Freight Train Operation -

and Model Car Forwarding Methods

By Dave Clemens

One morning as you were filling your cereal bowl with Rice Krispies you realized the box is nearly empty.

You and others buy a new box, which starts a chain reaction rippling across the North American rail network.

The supermarket will replenish its supply from a local warehouse,

who will be resupplied by the regional distributor.

Kelloggs will resupply from stock, or

thousands of purchases will affect the size of the next batch of Rice Krispies production.

Rice Krispies contains rice, sugar, salt and malt flavoring.

Kelloggs probably has some supplies of rice on hand, but eventually more rice will be needed.

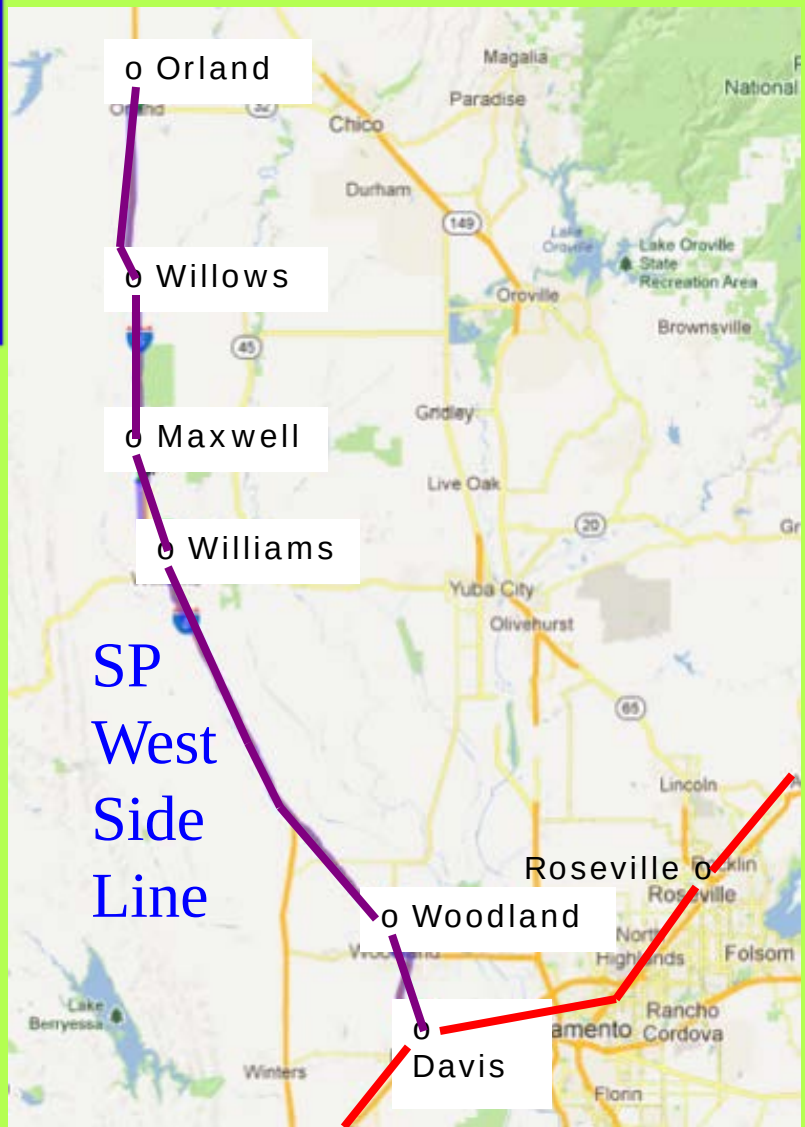
Northern California's Sacramento Valley is the largest supplier of rice in America.

Local Rice farmers have contracts for steady streams of rice to Kelloggs.

Eventually, the farmer or local elevator operator will order boxcars or covered hoppers (depending on the era).

to move the bulk rice to Kelloggs in Battle Creek, Michigan.

Until the early 1980's, the Southern Pacific served the rice growers on the west side of the Sacramento Valley. Today, the California Northern (CFNR) does the work.



