Documentation Package

For

HO-Scale Flat Car SVL 65410

Submitted as part of the NMRA AP

Car Certificate Requirements

By

J. Joseph Brann

NMRA 101103

Time Frame – June / July 1952

Background

The HO scale SVL 65410 flat car is a heavily used and somewhat battered flat car which the Susquehanna Valley Line (SVL) RR purchased from the PRR in the late 1940-s. The original PRR flat car was numbered PRR 473022 and was renumbered and relettered as SVL 65410 upon arrival. The car was built during the ramp-up to the war when car throughput per day was paramount, sometimes at the cost of exactness particularly wrt the deck boards. Little maintenance / repair has been done to this car by the SVL because of budgetary concerns, thus there are some paint scratches / scrapes, slightly warped grab irons and a brake line reservoir which apparently got bumped in transit one day. The boards in the deck show considerable wear including somewhat tattered ends. Replacement of these boards will be the first priority of maintenance once funds are available, i.e. post-war era.

The dimensions and construction sequence of this car are strictly based on a fine article in the October 1977 issue of Model Railroader by John R. Porter entitled *Build a Pennsy flatcar from scratch.* The prototype photo at the head of John's article shows a PRR FM class riveted flat car; however, John's very detailed construction article describes how he built his flat car as a welded flat car possibly similar to PRR F30(e) class flat cars. See the cover page to John's article in the Appendix below.

My model train layout in named the Susquehanna Valley Line and is located in my hometown of Williamsport Pennsylvania. In downtown Williamsport and along the Susquehanna River is a Bethlehem Steel plant. As I completed my stock car, I thought it would be appropriate that I add a car load of a Bethlehem Steel product to my flat car. Thus I added a steel beam load to the car.

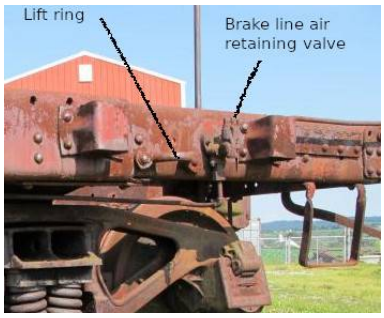
Conformity

1. I drew the side sills, center sills, cross sills, center sill spacers, outer body bolster sills, and top and bottom bolster stiffeners in Cadrail © based on the prototype flat car dimensions from the John Porter article. I then used the Edit Size Cadrail © tool to reduce the prototype dimensions by a factor of 1/87. Following this conversion, I changed the dimensional data presentation from 3 decimal places to Fraction (Feet/inches). I did this because I did not any device to accurately measure the numerous parts of this car to three decimal places. The smallest dimension encountered in this conversion was 1/32-nd of an inch and I do have a square with 1/32" markings on it. The above-mentioned drawings, construction / assembly sequences, and drawings for all the small brass detailed parts such as end-channel, poling pocket, stake pockets, grad irons, lift rings etc. from the Porter article can be found in the Appendix of this documentation package.
2. I used the shape and markings on the journal box cover of the FM flat car shown at the top of the Porter article to select the correct truck type.

3. The deck of the flat car is 3' 10-3/8" above the rail per Peter Vanvliet's web site shown in Reference #5 below. The height is very close to .5" + 1/32" in HO scale.
4. NMRA Data Sheet D5d Safety Appliances Figures 8a and 8b was used to establish Grab iron length, standoff distance and distance from end of car, Center line of stirrup steps, and Distance of the rim of the brake wheel from the left side of the flat car.

Details

1. Complete AB Brake System installed.
2. Brake line air retaining valve located on the left side of car (as viewed from brake wheel end of car) and located between first stake pocket and lift ring as shown in the adjacent photo.



3. Scratch built poling pockets added to each car in the end channels
4. Poling pocket reinforcing supports added
5. One each Kadee 0.015" and 0.10" shim installed under each bolster so that flat car deck height is at 3-ft 10-3/8 inches
6. Bends in main brake line are at 45-degrees +/- a skosh.
7. Elbow and tee connectors on main brake line
8. Dust collector / air filter added where branch brake line enters the AB Control Valve
9. Items located as specified in NMRA Data Sheet D5d Safety Appliances Figures 8a and 8b
    a. Grab iron length, standoff distance and distance from end of car
    b. Center line of stirrup steps
    c. Distance of the rim of the brake wheel from the left side of the flat car
10. 12 stake pockets on each side of car
11. 2 grab irons on each side and end of car
12. 2 stirrups on each side of car
13. 2 lift rings on each side of car
14. Sign located on the brake system reservoir denoting the date and the railroad name where the last brake system maintenance was performed
15. Metal baseplate at base of brakestaff
16. Deck boards distressed to show age, wear and tear.
17. Dirt shown on both sides of all 8 wheels.
18. Steel beam load
    a. One 21" high beam with joining plates, and two 14" high beams with extensions
    b. Cross ties under the beams
    c. Nut, bolt and washer castings representing the large carriage bolts which secure the small blocks to the cross ties
    d. Corporate logo applied to the beams
    e. Installation numbers applied to each beam

