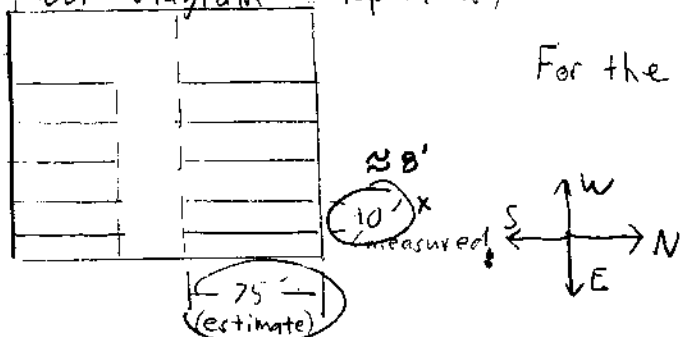


12)

Floor Diagram (Top view)



For the small cross-beams, $b_{c1} \approx 7.572$

Dead load

(this is quite high)

The T-beam supports the 3rd, 4th, and 5th floors.

This is not true... The beams support their own floor, their weight, & any live loads on that level. They frame into columns which take the load into the ground. The first level columns support floor loads from above.

for 1 floor

Thickness of concrete floor: 9"

For one small floor support.

Load from floor weight: Tributary area * thickness * density
 $F_f = 750 \text{ ft}^2 \cdot \frac{3}{4} \text{ ft} \cdot 150 \text{ lb/ft}^3 = 84,375 \text{ lb}$

Support dimensions: $4" \times 21" = 84 \text{ in}^2 = 0.5833 \text{ ft}^2$

Weight of support = Area * length * density

$F_s = 0.5833 \cdot 75 \cdot 150 = 6562 \text{ lb}$

I'm impressed w/ the level of thought you've provided - thank you! However, since cars are ABLE to move, they are always considered to be live loads.

The weight of the cars could be represented as a live load over the tributary area, however, since the garage spends much of its time filled with parked cars, it may be more accurate to represent the cars as dead loads. The spaces are 10' apart, with an average of 2 cars parked over each small support. The two methods are compared

Live load:

For a garage: 50 lb/ft^2 ✓

$F_c = 50 \text{ lb/ft}^2 \cdot 75 \text{ ft}^2 = 3750 \text{ lb}$ ✓

Parked

Avg. car weight: 3000 lb

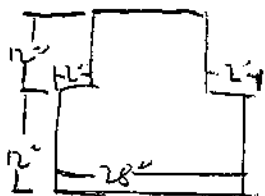
2 cars/beam

$F_c = 6000 \text{ lb}$

The larger force will be used for increased safety

Total support load: $= F_s + F_f + F_c = 6562 + 84,375 + 6,000 = 96.9 \text{ kip}$

This is the load acting on the small support. It transmits this load through pin supports to the T-beams at either end of it. Neglecting the slope of the garage, symmetry may be assumed. Therefore, the T-beam receives point loads of 48.5 kip at 10' intervals, averaging 4.85 kip/ft. However, it must also support its own weight



The beam was assumed solid, due to an inability to see through the beam. Parking wasn't too keen on drilling, either ✓ (I think that would have gotten me in some hot water...)
All dimensions were measured

HW

8/28/06

CE 461

Using the density, a weight of 650 lb/ft is obtained,

Thus, supporting one floor, the T beam experiences a load of 5.5 kip/ft . 1 floor

However, the beam in question supports three floors. From the garage design, it appears much of the load on each floor is carried to the outside of the structure as opposed to through the floors.

Load Path



However, some load must be supported by the floors below. Assuming an equal load distribution, the T beam supports 15.5 kip/ft .

This ignores the point-load distribution of weight of the above floors, instead treating them as distributed evenly across the floor. Such a design would make parking even more difficult than it currently is.