



## **2024 STAGE MACHINE DESIGN COMPETITION CHALLENGE DESCRIPTION**

### **2024 CHALLENGE DESCRIPTION: DUMBWAITER DEVICE**

The director and design team for an upcoming production have asked for a working dumbwaiter to be part of the set. During the production as part of the action, actors will transfer props from a second-story platform to a first-story platform and vice-versa. Because of the absurdist nature of the production, the nature of the props will be highly variable, as will the speed at which the transitions between floors will happen.

Specifically, the director has shared that the move will need to travel between one floor and the other in about 4 seconds, carrying a 14-pound bowling ball in a bowling bag traveling both up and down.

Your task as the machine designer is to develop the mechanism that raises and lowers this dumbwaiter. The technical director (i.e., the competition organizers) will provide the wall and the “shaft” in which the dumbwaiter cab will travel; you will need to design the rest of the mechanism, including any elements that prevent lateral movement (side to side, front to back) of the cab, if required).

One thing to note: the producing organization behind this event prides itself on its outreach to local academic institutions, including a college internship program that provides undergraduate students with “hands-on” backstage opportunities. In other words, this machine should be person-driven, not motor operated, pneumatic, or hydraulic. You should anticipate that a “typical” college undergraduate, with a maximum (peak) force of 40 pounds, and a sustained force of 25 pounds, would operate the effect.

On the day of the competition, the organizers will provide:

- a 11-foot tall dumbwaiter “shaft” (specifications attached)
- two openings in the shaft to represent the different “floors”
  - each opening will be 18” wide by 24” tall
  - the lower floor opening will be at 1’-0” off the floor
  - the upper floor opening will be at 8’-0” off the floor



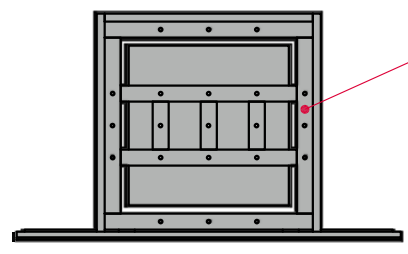
- objects to simulate the 14 pound weights
- methodology for consistently measuring average dumbwaiter cab velocity.

On the day of the competition, each team will provide:

- a dumbwaiter “cab” whose dimensions must be no more than 20”w x 26”h x 20”d
- any elements required to suspend or operate their dumbwaiter “cab.”

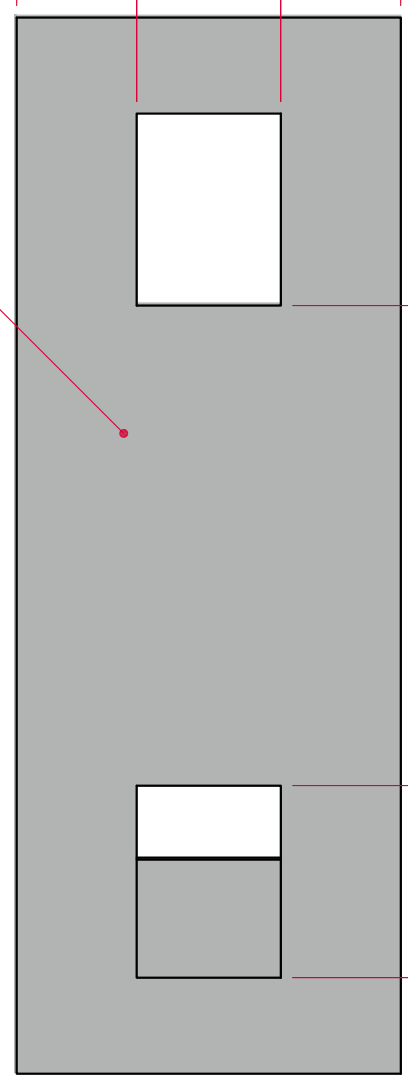
The winning team will be given:

- personalized awards.
- passes to the annual United States Institute of Theater Technology (USITT) conference.
- the opportunity to showcase the winning device at the USITT conference, with prototype shipping cost covered by the Fusion Studio for Entertainment and Engineering at Purdue University.