Construction

1. Created 0.030” styrene templates – see Photo 1
2. Sanded Basswood before cutting any parts
3. Cut side sills, center sills, cross sills, center sill spacers, outer body bolster sills, and top and bottom bolster stiffeners from 1/32” Basswood – see Photo 2
4. Welded underframe basswood pieces and scale lumber pieces with Elmer’s Carpenters glue, per assembly drawings shown in the Appendix.
5. Cut flanges from 2”x4” and 2”x8” scale lumber and welded these on the center, side, and cross sills. Photo 3 shows a partial assembly of the items in #4 and #5.
6. Plugged the cavity between the center sills and the small sill #2 spacers with cross-layered pieces of Northwest Scale Lumber to completely fill the cavity.
7. Drilled and threaded holes in the plugs created in the above step for the 4-40 truck mounting screws
8. Drilled holes through basswood center and cross sills, and outer body bolsters for AB Brake System plumbing lines. See Photo 3
9. Welded styrene C-channel end pieces to the ends of the center and side sills with CA to complete the underframe welding tasks. See Photo 4.
10. Used a sequence of #77, #69 and # 61 drill bits to create a hole in each of 4 pieces of 0.06” rod for use as the poling pockets
11. Painted underside of underframe
12. Created poling pocket gussets from 1”x6” styrene strip, and made poling pocket reinforcements pieces from 1”x4” strip styrene.
13. Installed AB Brake System components, using CA where applicable. See Photo 5. The main air line is 0.019” brass wire. The line to the Brake Line Air Retaining valve and the lines to the brakes are 0.012” brass wire. The mounting post for the end of the small brake lever is made from .08”x .08” strip Styrene cut on a diagonal. The end of the small lever is secured to the mounting post with a 2” bolt. 40-link per inch chain is used on both ends of the brake wheel pull rod which is made from 0.012” brass wire. Note: The brake levers are down between the flanged center sills and are a little hard to see
14. Welded poling pockets, poling pocket mounting gussets and poling pocket reinforcements to end channels and side sills with CA
15. Welded commercial air hoses on both end channels, on the open-jaw side of the couplers, with CA
16. Formed 4 stirrups from 1/32” wide 0.005” thick sheet brass. A piece of .100” x .125” strip Styrene was used as the shaping tool for the stirrups
17. Formed brakestaff stirrup from 1/16” wide 0.005” thick sheet brass
18. Formed 12 stake pockets from 1/16” wide 0.005” thick sheet brass using forming / shaping tool I made as shown in Photo 6.
19. Formed 8 16-inch wide grab irons and 4 9-inch diameter left rings from 0.012” brass wire. Grab irons were formed using forming / shaping tool I made as shown in Photo 6
20. Welded stake pockets, grab irons, lift rings, and stirrups to side sills and end channels with CA
21. Painted the AB Brake System reservoir, cylinder and AB Control valve. (see also #28)

22. Cut 1.25” wide deck boards from 2”x6” strip wood. Note to create the “weathered ends” of the deck boards the 2”x6” strip wood pieces were broken to length by holding the strip wood piece in the jaws of a needle nose plyer and snapping the strip wood until the piece broke off. This process proved to be a very effective process to create the “weathered end” appearance that I desired for the deck of this very battered and heavily used flatcar.
23. Painted air hoses
24. Painted brake levers
25. Installed brake line air retaining valve
26. Painted all AB brake system components
27. Stained deck boards
28. Painted side sills and end channels
29. Painted wheels
30. Formed and installed coupler release levers. Release levers are made from pieces of 0.012” brass wire and mounted with eye-bolts
31. Painted tip of air hoses
32. Applied decals using Micro-Sol and Micro-Set
33. Painted trucks and couplers
34. Installed deck boards
35. Cut brakestaff base plate from 0.005” thick sheet brass
36. Installed brake wheel, brakestaff, and base plate, and painted these items.
37. Weathered trucks, underframe and couplers
38. Painted all stake pockets, stirrups, grab irons, brake release levers and left rings to improve the rusted appearance of these items
39. Weathered deck boards
40. Installed trucks with wheels, and couplers.
41. Built, painted and installed steel beams per Cadrail drawing
42. ~~Gave up~~ Declared Victory

