come from
- Designed all glass skin, all around, no step-backs, no other material penetration
- Any future leak responsibility falls on Glazing Contractor or Roofing Contractor



1220

Crown Castle
Spiker Davis D.D.S.
Colt Riley D.D.S.







12701

Imperial Linen, Stafford, Texas

- 50,000 sf facility, 30' clear ceiling height
- 270' X 250' SLAB. VERY BAD SOIL, MUST BE TREATED TO 8' DEPTH TO HAVE PVR OF 2 ½" ACROSS BUILDING
- Do you go to 6' or 8' in replacing and treating soil? A lot of cost in those additional 2'. Will the client accept more than 2 1/2" PVR end to end? Will the engineer consent?



CAN DESIGN SAVE MONEY FOR CLIENT?

- Cost is very large for 8' depth soil replace and treatment
- Being 300' wide, can perimeter 50' of slab have the 8' soil treatment while the inside at 4' or 6' soil treatment?
- Can tilt wall distance below ground be increased to where wall becomes "Dam" against water penetration?
- What solutions versus Contractor's "Value Engineering"?



12701

Shipping and
Receiving
(Back Right)
Door #1
Shipping and
Receiving
(Ground Level)
Door #2

DO NOT
ENTER



IMPERIAL LINEN, Stafford, Texas, ROOF DESIGN

- High Ridge in Middle front to back
- Slope to sides. Parapet only near front to give building shape
- No parapet along the rest of the sides
- No Internal Drainage



“CHI HAIR PRODUCTS” WAREHOUSE FOR FAROUK SYSTEMS

Richie Road at Hardy Tollway

- 200' x 500' building, 30' clear height
- Tilt-up panels poured on slab and stacked side by side for speed



CONSTRUCTION MONITORING

- Wheel marks of forklifts when the tilt up was lying flat on foundation. Watch-out how they move equipment in field, it's very expensive to remove and repaint Happens when you don't have enough access on sides or rear
- What happens during construction can haunt you later

D. Considerations when building for your own

General Contractor relationship, profit and loss versus sound practices, Banking Relations and how to protect your interest

- Have permit in your name
- Get Lien Releases, check with subs that they are paid
- When a lien is placed: Options
 - Surety Bond: it is setting an amount of money to cover lien with a Surety Company
 - If there is a judgement the Surety will immediately pay lien holder or as Court directs
 - Needs to be in cash, 2 to 2 ½ times the amount

Do Title Companies Insure Title if you produce a Surety Bond?

- Actually none do on Residential, they want the lien out regardless
- If you are going through refinance, it holds the loan and you end up paying construction loan interest in lieu of mortgage payment

Bank Construction Loan

- Great when you need money
- Watch what you sign, make sure you have extensions
- Construction Loan ends with a permanent loan.
- Define Time frame, get option on extension
- If construction not finished, you will pay interest on the full construction loan plus the monthly mortgage
- Interest compounds like crazy in favor of Bank

