Selective Compression and The Value of Creating Mockups

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Theme of this clinic:

1. You can fool some of the people all of the time.

2. You can fool all of the people some of the time.

3. Don’t let potential rivet counters distract you from accomplishing #1 & #2.

Lessons Learned – The SP Sacramento Shops

1. **If possible, work from blueprints printed in the scale being modeled: (HO = 87.1:1, N = 160:1, etc.)**

Lessons Learned – The SP Sacramento Shops

The Historic American Engineering Record (HAER) project created detailed drawings of the SP Sacramento Shops.

Having a complete set of the HAER drawings - reprinted in HO scale by an SMRHS member – saved a huge amount of time!

Lessons Learned – The SP Sacramento Shops

ALTERNATIVE RESOURCES can be used:

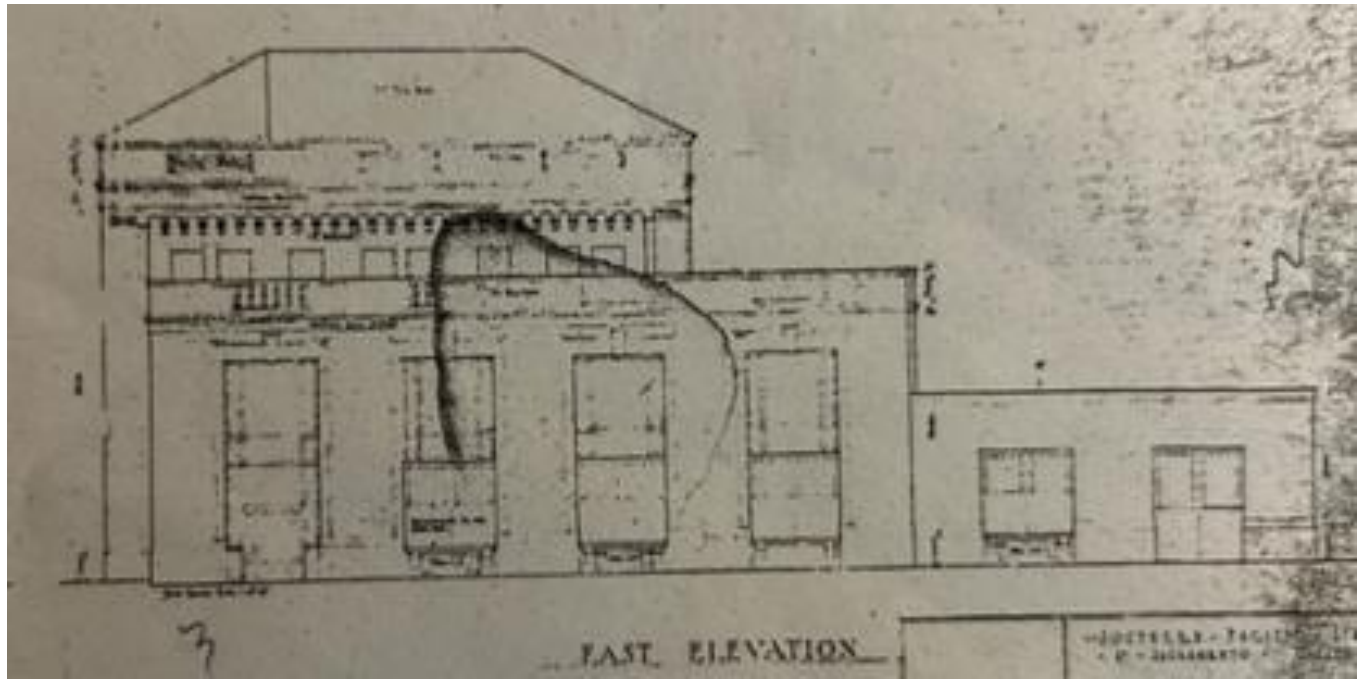
- ***Blueprints printed in other scales,***
- ***Photographs of the prototype building***
- ***Data collected from measuring the prototype***
- ***Other???***

BUT:

Expect to take lots more time - and to do lots of math - when using blueprint alternatives!

2. Focus on the era being modeled:

- Don’t be distracted by as-built blueprints or photos that predate the era you want to model.



