# Designing Structures for Elevators

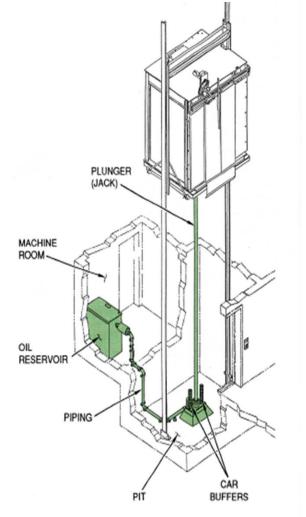
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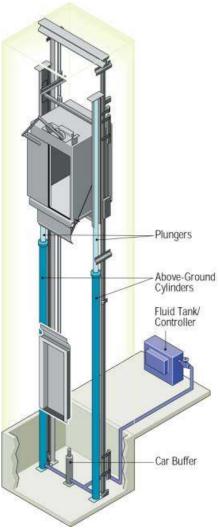
### Agenda

- Elevators 101 : Hydraulic VS Traditional Traction VS MRL
- Forces on the Structure Pit, Rails and Overhead
- Forces on the pit, sump location
- Rail forces Attachments, Spacing
- Forces at the top of the shaft, Overhead clearances
- Coordinating with architectural drawings Dimensioning, Fire rating, rough Openings, Slab at the front wall.

## Elevator 101

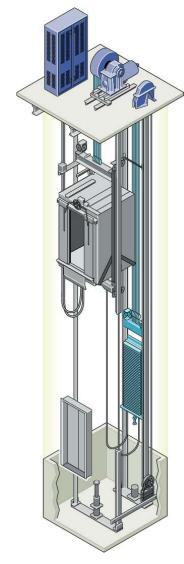
- Type of Elevator Hydraulic
- Low rise < 30' Travel , < 150 FPM (most are 100-125)

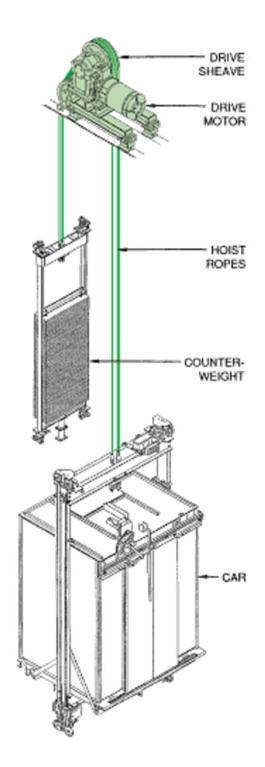




# Elevator 101

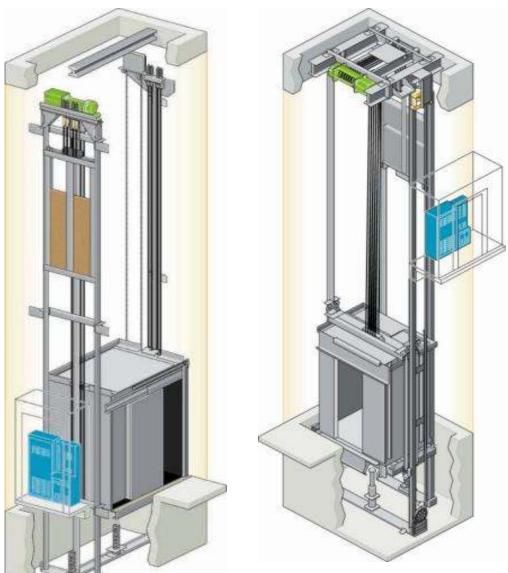
- Type of Elevator Traditional Traction
  - Speeds from 150- 2200 FPM
  - From 3 stories to the tallest buildings in the world.





# Elevator 101

- Type of Elevator MRL Traction
- Rail mounted Machine-
  - 3 to 15 Floors
  - Speeds 150-350 FPM
- Structural Steel Mounted
  - 8 to 60 Stories
  - 350 500 FPM



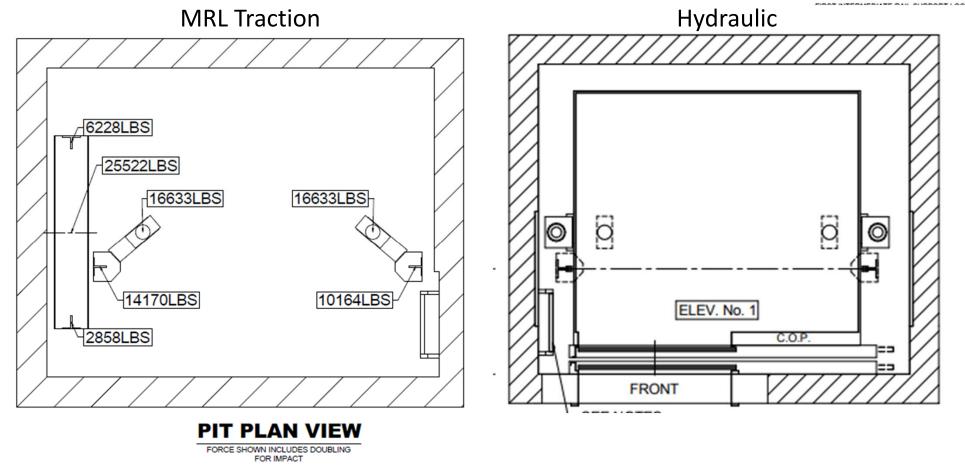
#### Forces Imposed on the Structure

- Forces on the pit
  - Car Buffer loads
  - Counterweight Buffer Loads
  - Rail Impact