Construction Loan \$1,5 million

Converts to a Mortgage after 18 months

Owner borrowed \$400K equity loan on existing home

Due to delays, after 18 months you only drew \$1 Million

Bank converts you to a mortgage

Now you're paying interest on the \$1,5 million mortgage loan

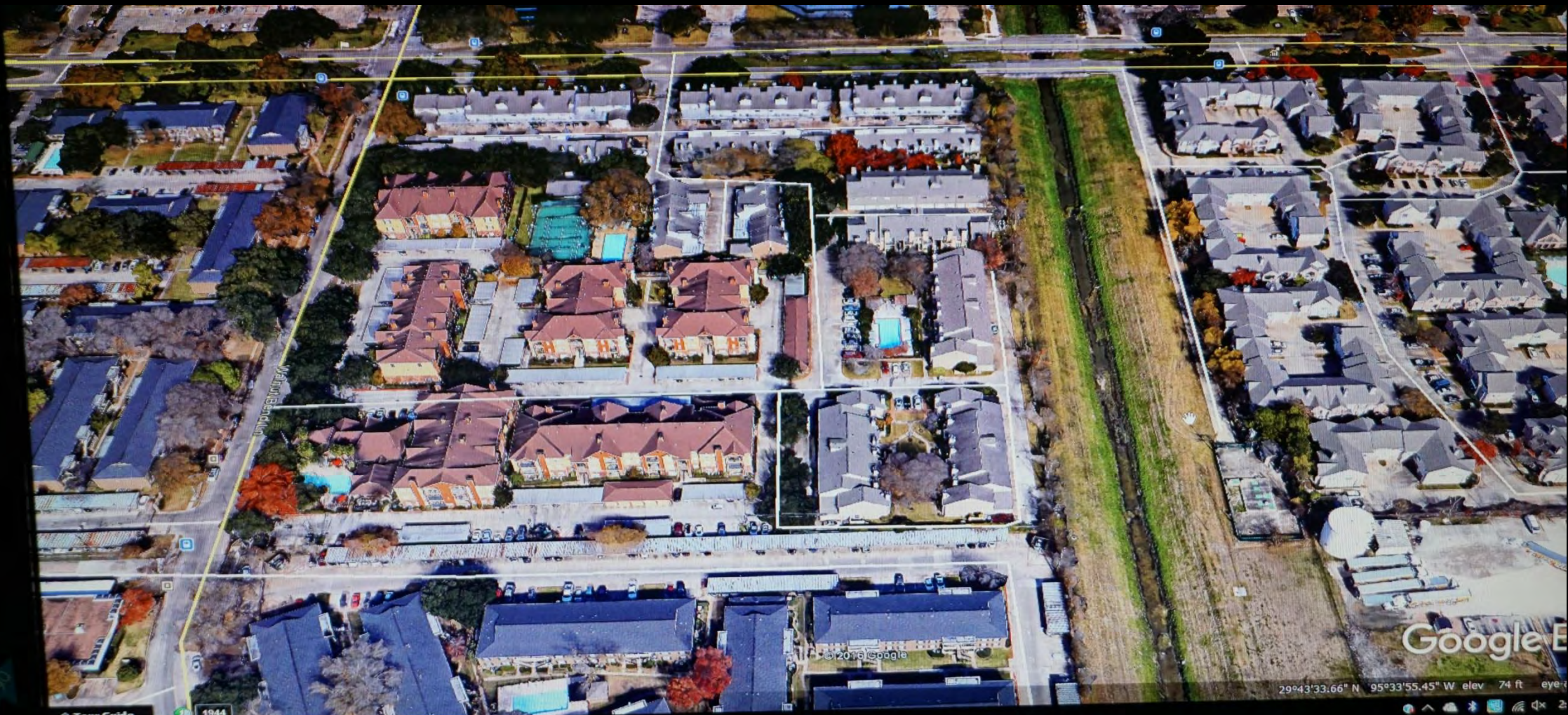
eventhough you only used \$1 million, plus interest on the \$400,000 equity loan, until you finish the house and go through a new Closing

CONSTRUCTION DOCUMENTS ISSUES

Westchase Gardens

Two similar buildings, one was called “Build in Reverse”
In lieu of redrawing the building

Will they do the underground Plumbing in reverse and
will they pour the foundation over it also in reverse?

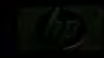


Tour Guide

1944



Computing takes a right turn. Rotate your screen from landscape to portrait in a snap with the Automatic Portrait Rotation feature for less scrolling and better viewing.



St Clair Tower, 1111 Bering Drive

Developer bought Penthouse and wants Pool on 13th floor

How to do it?







1114 Bering Dr

- Raise concrete ceiling of unit below 2', build pool ledge 2' above deck to get close to 4' depth.
- What this entailed is raising the whole 12th floor 2 ' all around the building and the associated cost
- Had heavy perimeter beams under pool
- Kept pool over one unit below, ceiling lowered to 8' - 9", had extensive insulation,
- Aluminum Pool was brought by helicopter in two sections, assembled on job

- Concern about Movement, leaks
- Had owner sign release to Architect
- As expected, substantial leaks occurred over the years
- Penthouse was foreclosed, pool was removed by Bank

CASE STUDY

LOG CABIN FIRE + DRAINAGE PROBLEM

RAINBOW LODGE RESTAURANT ELLA STREET AT 21ST

FORMERLY KNOWN AS LA TOUR D'ARGENT



CITY REQUIRES PROPERTY TO DRAIN INTERNALLY
TO STREET

PROBLEM: BACK YARD SLOPED DOWN INTO A
RAVINE AT LEAST 50' BELOW STREET+

RAVINE DID NOT SHOW ON CITY MAPS

CITY INSPECTOR WAS ASKED TO VISIT

CANNOT CHANGE CITY REQUIREMENTS,
WANTS PROPERTY TO DRAIN INTERNALLY TO STREET

IRONICALLY, THE STORM INLET IN THE STREET DRAINED
DIRECTLY UNDER THE STREET TO THE RAVINE

CITY INSPECTOR STILL ASKED FOR PROPERTY TO DRAIN
INTERNALLY TO STREET

SOLUTION

ASKED THE CIVIL ENGINEER TO SPLIT THE PROPERTY INTO TWO TRACTS, WITH ONLY 5' AROUND THE EXISTING STRUCTURE, PROVIDE A SWALE IN THAT 5' ALL AROUND TO AN INTERNAL INLET NEAR THE STREET