Poor-quality 1926 blueprint shows a 1-story boiler room

BUT …

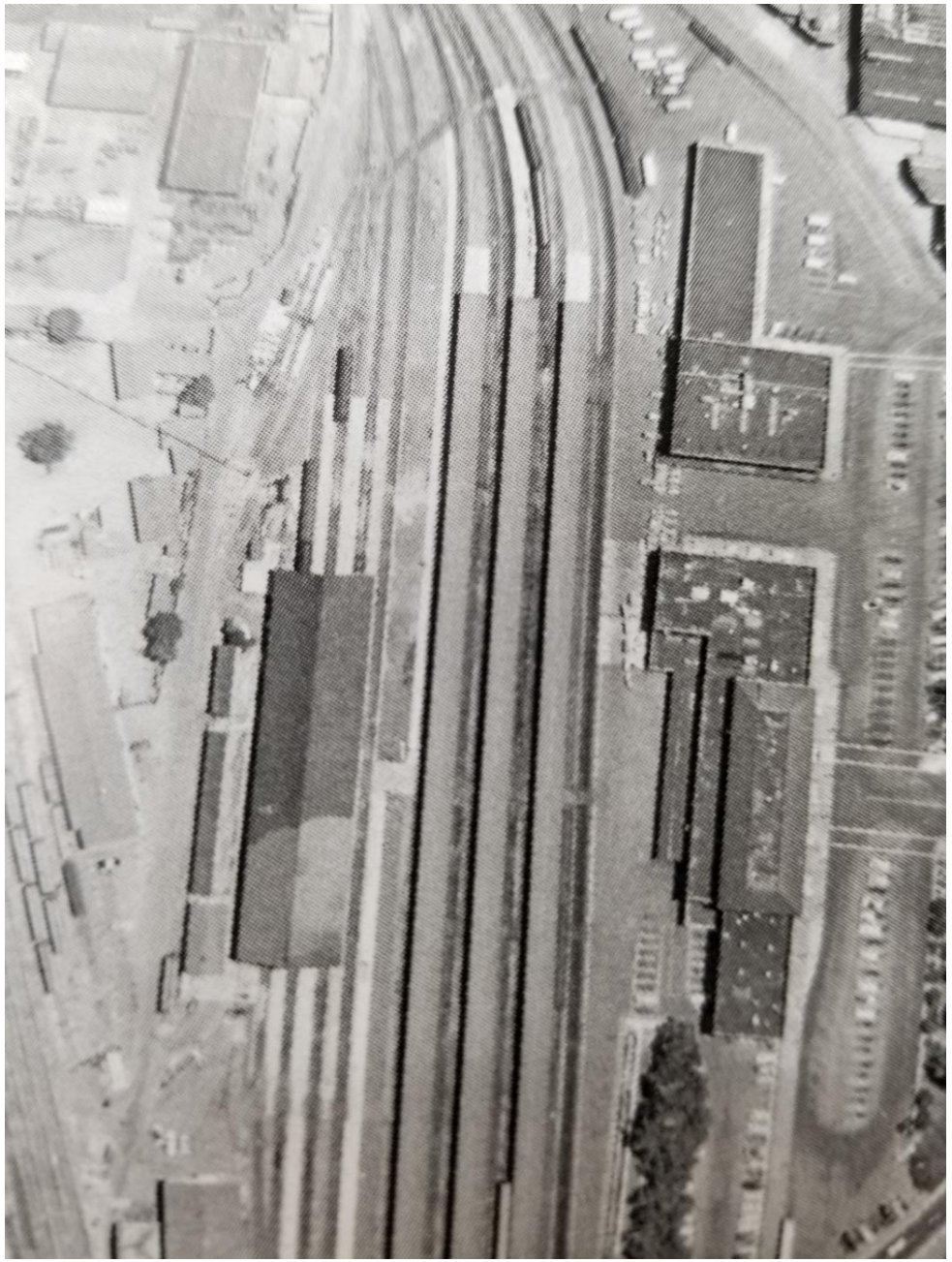
It was replaced by two more 2-story bays before the era being modeled at SMRHS.

- Don’t be distracted by changes made after the era modeled:

  The “Pullman Shed” to the left (aka “the SP Cooling Shed”) is gone & will not be modeled

  The Freighthouse truckdock at the upper right was recently replaced by a street, but is being modeled at SMRHS

Photo credit: Bill Calmes



3. Identify and measure the layout space the model building is to occupy.

- Will a full HO scale model fit in the space?
- Be mindful that the layout designer(s) may not have thought through what – or the size of what – was to occupy the space!
- Should/could planned or existing models of geology or other structure(s) be moved or altered to allow a full HO scale model?

Applying #3: The existing roundhouse, turntable & 3 main tracks on the standard gauge layout + a brick wall + the narrow gauge layout all limited the space available for models of the SP Shops!

Some compression was going to be necessary!!!

4. Identify prototype features that will be difficult or impossible to compress

Any narrowing the "old" half of the Erecting Shop north elevation would have required:

- Altering the 4-part roofline or
- Reducing the height of the building

5. **Identify building side(s) familiar to potential viewers!** *The SP Shops as seen from I-5:*

Take benefit from human nature: Viewers' brains will assign credibility to a model if familiar sides or features seem "correct"

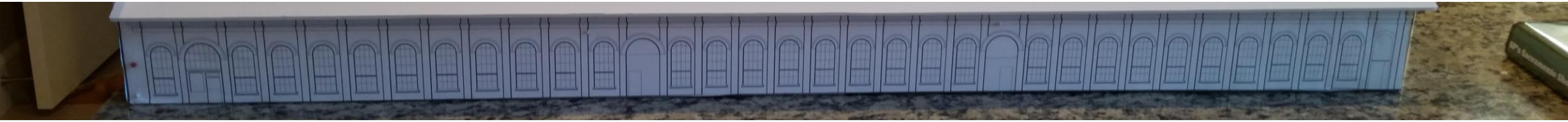
6. **Model familiar side(s) as close as possible to full scale.**
   - Car Machine Shop West Elevation (75' wide X 62' high) fit the available space at full HO scale
   - Erecting Shop North Elevation (180' wide X 65' high) fit the available space at full HO scale

Other SP Shops elevations required selective compression:

- 551’ Erecting Shop length (familiar west elevation partly obscured by the boiler shop)
- 460’ Boiler Shop length (familiar west elevation)
- 190’ Car Machine Shop length (unseen north elevation)
- 151’ Boiler Shop width (north elevation obscured by firing line)