Construction Process Referenced Photos

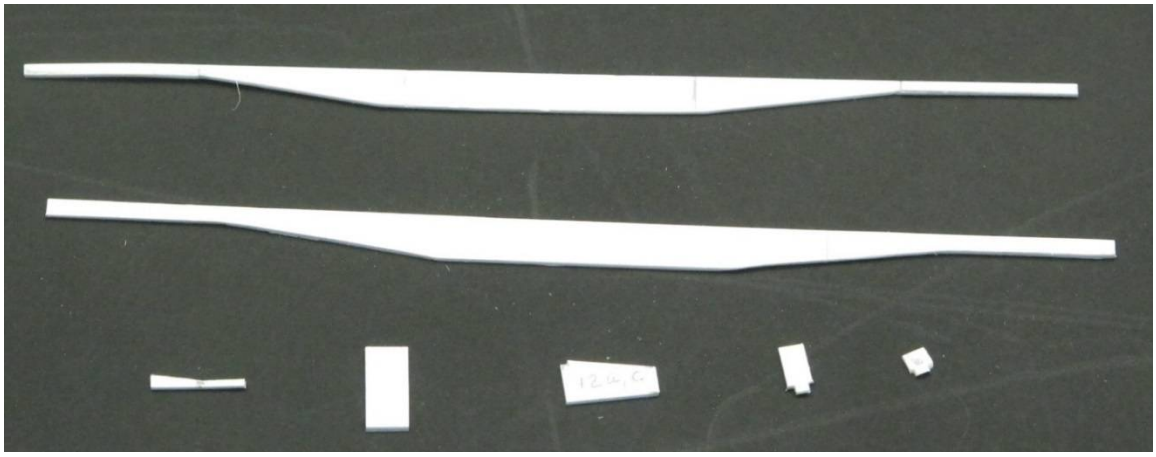


Photo 1 – Styrene cutting templates

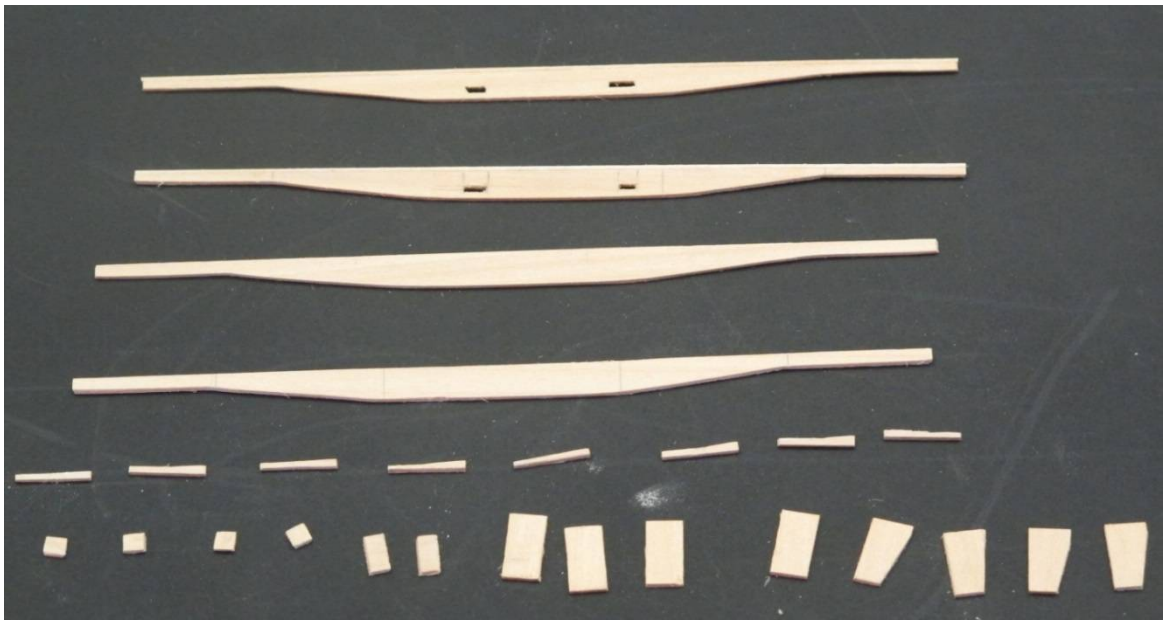


Photo 2 – Basswood pieces for underframe

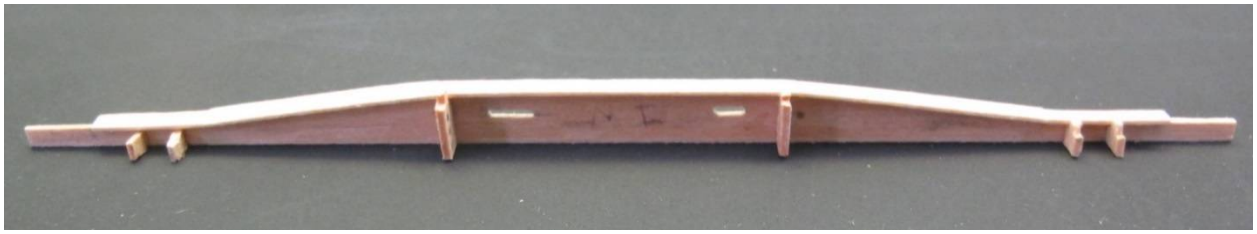


Photo 3 – Partially assembled center sill with attached center sill spacers. Horizontal holes are for the AB brake system levers.