THE NIGHT WE RECEIVED THE BUILDING
PERMIT FROM THE CITY, A FIRE BROKE
OUT, MOST LIKELY BY A DISGRUNTLED
EMPLOYEE

WE ALL MET ON SITE LOOKING AT THE
CHARRED LOGS. PARTS OF THE ROOF ALSO
BURNED

SOLUTION OFFERED BY ARCHITECT

LOGS BEING SO THICK ARE NOT GOING TO
BURN BEYOND THE THIN LAYER OF BLACK
SURFACE CARBON SINCE OXYGEN DOES
NOT REACH THE REST OF THE LOG

ARCHITECT ASKED OWNER TO SANDBLAST
LOGS TO REMOVE CARBON LAYER AND SEE
WHAT'S BEHIND

THIS WAS DONE, THE BUILDING WAS
INTACT STRUCTURALLY

WE RESUBMITTED AND REBUILT ROOF AND
IT IS HERE TODAY

CASE STUDY

W. AIRPORT AND HWY 6 SHOPPING CENTER
17,000 SF



Supplies DO-NUTS

ROYALE WOODBRIDGE
PLAZA
11313
SPACE AVAILABLE
713.300.0300

Massage

SHAHIDA'S
BEAUTY SALON

Forever
Nails & Spa

Shahida's

怡東餐廳

Elephant Garden
CHINESE CUISINE

Elephant Garden

NEW MANAGEMENT
BEST CHEF IN TOWN
GREAT PRICE FOR DELICIOUS FOOD

BETWEEN DESIGN CHANGES AND SHOP DRAWINGS

STEEL FRAME FOR ONE PYRAMID WAS WRONG
DIMENSIONS,
ALREADY DELIVERED TO SITE

D-NUTS



ROYALE WOODBRIDGE
PLAZA
11315

SPACE AVAILABLE
713.300.0300

 **Massage**

**SHAHIDA'S
BEAUTY SALON**

*Forever
Nails & Spa*

Saladmaster

怡東餐廳



OPTIONS

- FASTEST AND EASIEST WAS TO REDESIGN ELEVATION AND REBALANCE IT ACCORDING TO STEEL DIMENSIONS
- INFORMED OWNER WHO IS AN MEP OIL COMPANY ENGINEER, WAS OVERSEAS AT THE TIME, AFTER MUCH DISCUSSION AGREED TO PAY FOR CHANGE TIME
- TOWARDS END OF PROJECT OWNER REFUSED TO PAY AND WAS STALLING



Shipley DO-NUTS

11315
J

OPEN



TEXAS
BCY-9520

TERMINATION CLAUSE EFFECT

- WE HAD A SOLID CONTRACT WITH A TERMINATION CLAUSE WITH 7 DAYS NOTICE
- WE EXERCIZED THE OPTION. OWNER COULD NO LONGER GET OUR CERTIFICATION FOR COMPLETION AND OCCUPANCY
- BOTH HIRED ATTORNEYS, AGREED TO MEET AT SITE

YOU ARE RIGHT BUT...

- OUR ATTORNEY ADVICE: YOU CAN REALLY HURT OWNER BECAUSE YOU HAVE A SOLID CONTRACT
- IT WILL BE A YEAR BEFORE CASE COMES TO TRIAL
- ARCHITECT HAS DAMAGES OF \$11,000

OWNER WOULD HAVE OVER A MILLION DOLLARS IN LOSSES
AFTER A YEAR IN MORTGAGE, TAX, INTEREST, INSURANCE,
VACANCY, ETC

WHO DO YOU THINK THE JURY WILL SIDE WITH?

WILL THEY PENALIZE YOU AND YOUR ENGINEERS FOR CAUSING
SO MUCH DAMAGE TO OWNER IN RELATION TO YOUR
DAMAGES?