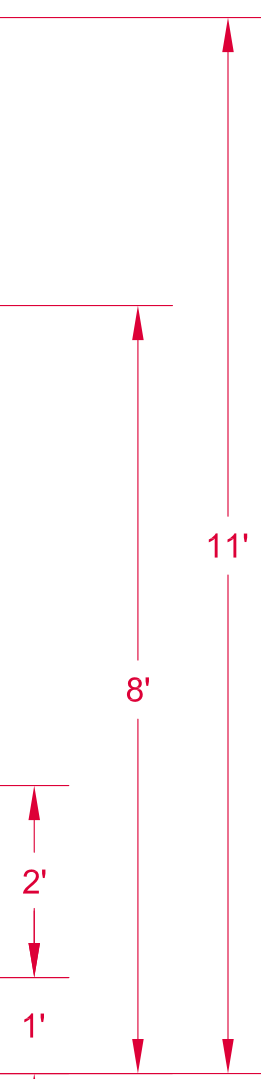


SHAFT  
SEE PLATE 3

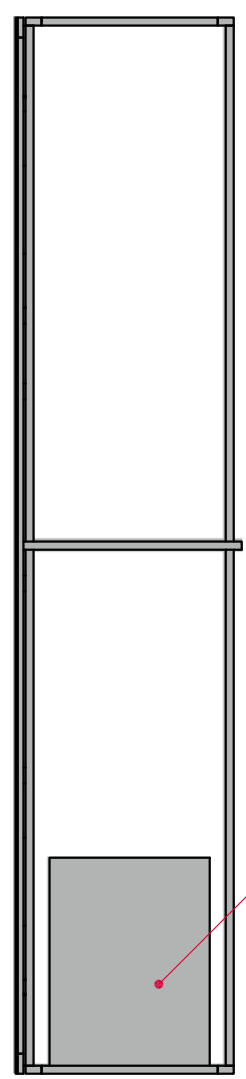
TOP



WALL FLAT  
SEE PLATE 2

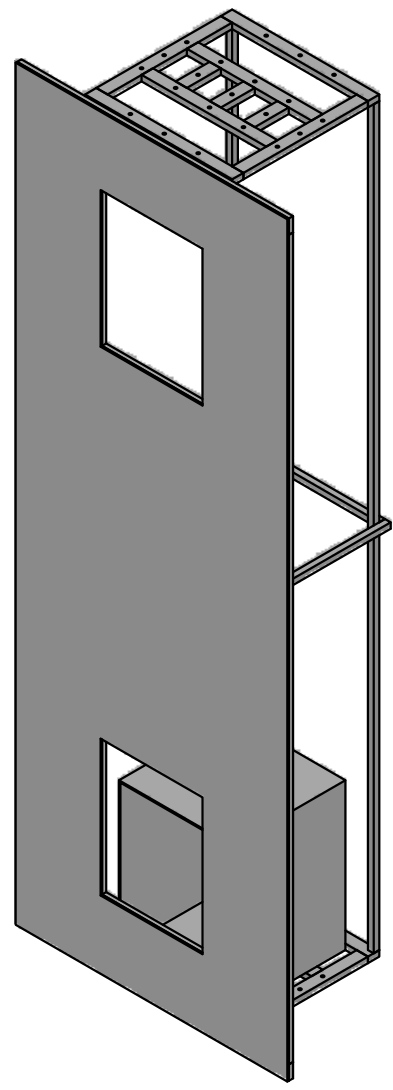


FRONT



CAB (NOT  
PROVIDED)