THIS FORCE INCLUDES IMPACT SEE NOTES 8 & 9

	SEISMIC	VX	2160 lbs
ELEV. NO.	SEISWIC	W	1080 lbs
1	APPLICATION	R1	279 lbs
	APPLICATION	R2	144 lbs
*EACH BUFFER IMPACT LOAD			10027 lbs
*EACH CYLINDER IMPACT LOAD			7800 lbs
CAR MAXIMUM BRACKET SPACING			14'-0'
PLUNGER MAXI	MUM BRACKET SP	ACING	14'-0'

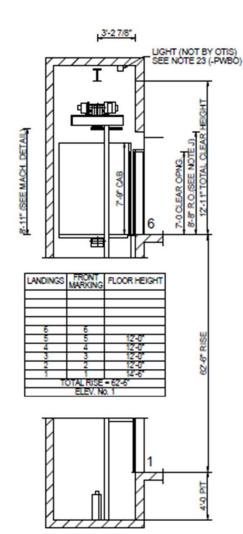


## Elevator Guide Rails and Brackets





#### Rail Forces - Vertical Locations



FRONT HOISTWAY SECTION FOR MAX. SPACING BETWEEN INSERTS SEE RAIL FORCE DETAIL ELEV. No. 1

	TABLE 1 ELEV. No. 1
(	CAR RAIL BRACKET INSERT TABLE
4'-9"	9th BRKT, LOC, FROM 8th BRKT.
4'-2"	8th BRKT, LOC, FROM 7th BRKT.
12'-0"	7th BRKT, LOC, FROM 6th BRKT.
12'-0"	6th BRKT, LOC, FROM 5th BRKT.
12'-0"	5th BRKT, LOC, FROM 4th BRKT,
12'-0"	4th BRKT, LOC, FROM 3rd BRKT.
4'-6"	3rd BRKT. LOC. FROM 2nd BRKT.
11'-0"	2nd BRKT. LOC. FROM 1st BRKT.
3'-0"	1st BRKT. LOC. FROM PIT FLOOR

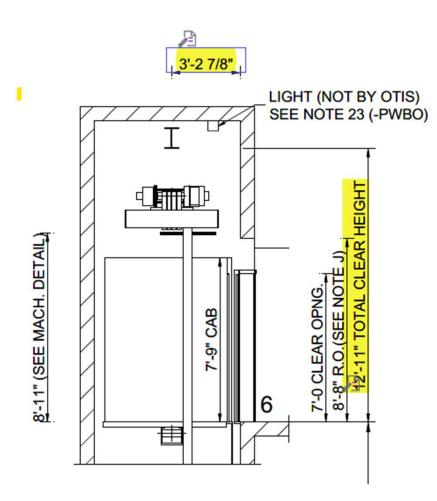
RAIL FORCE & BRACKET SPACING DETAIL					
	R2 VY R1 VX		2 Y		
	SEE	NOTES 6 & 7			
CAR		R1	518 lbs		
	R2		90 lbs		
	VX		2033 lbs		
	VY		1016 lbs		
	MAXIMUM BRACKET SPACING		12'-0"		
	RAIL SIZE		1-1/2		
сwт	R1		260 lbs		
	R2		19 lbs		
	VX		2137 lbs		
	VY		1069 lbs		
	MAXIMUM BRACKET SPACING		12'-0"		
	RAIL SIZE		1-1/2		
DEH (DEAD END HITCH)		R1	660 lbs		
		R2	1590 lbs		

