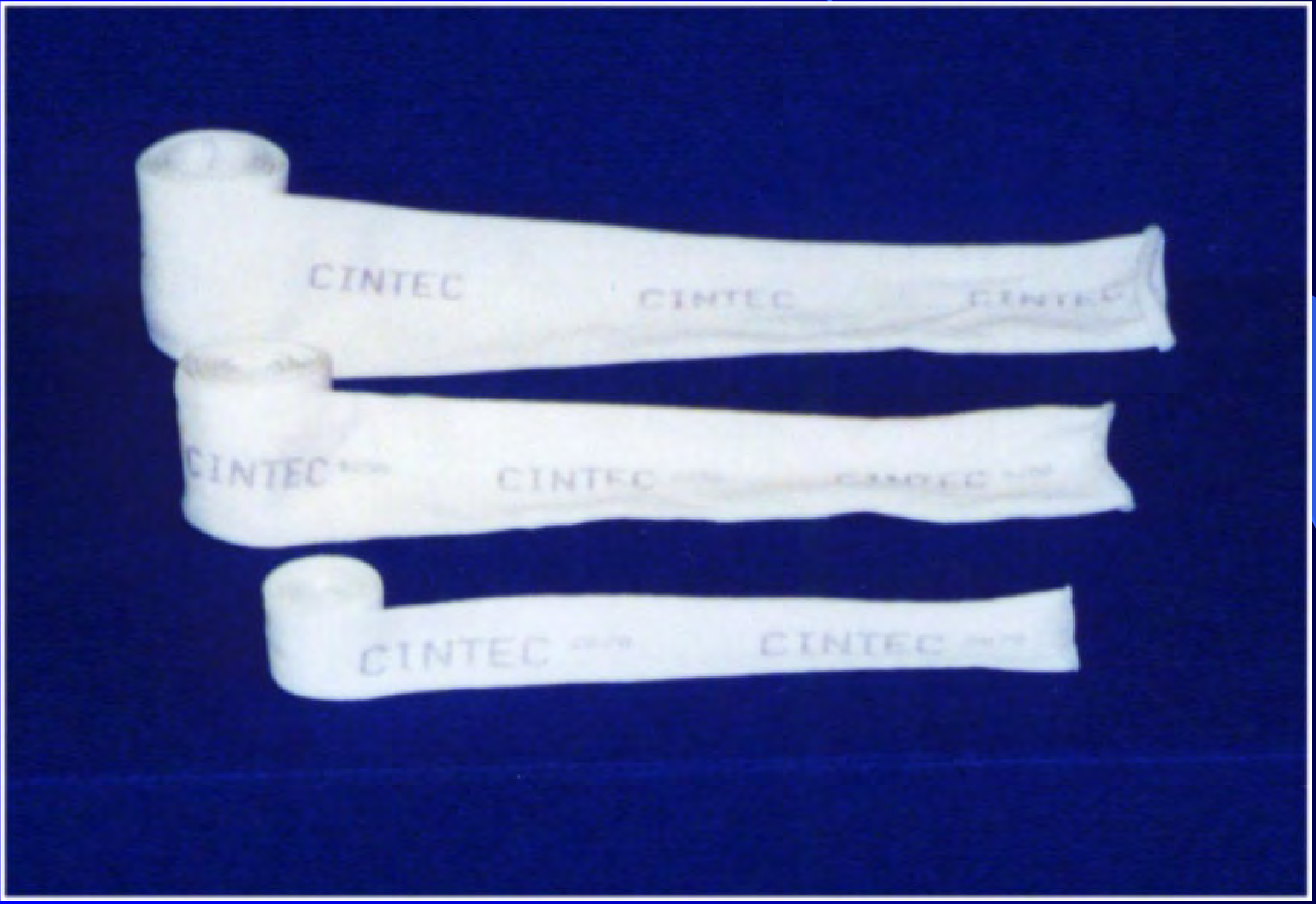
CINTEC AMERICA Inc

Structural Reinforcement & Anchoring Systems for Strengthening - Stabilization Seismic - Blast

The Bar

The Sock

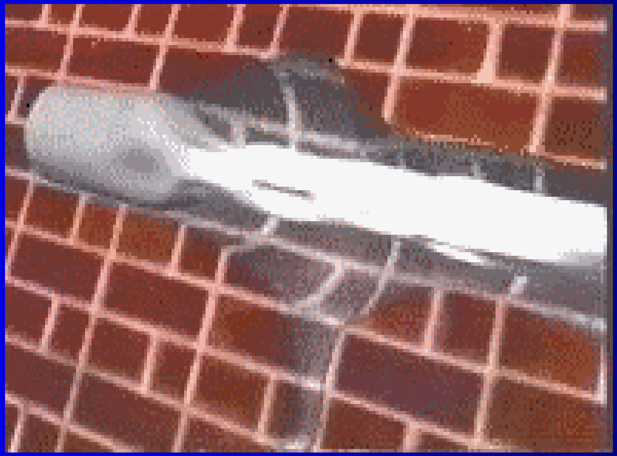


The Grout

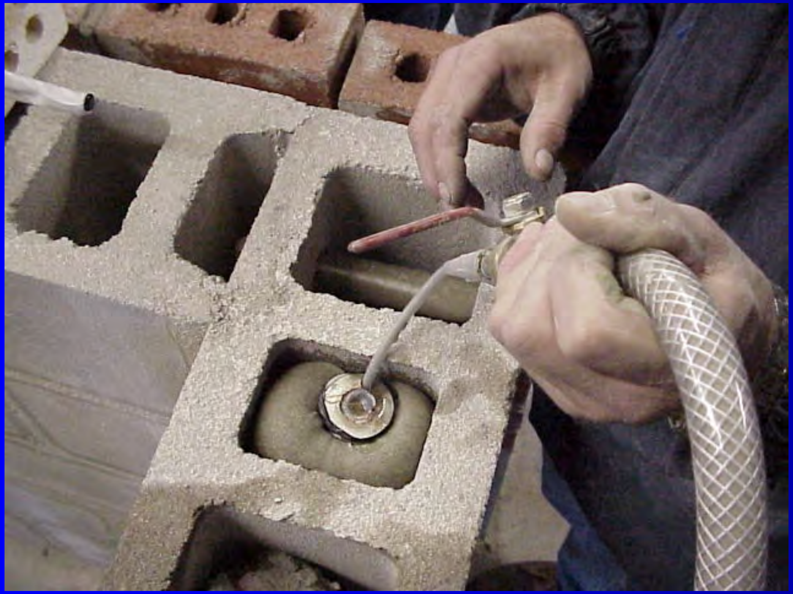
GÜTEÜBERWACHUNG
MÖRTEL
DIN 18555
ÜBERWACHT

Non Percussive Drilling

Anchor Principle



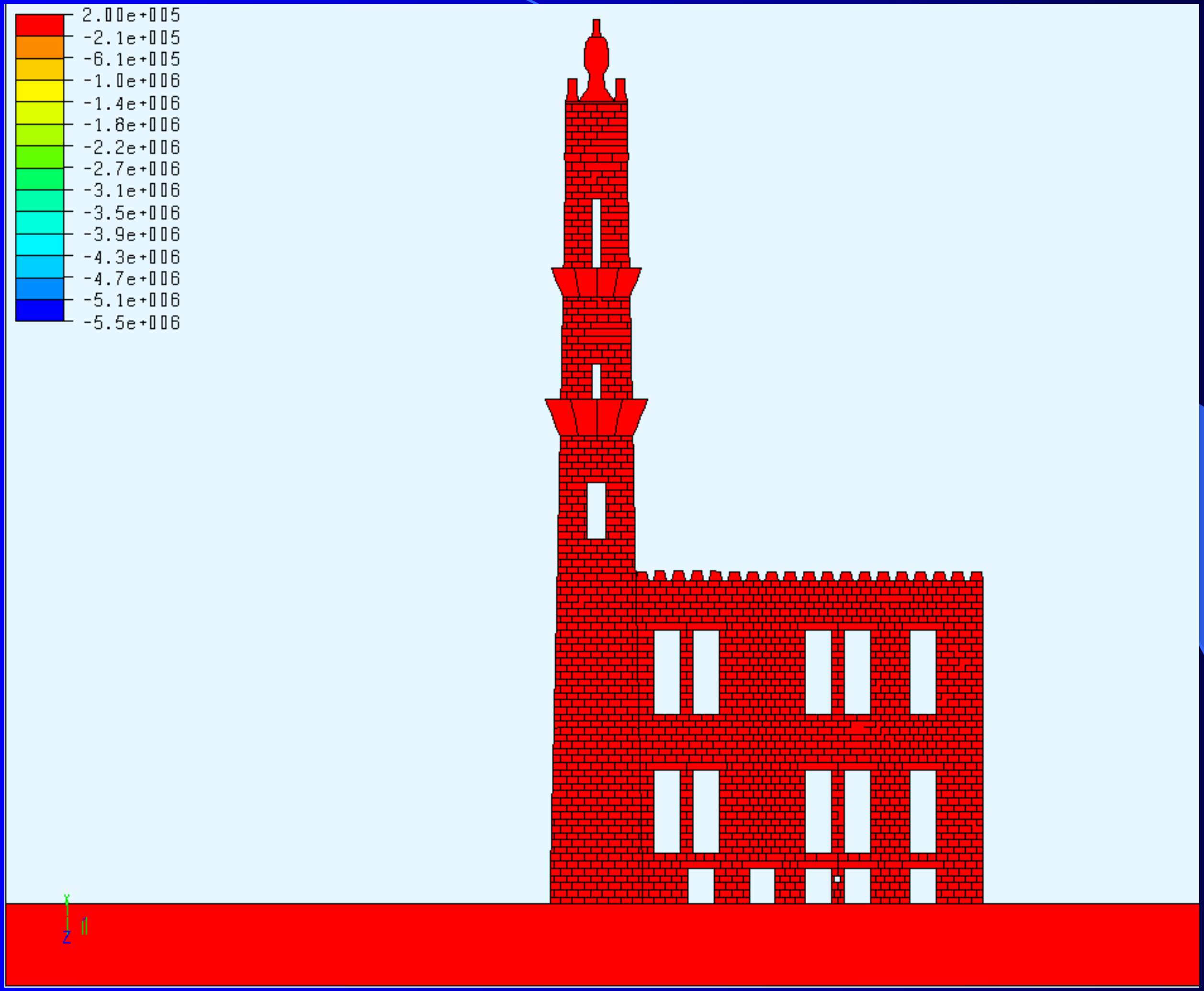
Cintec Sock Inflation



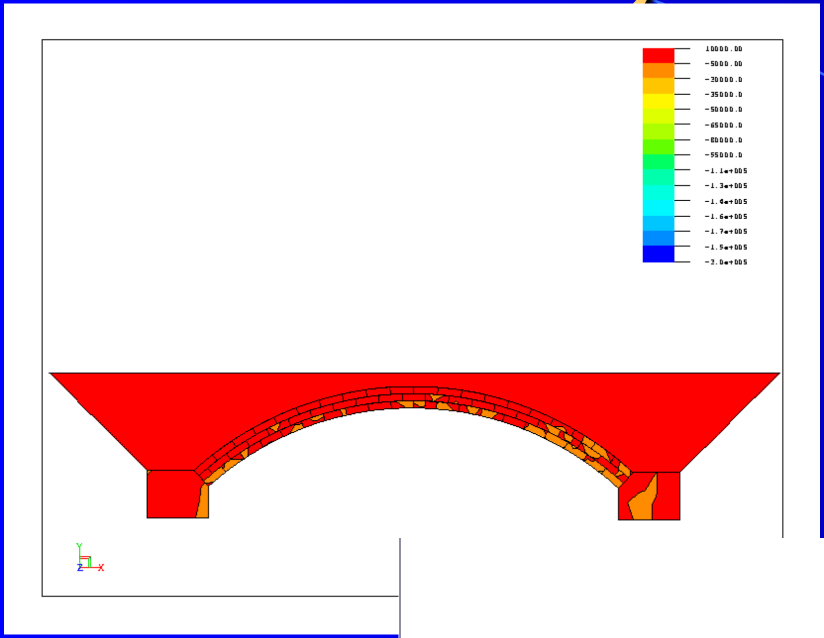
Anchor Injection

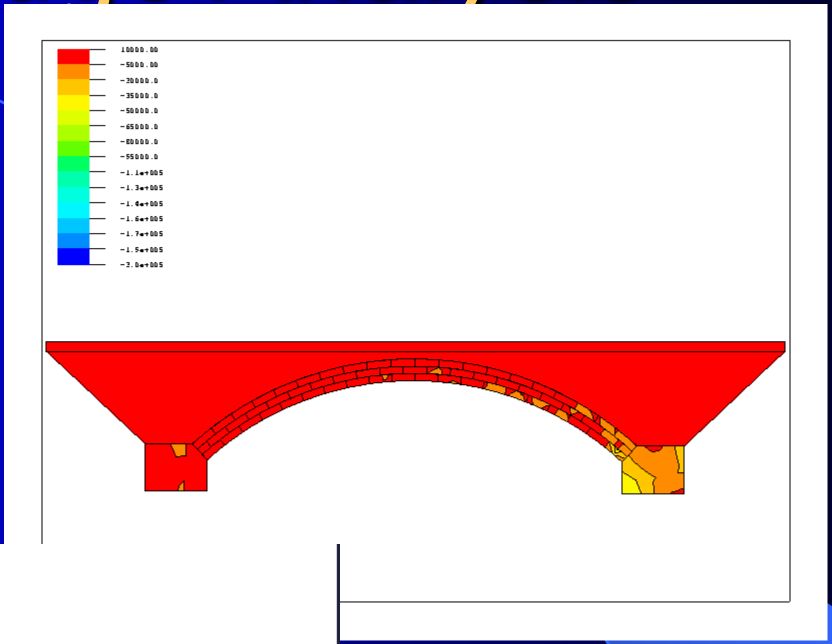
Analysis

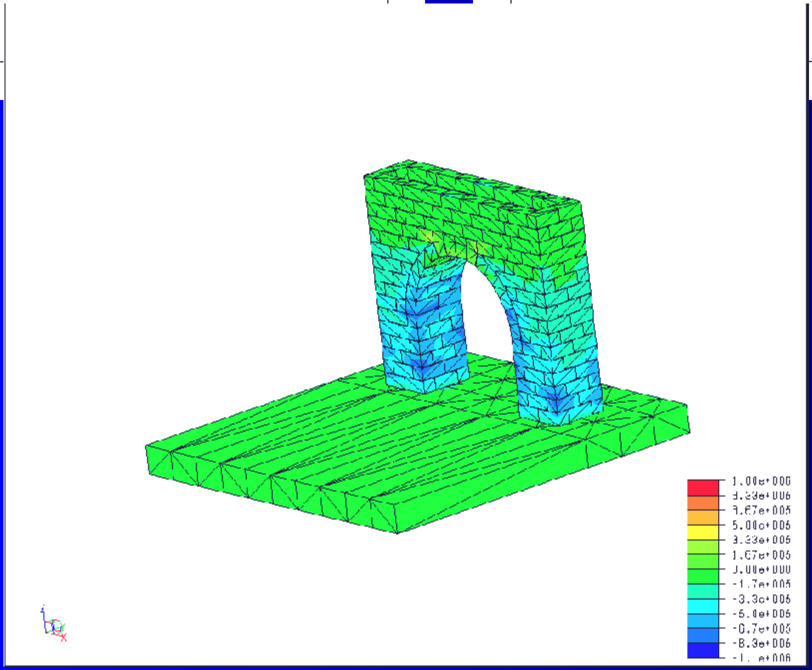
Masonry Analysis



Masonry Bridge Analysis







Cintec Designed Anchor System

Some

Design Issues and Parameters

Design Methods

- Cone pull-out resistance
- Tensile strength of the steel anchor body
- Shear strength of the steel anchor body
- Bond pull-out resistance
- Bearing resistance
- Shear resistance toward the free edge

Design Parameters

- Base material in the anchor body SS Type 304 or 316
- Micro-fine Presstec grout - very high early strength
- SUBSTRATE!
- Anchor configuration

Salient Points to Consider Before Ordering Anchors

This is a designed anchor system, therefore as much information as possible about the type of substrate and possible voids etc. is required to enable us to manufacture the exact anchor to meet your requirements.