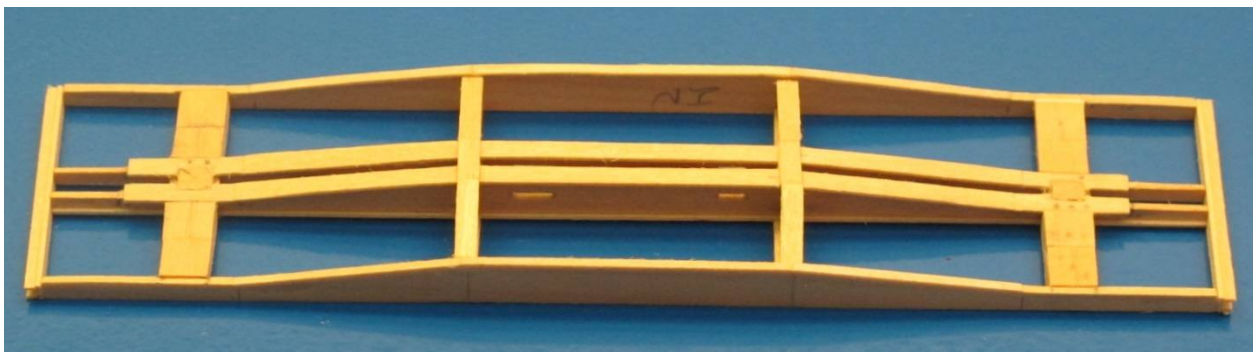


Photo 4 – Completed flat car underframe

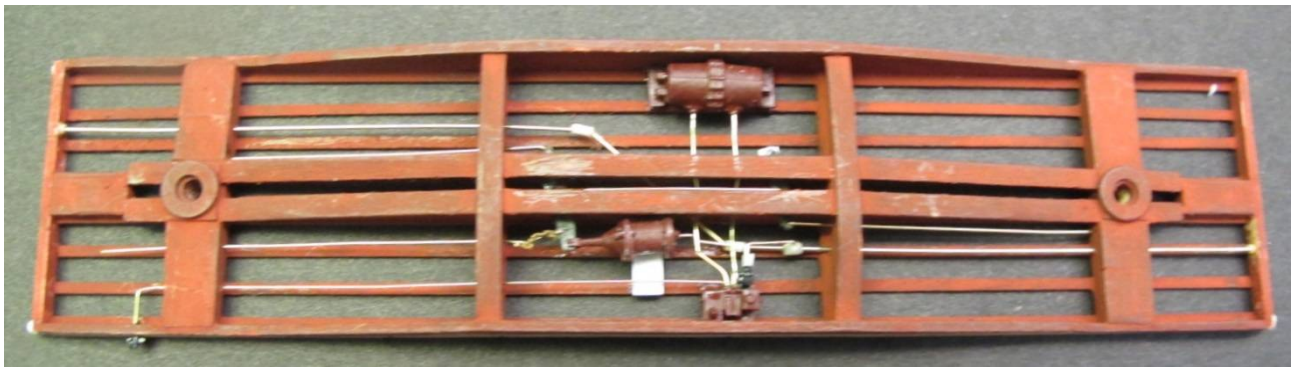


Photo 5 – AB Brake System prior to painting

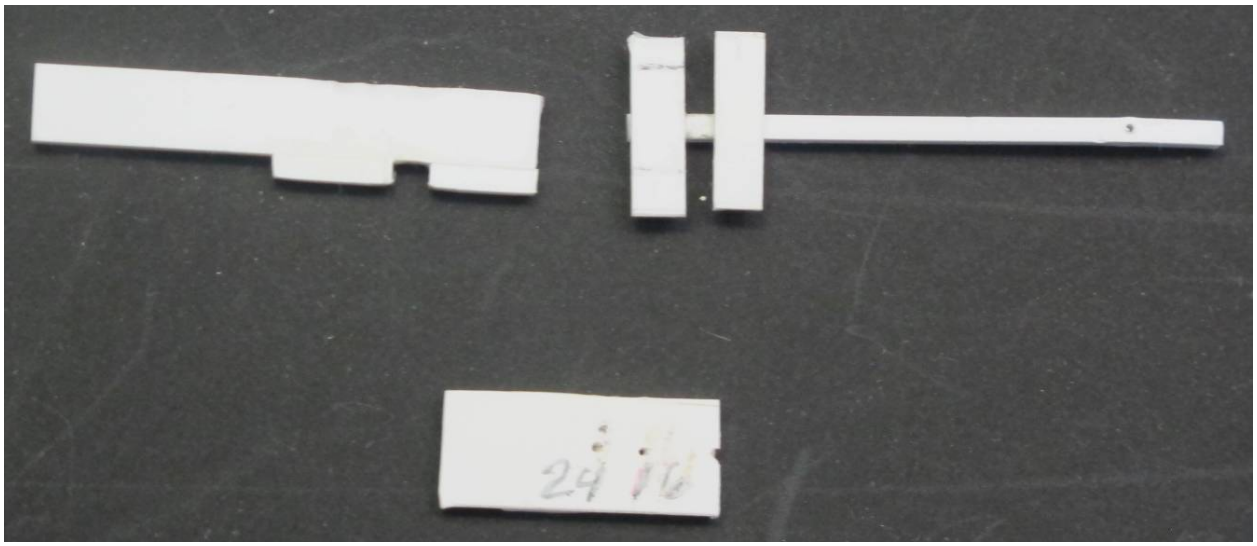


Photo 6 – Stake Pocket forming / shaping tool (top), and grab iron bending tool (bottom)

Finish and Lettering

Since the SVL 65410 flat car was originally owned by the PRR I desired to keep the lettering as consistent as possible with the car's original letting. I made an inquiry on https://prr.groups.io/g/PRR/topics asking for help in identifying the PRR font style / font type that was used for PRR car lettering. The general consensus from the list of PRR modelling experts was that the PRR created their own stencils for marking cars, arrogant bastards aren't they! Microscale Decals set #87-1510 Pennsylvania Railroad Early Fright Cars decal set was used on this car. An advantage of this specific decal set is that the letters S, V and L are all contained in the word Pennsylvania.

It appears that the transfer of ownership papers from the PRR to the SVL did not include the file card with the name of the paint and a sample of the paint that was used by the PRR on the

original car. As such the underframe was originally painted with Floquil Tuscan paint and later repainted with Floquil ATSF Mineral Brown which the SVL believes was a much closer match to the original paint.

The AB Brake System components and lines were Painted with Model Master Grimy Black.

The underside of the underframe was painted with Floquil Tuscan and Floquil ATSF Mineral Brown

The side sills and the end channels were painted several times with Floquil ATSF Mineral Brown

The deck boards were stained with three different home-made mixtures of alcohol, Black, and Brown India Ink.

The air hoses were painted Grimmy Black and the tip of each air hoses was painted Pewter Gray.

The wheels were painted with Model Flex Shipyard Rust and while the paint was still wet the same paint brush that was used to apply the Shipyard Rust paint was used to dab on Bragdon Soot weathering powder to create the textured appearance of dirt buildup on the wheels.

The stake pockets, grab irons, coupler release levers and lift rings were painted with Americana Burnt Sienna

The trucks were painted with Americana Raw Umber

The brakestaff, brake wheel, and base plate were painted with Grimmy Black

Bradgon Weathering Powders were used for highlighting and weathering all parts of the SVL flat car. The powders used were Soot, Weathered Brown, Grimmy Black, Dust Bowl Brown and a custom mixture I had used on a structure several years ago.

Testors DullCote was used to seal the decals, and after various applications of the paints and/or weathering powder

Scratch built

A detailed EXCEL spreadsheet listing all the parts used in the construction of the SVL 65410 Flat Car can be found in the Appendix. By broad category the part counts are as follows:

Category		Scratch built part count		Commercial part count
Basswood pieces		34		
Strip wood pieces		138		
Brass sheet and wire pieces		57		
Styrene pieces		78		
Non-excluded				8
Totals		307		8

The end result shows that the SVL 65410 Flat Car contains 97.46% scratch-built parts, which exceeds the minimum acceptable percentage. It is understood that the following commercial pieces / components are exempt from the scratch-built parts count.

1. Trucks and wheels with axels
2. Couplers
3. Screws to attach the above two items
4. AB Brake System
5. Paint
6. Decals

References

1. Article in the October 1977 issue of Model Railroader by John R. Porter entitled *Build a Pennsy flatcar from scratch*
2. NMRA Data Sheet D5d – Safety Appliances
3. https://prr.groups.io/ PRR modelling forum – answers to general inquiries
4. https://www.railroad-line.com/forum/topic.asp?TOPIC_ID=24682 NMRA Car certificate forum
5. https://pmrr.org/Equipment/FM/index.htm – Peter Vanvliet's excellent web site detailing his construction of a flat car including photos from his visit to the Railroad Museum of Pennsylvania
6. http://prr.railfan.net/diagrams/ - PRR equipment diagrams and dimensions
7. *Model Railroading's Dark Underbelly,* Clinic handout, date, clinician and location are unknown
8. *Detailing Freight Cars* by Jeff Wilson, Kalmbach Books
9. Step by Step article by Cody Grivno Model Railroader November 2108, page 25
10. Model Railroad Hobbyist #84 February 2017, "Getting Real|19, page 43

Lessons Learned

1. Use styrene instead of basswood for underframe
2. Do not create fish belly style underframe, too hard to get brake system installed.
3. Use the same Kelvin rated and CRI rated light bulb at train work desk as is used in the train layout room. (Lesson learned very late in the SVL 65410 flat car construction process. See photos below when the light bulb was changed on 6/14/19)

Deck photo under CFL bulb

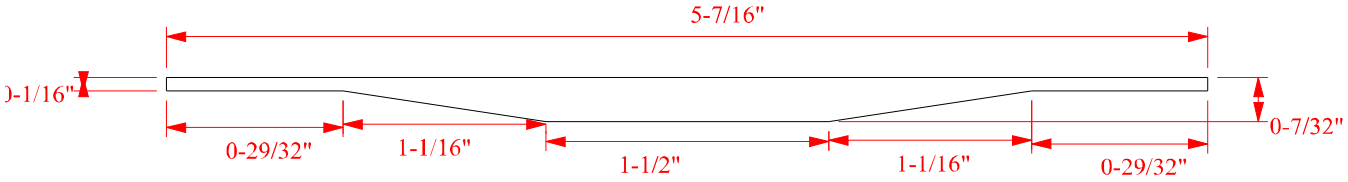
Desk photo with CREE 5000K, CRI 90+ LED bulb