CASE STUDY

NORA'S HOME FOR TRANSPLANT PATIENTS AND THEIR FAMILIES

16 GUEST ROOMS, KITCHEN AND DINING, RECEPTION AND
OFFICES

16 GUEST ROOMS, KITCHEN AND DINING, RECEPTION AND
OFFICES

12,000 SF STRUCTURAL SLAB ON VOID BOXES



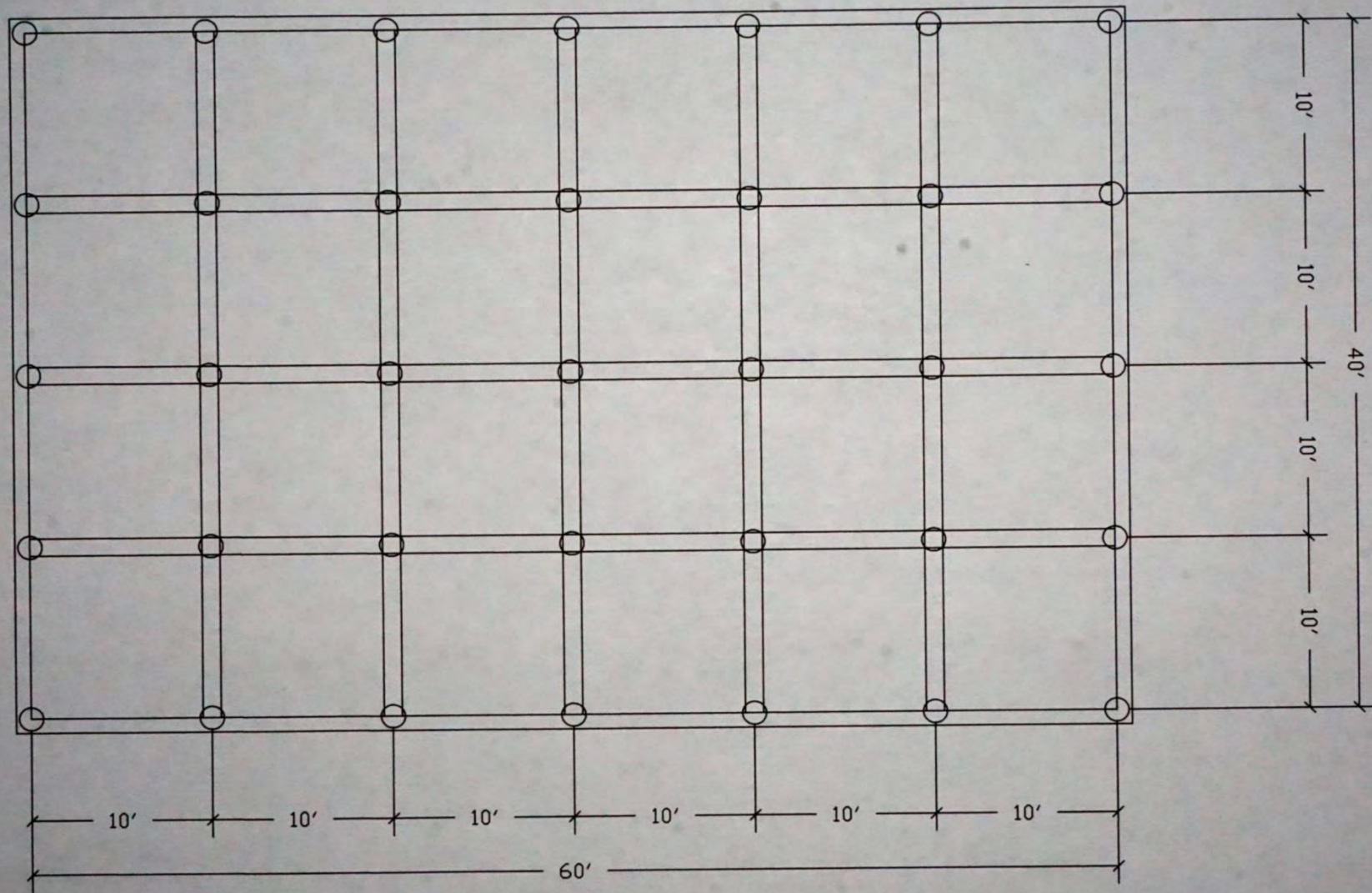
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Goog



HOW TO DESIGN AN EFFICIENT FOUNDATION WHEN YOU HAVE SO MUCH PLUMBING UNDER IT?