The minimum embedment depth of any anchor is 75mm (3") unless test anchors have been installed to determine the load achievable with a reduced embedment.

The maximum length of an 8mm (5/16")or 10mm (3/8") anchor in a 20mm (3/4") hole is 500mm (20").

For lengths between 500mm (20") and 1000mm (39") a 24mm (1") hole is required using a 10mm (3/8") chs anchor.

The general rule is that the bore hole must be twice the diameter of the anchor body utilised. This is only applicable up to certain lengths and the hole size must be increased on longer anchors.

The guidelines are as follows:-

8mm (5/16") chs	20mm (3/4") bore hole	up to 500mm (20")
10mm (3/8") chs	20mm (3/4") bore hole	up to 500mm (20")
10mm (3/8") chs	25mm (1") bore hole	up to 1000mm (39")
10mm (3/8") chs	32mm (1 1/4") bore hole	up to 2000mm (6'6")
15(5/8") x 15(5/8") shs	32mm (1 1/4") bore hole	up to 3000mm (9'9")
20(3/4") x 20(3/4") shs	40mm (1 1/2") bore hole	up to 3000mm (9'9")
30(1 3/16") x 30 (1 3/16") shs	60mm (2 1/2") bore hole	up to 4000mm (13'0")
M10 (3/8") studding	32mm (1 1/4") bore hole	up to 1000mm (39")
M12 (1/2") studding	25mm (1 1/4") bore hole	up to 1000mm (39")
M16 (5/8") studding	40mm (1 1/2") bore hole	up to 3000mm (9'9")
M20 (3/4") studding	50mm (2") bore hole	up to 4000mm (13'0")

CARE OF ANCHORS AND GROUT

The anchors and fixings are supplied with the correct amount of grout. Care must be taken not to waste grout. The anchors, fixings and the grout should be stored safely away from all work areas until needed.

GROUT

Store grout in a dry place off the ground. NEVER allow the grout to become damp, or wet, or store in a place where the temperature can drop below 5ºC (41°F).

NB - The marriage of steel and fabric is very delicate and the anchors must be treated accordingly to ensure that no damage to the fabric sock occurs. DO NOT leave anchors lying around on the ground or on scaffolding. NEVER use anchors to test the hole depth.

Problems Encountered During Inflation

Grout blockage can occur in the hose and control valve if left in direct sunlight or the mixed grout has not been sieved correctly.

The anchor will not inflate if the sock has been ripped during installation. Remove the anchor from the bore hole and check the sock, small tears can be repaired and the anchor re-installed, if the damage is more severe remove the grout and fabric sock and wash off the anchor completely. Notify Cintec International Ltd who will arrange a repair procedure.

Anchor fails to fill only partially fills, fails to reach surface of bore hole.

There are a number of factors to consider here, check all the following possibilities:

> Grout mixture too thick either by incorrect mixing or outside the working time of the mixed grout (usually between 45 minutes and 1 hour, dependent on conditions).
>
> Grout has passed its shelf life. Check date on side of bag.

Anchor installed in a larger diameter bore hole than the anchor was designed for. Check original order.

Large voids are present tensioning the sock at the front of the anchor. A larger sock may be required.

Insufficient pressure in the pot. Shut off the air from the compressor and check that the pressure pot is maintaining a constant pressure. If it is dropping check for leaks. Remember, what is shown on the gauge is not necessarily what is in the pot because the air can be passing into the pot and straight out through any leaks.

The sock has twisted during installation, preventing the grout passing the twist. Do not force or twist the anchor while inserting

Sock not distributed evenly before insertion therefore there is too much sock at the front of the bore hole preventing complete inflation.

Failure to wet sock, this is very important in porous substrates and in dry/hot weather conditions.

Design Information

Lake County Courthouse					
Soffit Stones					
Solid Threaded Rod Anchor					
Basic Design Calculations					
Limit State Design					
Anchor diameter:	d_a =	16.00	mm =	0.630	in
Hole diameter:	d_h =	32.00	mm =	1.260	in
Hole length:	L_d =	50.00	mm =	1.969	in
Side cover:	m_{sc} =	254.00	mm =	10.000	in
Steel strength:	f_{su} =	199.95	MPa =	29000.0	psi
Thread factor:	t_f =	0.75			
Resistance factor for steel:	ϕ_s =	0.85			
Base material strength:	f_c' =	5.00	MPa =	725.2	psi
Base material factor:	λ =	1.00			
Bond resistance factor:	α =	0.20			
Resistance factor for base material:	ϕ_c =	0.60			

NOTE:	All resistances should be not less than f_s * working load, where				
	f_s = 1.25 for DL, and 1.5 for LL. Bond pull-out resistance				
	will also have hidden factor of safety of 4 for bond stress.				
Cone Pull-Out Resistance					
$A_{net} = (2 * L_d + d_h)^2 - \pi * d_h^2 * 0.25 =$	16619.75	mm^2 =	25.76	in^2	
$P_r = 0.3 * \lambda * \phi_c * (f_c')^{1/2} * A_{net} =$	**6.689**	kN =	**1503.820**	lb	
Tensile Strength of the Anchor					
$T_s = t_f * \pi * d_a^2 * 0.25 * \phi_s * f_{su} =$	**25.629**	kN =	**5761.558**	lb	
Bond Pull-Out Resistance					
$A_{cyl} = \pi * d_h * L_d =$	5026.55	mm^2	7.79	in^2	
$P_{b,Pull} = \alpha * \lambda * \phi_c * (f_c')^{1/2} * A_{cyl} =$	**1.349**	kN =	**303.214**	lb	
Bearing Resistance*					
$A_b = d_h * L_d * 0.25 =$	400.00	mm^2	0.62	in^2	
$P_b = 1.4 * \lambda * \phi_c * f_c' * A_b =$	**1.680**	kN =	**377.679**	lb	
Shear Resistance Towards Free Edge					
$P_{Ve} = 0.3 * \lambda * \phi_c * (f_c')^{1/2} * 2 * m_{sc}^2 =$	**51.934**	kN =	**11675.316**	lb	

Types of Substrate

- Terra cotta - in many forms
- Stone
- Brick
- Hollow concrete block (CMU)
- Concrete
- Adobe
- Ground Anchors

Design Challenges

- Terra cotta
- Substrate strength
- Cintec’s R&D

Fire Resistance

Cintec anchors >4 hours

Epoxy melts at 80 dec. C

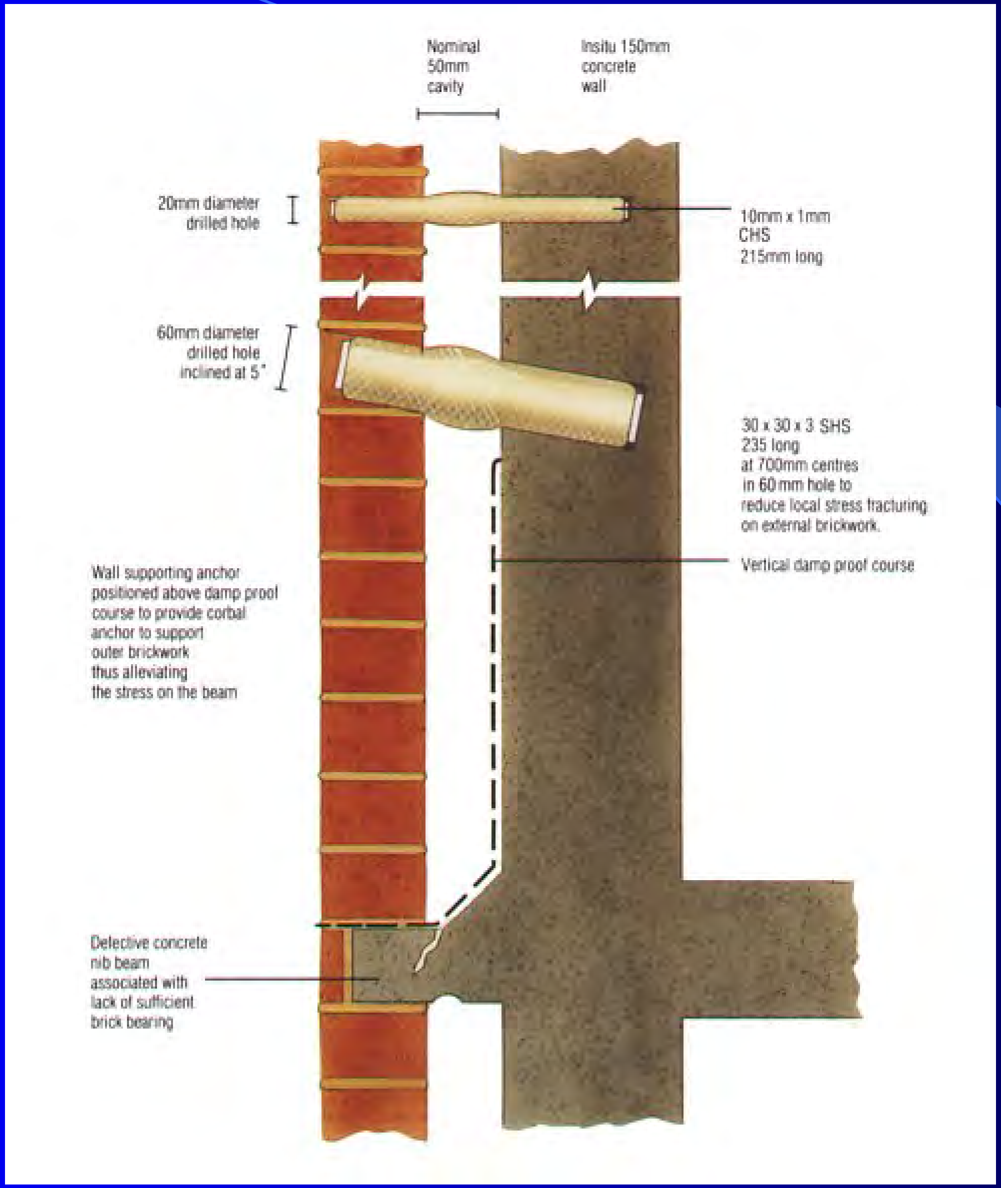
ADVANTAGES

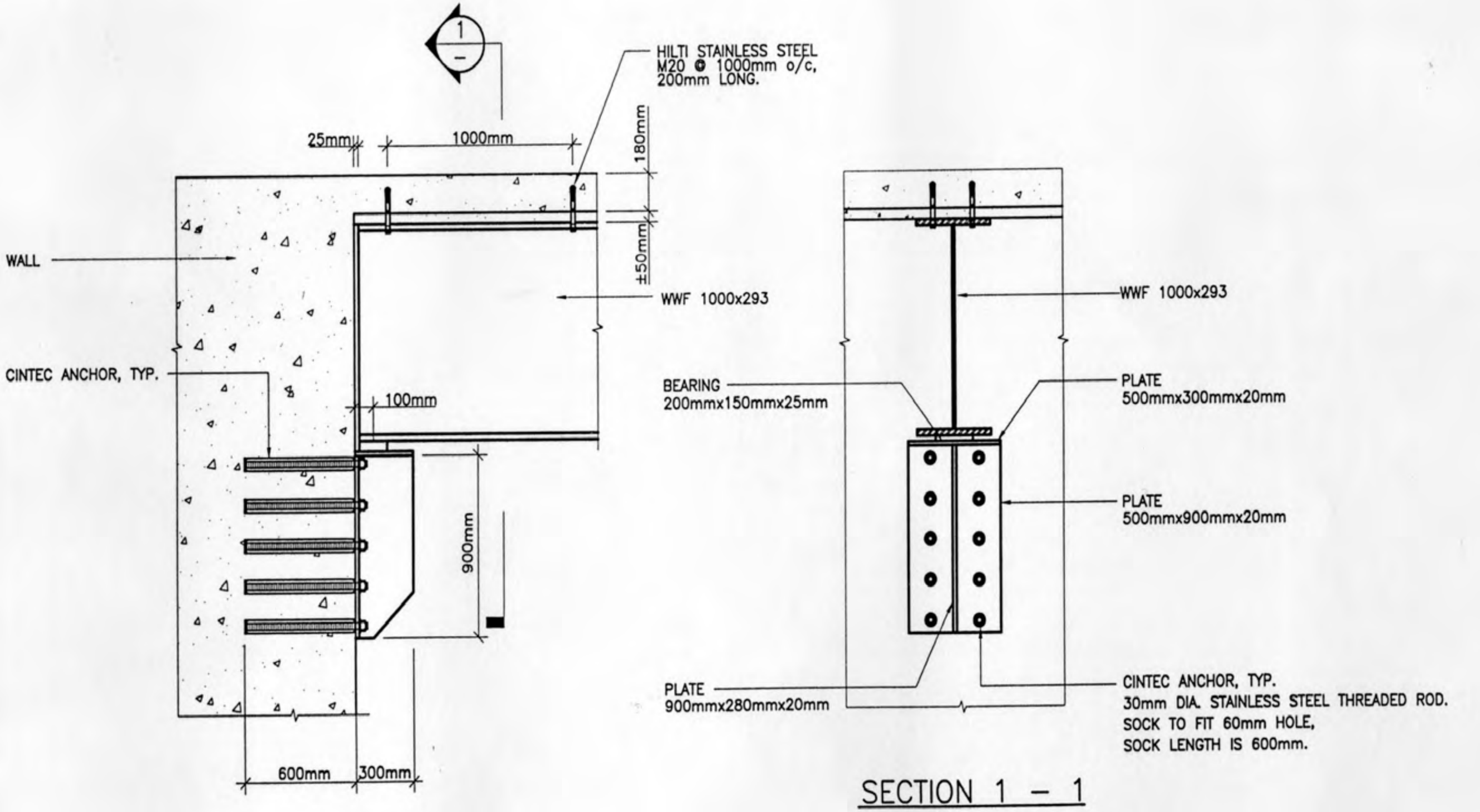
- Easily fixed, even in weak substrates
- Easily used in poor quality materials and in bridging applications.
- Sympathetic with existing structure (Anchors don't fail structures fail!)
- Cementitious based
- Versatile
- Easily designed for differing applications by designers
- Above or below grade
- Damp wet or under water installation
- Permanent.
- Capable of rapid manufacture.

