

CE222

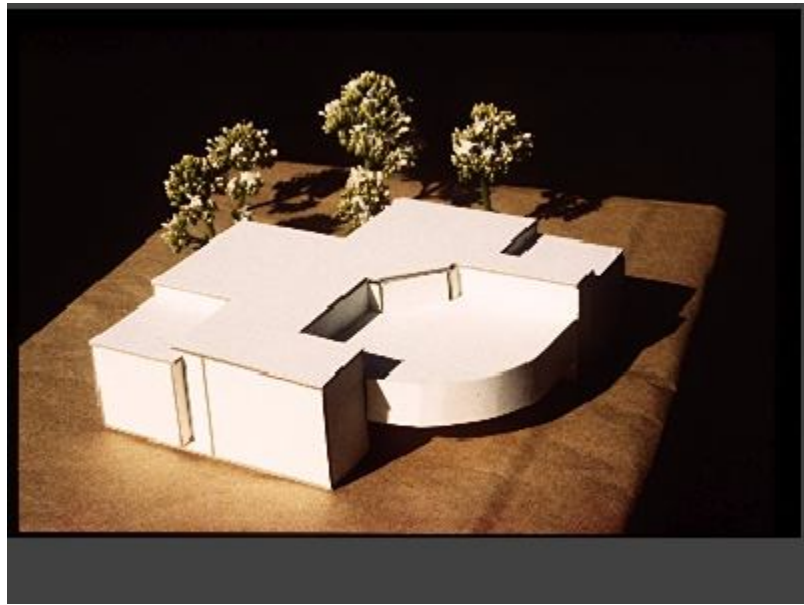
Team Atlantic

Starring...

- ★ Architect: ***Bonnyce Barré*** (France) UC Berkeley
- ★ Engineer: ***Abhijit Marathe*** (India) Stanford
- ★ Constructor: ***Rog Macdonald*** (Canada) Stanford



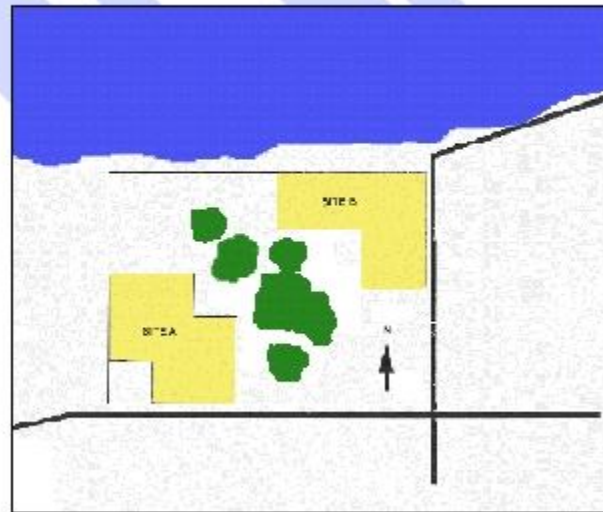


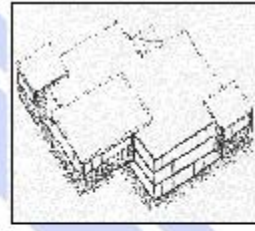




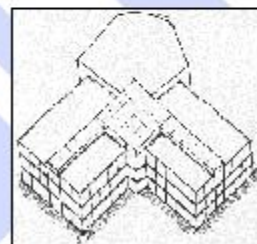
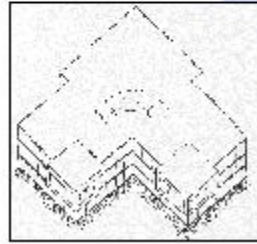
ARCHITECT

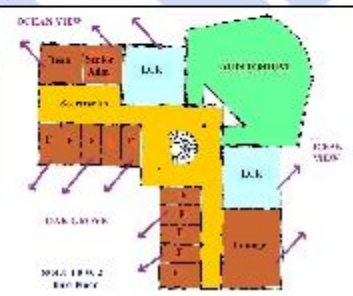
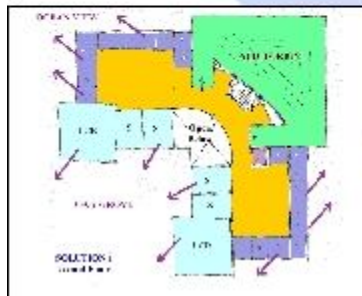
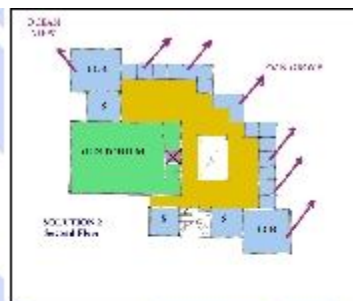
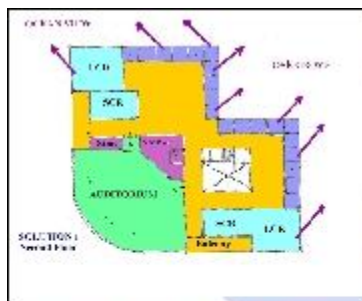
The Site