Appendix

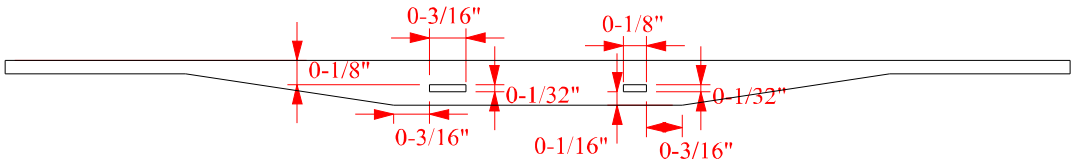
Page #	Contents
1	Front page of John Porter article
2-10	Cadrail drawings • Principle Underframe Structural Pieces – Large • Principle Underframe Structural Pieces – Small • Miscellaneous Parts • Assembly Notes and Dimensions • Brass Things • Steel Beams
11,12	Part count Excel spreadsheet

Principle Underframe Structural Pieces - Large

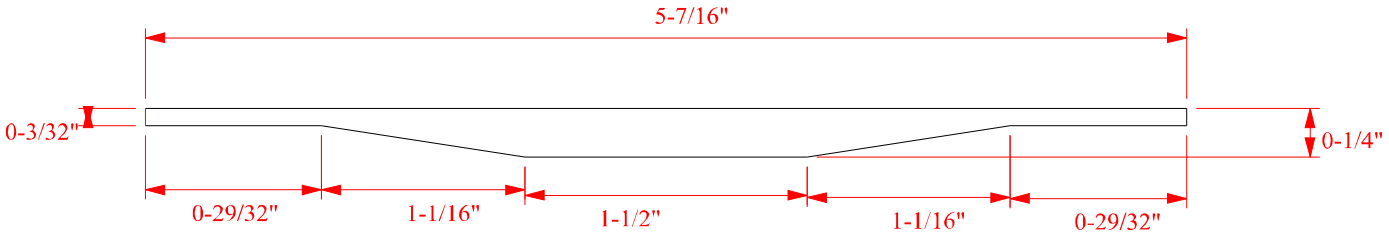
Cut all underframe structural pieces from Northeastern Scale Lumber 1/32" sheetwood



Center Sill - 2 req.



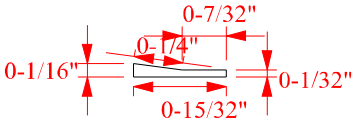
Center Sill Brake Lever Slots



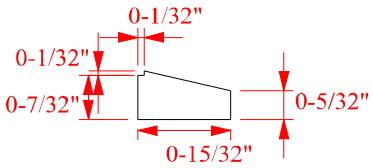
Side Sill - 2 req.

Principle Underframe Structural Pieces - Small

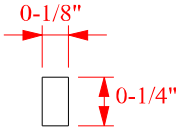
Cut all underframe structural pieces from Northeastern Scale Lumber 1/32" sheetwood



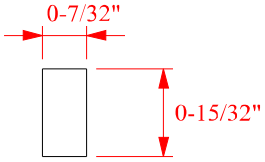
Outer Body Bolster Sill - 8 req.



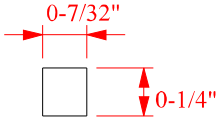
Cross Sill - 4 req.



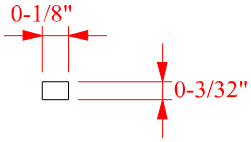
Spacer-1 - 2 req.



Top Stiffner for Outer Body Bolster Sill - 4 req.



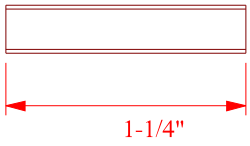
Bottom Stiffner for Outer Body Bolster Sill - 8 req.



Spacer-2 - 4 req.

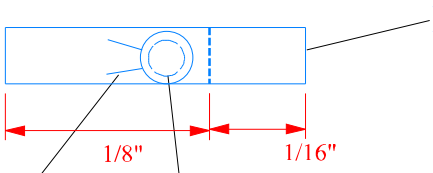
Micellaneous Parts

End Channel not to scale, make 2



Evergreen Styrene C-channel 0.08" wide

Poling Pocket not to scale, make 4



Poling Pocket gusset Evergreen Strip Styrene 1" x 6"

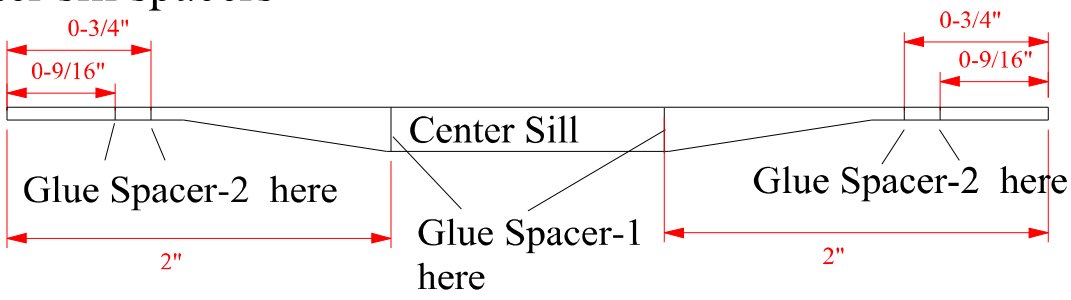
Poling Pocket Evergreen 0.06" rod drilled out

Poling Pocket Reinforcements Evergreen Strip Styrene 1" x 4"

Assembly Notes and Dimensions

(NSL - Northeastern Scale Lumber Strip Wood)

Center sill spacers



Flanges

Glue NSL 2 x 4 to top edge of Center Sill - overhang to the outside

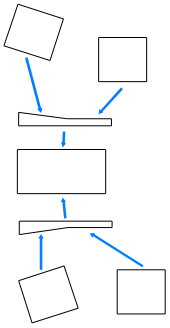
Glue NSL 2 x8 to bottom edge of Center Sill - centered

Glue NSL 2 x 4 to bottom edge of Side Sill - overhang to the inside

Assembly Notes and Dimensions

(NSL - Northeastern Scale Lumber Strip Wood)