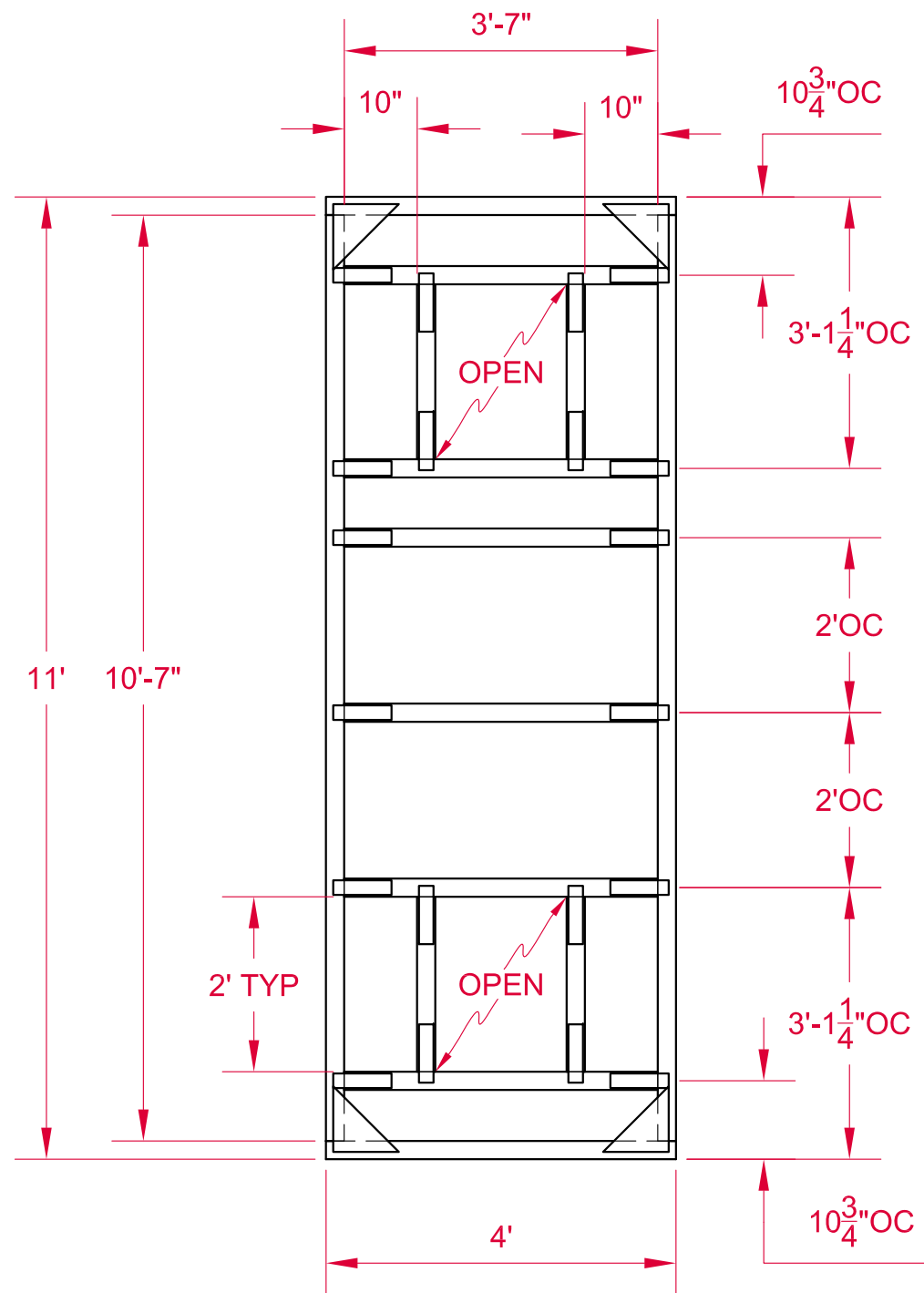
RIGHT SIDE



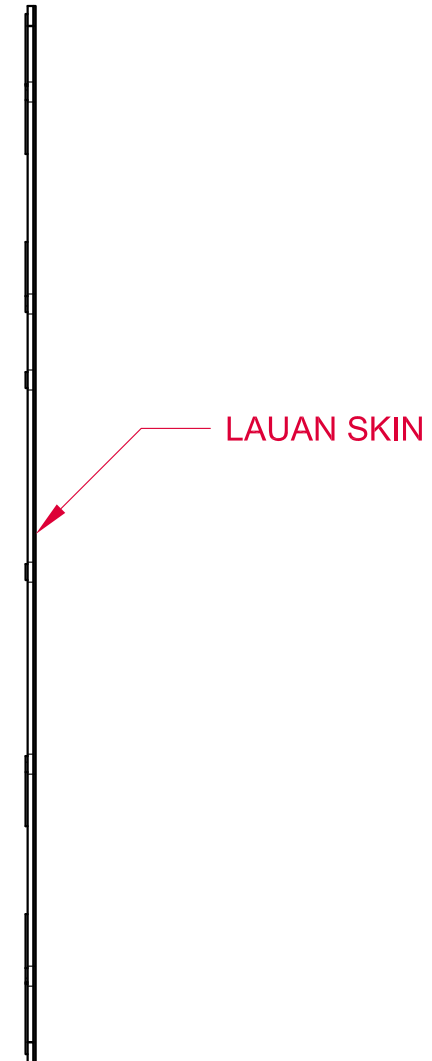
NOTES



TITLE DUMBWAITER SHAFT			DRAWING # <b>1</b>
DRAWING OVERVIEW		DRAWN BY RICH DIONNE	
SCALE 1/2" = 1' - 0"	DATE 9/24/2019		



WALL FLAT - REAR VIEW  
1/2" = 1' - 0"