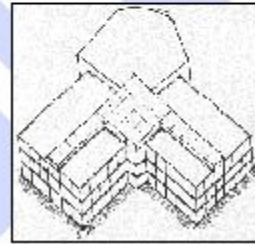
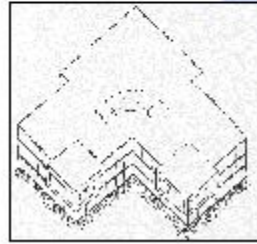
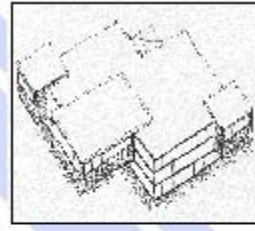




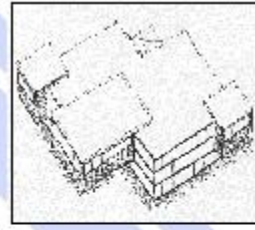
evolution



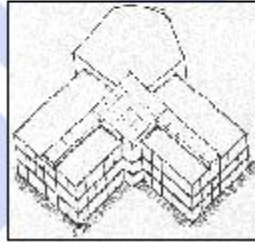
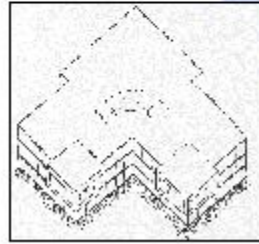


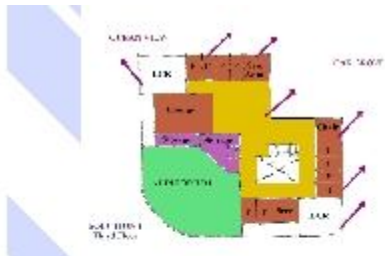
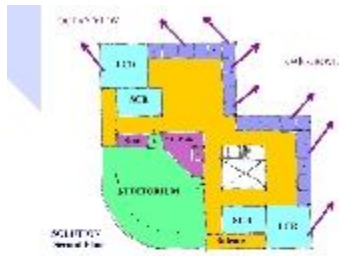


evolution

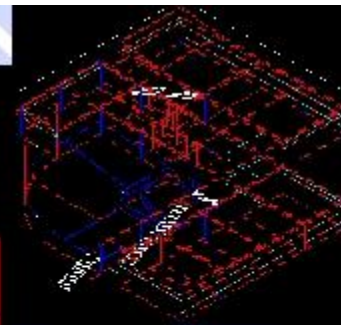
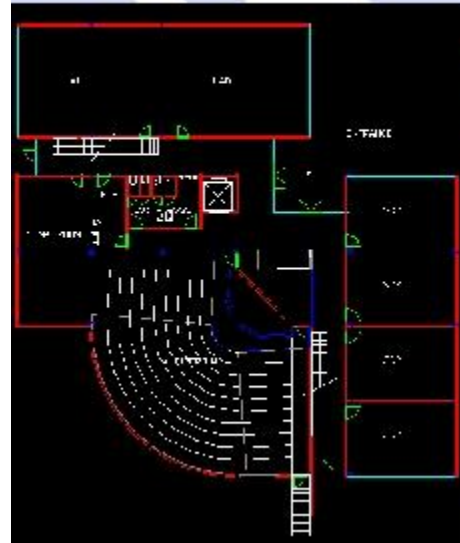


evolution

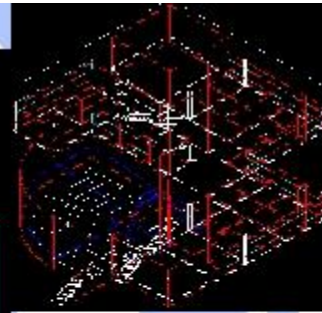
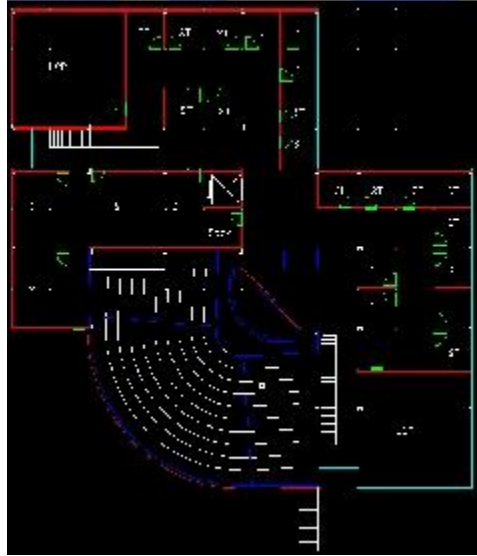