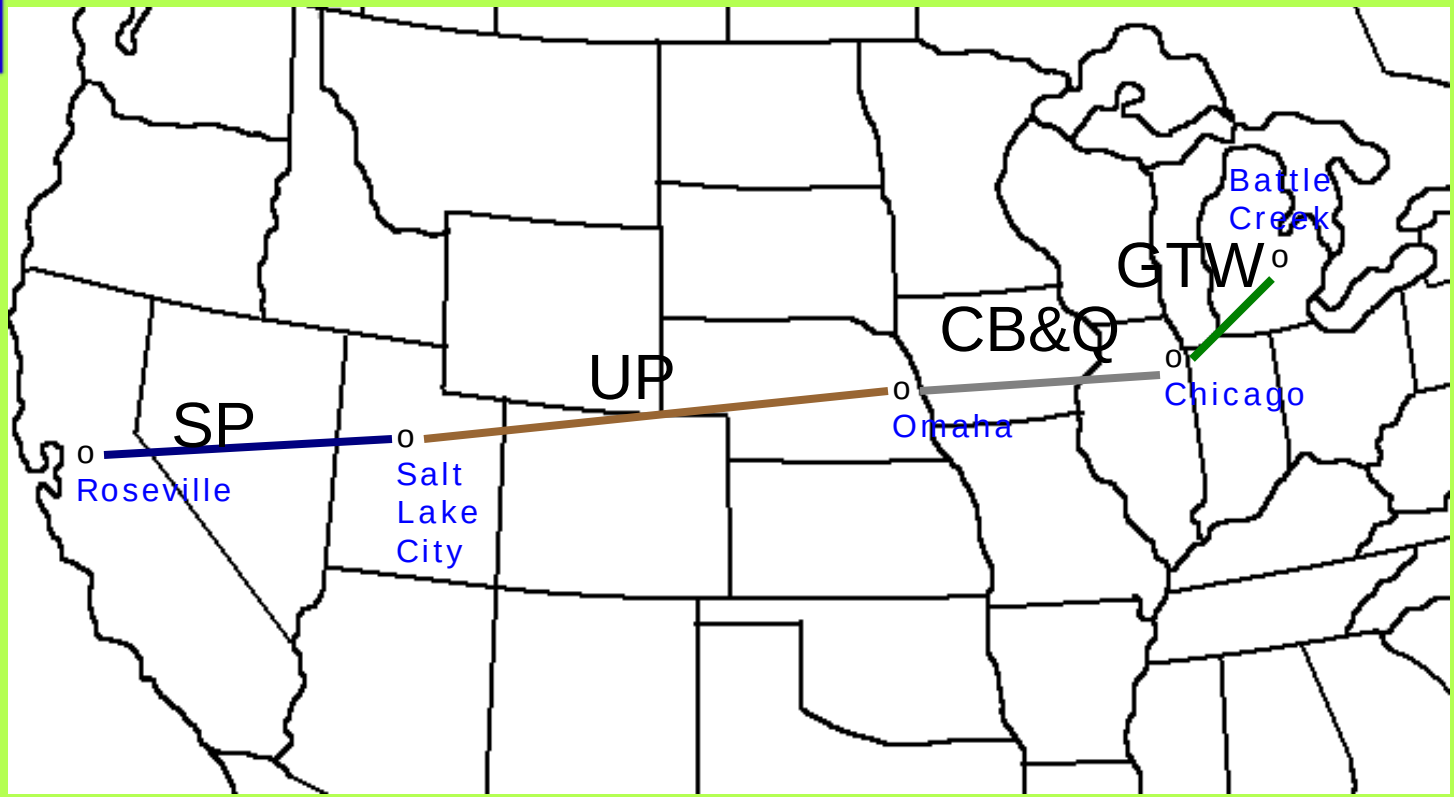
If an appropriate car isn't available locally, the request will move up the SP/CFNR/UP (post 1996) car distributor chain

until perhaps an appropriate car is dispatched from Roseville Yard to the elevator siding to be loaded.

When loaded, the car will be pulled,

and sent to Roseville to be combined with other cars bound for the Mid-West.