Bolster Assembly - make 4



Bottom Stiffners

Outer Body Bolster

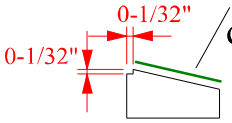
Top Stiffner

Outer Body Bolster

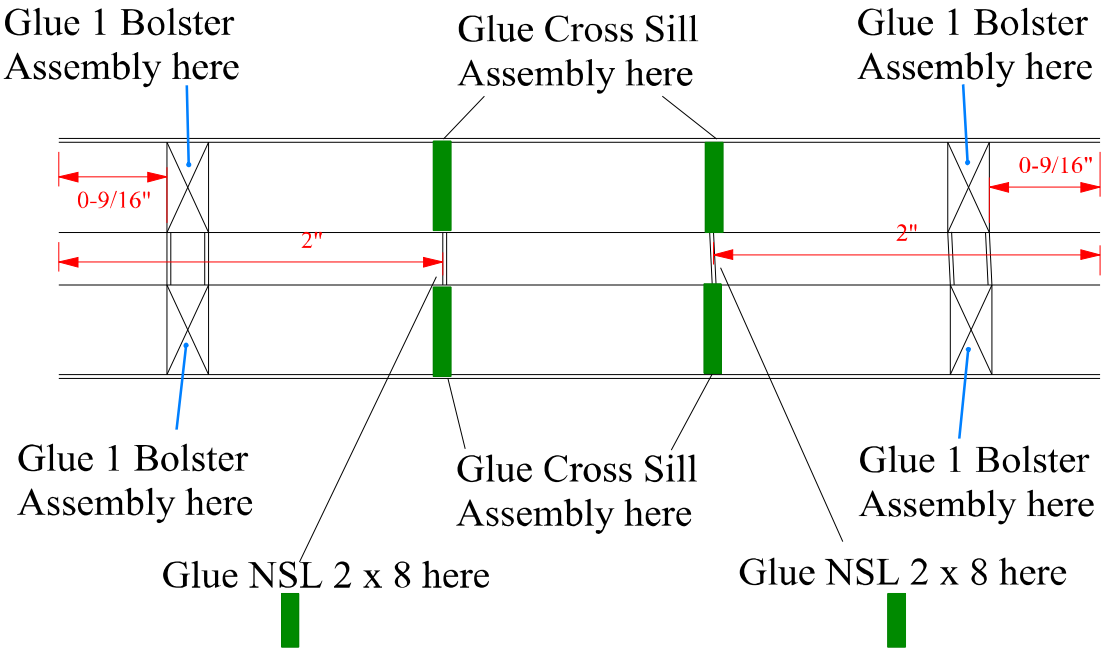
Bottom Stiffners

Glue Arrow

Cross Sill Assembly - make 4



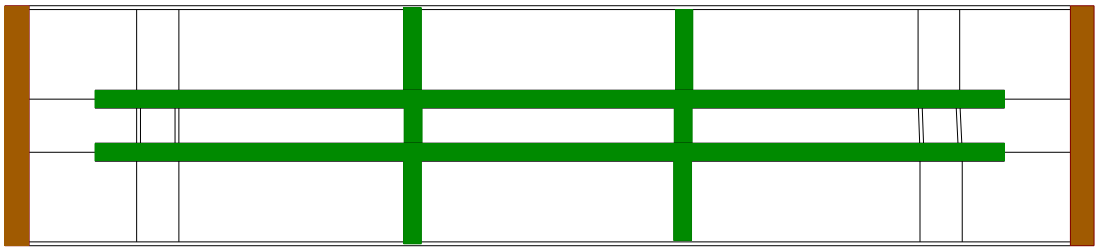
Glue NSL 2 x 8 to diagonal surface - centered



Assembly Notes and Dimensions

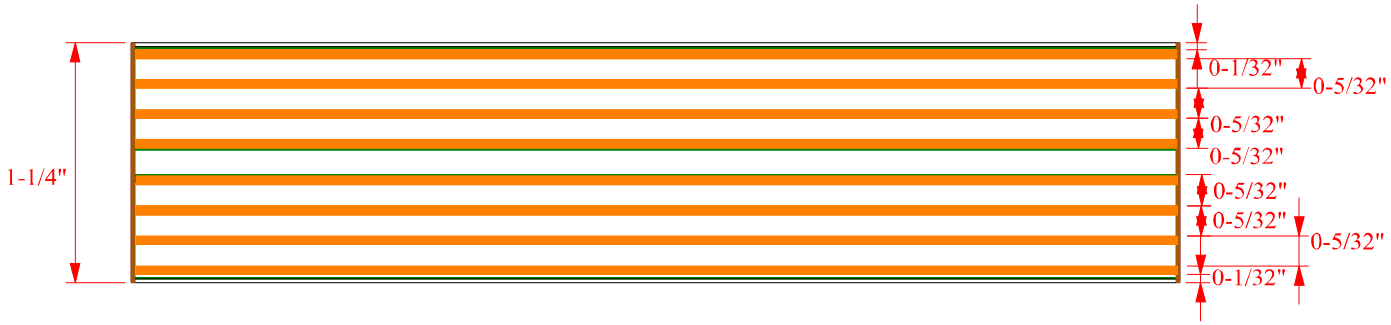
(NSL - Northeastern Scale Lumber Strip Wood)

Glue end channel to ends of side and center sills. Top of end channel is even with top of side sills. Put pieces of NSL 2 x 4 under center sill which sit 1/32" below top of end channels.



Bottom View

Stringers NSL 2 x 4



Assembly Notes and Dimensions

(NSL - Northeastern Scale Lumber Strip Wood)

Floor Boards NSL 2 x 6 w/0.005" Spacing

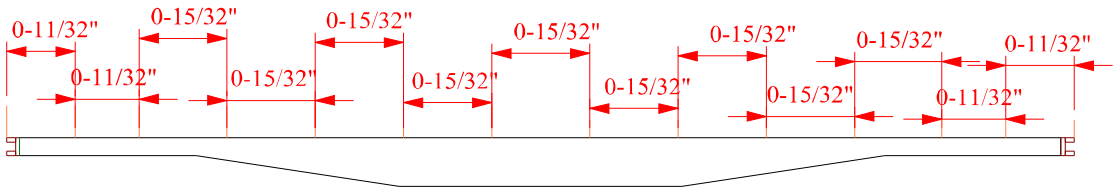
Locate brake wheel so that rim of brake wheel is 11/32" in from top left end of flooring deck per NMRA Data Sheet D5d Figure 8b