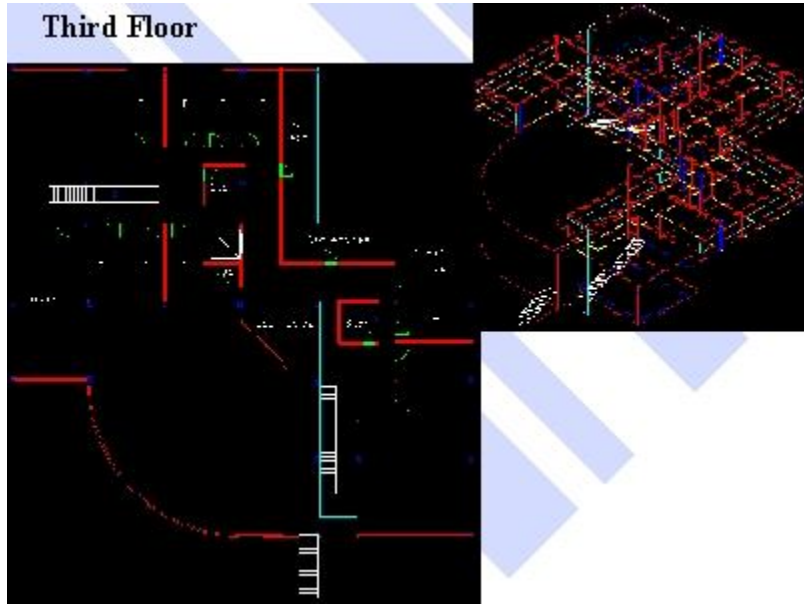
First Floor



Second Floor

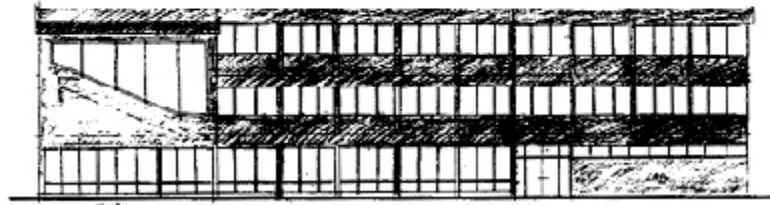


Third Floor

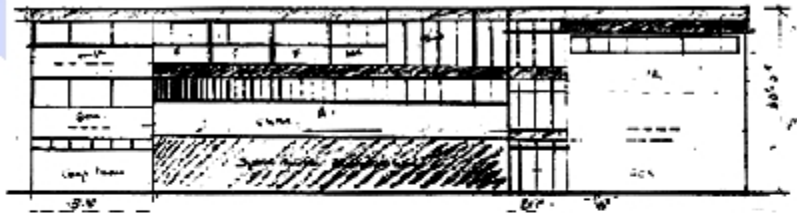




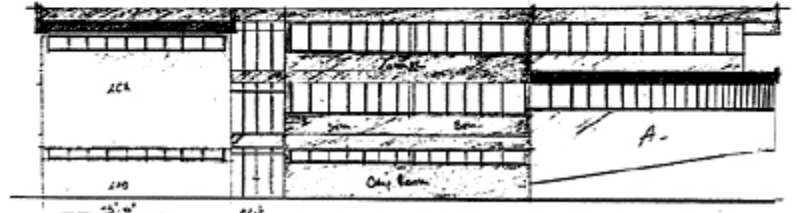
01/20/2014 11:00 AM facade north



01/20/2014 11:00 AM Facade East



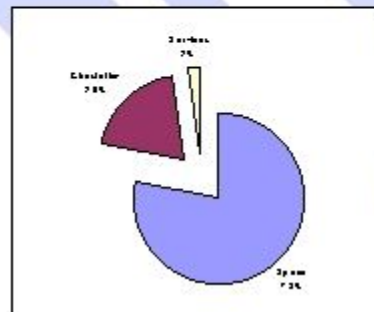
Facade south

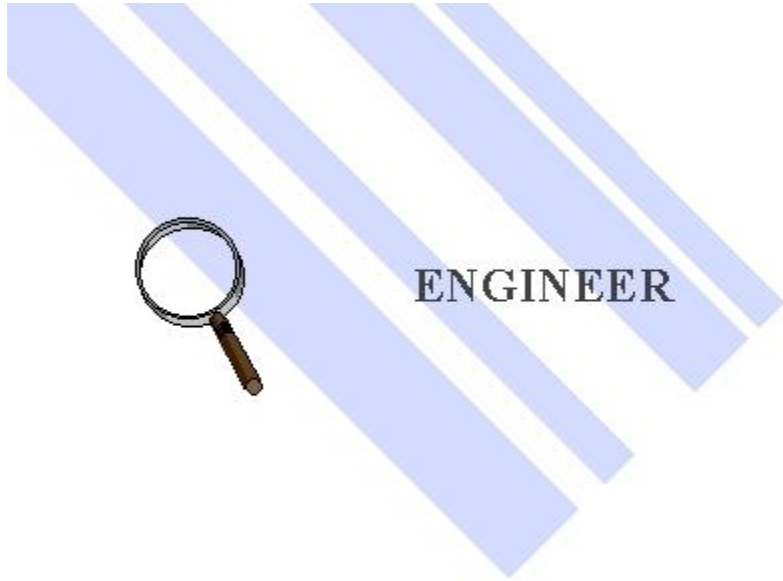


Facade West

Architectural Evaluation

- Adjacencies
- Views
- Area





ENGINEER



Engineer

■ **Loading**

- wind
- snow
- no seismic

■ **Structural system**

- Final design solution

Choice of structural system



■ Systems considered

- Steel frame structure with concrete deck
- Ordinary concrete frame structure with two-way slab system
- Concrete frame system with post-tensioning.