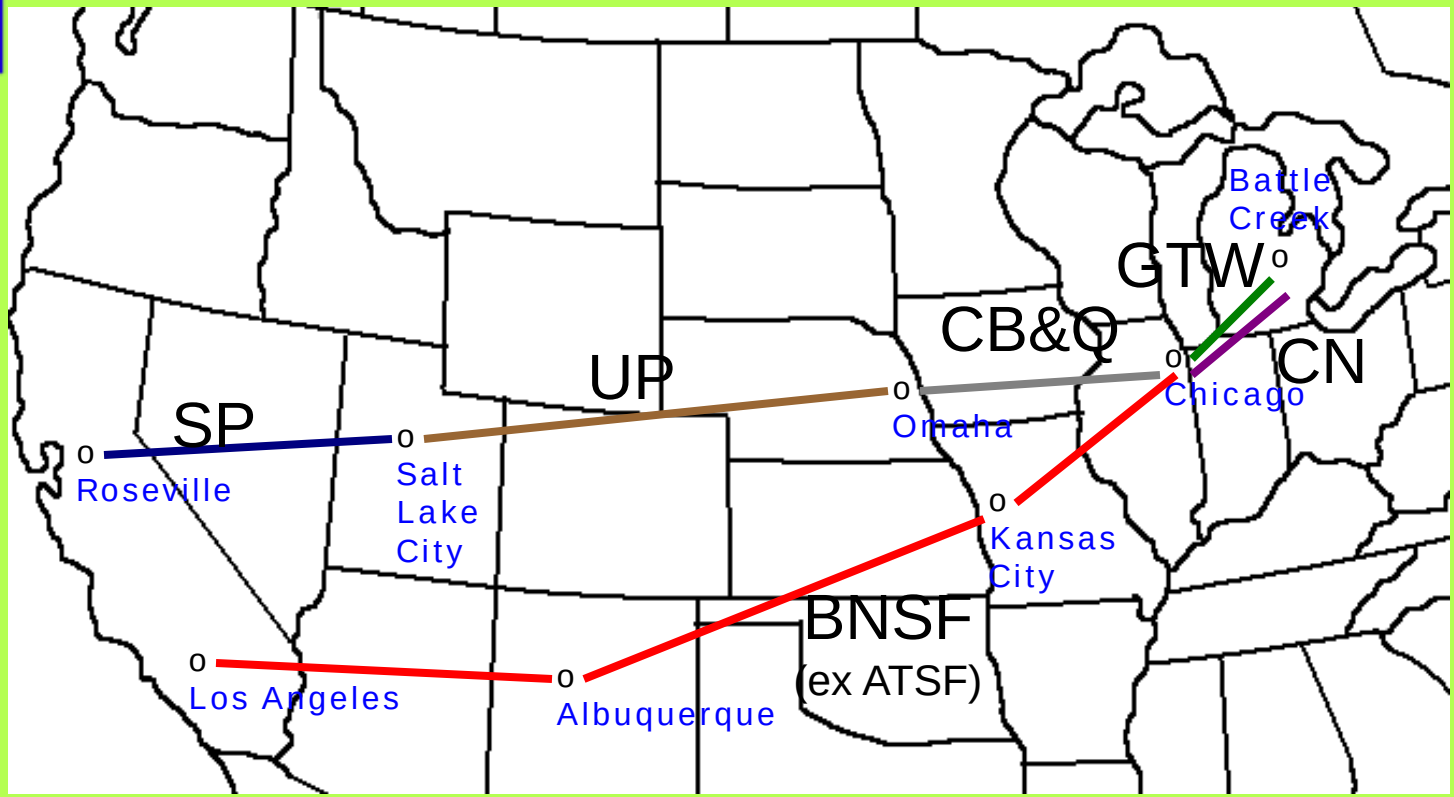
Days later, after traversing multiple railroads, the car will slip through Chicago enroute to Battle Creek and Kelloggs.



Meanwhile, the Kelloggs West Coast Distributor in LA combines supermarket requests, and orders to restock the distribution chain,

and Kelloggs orders the cars to deliver the West Coast order.

Over time, the number of available routes has shrunk to just six majors today.

