

# Northwestern Parking Garage

An Introduction to ME 323



Let's use Purdue's Northwestern parking structure as an application of what you have already seen about stress in ME 270.



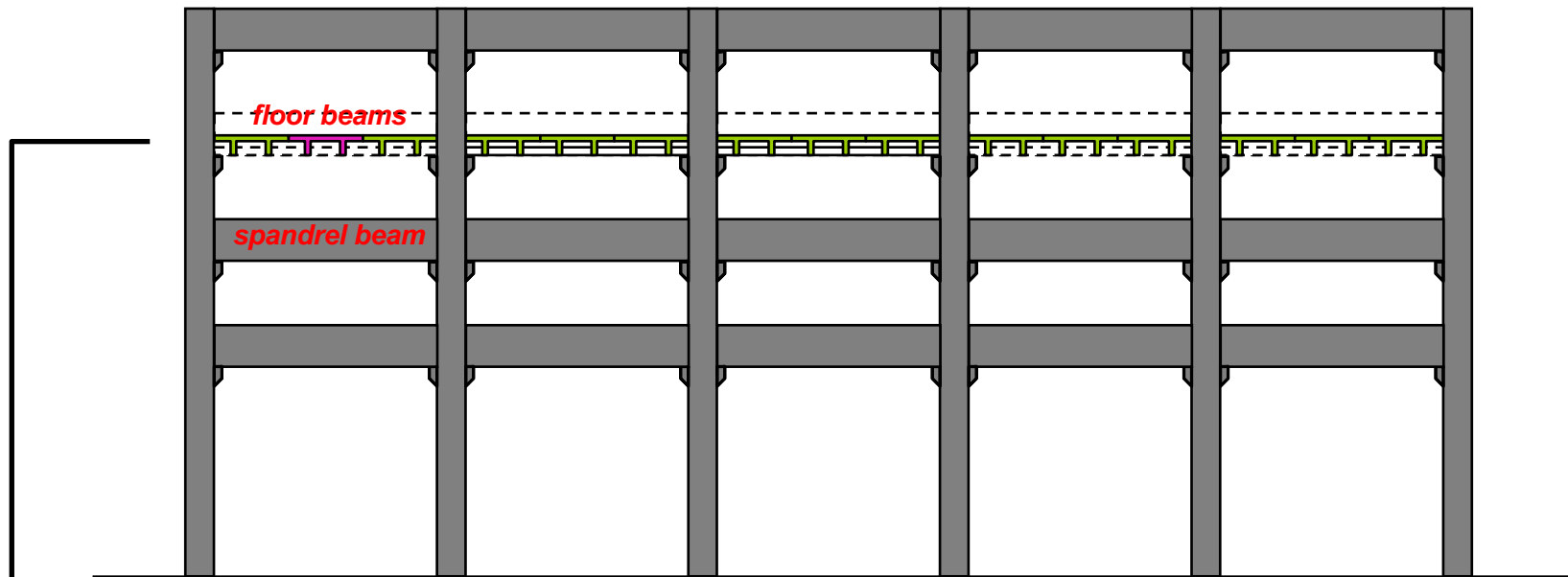
# Northwestern Parking Garage

Three critical structural components in the structure: spandrel beams, floor beams and corbels on support columns.

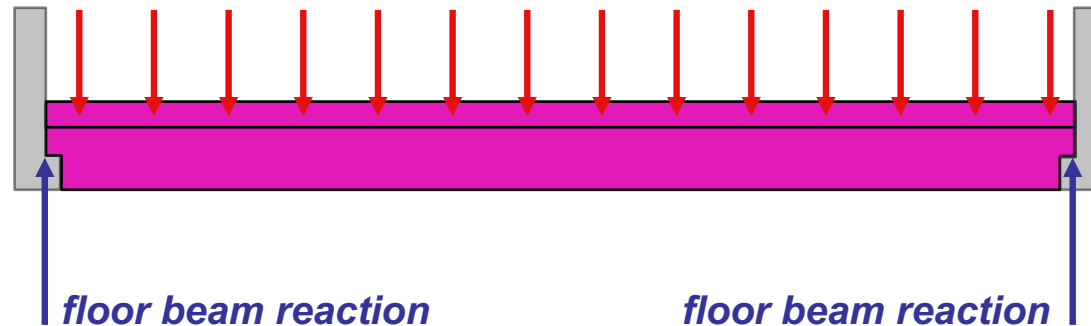
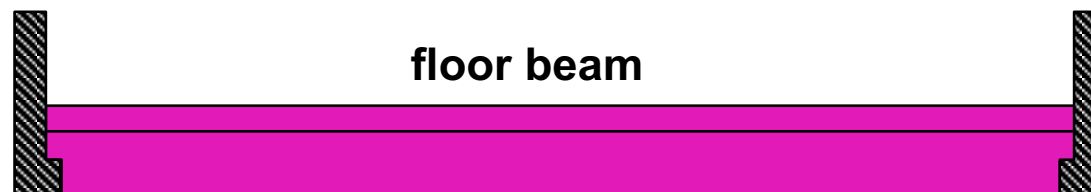