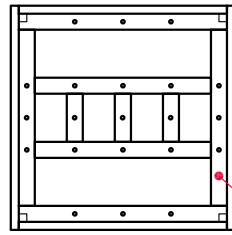
WALL FLAT - SIDE VIEW  
1/2" = 1' - 0"

NOTES

- 1x3 FRAMING
- 1/4" PLY CORNERBLOCKS AND STRAPS  
(CHEAT WHEN NECESSARY TO FIT)
- LAUAN FACING
- GLUE AND NC STAPLES
- ROUT INNER WINDOWS TO FRAMING



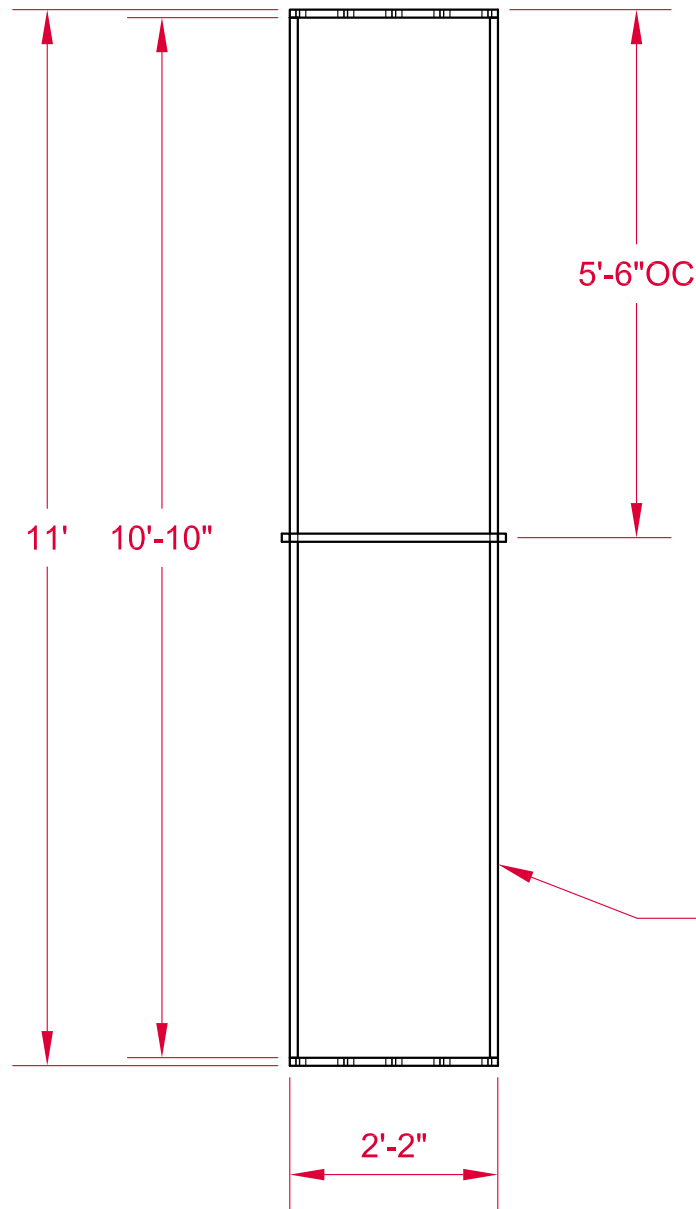
TITLE DUMBWAITER SHAFT		
DRAWING WALL FLAT	DRAWING # <b>2</b>	
DRAWN BY RICH DIONNE		
SCALE AS SHOWN	DATE 9/24/2019	



1x2x14ga A500 (TYP)