The system is decided upon !



lesser depth than steel ,
more place for HVAC

prior experience
of contractor

Concrete frame
structure with
post-tensioned slabs

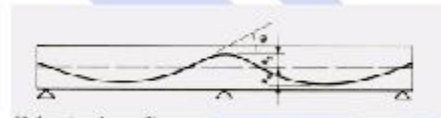
thickness of slab
reduced

cheaper than steel
frame system

Tendon profile



Theoretical profile



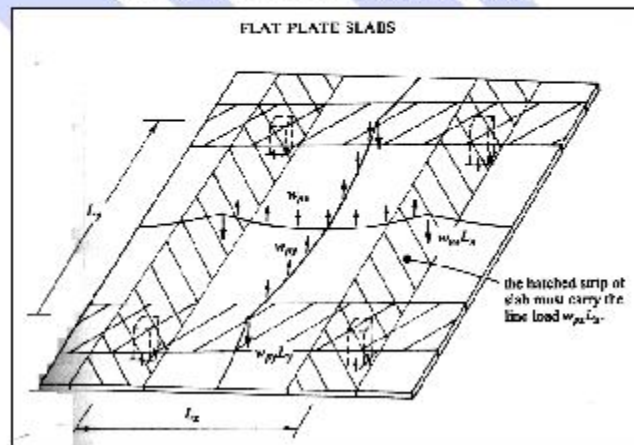
Actual Profile



Easier construction
More even stress distribution.

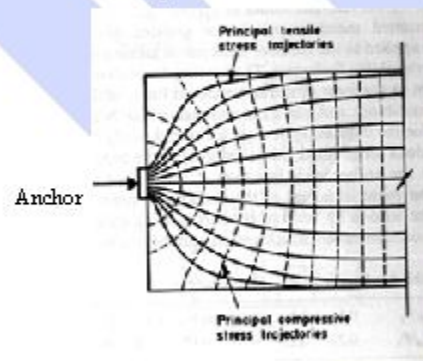
Flat plate post-tensioned slab

Concentration of tendons along the column lines



Bursting forces in end block

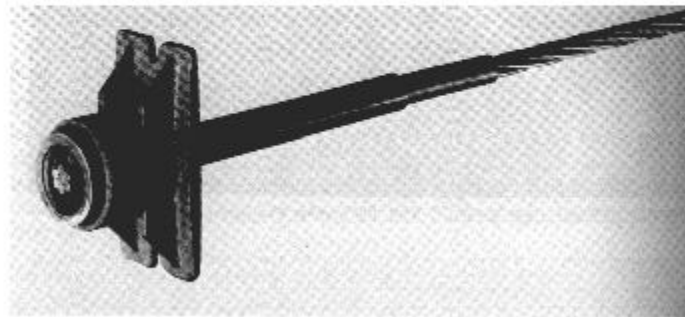
High Stress Concentration



Post-tensioning devices

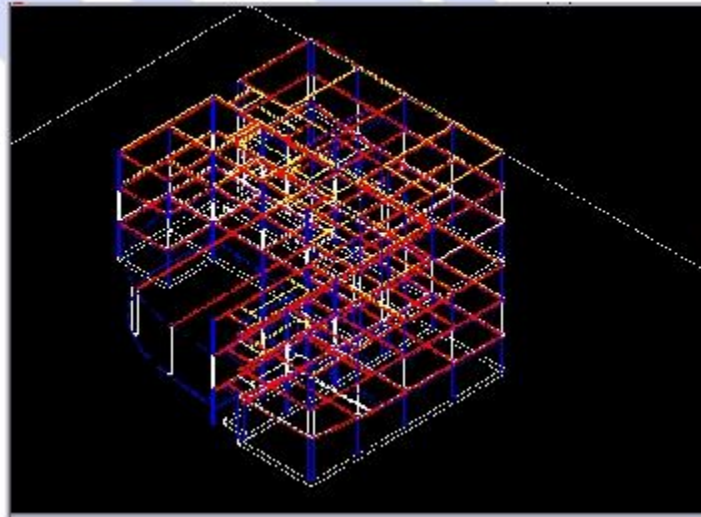
Helps hold tendon in place after jacking procedure

Anchorage for slabs, unbonded



(a)

Structural Skeleton



Structural Layout





Lateral load considerations

- **Lateral loads due to wind**

Challenges posed by the auditorium

What is the challenge ?

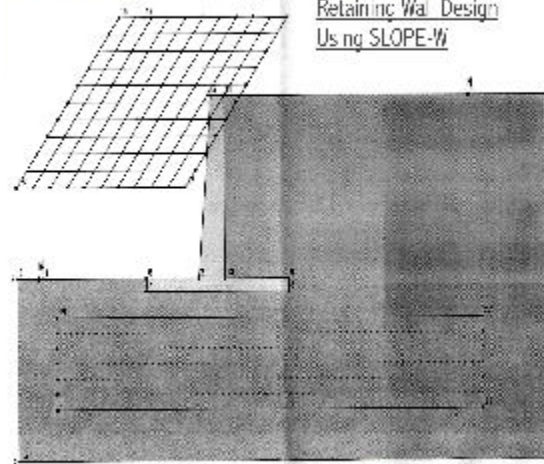


- very large clear span
- architectural requirement of column positioning
- choosing a solution of minimum cost: very large cost variations depending on support system.