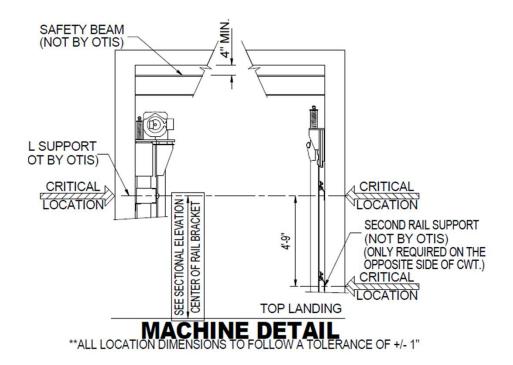
IN MULTICAR GROUPS THE VALUES ABOVE ARE THE LARGEST VALUES FOR THE ENTIRE GROUP

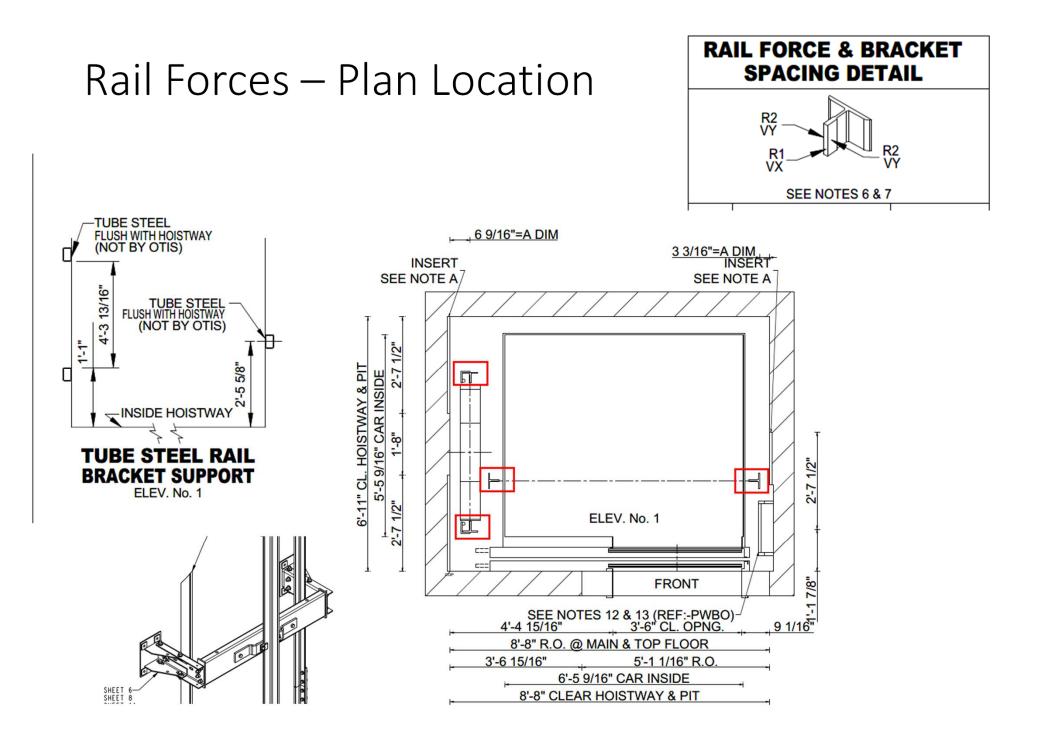
FIRST INTERMEDIATE RAIL SUPPORT LOCATION TO BE LOCATED 14' 0" FROM PIT FLOOR. ALL OTHER INTERMEDIATE SUPPORTS CANNOT EXCEED THE MAXIMUM BRACKET SPACING IN THE RAIL FORCE & BRACKET SPACING DETAIL

CAR R1 = SAFETY APPLICATION CWT R1 = LOADING OR RUNNING R2 = LOADING OR RUNNING REQUIREMENTS FOR RAIL BRACKET SUPPORT (NOT BY OTIS): DEFLECTION NOT TO EXCEED 1/8" BASED ON HORIZONTAL RAIL FORCES.

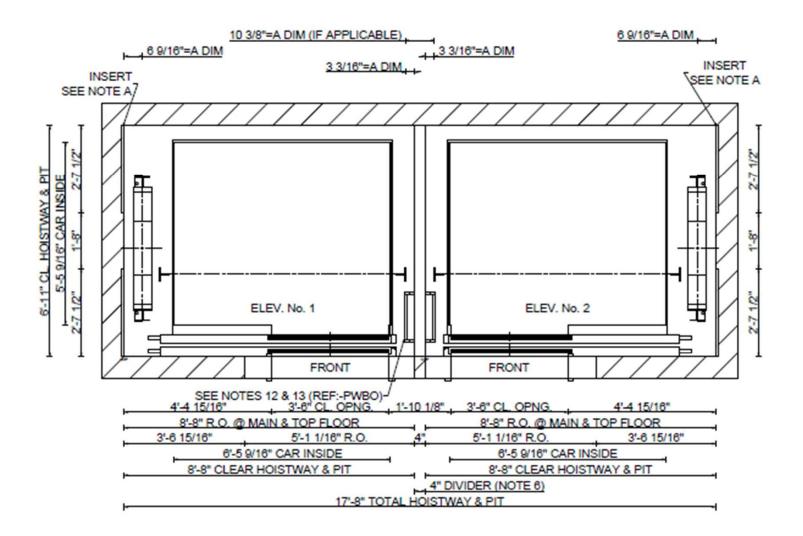
## Top of Shaft







#### Multi-car Hoistways



#### Architectural Coordination

- Minimum HW dimensions are taken from the "tightest point" which means the support plates or GWB not framing.
- Slab edge in the front should be flush with the front of the shaft. The other three walls can be held back for rating issues
- If support columns are contained within framed walls, then plates can be added at appropriate elevations. Column dimension need to account for this.
- Steel members such as spreader beams, vertical columns and safety beams that are not part of the actual building structure do not require fireproofing.
- Meetings with Elevator Contractor, GC, architect and structural engineer during design can eliminate many problems in the field.