Quality Control

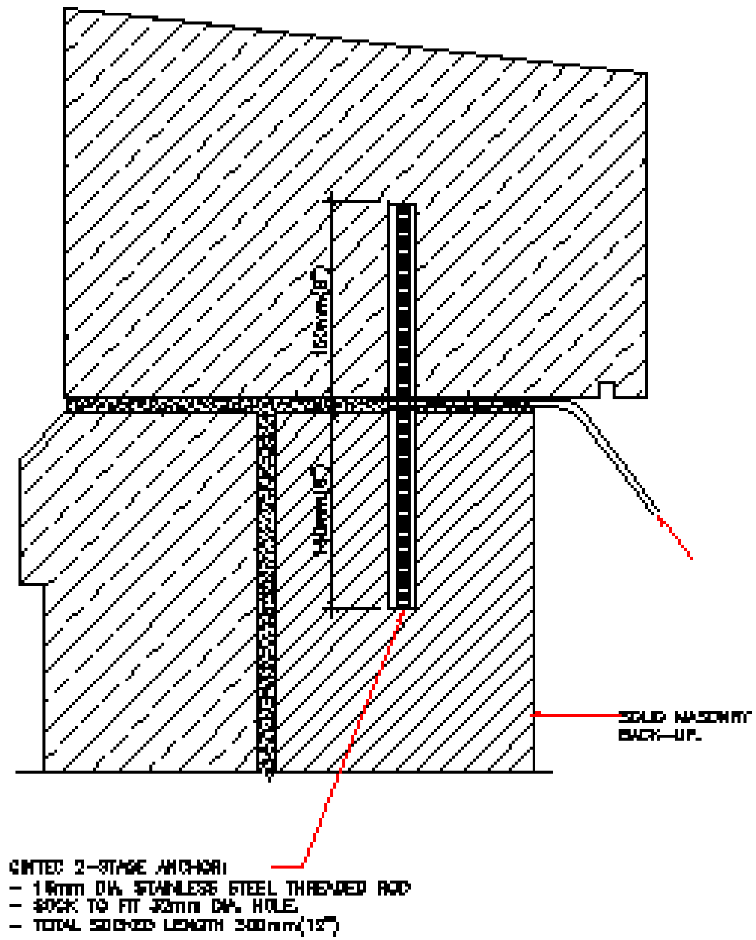
- Hole is easy to inspect
- If anchor is rigid after installation , all is OK
- If anchor is loose, take it out and re-sock it.
- Mechanical anchors sometimes don’t set, but Contractor doesn’t fix it.
- Significant grout can be lost with un-socked rock anchors. (EPA problems!)

Anchor Types

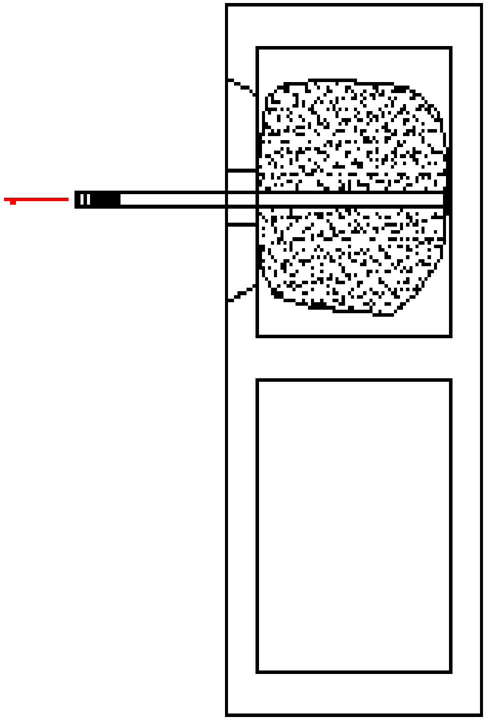

Nominal
50mm
cavity
Insitu 150mm
concrete
wall
20mm diameter
drilled hole
10mm x 1mm
CHS
215mm long
60mm diameter
drilled hole
inclined at 5°
30 x 30 x 3 SHS
235 long
at 700mm centres
in 60 mm hole to
reduce local stress fracturing
on external brickwork.
Vertical damp proof course
Wall supporting anchor
positioned above damp proof
course to provide corbal
anchor to support
outer brickwork
thus alleviating
the stress on the beam
Defective concrete
nib beam
associated with
lack of sufficient
brick bearing