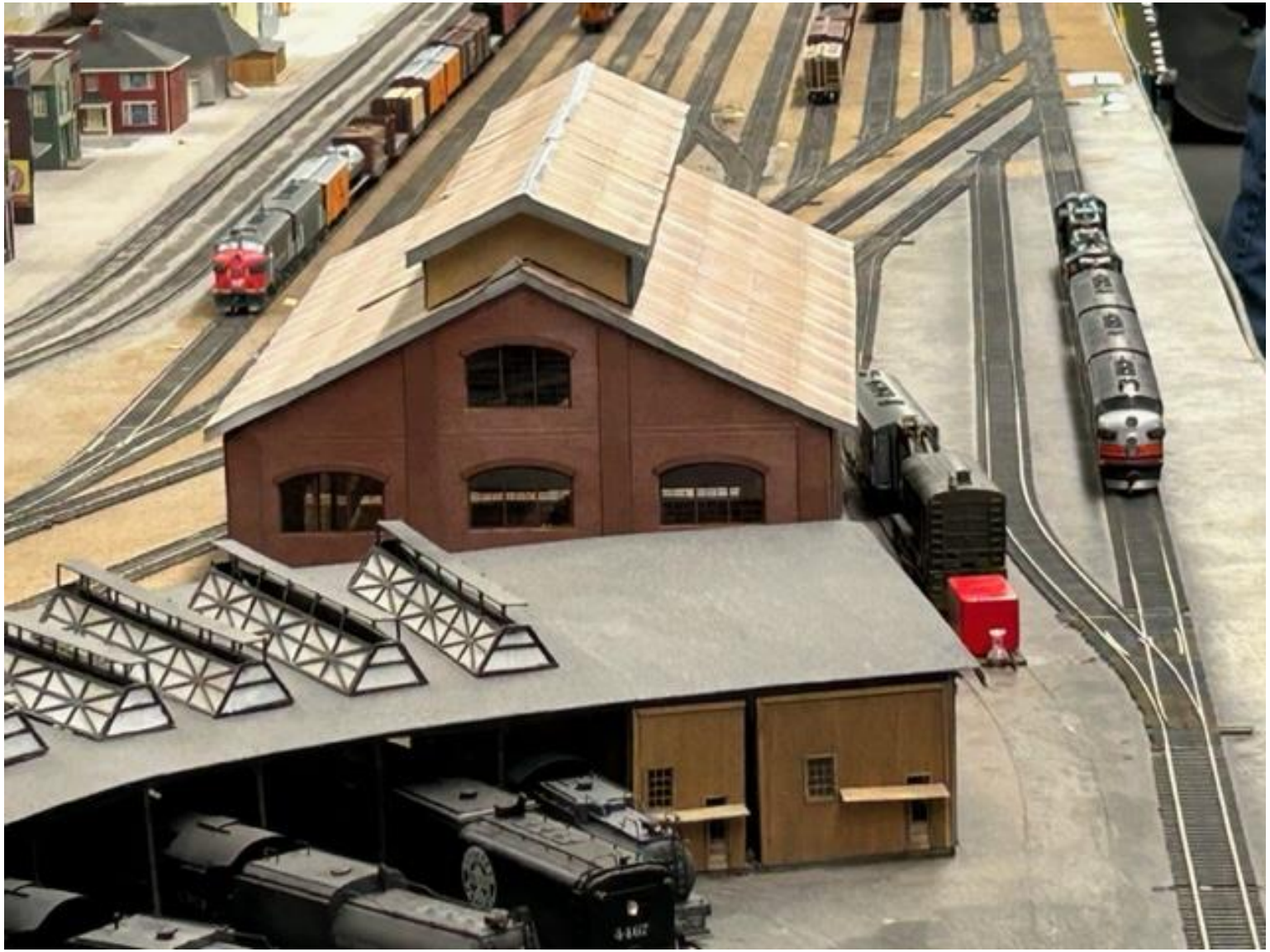
7. Selective compression by omission is useful for less-familiar features:

- The sameness of rarely-seen East Elevation features makes it difficult to detect omissions from Erecting Shop length.



- Different sameness + being hidden by Boiler Shop makes it difficult to detect omissions from Erecting Shop West Elevation.

The “too long” sides of the Car Machine Shop cannot be seen from familiar “I-5 perspective”.



COMPRESSION BY OMISSION TECHNIQUE:

Problem 1: A Car Machine Shop model at full HO scale (190’ = 26.2”) would have intruded on yard tracks east of the building.

***Solution:* Omit 1 (of 8) bays that viewers can’t see from I-5.**

***Results:* Viewers comfortable with a full HO width & height model compressed to 20.5” long (78% = 149’ HO) don’t miss the omitted bay.**

Problem 2: An Erecting Shop model at full HO scale (551' = 76") would displace 3 mainline tracks + go through the brick wall + intrude into the narrow gauge layout.

Solution: ***Omit 11 (of 26) west wall bays which viewers can't see or count from I-5 + omit equivalent east wall bays.***

Results: ***(1) Viewers comfortable with a full HO width & height model compressed to 43" long (56% = 311' HO) don't miss the omitted bays they cannot see from I-5, and***

(2) Viewers are comforted by modeling the familiar northernmost bays at full HO scale (so the doors look "correct" for an HO SD-40 sitting on the transfer table).

OMISSION CAN BE USED (judiciously) ON FAMILIAR SIDES:

Problem 3: A full HO scale width Boiler Shop model (151’ = 20.8”) would have limited the length that could be fit inside the mainline tracks curving behind.

Solution: ***(1) Omit narrow low bays (#2 & #4 of 5), preserving the North elevation roofline seen from I-5.***

Result: ***Viewers comfortable with the full HO scale height do not miss the bays omitted from a model compressed 15% to 17.6” wide (= 128’ HO).***

Problem 4: Full HO scale model of the Boiler Shop (460’ = 63.4” HO) would be too long for space available.