SHAFT - TOP VIEW

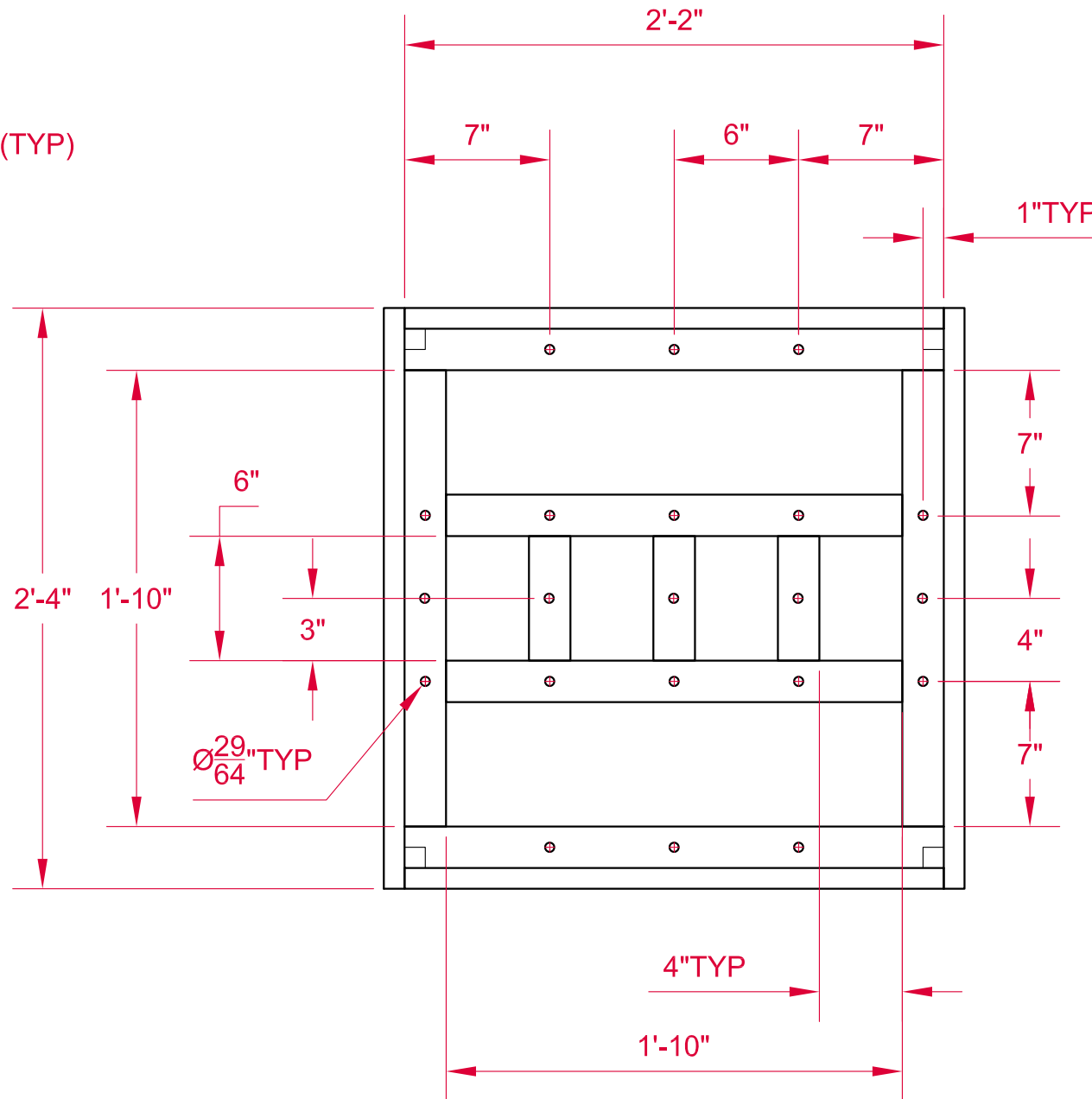
1/2" = 1' - 0"



SHAFT - FRONT VIEW

1/2" = 1' - 0"

1x1x14ga A500 (TYP)



SHAFT - TOP VIEW

1 1/2" = 1' - 0"

NOTES

- WELD ALL FACES AND FILLETS
- GRIND ALL FACE WELDS SMOOTH
- INSERT 3/8"-16 WELD NUTS:
  - MCMASTER P/N: 90594A031
  - BOTH TOP AND BOTTOM
  - WELD ON INSIDE FACES OF SHAFT
- WELD NUTS PROVIDE ATTACHMENT LOCATIONS FOR OPERATING SYSTEM



TITLE		DUMBWAITER SHAFT	
DRAWING	SHAFT DETAILS	DRAWING #	3
DRAWN BY	RICH DIONNE		
SCALE	AS SHOWN	DATE	