HOW DO YOU MINIMIZE AMOUNT OF CONCRETE AND COST,
and Plumbing lines damage due to pours, frequency, ease of
future repairs



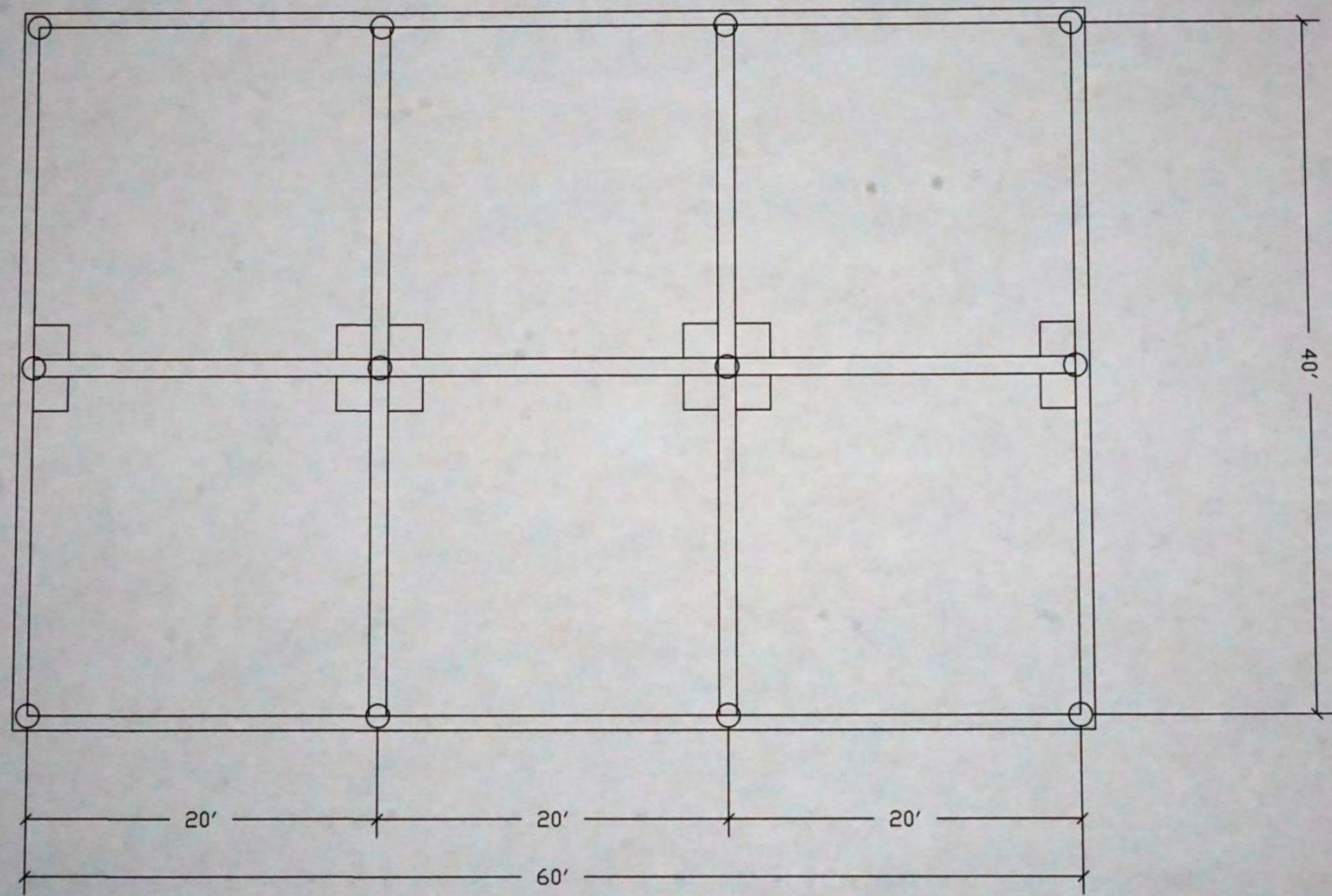
SOLUTION BY OUR STRUCTURAL ENGINEER:

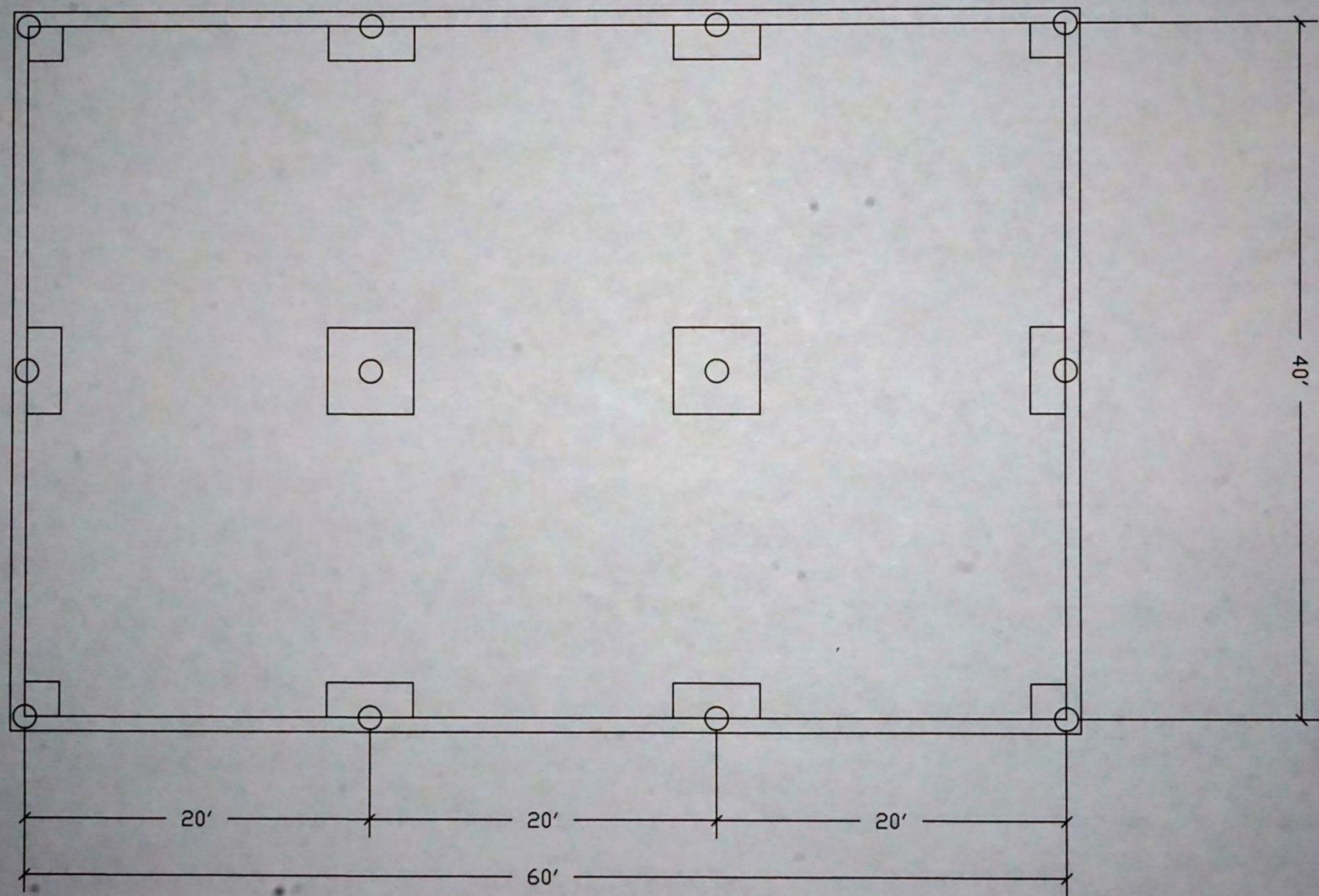
A 10" STRUCTURAL SLAB WITH TOP & BOTTOM STEEL

PIERS AT 20' CENTERS REDUCING NUMBER BY ABOUT OVER 60%

REMOVE INTERMEDIATE BEAMS,

VOIDS UNDER SLAB VERY UNIFORM





IT'S UP TO YOU AS STRUCTURAL
ENGINEERS TO JUDGE THIS DESIGN AND
HOW APPLICABLE

WE ASK FOR IT NOW EVEN ON SINGLE
FAMILY WHEN A STRUCTURAL SLAB IS
REQUIRED

Dionysius Periegetes

ca. 405 BCE











Design for the unexpected, Design for the unforeseen

The unforeseen is your experience with the past and
designing to minimize construction issues

Thank you