CONNECTION BETWEEN WALL AND NEW GIRDER

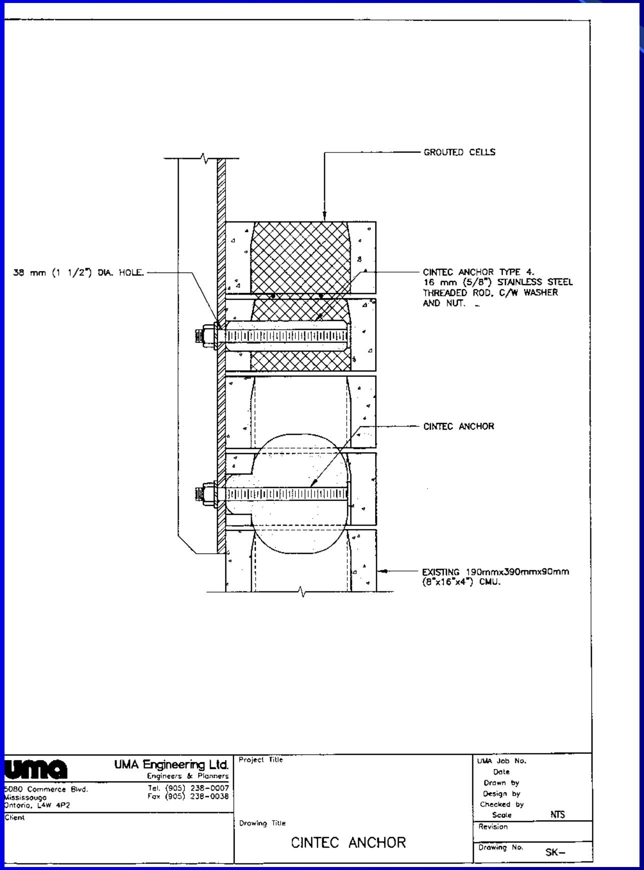


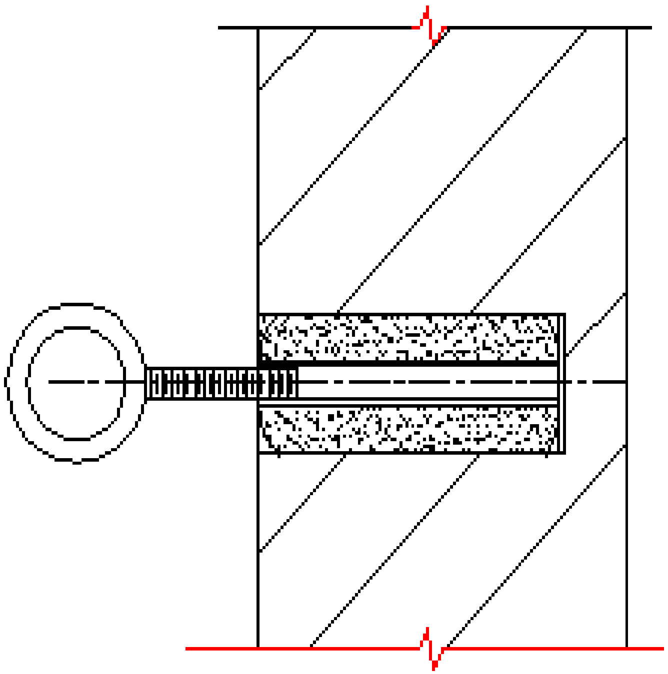
COPING STONE ANCHORS



TERRA COTTA IN TENSION

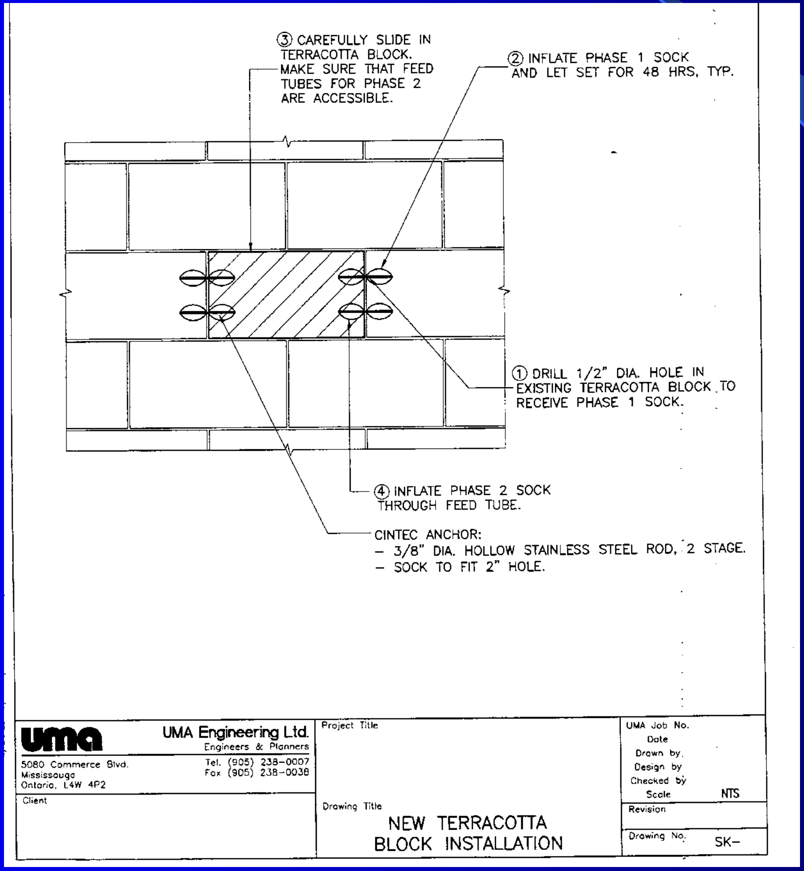
Hollow/Solid CMU



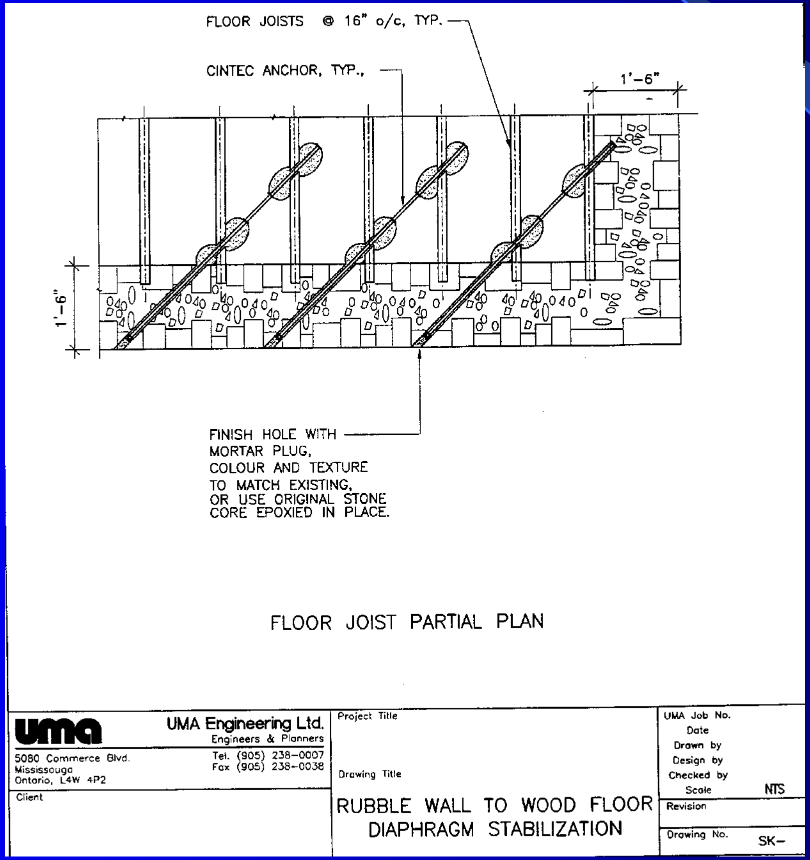


SPECIAL CONNECTION

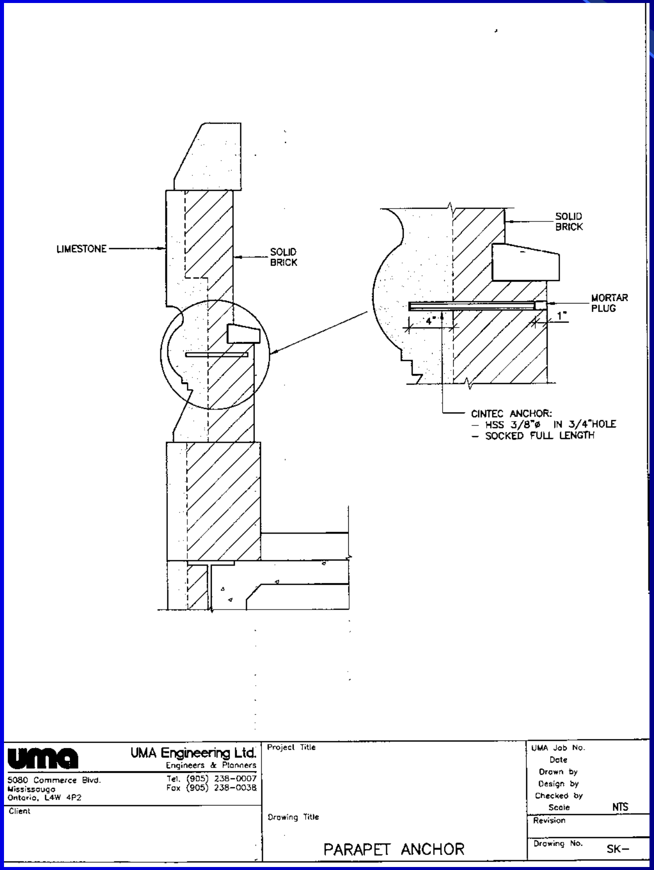
Terracotta Replacement Insert



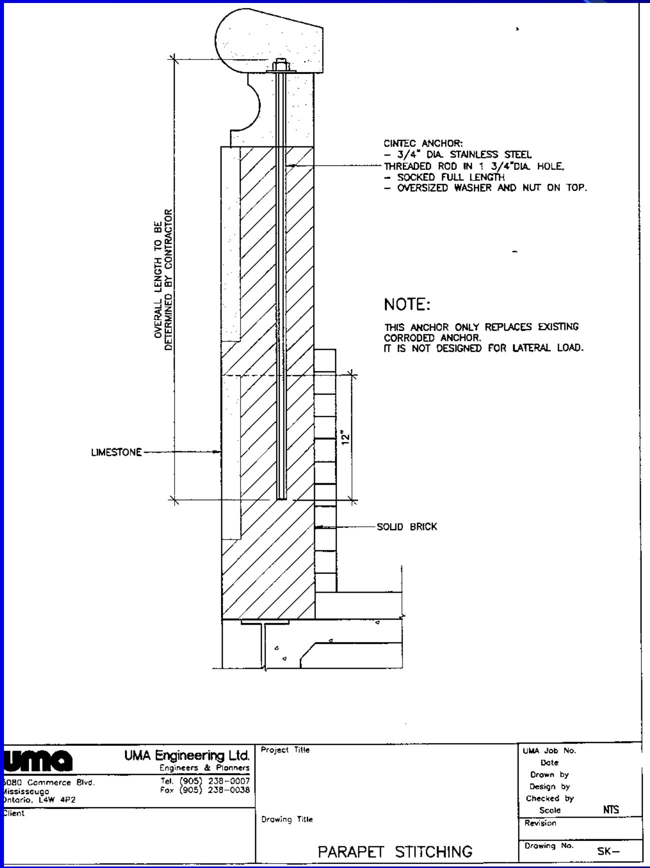
Rubble/Exterior Wall to Wood Joist



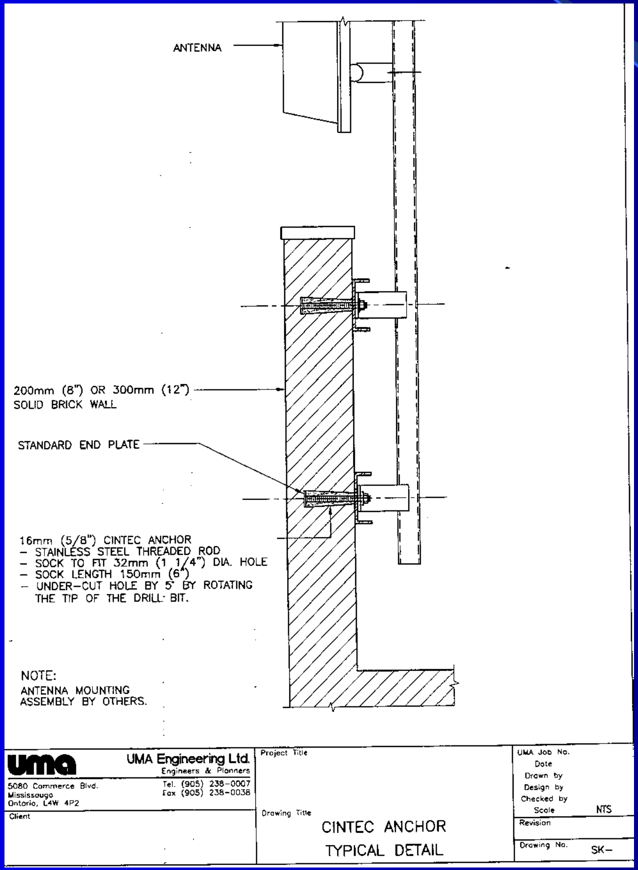
Limestone Stabilization



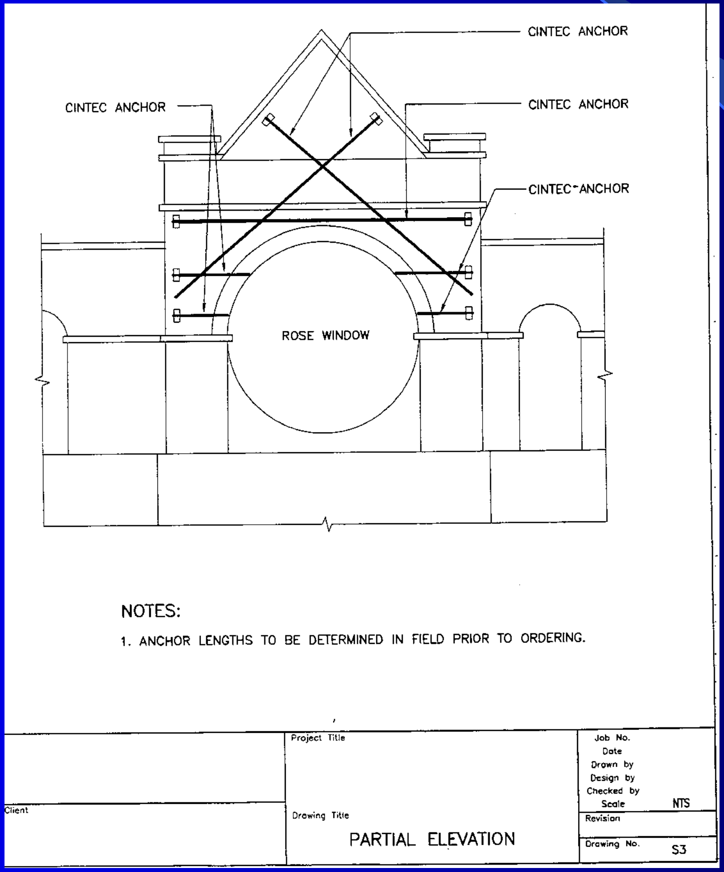
High Parapet Stitching



Undercut Technology

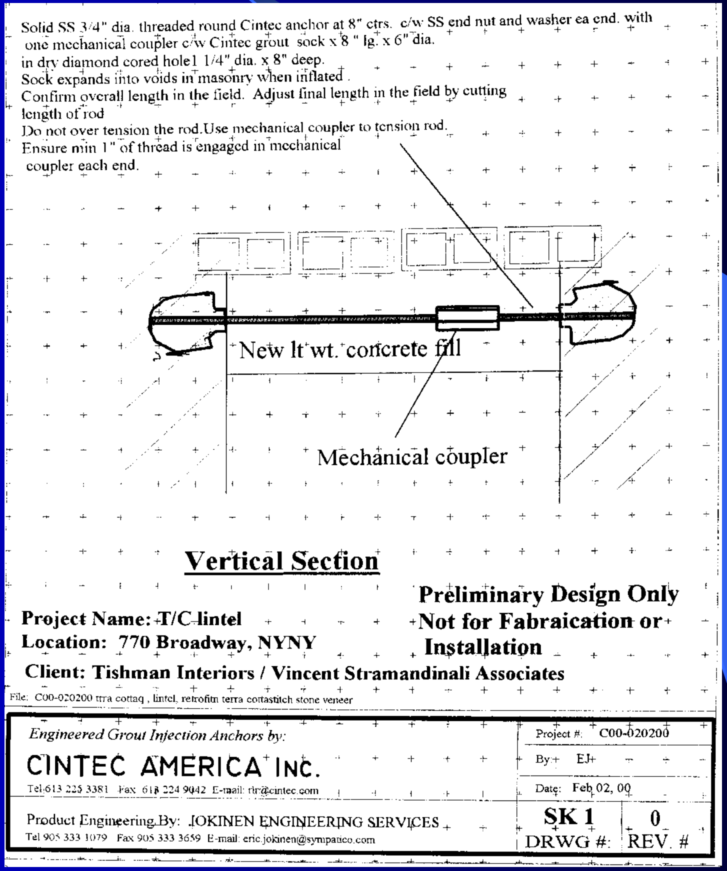


Façade Stabilization 8-30' Anchors

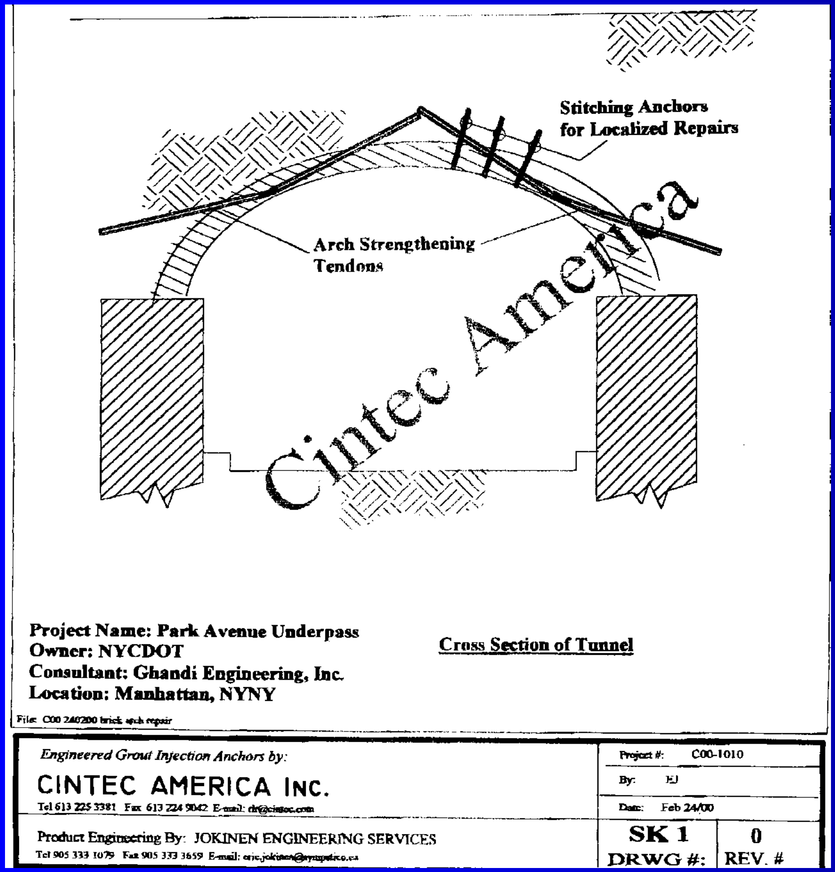


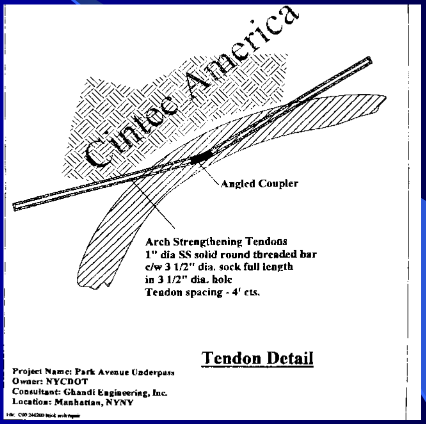
Flat Arch Terracotta Repair

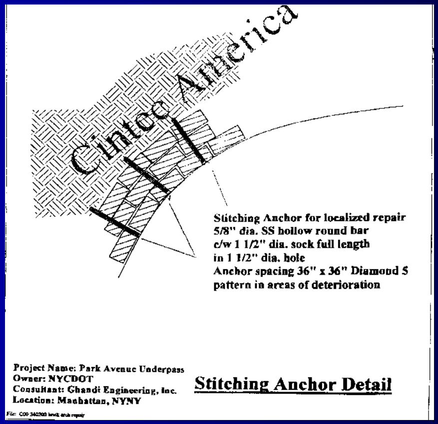
- Called on Thursday – 2PM
- Visit & Photos same day
- Email Photos that evening
- Design Friday
- Manufacture & Ship Monday
- Installed Tuesday
- Met Wednesday deadline