Solutions: ***(1) Omit west elevation length to fit the space; BUT (2) Preserve distinct roofline and base of former boiler tower); (3) Paint model black (per 1950’s SP practice); and (4) Omit “Sacramento Locomotive Works” sign that would give viewers “out-of-proportion” vibes.***

Results: ***Viewers are comfortable with a full HO height model compressed to 35.6” long (56% = 258’ HO) similar to shortening Erecting Shop length.***

COMPRESSION BY SHRINKING must be done with great care, to avoid giving viewers "out-of-proportion" vibes.

- ***Shrinking entire panels/sides risks giving viewers a "too short" or "too narrow" vibe.***
- ***Viewers accustomed to 6' 8" or 8' tall doors will get "too short" vibes from drastically-shrunken doors.***
- ***Viewers will get "too narrow" vibes if doors look like nearby road or rail vehicles would not fit through them.***

Narrowing window & door widths to squeeze in more bays may not be worth the effort! At SMRHS, the 15 Erecting Shop bays modeled are at full HO scale height and width!

8. IF AN HO SCALE BLUEPRINT IS NOT AVAILABLE, YOU CAN CREATE ONE. **Time spent translating different-scale measurements and photos to HO scale will be worth the effort.**

- Available CAD programs (at a cost for good ones), have varying features. ***Before starting, verify you will be able to print out the results in HO scale.***

- MATH FEATURES OF MICROSOFT EXCEL (or other spreadsheet software) eases computation of HO Scale lengths/widths from photos and other-scale drawings:
  - If a wall known to be 97’ wide measures 5" on a photo, use formula “Length / 87.1 * 12” to compute HO scale wall width:

    97/87.1*12 yields a 13.36" HO scale wall width

  - If the wall is 2” tall in the same photo, use formula “photo height / photo width * known length = HO wall height”.

    2/5*13.36 yields a 5.35" HO scale wall height

- **MICROSOFT EXCEL CAN EVEN BECOME A CAD-substitute:**

➢ NARROW ALL COLUMNS TO THE SMALLEST OBJECT WIDTH BEING DRAWN

✓For bricks 4" wide X 8" long, each column = 4“ brick ends

✓For concrete blocks 8” long X 16” wide, each column = 8” block ends; etc.

➢ ADJUST ALL LINE HEIGHTS TO THE MATCH THE SELECTED WIDTH DIMENSION

✓For staggered brick courses 3" tall, each line = 3” or use multiple lines

✓For staggered concrete block courses 8" tall, each line = 8”; etc.

➢ Use EXCEL "PRINTING PERCENTAGE" FEATURE to produce copies in HO scale

➢ YOU CAN CREATE ON-SCREEN RULERS IN LINE "1" & COLUMN "A“

✓Start with a “0” in cell A1

✓For 4” width increments (bricks) put A1+4 in A2, put A2+4 in A3, etc.

✓For 3" height increments (bricks) put A1+3 in B1; put B1+3 in C1, etc.

✓Add yellow color to your rulers to distinguish them from the plan.

Create your own “blueprint” with MS/Excel?

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1																						
2																						
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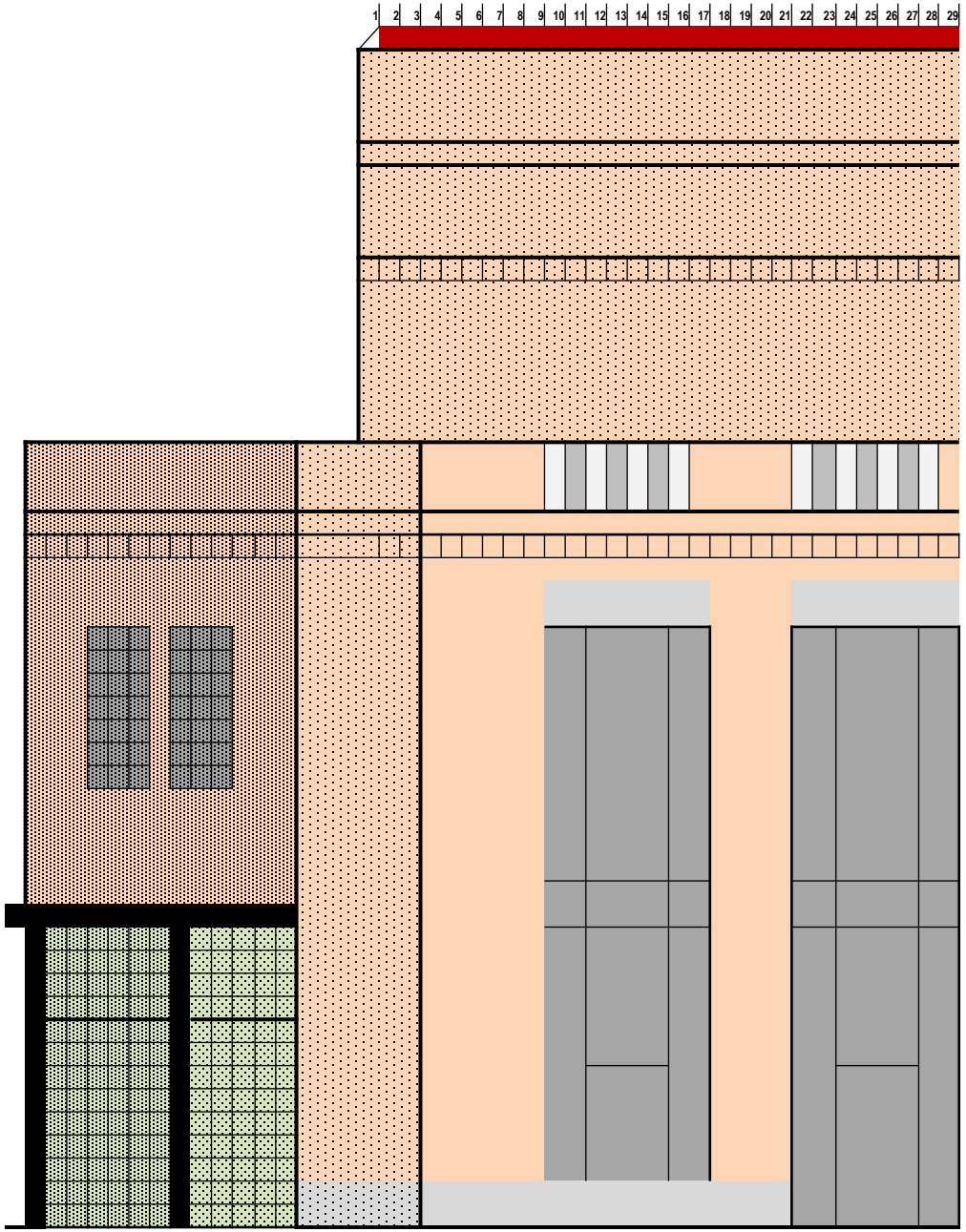
When considering compression alternatives, EXCEL "BORDERS" AND "COLORS" FEATURES ease imitation of the building being modeled.

