

The framing system of a three-story parking garage consists of precast concrete columns, rectangular beams, and solid slabs (Figure 1). These members can be analyzed individually assuming that the slabs and beams are simply supported. The primary objective of this project is to perform the design of the slab, beam, and column.



Use rectangular beam instead

Figure 1. Building Frame

Assumptions

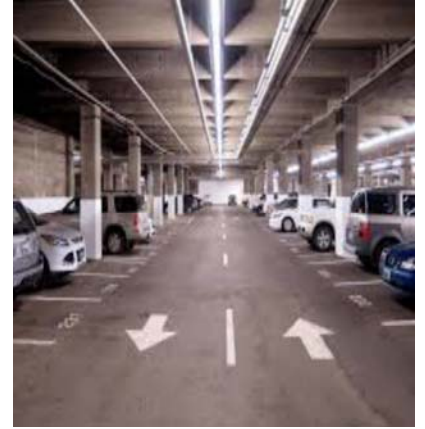
1. Dimensions in Figure 1: L1 = 20 ft, L2 = 40 ft, H = 14 ft.
2. Materials: concrete strength at 28 days = 6,000 psi. Density of NWC = 150 pcf. Grade 60 steel.
3. Member sizes:
 - 1) Precast slab: width = 48 inch; depth to be determined.
 - 2) Precast beam: dimensions to be determined.
 - 3) Precast column: assume use of square columns.
4. Dead loads (DL): Dead loads are the self-weight of precast concrete members (slabs, beams, and columns). Ignore the weight of all other members.
5. Live load (LL): 40 psf.
6. Wind load (W) for column: simply assume 30 psf uniform loading (perpendicular to the paper) along the column height.
7. Assume the distance between the centerline of the bearing (where a beam is seated on the corbel of the column) and the face of the column = 6 in.
8. Load combinations:
 - 1) 1.4DL
 - 2) 1.2DL + 1.6LL
 - 3) 1.2DL + 1.6LL + 0.8W
 - 4) 0.9DL + 1.6W

Deliverables

- 1) Calculation report summarizing the analysis and design of the slab, beam, and column.
- 2) Drawings including the member dimensions and reinforcing details.



New multi-level parking garage



New parking under additional classrooms

REMODEL VS. NEW CONSTRUCTION

(a decision based on need & reasonableness)

- New high school construction costs: Additional \$373 a year for 25 years
- Remodel of existing high school costs: Additional \$112 a year for 25 years

South Kitsap School District Remodel of Current High School Master Plan Estimates

New Addition- Cost Model By Program Area					
User	Classrooms	SQ FT	Cost/SF		Total \$
General Purpose	50 Clsrm	25000 SF	300		7,500,000
Discovery HS Classroom	10 Clsrm	5000 SF	300		1,500,000
NJROTC Classroom	5 Clsrm	2500 SF	300		750,000
Science	5 Clsrm	2500 SF	400		1,000,000
Student Rest Room	4 RR	1600 SF	400		640,000
Staff Rest Room	2 RR	800 SF	400		320,000
Student Work	2 RM	1000 SF	300		300,000
Custodial Rooms	2 RM	500 SF	300		150,000
Hallways	4 SP	25000 SF	300		7,500,000
Total (Building Only)		63,900 SF			19,660,000
Site Development					5,000,000
Elevation of Building					10,000,000
Upgrade Existing Utilities					5,000,000
Total					39,160,000
50 Clsrms @ 25 Stu ea	1250 Students				

Exclusions:		Exclusions:			
State Sales Tax		Furnishings &			
Testing and Inspections		Project Contingency			
Construction Contingency		Toxic Soils/Materials Removal			
Architect/Engineering Fees		Utility Fees/Connections/Charges			
Owner Consultants		Permits			
Builders Risk Insurance		Jurisdictional/Utility Co Fees			
Construction Management		GCCM/ECCM/MCCM Delivery			
Add 10 Teachers		10 Teacher	x \$85,000		850,000
Approximate Cost					40,010,000
Parking Garage (200 Cars)		1 Garage	60000 SF	300	18,000,000
Loan Costs 4% Loan		2nd HS		HS Remodel	
Amount Financed		\$200 M		\$60 M	
Monthly P & I (25 Yr		\$1,055,673		\$316,702	
Interest Cost		\$116,702,104		\$35,010,631	
OSPI/State Cost Match		\$ 9 M		\$8 M+	
Cost to Homeowners (Yr)		\$373.64		\$112.00	