Brass Things

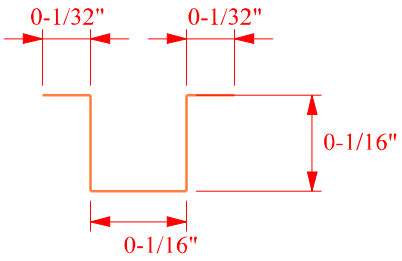
Brass Things made from 0.005" thick sheet brass, cut 1/16" (approx. 6" prototype) wide

Stake Pockets

Stake Pocket spacing on outside of side sill

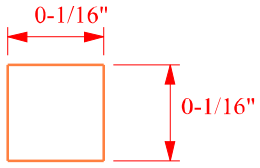


Stake Pocket, not to scale, make 24



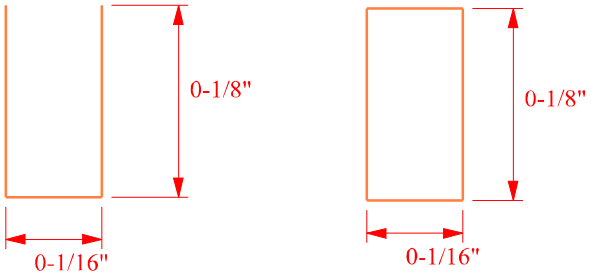
Front View

Note: Locate brake line air retaining valve between lift ring and first stake pocket



Side View

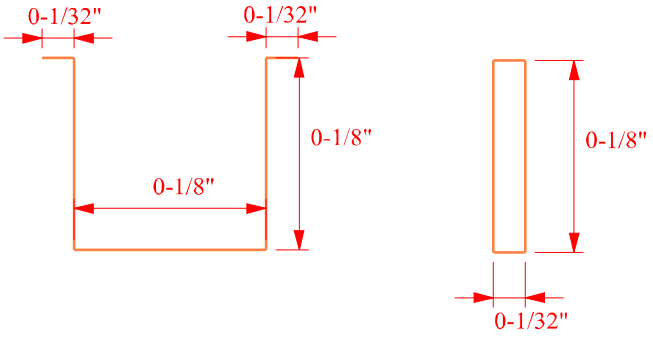
Brakestaff Stirrup, not to scale, make 1



Front View

Side View

Stirrup Steps, not to scale, make 4

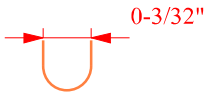


Front View

Side View

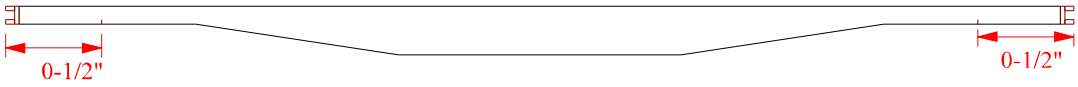
Brass Things (Cont.)

Cable Loop / Lift Ring, not to scale

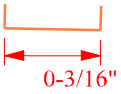


Use 0.012" brass wire for Lift Ring, make 4
Cut wire 5/16" long and form around # 42 drill bit

Cable loop locations - both sides



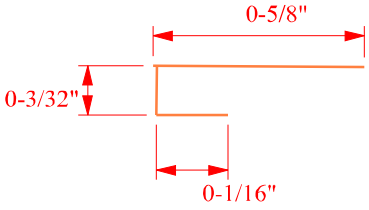
Grab Irons, not to scale



Use 0.012" brass wire for Grab Irons, make 8

Per NMRA Data Sheet D5d Figure 8 a and b
grab irons on ends of car located at most 3/16" in from end of car
grab irons on sides of car located at most 1/8" in from end of car
grab iron width 9/32" for 16" prototype grab irons
grab iron standoff distance 0.030"

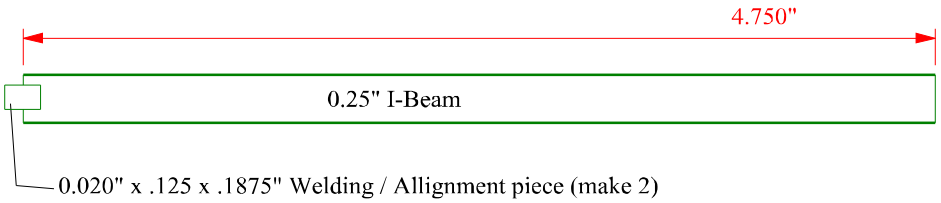
Coupler Release Lever, not to scale

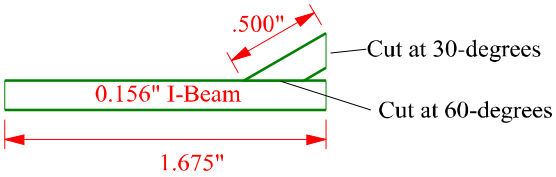


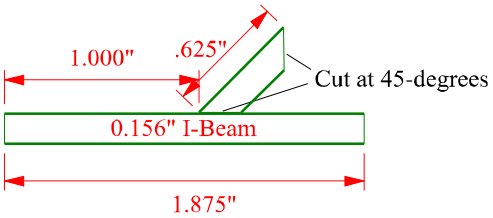
Use 0.012" brass wire for Coupler Release Lever, make 2

Locate supporting eye bolts 3/32" and 5/16" from end of end channel

Load Pieces


4.750"
0.25" I-Beam
0.020" x .125 x .1875" Welding / Allignment piece (make 2)


.500"
Cut at 30-degrees
0.156" I-Beam
Cut at 60-degrees
1.675"


1.000"
.625"
Cut at 45-degrees
0.156" I-Beam
1.875"