Section through auditorium

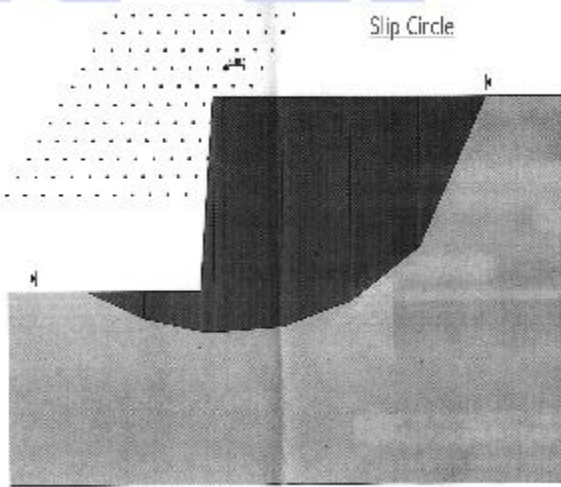


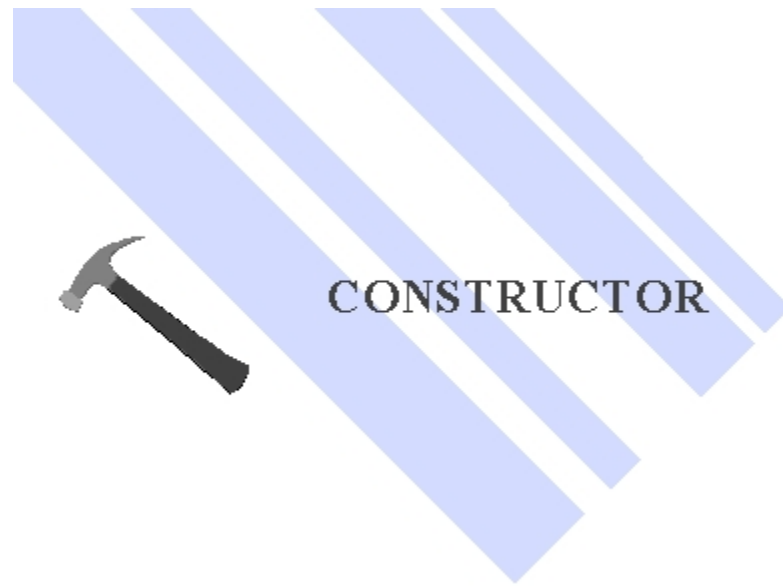
Analysis of retaining wall



Critical Slip Circle

Slip Circle





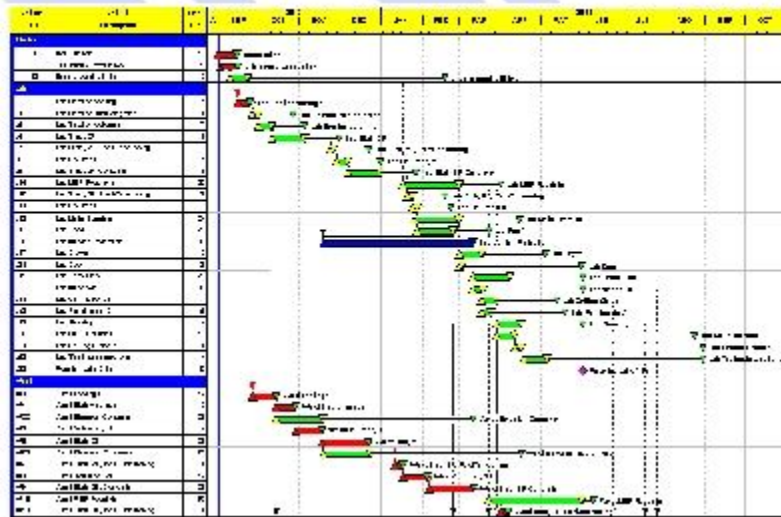


Contractor

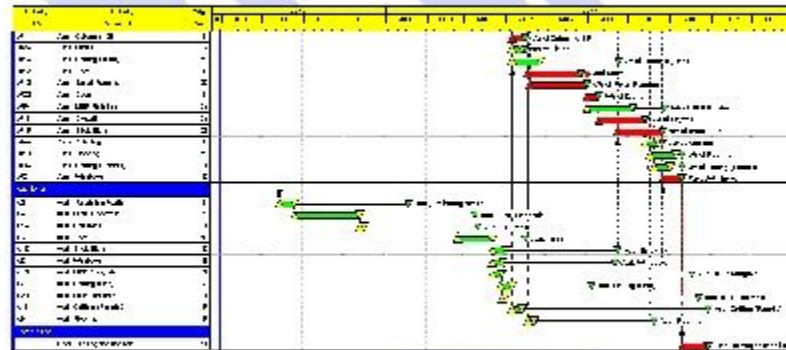
■ **Schedule**

- breakdown of construction:
 - » Lab Section
 - » West Section
 - » Auditorium Section