# Northwestern Parking Garage

Front view of structure showing FLOOR beams

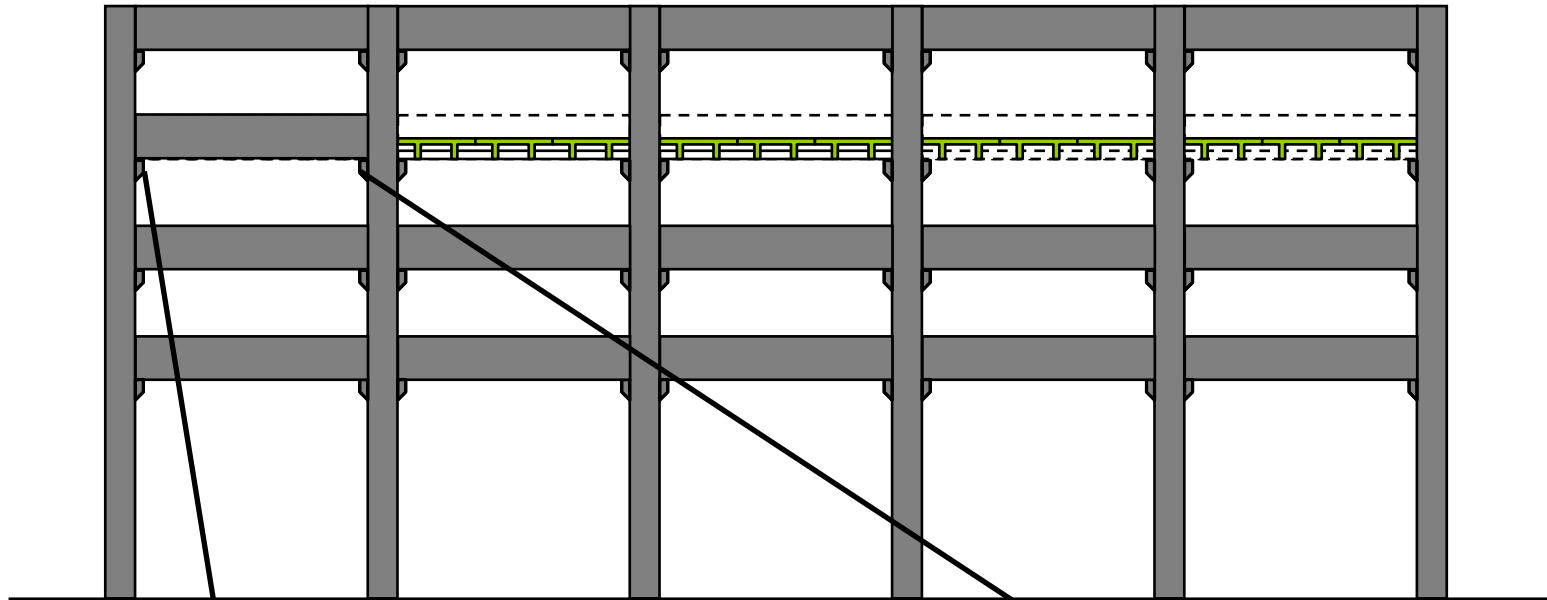


side view  
of beam



# Northwestern Parking Garage

Front view of structure showing SPANDREL beams



front view  
of beam

*reactions from floor beams*