EXAMPLE:

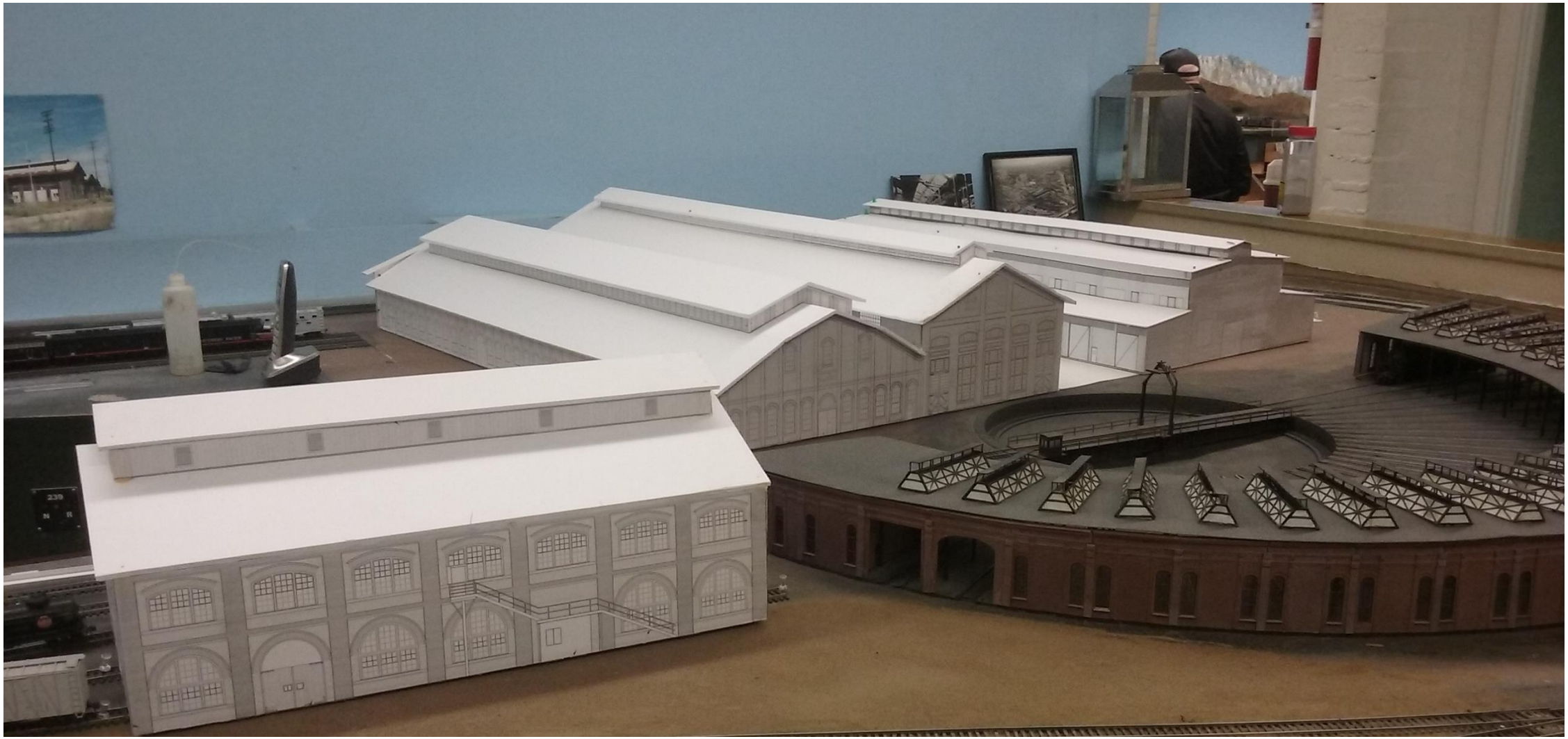
A west elevation of the SP Sacramento passenger station, showing offset components on the north (back) side