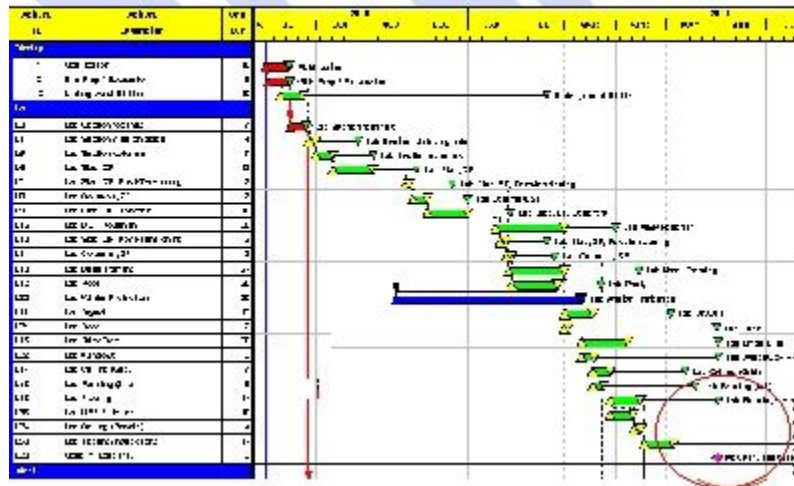
Construction Schedule



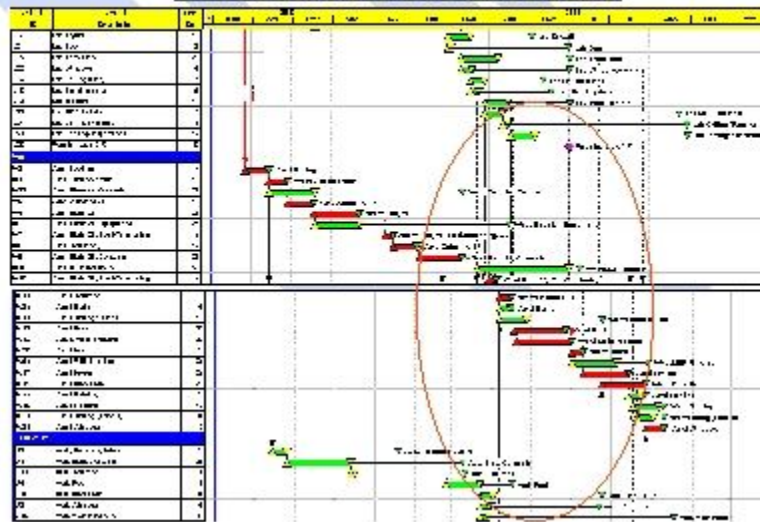
Construction Schedule (cont'd)



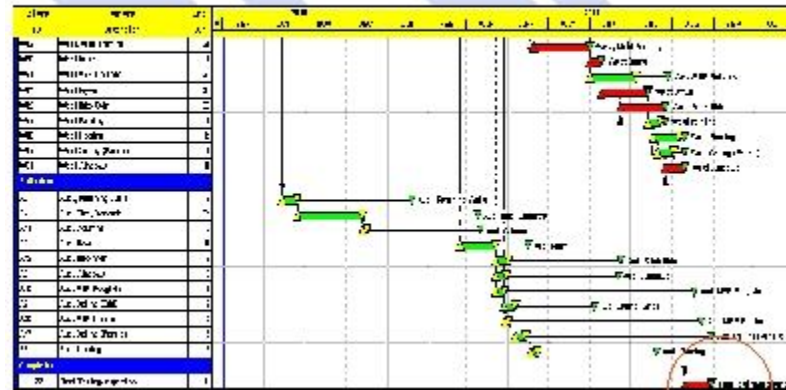
Early finish of Lab Section



Coordination between sections



Final Completion Date



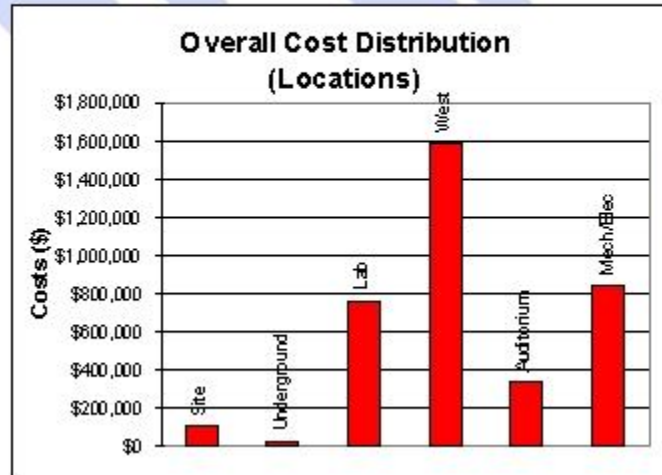
Total Estimate

		Estimate Total	
APP	12,427	2,110,777	sq
CONTRACT	11,250		
CONTRACT	10,111		
CONTRACT	10,277	4,227,600	sq
CONTRACT	10,111		
	52,176		
		6,338,377	
CONTRACT	10,111	218	T
CONTRACT	10,111	100	T
		4,308,569	
CONTRACT	10,111	218	T
	10,111	2,110,777	