*spandrel beam  
reaction*

*support beam weight*

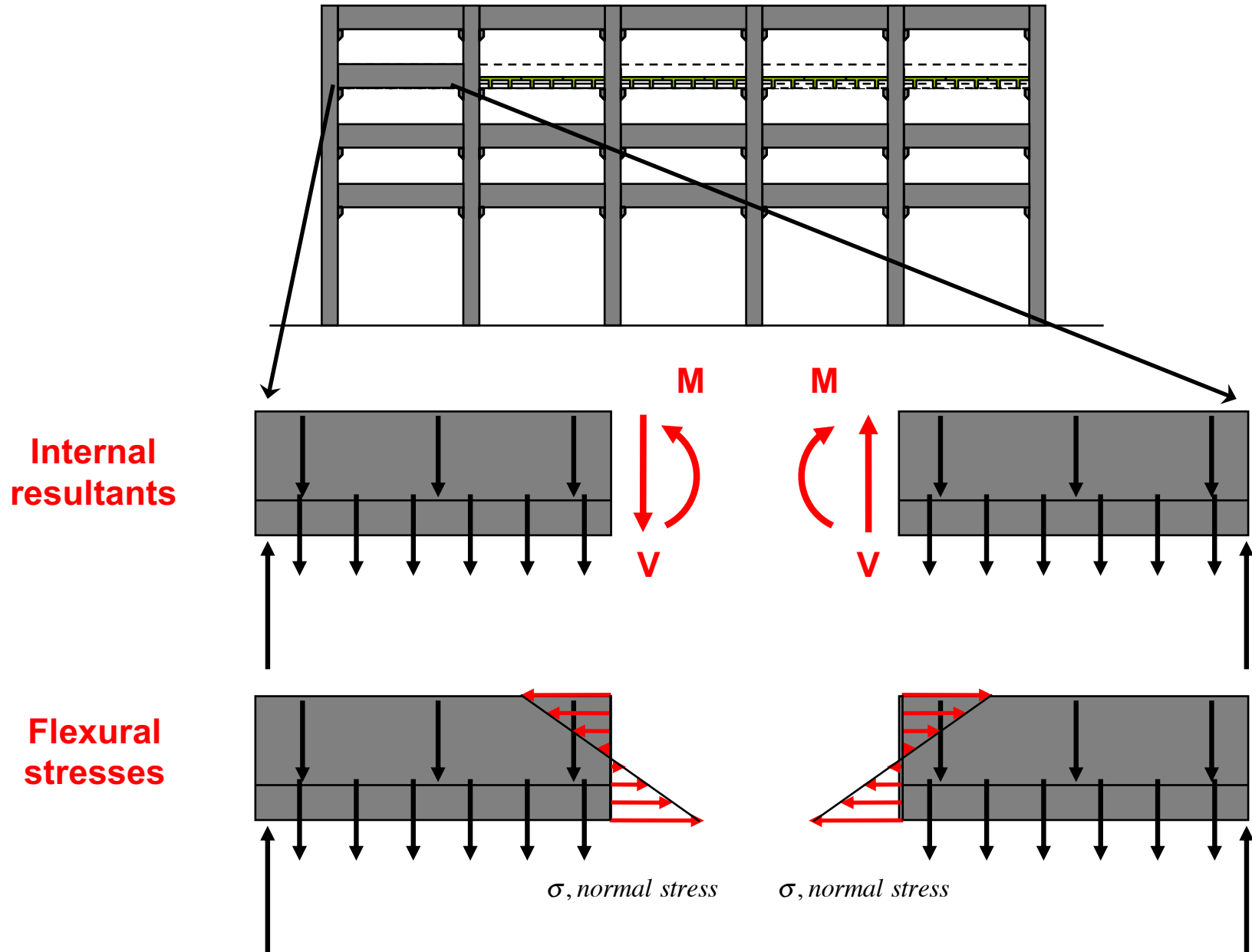
*spandrel beam  
reaction*





# Northwestern Parking Garage

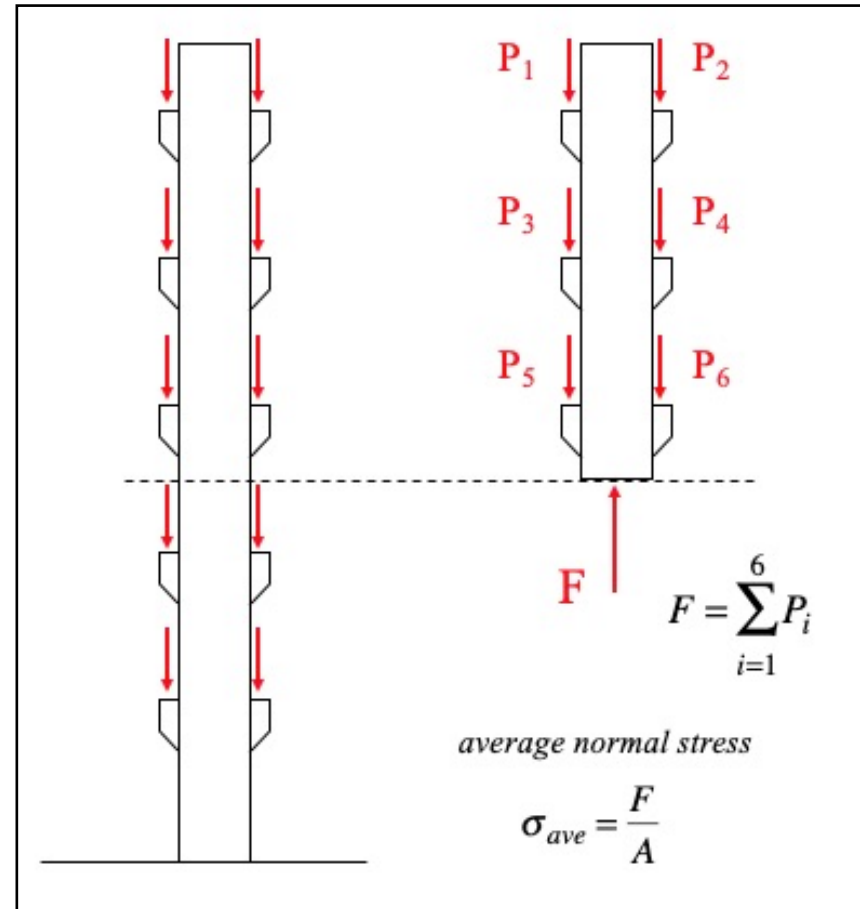
Front view of structure showing SPANDREL beams