9. BUILD A MOCKUP OF YOUR SELECTIVELY COMPRESSED BUILDING. ***The time & effort will be worth it!!!***

   - ***FOAMCORE BOARD IS A USEFUL MATERIAL.*** *Cuts easily, has some structural integrity, & accepts glued-on printouts. Huge sheets can be purchased at office supply stores.*
   - ***3/16" PLYWOOD PROVIDES MORE STRUCTURAL ITEGRITY +*** *can later be used as a permanent base for laser-cut veneers of building elevations.*

PUT THE MOCKUP(S) IN PLACE! Selectively-compressed "familiar-looking buildings" at SMRHS:



10. **KEEP MOCKUP IN PLACE FOR ASSESSMENT PERIOD**

- **MAKE YOUR OWN ASSESSMENT**. Does it look like the prototype? Does it fit with its surroundings?
- **PAY ATTENTION IF A MOCKUP GIVES YOU A "WRONG" VIBE!** *(A previous Erecting Shop mockup shrunk to 85% of HO scale triggered starting over.)*
- **LISTEN TO COMMENTS from club members, visitors, family, friends, etc.** *(Erecting Shop doors designed ~1905 seemed "too narrow" to some SMRHS members, but they were satisfied when told those doors were modeled at full HO scale of 1905-era construction practices).*
- **SEEK OUT - AND PAY ATTENTION TO - PEOPLE WHO HAVE ACTUAL KNOWLEDGE OF THE PROTOTYPE!** *(A rooftop relief station for Erecting Shop crane operators was added to the mockup, based on comments from a SMRHS member with knowledge of the building and its history.*

11. CORRECT THE MOCKUP to incorporate valid suggestions.

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13. PROCEED WITH PRODUCTION OF A FINAL MODEL ONLY WHEN CONFIDENT THAT MOST VIEWERS WILL SEE IT AS CORRECT!!!

SP Shops Diarama Results:

	Width	Height	Length
• Erecting Shop modeled at:	100%	100%	60.3%
• Boiler Shop modeled at:	84.8%	100%	56.1%
• Car Machine Shop modeled at:	100%	100%	78.4%
Pre-existing structures nearby:			
Turntable modeled at:	100%	100%	100%
Roundhouse modeled at:	100%	100%	100%

✓ ***11 dimensions modeled at full HO scale;***

✓ ***4 dimensions selectively compressed***

✓ ***NO selective compressions greater than 50%***

Applying lessons learned:
SP Sacramento Passenger Station (SAC-PAX)

1. NO HO SCALE BLUEPRINTS AVAILABLE.
   - No HAER drawings known to exist.
   - As-built blueprints acquired were of poor quality and printed in much smaller scale.
   - SMRHS member who reproduced SAC-SHOPS blueprints in HO scale no longer has the plotter he used.
2. SPACE AVAILABLE ON LAYOUT IS 108” WIDE x 9.25” DEEP
3. NO SAC-PAX FEATURES DEFY SELECTIVE COMPRESSION

4. SOUTH ELEVATION IS FAMILIAR TO MOST VIEWERS:
   Seen by anybody driving by on “I” street (one-way westbound).
5. ONLY SOUTH ELEVATION MODIFICATION WAS REMOVAL OF FREIGHTHOUSE TRUCK DOCK AFTER SMRHS-modeled ERA.

During the era being modeled, umbrella sheds and passenger trains obscured the North elevations of station & freighthouse from view.

(Photo taken from former 3rd platform after sign added + tracks & umbrella sheds removed)

West elevation was/is only visible from a parking lot.

Facing **Headhouse east & Freighthouse west elevations** were only familiar to baggage and Freighthouse customers using driveway between them.

Freighthouse east elevation was obscured from view by other buildings in era being modeled.

6. Converting South Elevations to HO Scale:

- West hall (restaurant & offices in 5 bays)……. 97’ = 13.3” HO
- Center hall (ticketing & waiting room in 5 bays).... 176’ = 24.3” HO
- East hall (baggage room in 5 bays)…… 97’ = 13.3” HO
- Driveway (headhouse <> freighthouse, est.)……. 100’ = 13.5” HO
- Freighthouse (ex-REA, now Starbucks in 4 bays)…… 72’ = 9.9” HO
- REA Truckdock (re-create removed building, est.)… 70’ = 9.6” HO

Total prototype scene width… 612’ = 84.3” HO

Layout space available (inches)……..108”

Over (-) / Under (+) space available (inches)…….. 24”

CONCLUSION: MODEL SOUTH ELEVATIONS AT FULL HO SCALE!!!

South elevation featuring prototypical orange brick and red roof tiles will look "correct" to viewers!

The problem:

The prototype building was “L-shaped” on a curving track alignment

SP passenger trains arriving from Oakland:

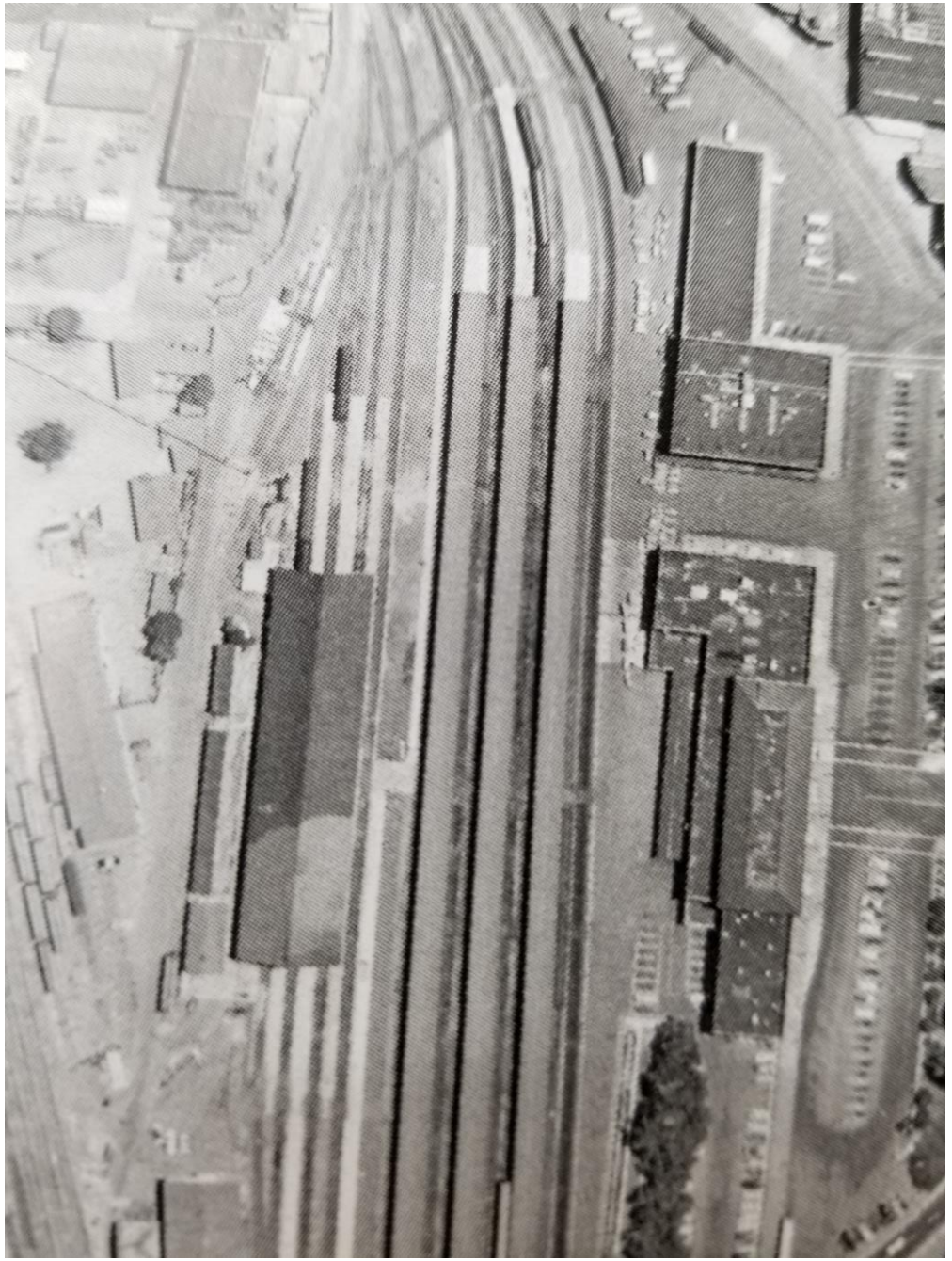
- Crossed the “I Street” bridge;
- Diverged right from the freight mainline to reach SAC-PAX platforms;
- Curved sharply left upon exiting the SAC-PAX platforms; and
- Curved sharply right to rejoin the freight mainline and continue east.

SMRHS layout planners provided space for very long trains, but did not include the prototype curves or leave space for a full-HO model of the L-shaped building.

A full-HO model of the SAC-PAX east elevation would have covered all 4 station tracks!!!

Changes from as-built suggested some solutions:

* Track in front of SAC-PAX is NOT being modeled *(vacated roadbed at top right)*.
* REA truckdock is being modeled *(removed after photo taken)*.
* As-built 1-story boiler room omitted.
* Track and umbrella shed closest to SAC-PAX *(removed leaving scar on ground in photo)* are being modeled.
* Pullman Shed *(removed after photo taken)* is not being modeled.



MULTIPLE OPTIONS COMPUTED AND CONSIDERED:

EAST ELEVATION DEPTH	FULL SCALE HO	OPTION A	OPTION B	OPTION C .
Available benchtop space……(inches)	9.25	9.25	9.25	9.25
Existing aisle intrusions tolerated?	CarCard Boxes	CarCard Boxes	Control Panel	None
Extend benchtop = Aisle intrusion (inches)	2.875	2.875	1.5	0
Maximum model depth (inches)	**12.125**	**12.125**	**10.75**	**9.25**
Center Hall awnings depth (feet)	*9*	*9*	*9*	*9*
Center Hall jut-out depth (feet)	*8*	*8*	*8*	*8*
East Elevation 6 existing panels (feet)	*126*	*126*	*126*	*126*
Track 4 platform depth (feet)	*12*	*12*	*12*	*12*
TOTAL CRITICAL COMPONENTS …(feet)	***155***	***155***	***155***	***155***
MODEL CRITICAL COMPONENTS…(inches)	***21.85***	***21.85***	***21.85***	***21.85***
EXCESS DEPTH (inches)	**9.23**	**9.23**	**10.61**	**12.11**

FIRST ROUND OF SELECTIVE COMPRESSION:

	FULL SCALE HO	OPTION A	OPTION B	OPTION C .
• Shrink awnings 9’ > 5’ (feet):	-4	-4	-4	-4
• Shrink jut-outs 8’ > 5’ (feet):	-3	-3	-3	-3
• Omit 2 of 6 east end bays not shown on original plan (feet):	-42	-42	-42	-42
• Shrink platform 12’ > 10’ (feet)	-2	-2	-2	-2
Saved by 1st compression (feet):	-51	-51	-51	-51
Reduced Critical Depth (inches):	**14.33**	**14.33**	**14.33**	**14.33**
STILL TOO LARGE (inches):	**2.20**	**2.20**	**3.58**	**5.8**

SECOND ROUND OF SELECTIVE COMPRESSION:

	FULL SCALE HO	OPTION A	OPTION B	OPTION C .
Shrink depth to (%):	100%	83.9%	73.2%	60.75%
• East side panels by (feet):	-0	-13.5	-22.5	-33.0
• Track 4 platform by (feet):	-0	-1.6	-2.7	-3.9
2nd Compressed Depth (inches):	**14.33**	**12.125**	**10.75**	**9.25**
STILL LARGE or FITS (inches):	**2.20**	**0.0**	**0.0**	**0.0**

Recommendation & SMRHS Board decision:

Full HO Scale: **33% depth compression REJECTED. Would worsen intrusion on already-narrow aisle and/or require relocating station tracks.**

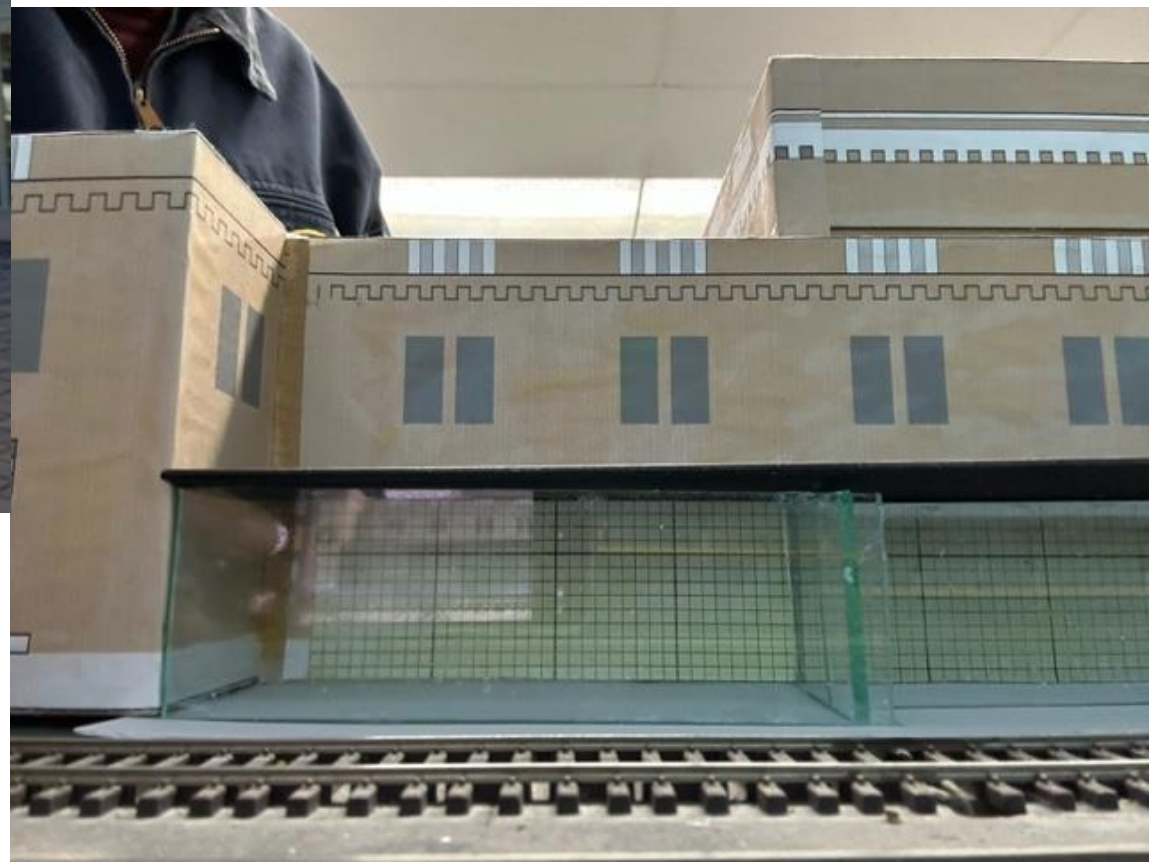
Option A: **42% depth compression REJECTED. Would worsen aisle intrusion (raising its height). Only benefit would have been larger models of building sides completely unfamiliar to viewers.**

Option B: **49% depth compression ACCEPTED. Reduces aisle intrusion by relocating car card boxes & adding 1.5” benchtop extension matching control panel. Unfamiliar building sides are fit into the space available.**

Option C: **57% depth compression REJECTED. Would have been noticed by viewers (i.e., too drastic). Would not have reduced existing aisle intrusion.**

Prototype “Greenhouse”

“Greenhouse” as modeled:



Prototype north elevation today

Compressed north elevation

The SAC-PAX mockups:

* Installed February, 2023 (just before NMRA operating session).
- Many favorable comments from SMRHS members and visitors.
- No known criticisms as of May, 2023.

Next step: Board will be asked for approval to proceed with laser-cutting selectively-compressed elevations to be glued onto mockup frame:

(1) Thin plywood with window cutouts; or

(2) Thin clear plastic with windows etched in place.

Any questions??