Park Ave Viaduct Brick Arch Stabilization





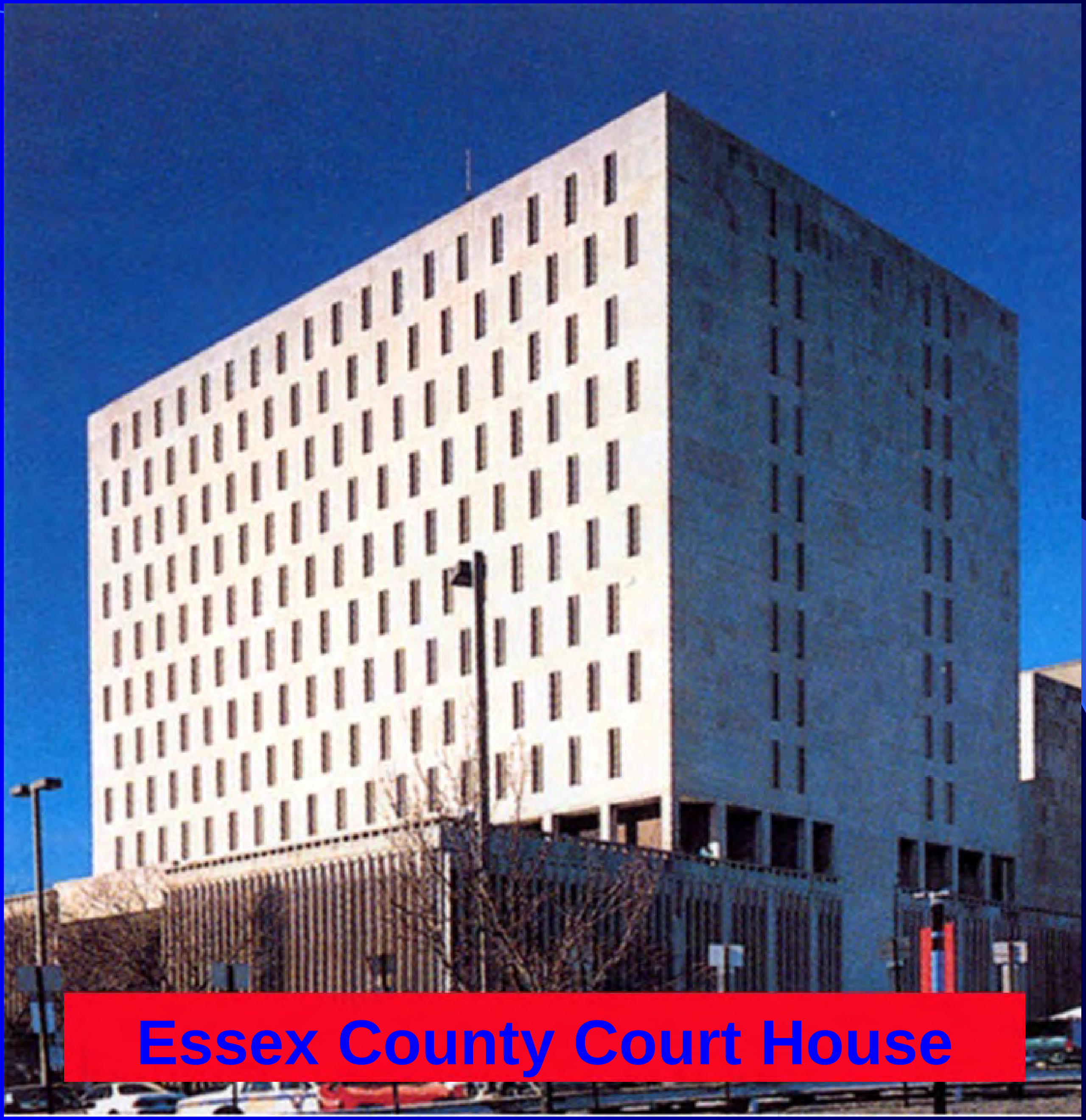


16 Harvin Place


PS 171

Shelf Angle Stabilization

Multi - Story


Essex County Court House

Horatio Street - Manhattan

Prince Street - Manhattan

Heritage

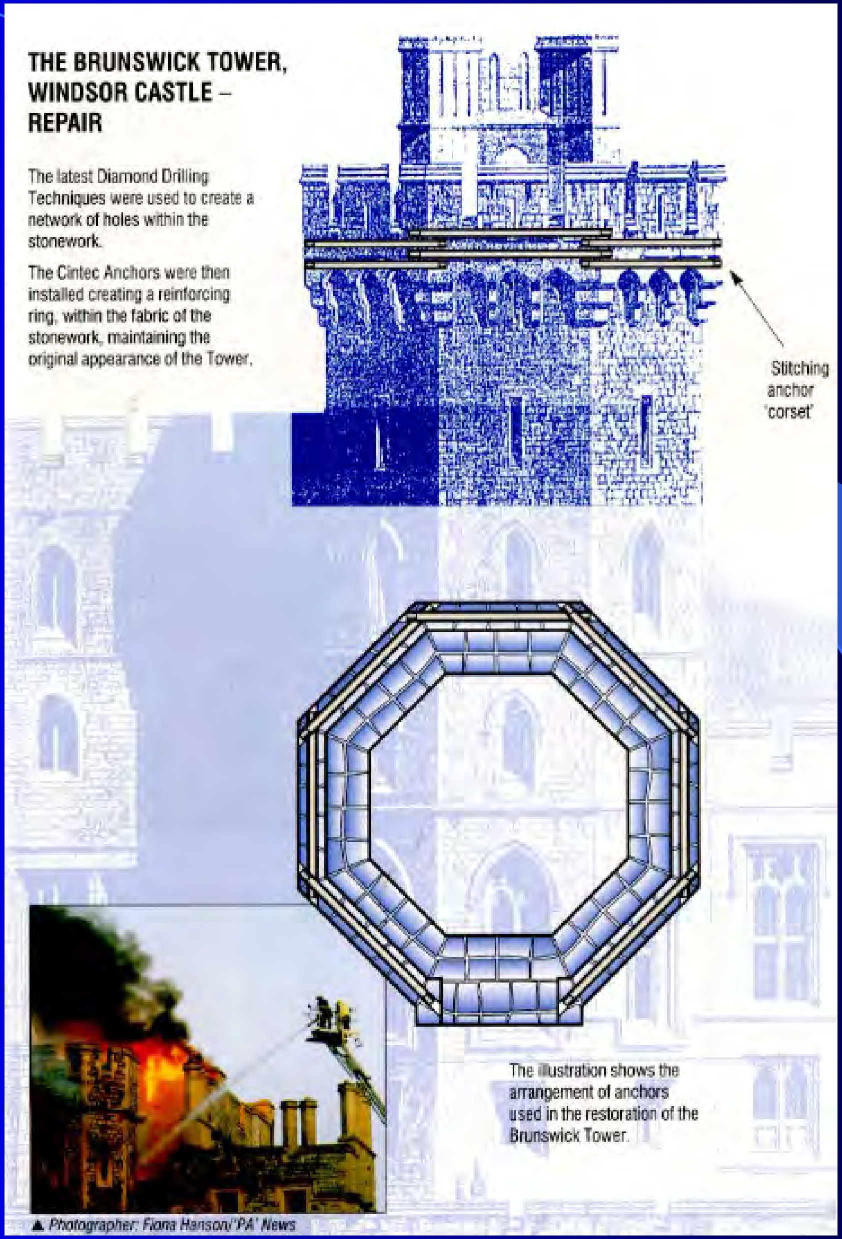
Grace Church - Brooklyn

Ralph Lauren Shop - Madison Ave

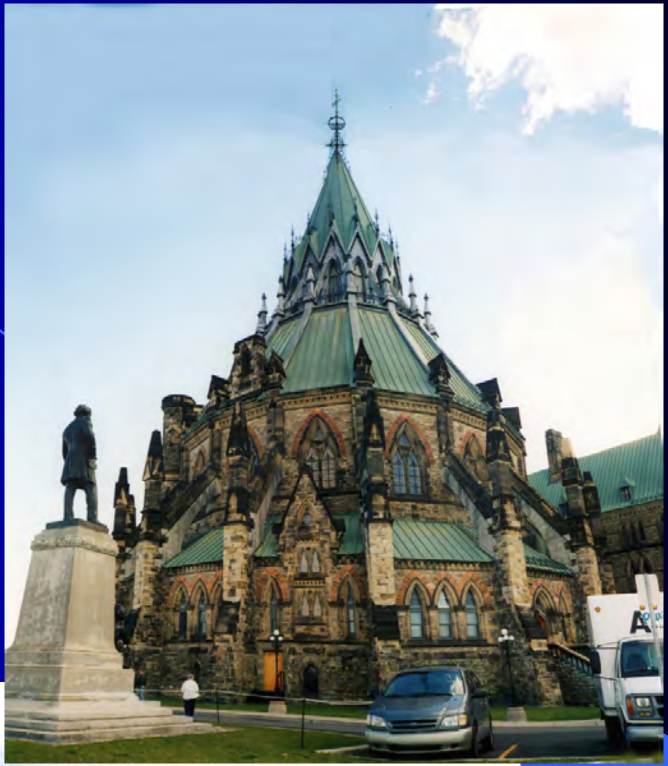
Abigail Adams Smith Museum

Windsor Castle

Windsor Castle



The Canadian Parliament Buildings



Silverton Town Hall - Colorado

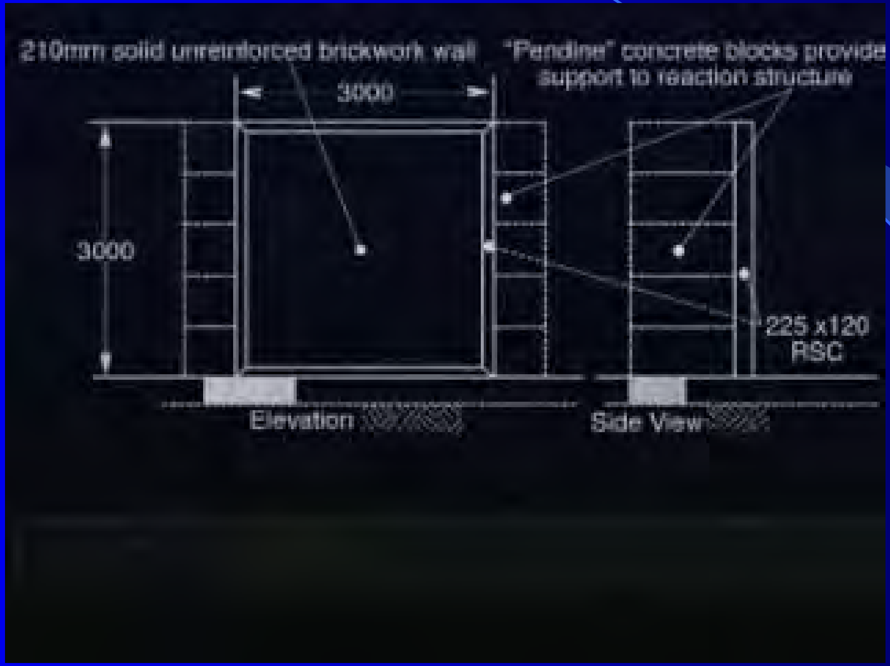
Royal Border Bridge - Scotland

St Ives Bridge

Archtec – Leominster Bridge

Blast Protection

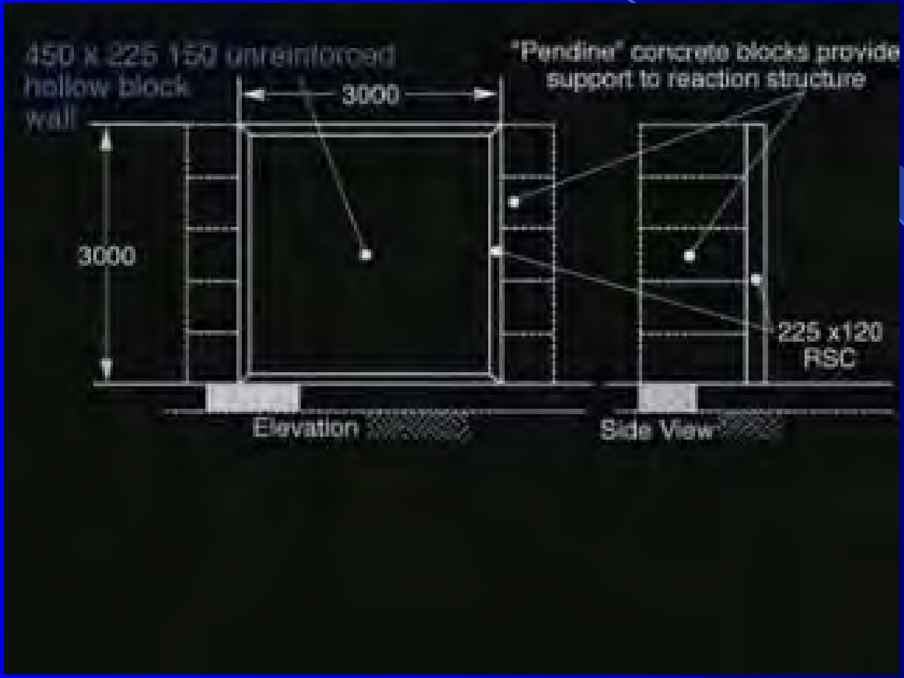
Retrofitted Masonry Wall Tests - 1999



p_r = 5,800 psi

i_r = 700 psi-ms

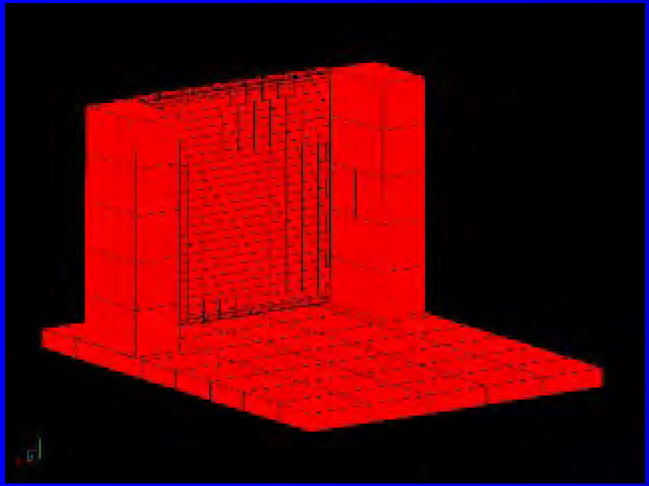
Retrofitted Masonry Wall Tests - 2000



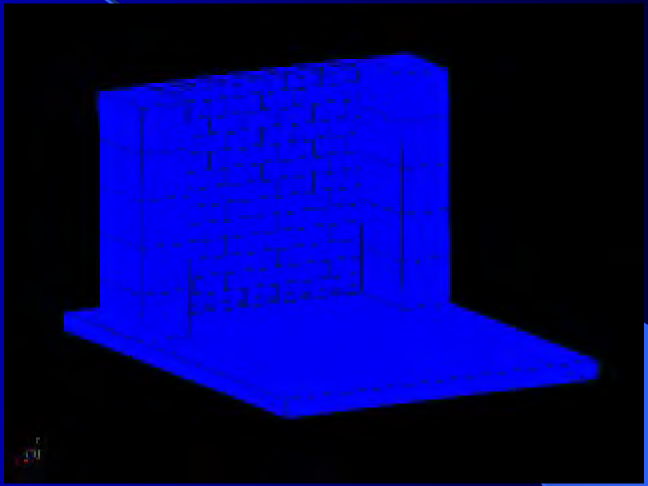
p_r = 2,480 psi

i_r = 390 psi-ms

CMU Model