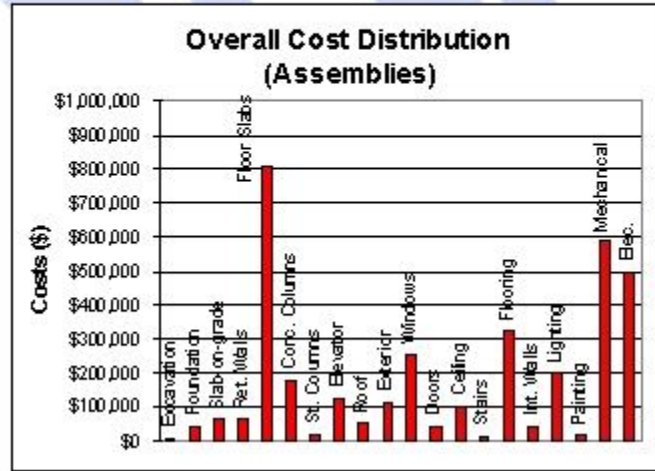
4,308,569

6,333,596

Estimate



Estimate





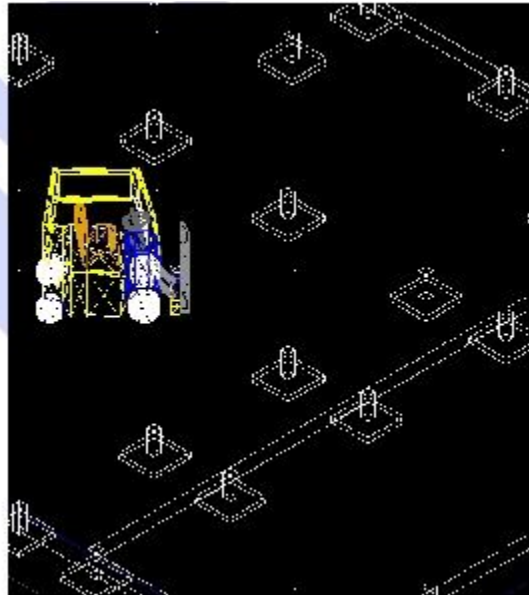
4D Sequence

4D Sequence ...

1

Excavation and
placement of
footings / slab on
grade

* Lab section has
first priority!





4D Sequence ...

2

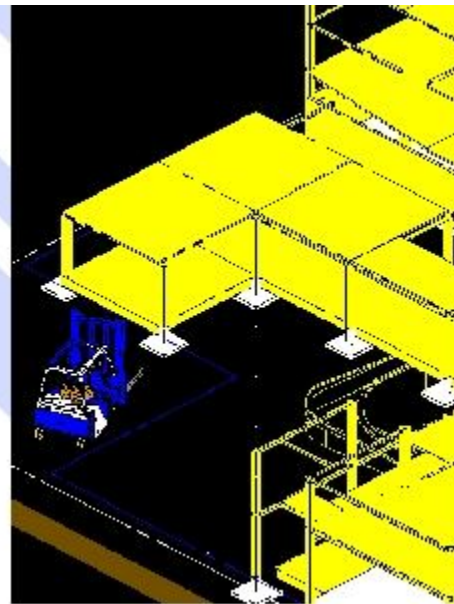
Completion of lab
section structure /

Start on lab first floor
interiors /

Place West section first
floor structure /

Start on West 2nd
floor columns /

Aud. slab placement
starts





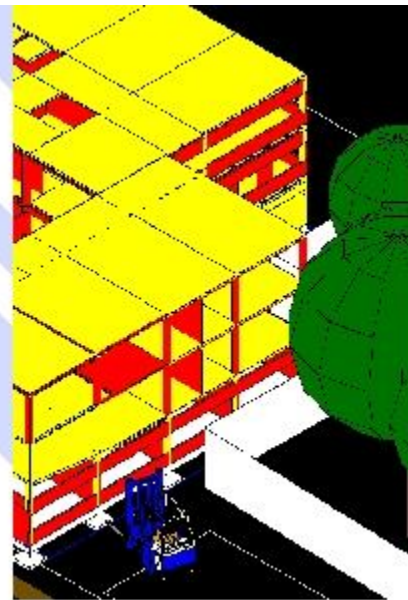
4D Sequence ...

3

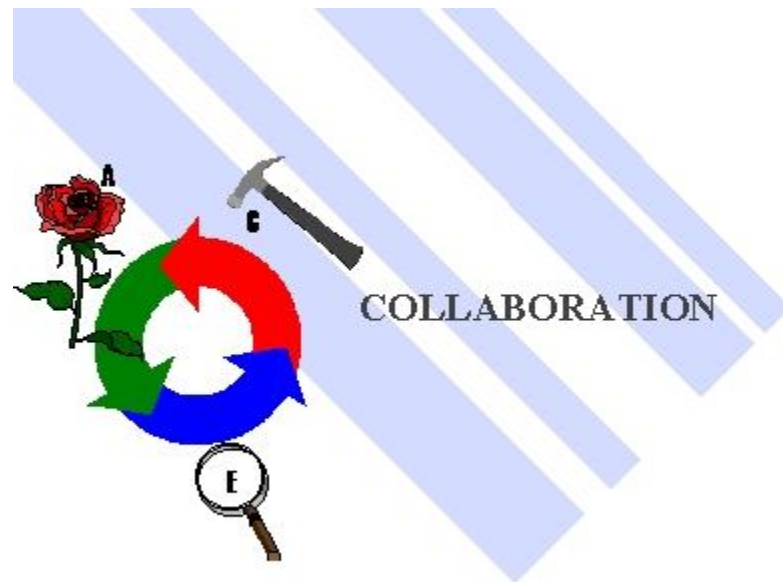
Completion of lab section, inc. structural system, exterior closure (temp, winter protection), and 1st floor interior/

Completion of West and Aud. section structures/

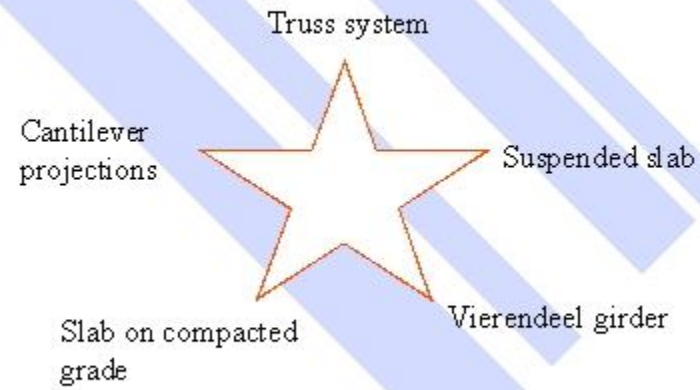
Flow of interior crews through Lab - Aud. - West sections