# Northwestern Parking Garage

Showing support column

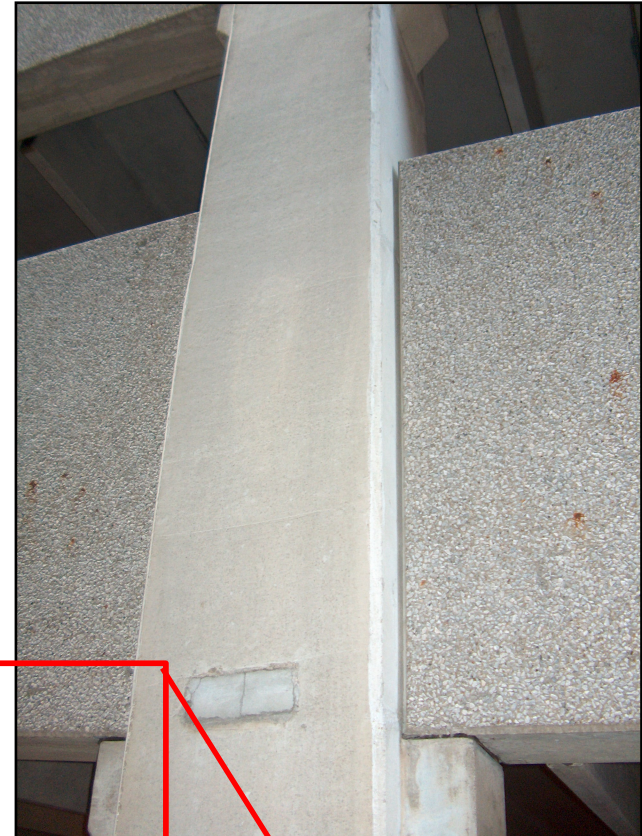
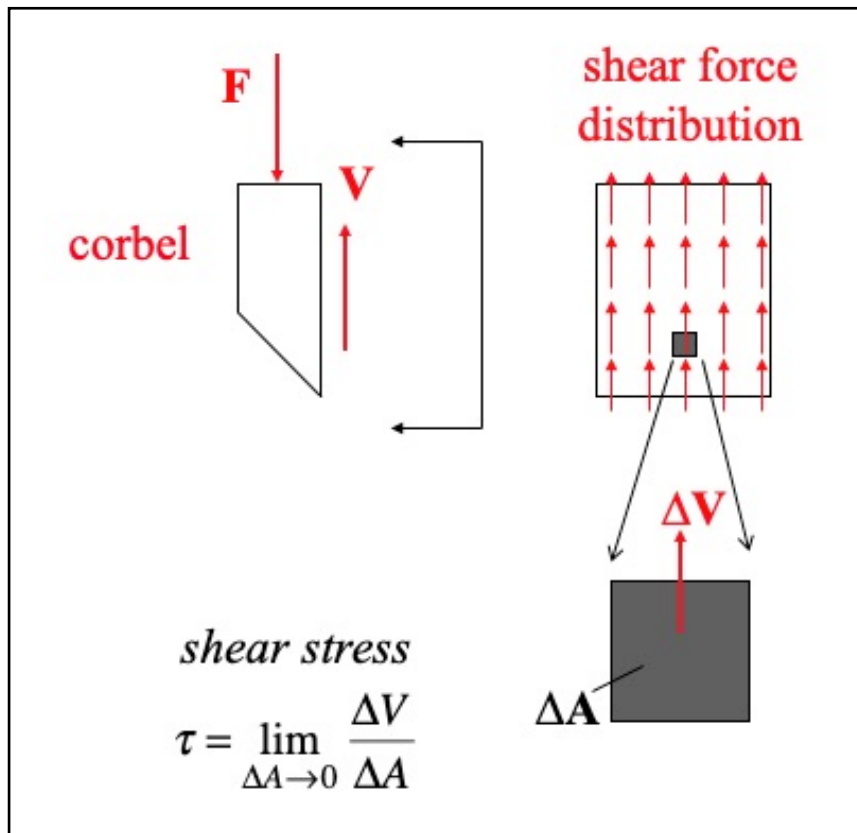
Axial stress in the support columns.



# Northwestern Parking Garage

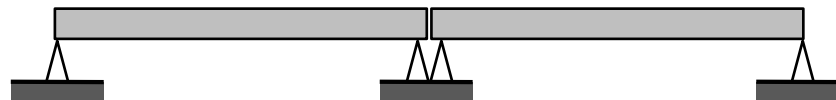
Corbel support in the support beams

Shear stress in corbel supports.



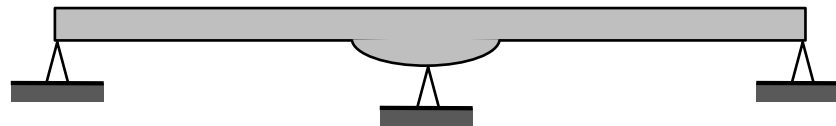


# Railroad Overpass on Sagamore Parkway



*A set of two simply-supported beams:  
"Easy" to solve for stresses, right?*

# Highway Overpass on I-65 (Indiana)



*A single beam with three supports:  
Can you solve for the stresses in this beam?  
Also, why the “bulge” in the beam?*

## ***Bridge designs***

What do these bridge designs have in common (from a structural standpoint) and are different from a highway overpass bridge?

Kennedy Bridge  
(truss structure)



Sherman Minton Bridge  
(truss-cable structure)



Lincoln Bridge  
(cable-stayed structure)



stone archway  
bridge



highway overpass  
bridge





# Sun Kinks in Railway Rails

*What caused this?*



# Some questions for this semester in ME 323

## *Concepts*

- How big is a *Pascal*? A *PSI*? Which is larger?
- Do *material properties* affect stresses?
- How do you solve an *indeterminate* problem?
- More important: *shear stress* or *normal stress*?
- *Stress without strain*? *Strain without stress*?
- How do materials *fail*?
- Why are automotive drive shafts *hollow*?
- What role does the *second area moment of a beam* play in finding stress in beams?
- Why do we care about *shear force/bending moment diagrams* in beams?