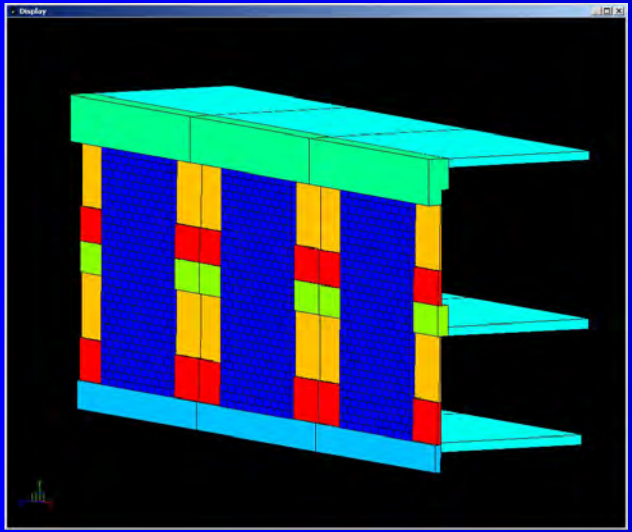
Unreinforced model



Reinforced model

121 Army Hospital - Seoul

121 Army Hospital - Seoul



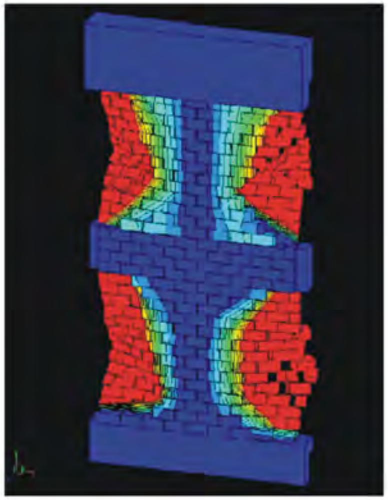


Figure A5.6 Elfen Model Prediction for an Unreinforced Bed Wing Wall Pier Subjected to a Blast Load of 250lbs TNT at 50 ft.

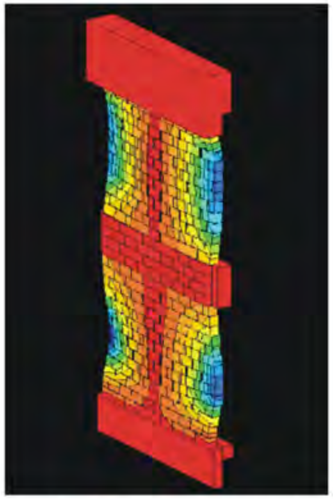
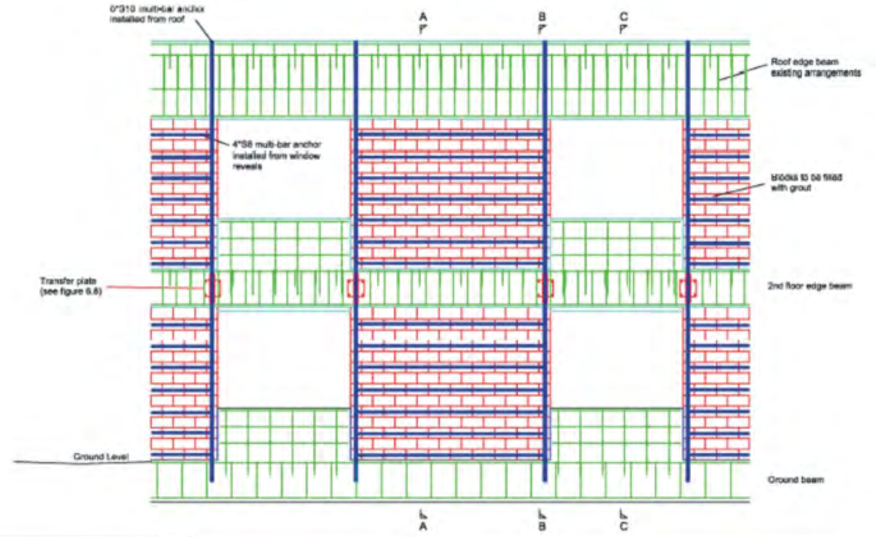


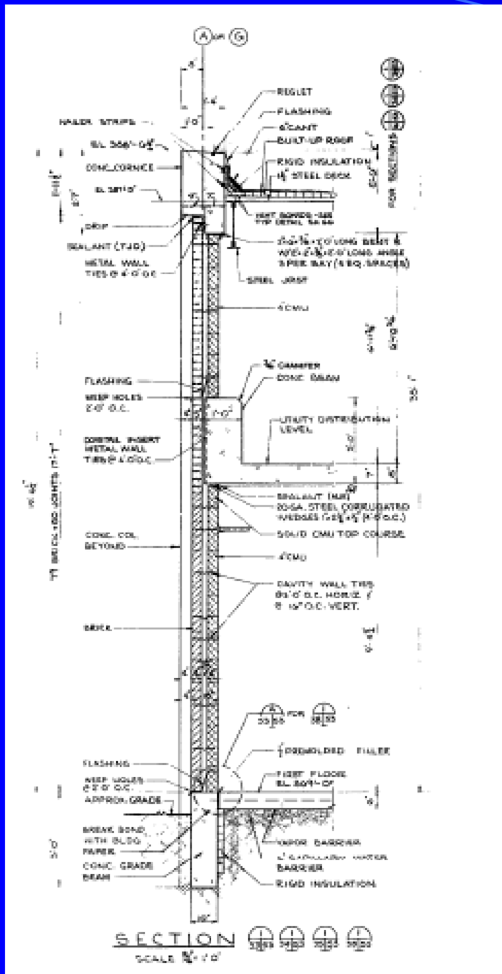
Figure A5.7 Elfen model prediction for a reinforced bed wing wall pier subjected to a blast load of 250lbs TNT at 50 ft.

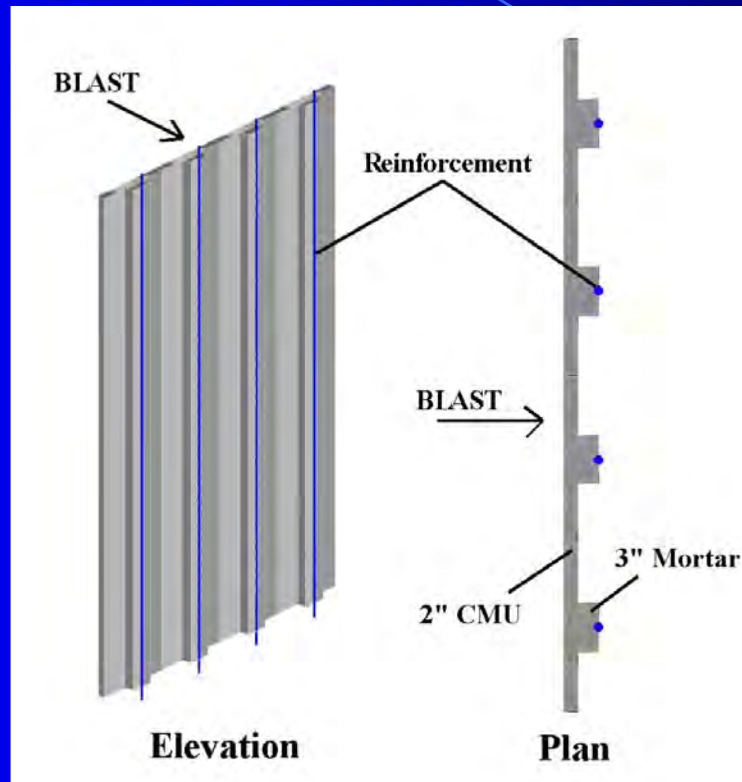


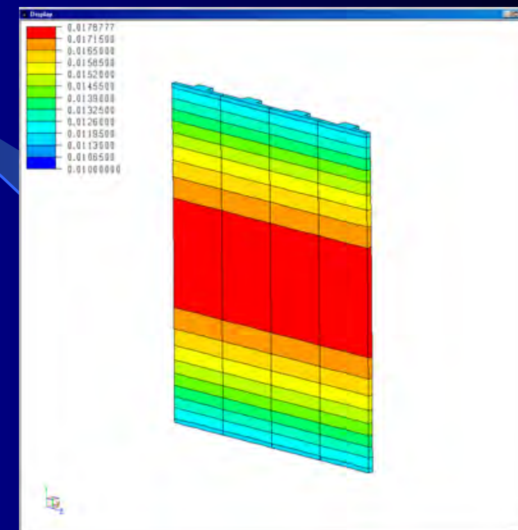
USAMRIID (United States Army Medical Research Institute for Infectious Diseases)

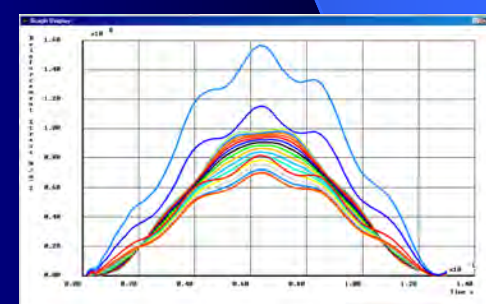
USAMRIID

(United States Army Medical Research Institute for Infectious Diseases)









Powerframe Window Analysis

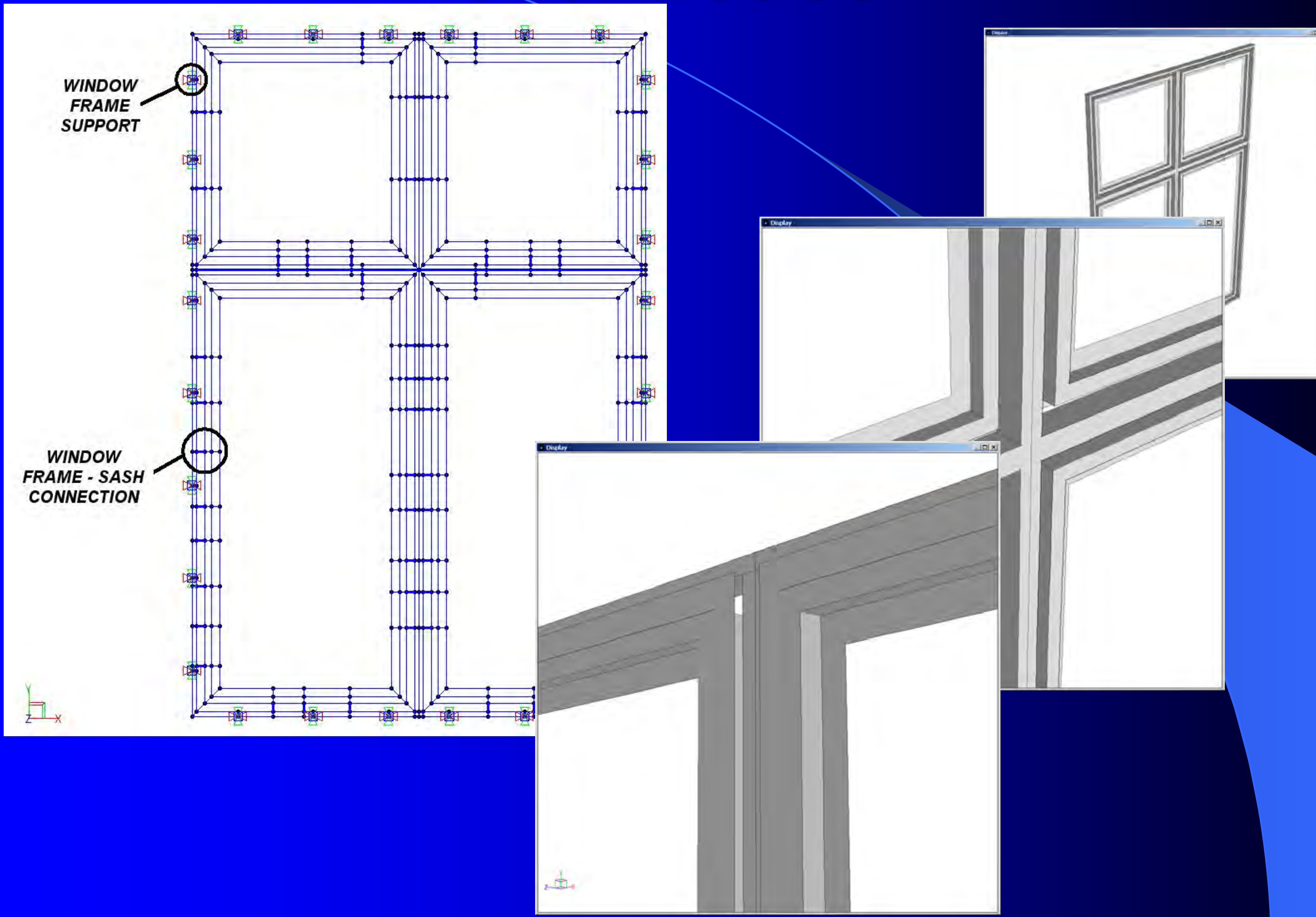
(car bomb – 550lbs TNT @ 110ft)

(p_r = 12.6psi; i_r = 106psi-ms)