Build a Pennsy flatcar from scratch

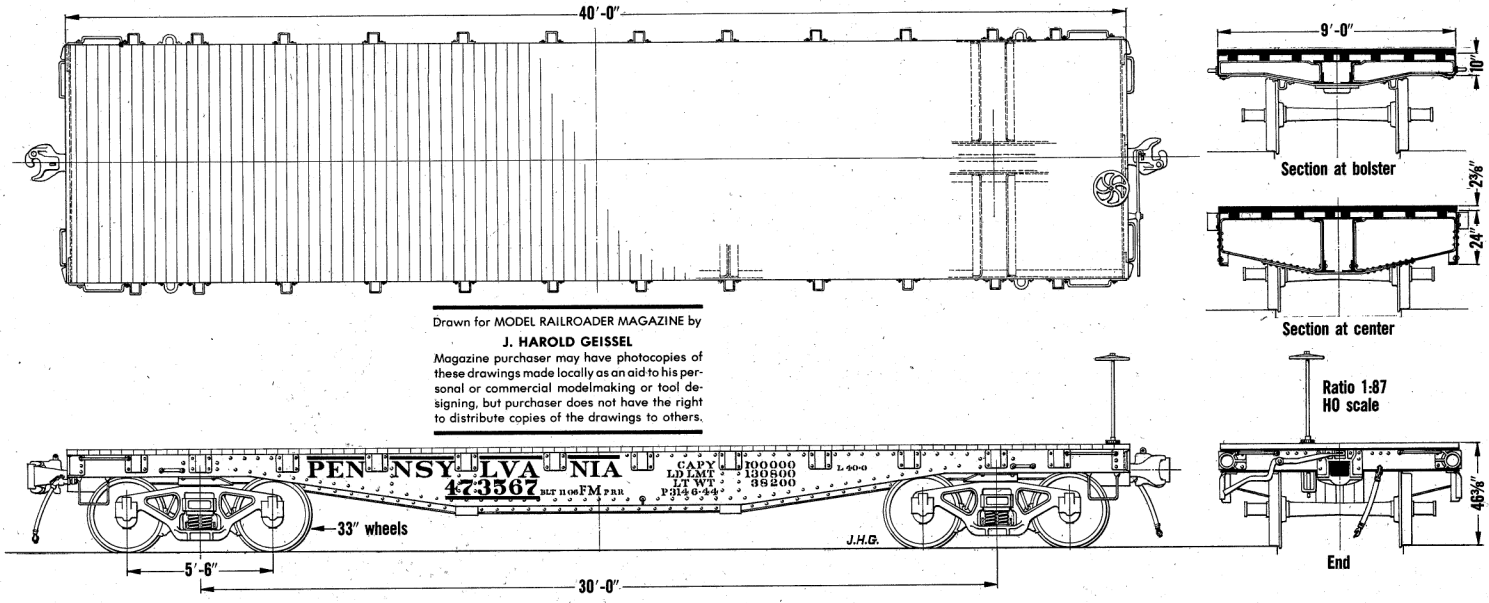
An ideal first scratchbuilding project for the beginner, yet challenging enough for the experienced modeler

BY JOHN R. PORTER
PHOTOS BY A. L. SCHMIDT

FLATCARS are nearly indispensable on most real railroads because they can be used for all sorts of loads that will not fit in other cars. This particular model was built along the lines of a Pennsylvania RR. design that was made in large numbers during the steam era. Most of the real flatcars of this type were riveted together like the one in the drawing. However, I was able to find several similar flatcars that the Pennsylvania RR. built with all-welded construction. The welded car was ideal for this project because it eliminated the need for including rivet detail on the model.

This car project is not a one-evening project. It is an ideal first scratchbuilding project for the beginner; yet it still retains enough challenge to keep an experienced modeler busy. The model was fabricated the same way the prototype was built, but wood [or styrene] was used in place of steel. The completed model weighs only a few ounces, but it does track well with no additional weighting. I feel this is the result of prototype construction methods and the fact that the model is square and doesn't have any warp to it. My model was built in S scale, so material dimensions are what I used. Actual car part dimensions are in scale feet and inches so they can be used in any scale. I recommend using the 1/32" material thickness for the frame parts if the car is made in HO or 1/4" scale.

The tools used for this project are the usual items found on most modelbuilders' workbenches. They include: a hard-backed 1¼"-deep razor saw, a scriber, an aluminum miniature miter box, emery boards, a hobby knife, extra blades for the knife,



Drawn for MODEL RAILROADER MAGAZINE by
J. HAROLD GEISSEL
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SVL-65410

Manufacturer	Part #	Part Name	Scratchbuilt Part Count	Commercial Non-exempt Part Count	
Northeastern Scale Lumber	70138	Basswood	2		center sill
			2		side sill
			8		outer body bolster sill
			12		Stiffners for outerbody bolster sills
			4		outer cross sill
			6		center sill cross member/spacer
	3012	2x4 strip wood	12		flanges
			8		stringers
	3014	2x8 strip wood	20		flanges and spacers
	3030	4x4 strip wood	4		glue blocks
			30		blocks under steel beams
	3013	2x6 strip wood	64		deck boards
K&S Brass	250	0.005" sheet	24		1/16" wide stake pockets
			1		1/16" wide brake shaft stirrup
			1		brakestaff base plate
			4		1/32" wide stirrup steps
Evergreen Strip Styrene	8106	1x6 strip styrene	4		poling pocket corner gussets - end
			4		poling pocket corner gussets - side
Plastruct	90585	0.06" rod	4		poling pocket
			2		brake line coupling to air hose
Evergreen Strip Styrene	8104	1"x 4" strip	8		poling pocket reinforcing brakets
Evergreen Styrene	263	C channel	2		2.5" long end channels
	281	0.06" H channel	4		support bracket for reservoir and AB Control valve
	211	0.04" rod	7		main brake air line couplings
			1		brake wheel mounting coupler
	277	0.25" I-beam	1		steel beam
	275	0.156" I-beam	4		steel beam
	146	.040"x0.125" strip	1		platform for brake cyllinder
Tichy Train Group	8142	2" nut 3.5" washer	1		bolt for small brake lever mount
			24		anchor blocks on under steel beam supports
	3037	eye-bolt	4		brake release lever mounts
			6		cable hold downs
Evergreen Strip Styrene	164	0.08"x0.08" strip	1		mount for small brake line

Detail associates	2506	0.019" brass wire	3		main brake air line
			1		brakestaff
	2504	0.012" brass wire	2		truck rods
			1		AB control valve to cylinder
			2		AB control valve to reservoir

SVL-65410

Manufacturer	Part #	Part Name	Scratchbuilt Part Count	Commercial Non-exempt Part Count	
Detail Associates			1		brake wheel pull rod
			1		AB control valve line to air retainer valve
			1		brake lever push rod
			4		cable loop / lift ring
			8		grab irons
			2		coupler relese levers
			1		branch air line to AB control valve
A-Line Chain	29219	40-link per inch		2	brake wheel pull rod chain
Cal-Scale	276	Air hose		2	end of car air hose
Kadee	209	0.010" washer		2	under bolster
	208	0.015" washer		2	under bolster
			---	---	
			307	8	
		Percentage	97.46%	2.54%	