Auditorium Iterations

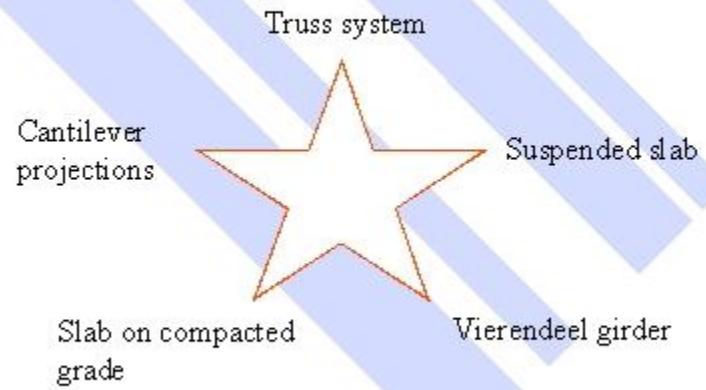


Truss Alternative

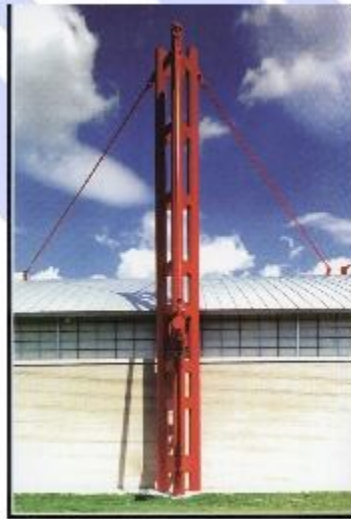
Truss Design Using FrameMac



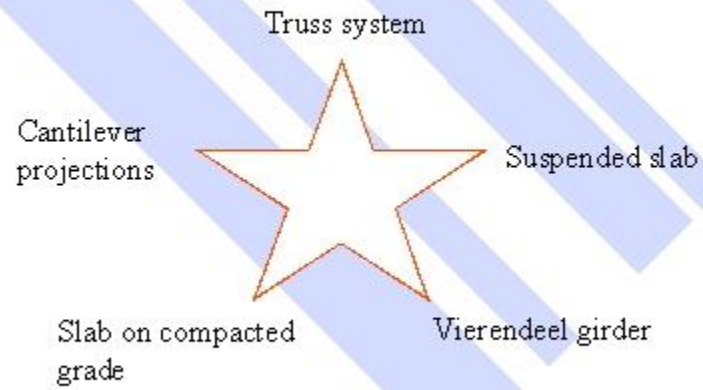
Auditorium Iterations



Niles West High - Field House



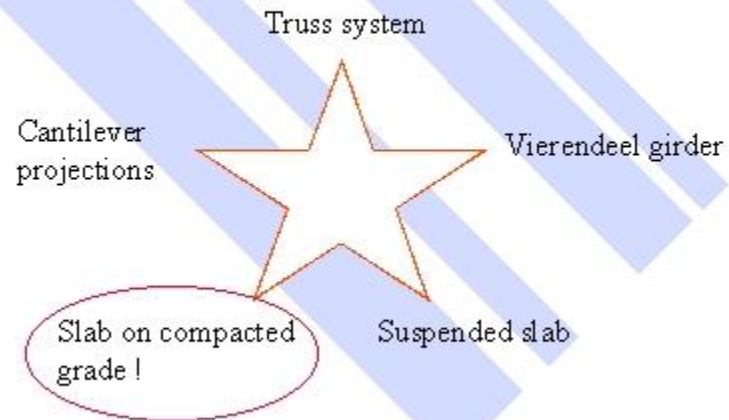
Auditorium Iterations



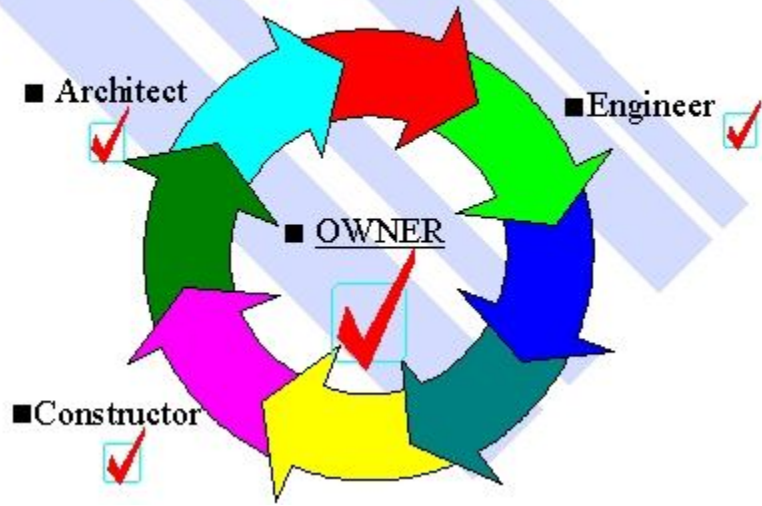
Section through auditorium



Auditorium Iterations



Auditorium Solution





CONCLUSION