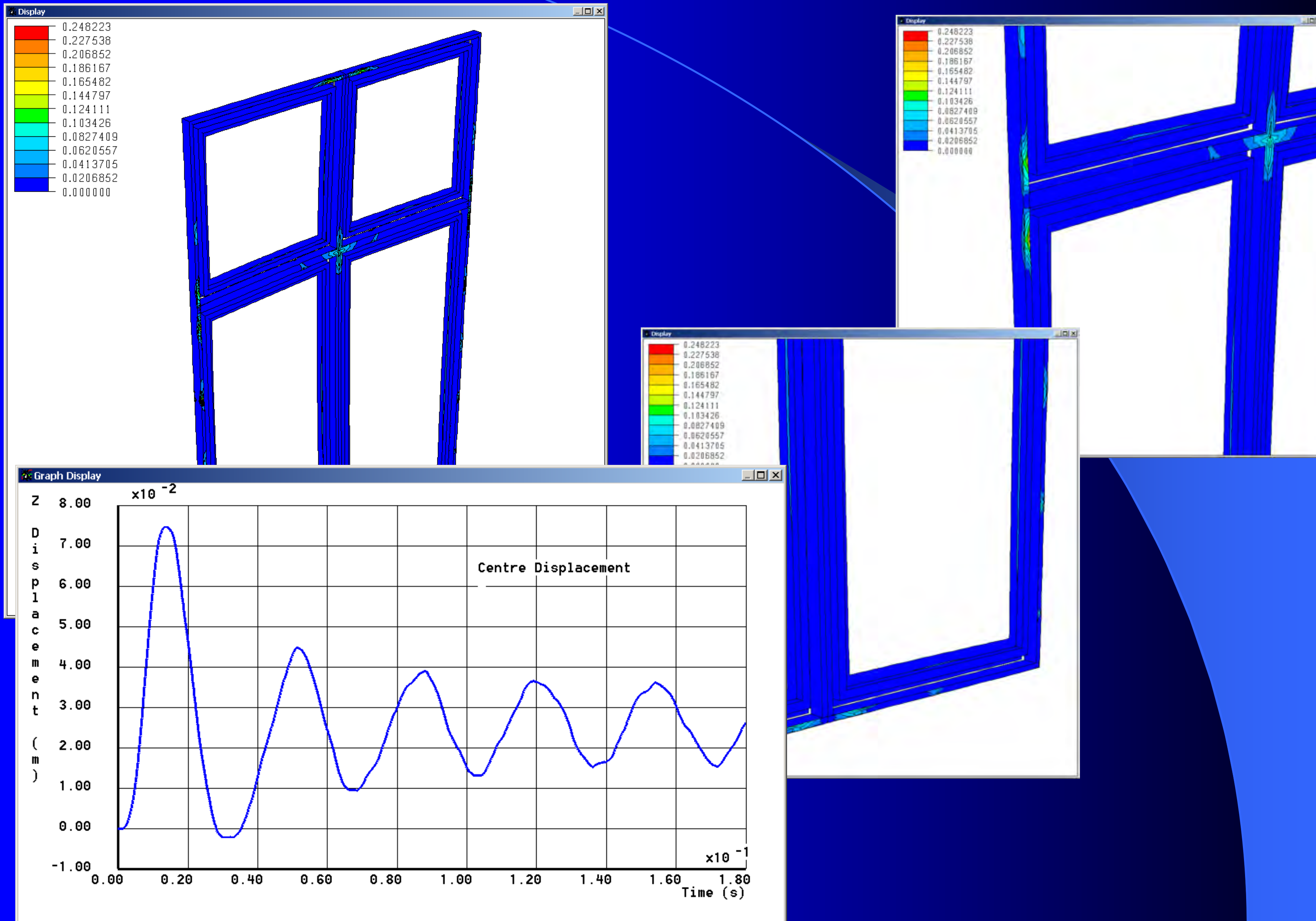
Before

After

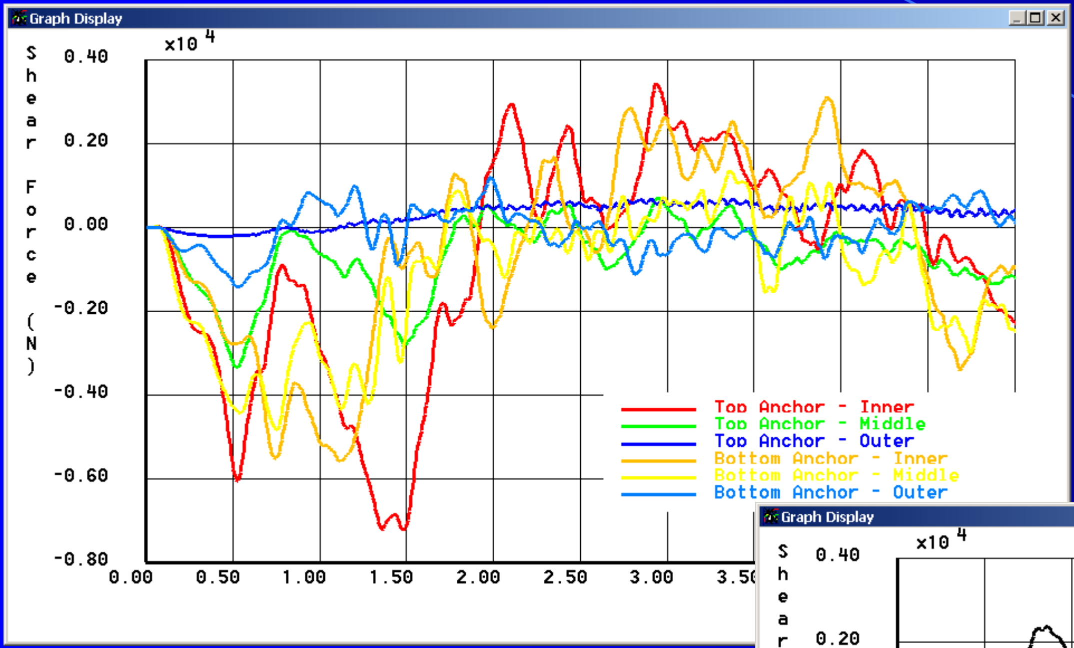
Anchor Loads - 1



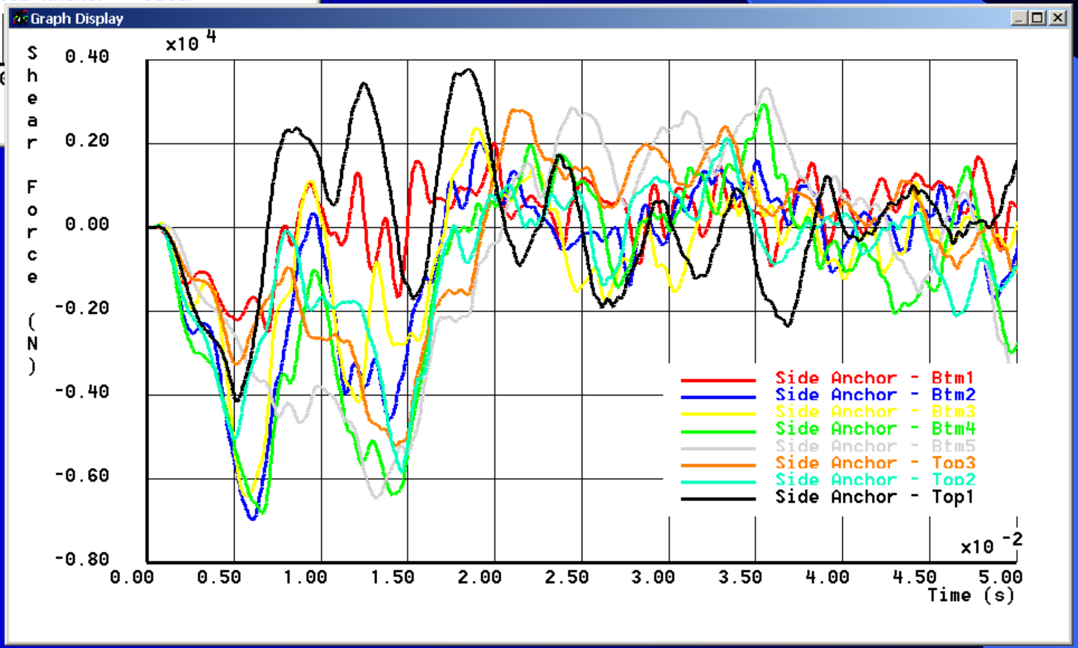
Anchor Loads - 2



Shear Reactions

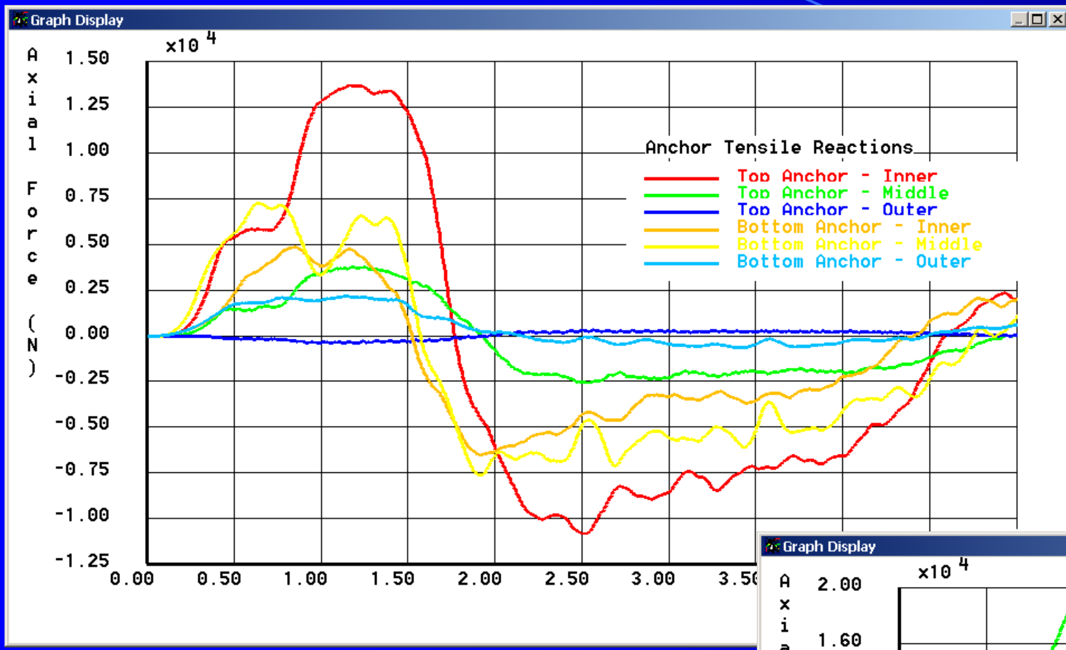


top & bottom anchors

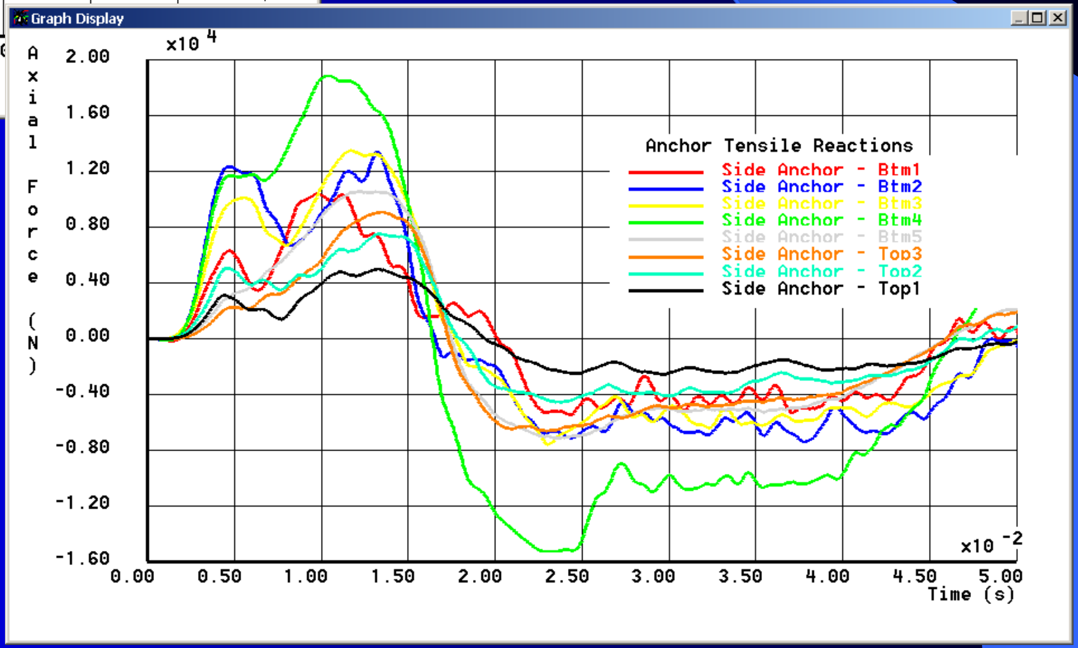


side anchors

Tensile Reactions

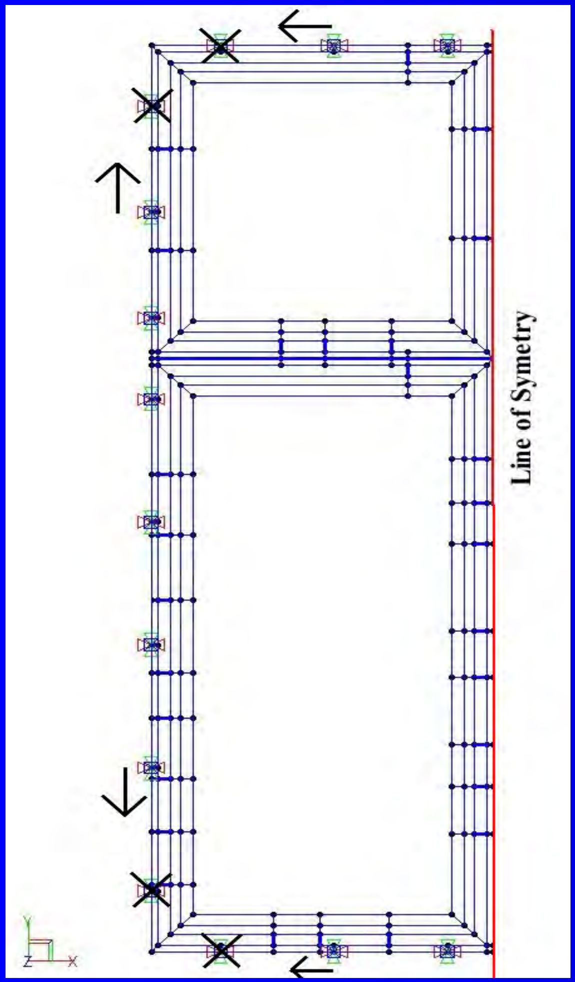


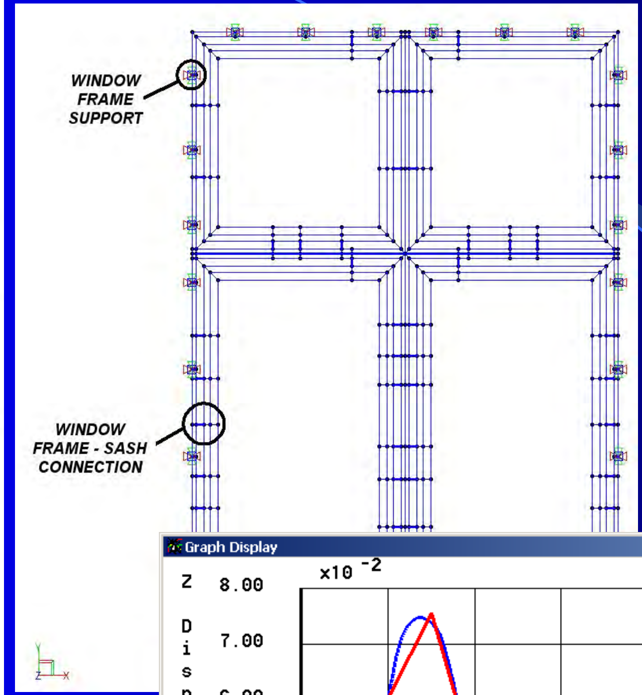
Top and bottom anchors

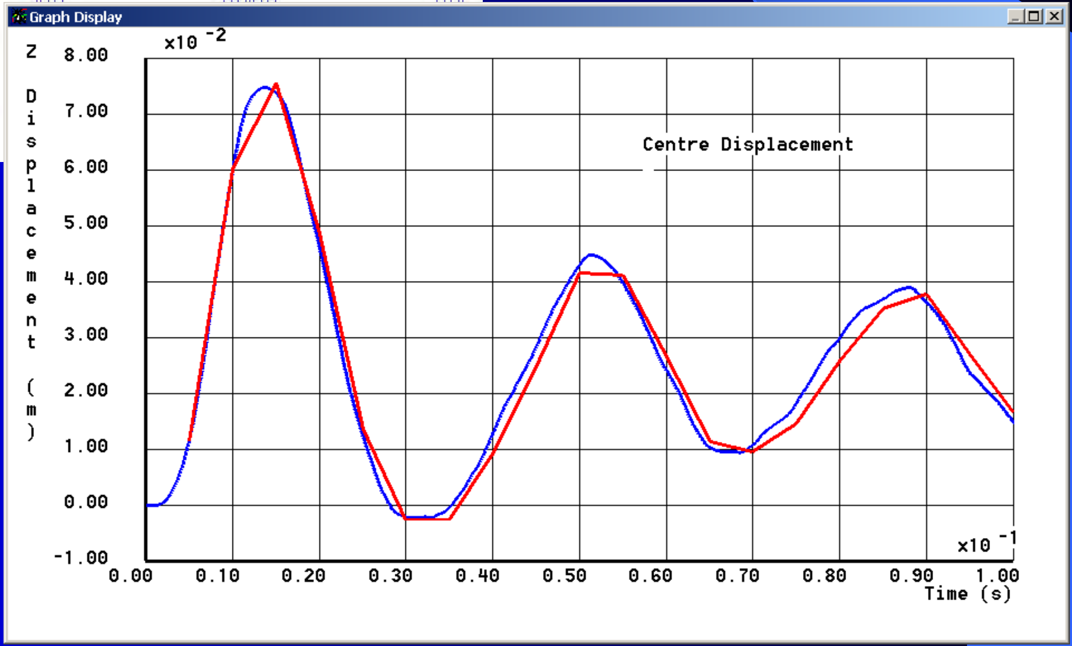


Side anchors

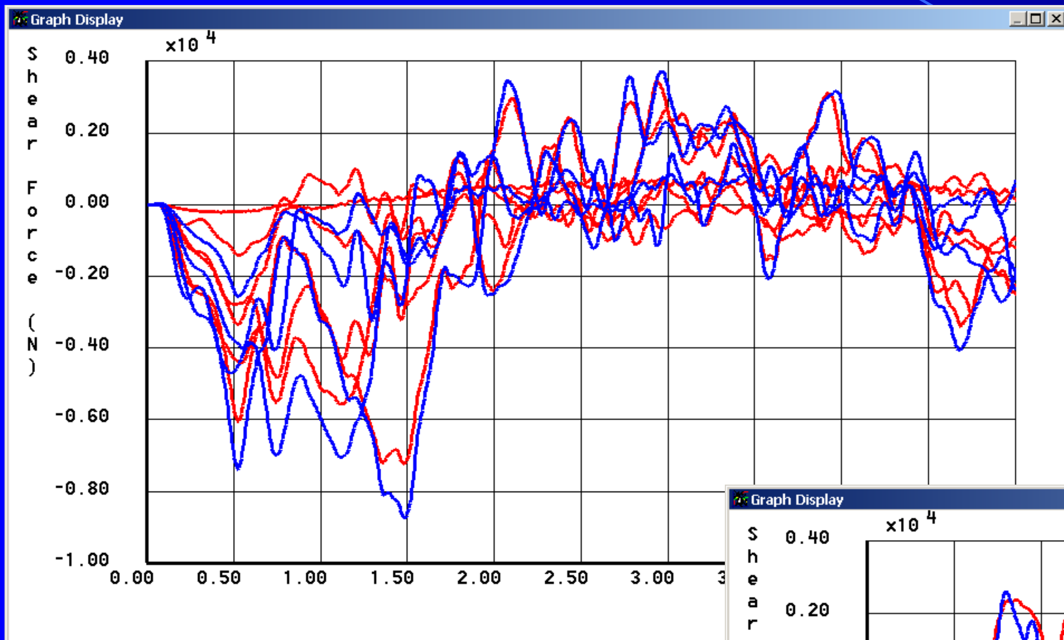
Frame Analysis – 20 Anchors



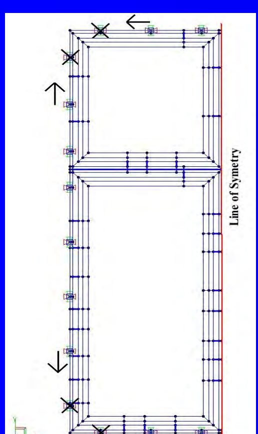




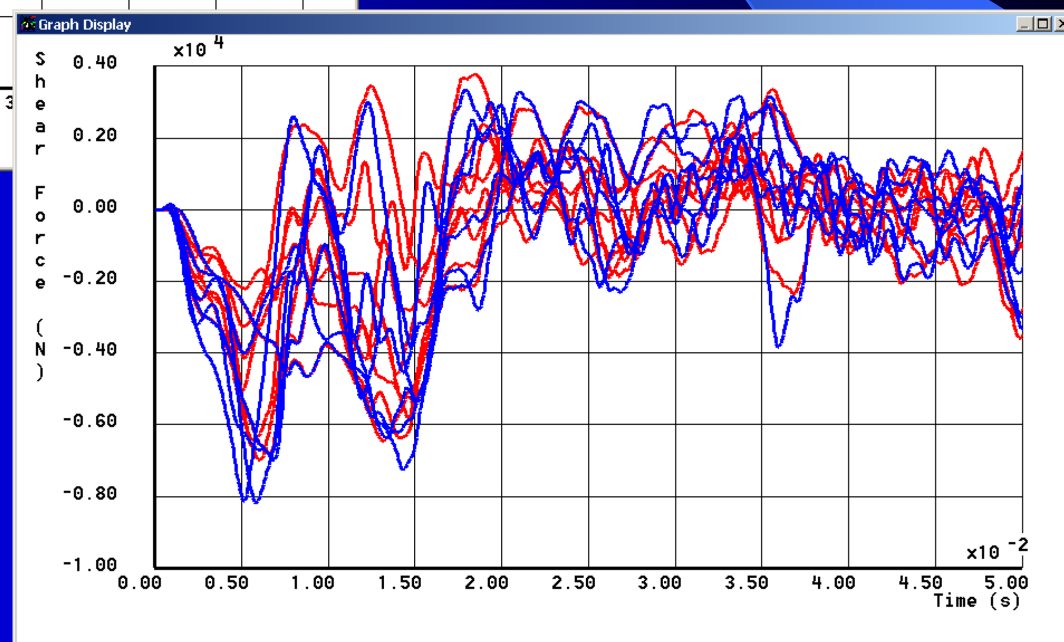
Shear Reactions – 20 anchors



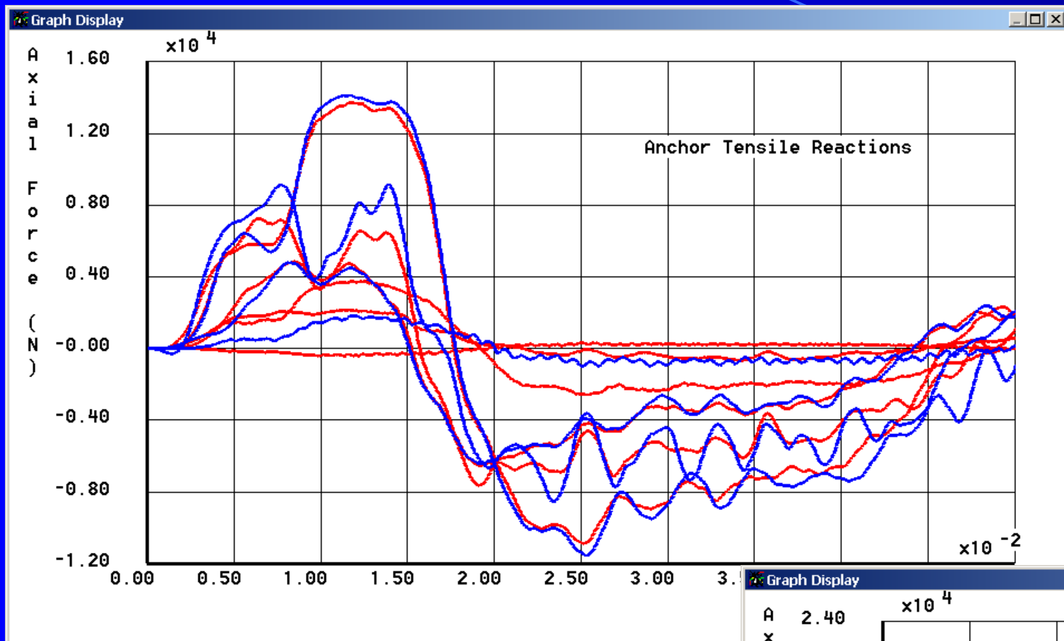
Top and bottom anchors



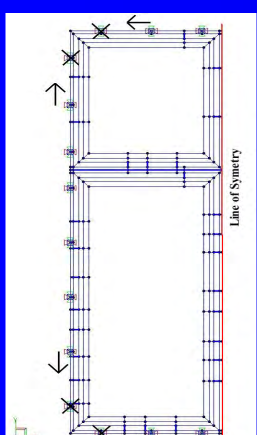
Side anchors



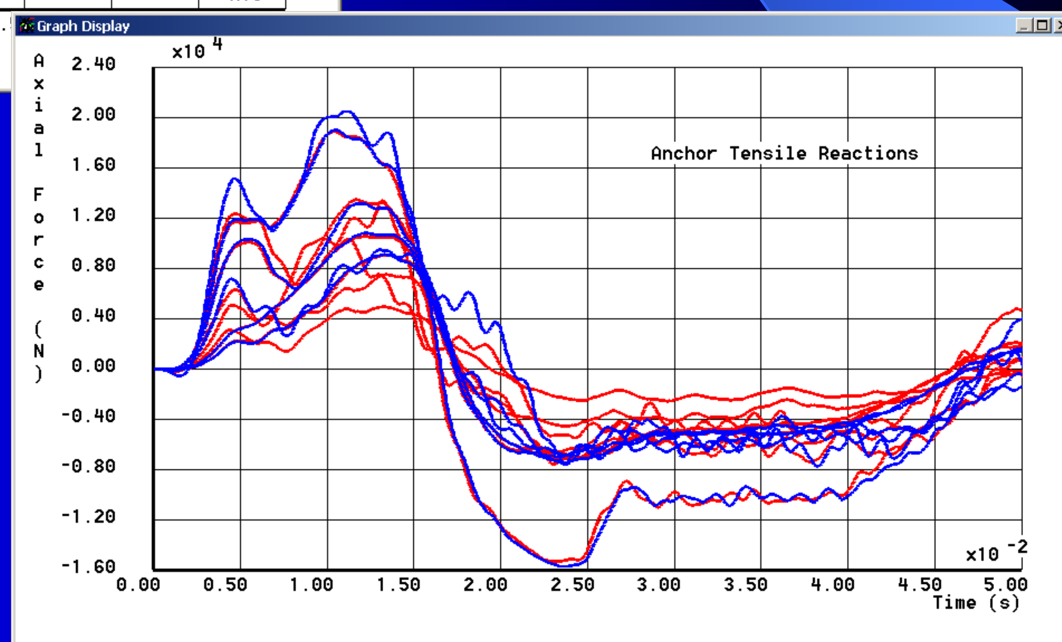
Tensile Reactions – 20 anchors



Top and bottom anchors



Side anchors



Percentages vs Magnitudes

- Material substitution – 2-5% cost savings
- Procedural Change – 5-30% cost savings
- Conceptual Change - 10-90% Project Change

Springfield Municipal Complex

8.5M for rip-out-and-replace

$5.5 with Cintec to stabilize in place

NYC SCA Chimney Repair – 90% Cost Savings and completed in 1 week not 6

Preliminary Design Input

CINTEC Anchoring System

Loads

Vertical: Down ____________ eccentricity ________________

Uplift ____________ eccentricity ________________

Lateral: Pull Out _______________________________________

Compression ________________________________

Horizontal _______ eccentricity ________________

Anchor Design Mechanism _____________ (Straight pull out, double curvature flexure, single curvature flexure, shear, etc.)

Load Free Body Diagram

Cross Section Detail

Comments;

Thank you for your interest

Please visit www.cintec.com for further information and

www.cintec.net for more blast protection data