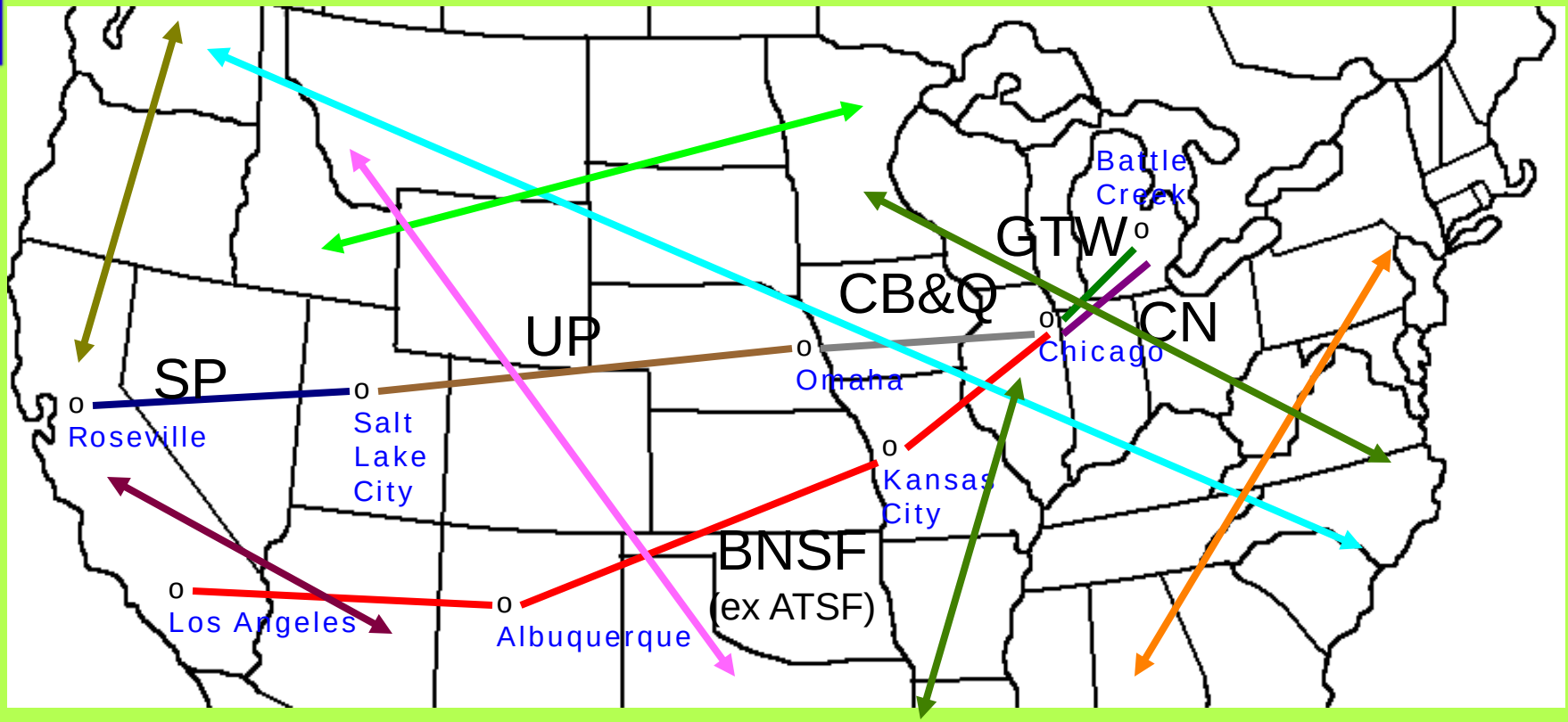


Today, that route might be CN (ex-GTW) or CSX (ex-PRR) to Chicago, then UP or BNSF (ex-ATSF) beyond.

While the Rice Krispies cycle is proceeding, thousands of other products or materials, are being ordered, shipped,

and delivered over hundreds of routes, between a myriad origins and destinations.

Good grief, how can we make sense of this?



Why is this Important?

I’ve spent the past six decades trying to understand, “How do railroads work?”

My earliest insight “paired” industries on your railroad such as a coal mine and a coal dealer, a lumber mill and lumber yard, cattle pen and slaughter house.

These examples on a typically sized model railroad make little sense. None of these just miles apart justify a railroad move.

Yet, the examples make sense over longer if the origin or destination is “beyond” the railroad.

A coal dealer on the layout would be served by a mine “off stage”.

Why is this Important?

As a part-time employee at a local train shop, I recommend adding one or more switches to a train set with each track serving an industry/business.

The simple addition of a switch transforms boring lap running into a day in, day out activity setting out a car for loading or unloading.

Then add a second, or third industry location, a yard track or two, and your model begins to feel more like railroad.

Yet, along came Model Railroader in their February 1960 issue on Operations and the illusion went “poof”.

Railroads are more than a collection of tracks and industries. Railroads pool resources to provide transportation service.

So, What's a Railroad??

In the simplest form, a railroad moves people or products from one place to another efficiently and cost effectively.

But, the common element isn't just the rail-to-rail spacing, but the inter-connected nature of the railroad industry.

Railroad's cannot exist without other railroads. Otherwise, the New York Central boxcar in California would need to "helicopter in".

Railroad modelers use a "sleight of hand" to create some form of "beyond the railroad space" connection to the outside world.

The interchange track might be just a few cars in length tucked behind a hill or warehouse. With two interchange locations, small railroads function just like an actual railroad.

Historical perspective

The earliest railroads railroads dictated terms and conditions, established rates by fiat, and set priorities of service largely by "what the market would bear".

The Commerce Act of 1887 set the stage for nearly 100-years of Federal regulation by the Interstate Commerce Commission (ICC).

By the 1960's railroads faced declining long distance passenger ridership, redundant routes, and a declining industrial base particularly in the east, and upper Mid-west.

The Railroad Revitalization and Regulatory Reform Act (4-R Act) of 1976 created Conrail in hopes of creating a healthy successor.

The Staggers Rail Act followed in 1980 opening up rates, permitting customer contracts, and abolished collective rate making.

Bill of Lading to Waybill

Much like the military, nothing moves on a railroad without written instructions.

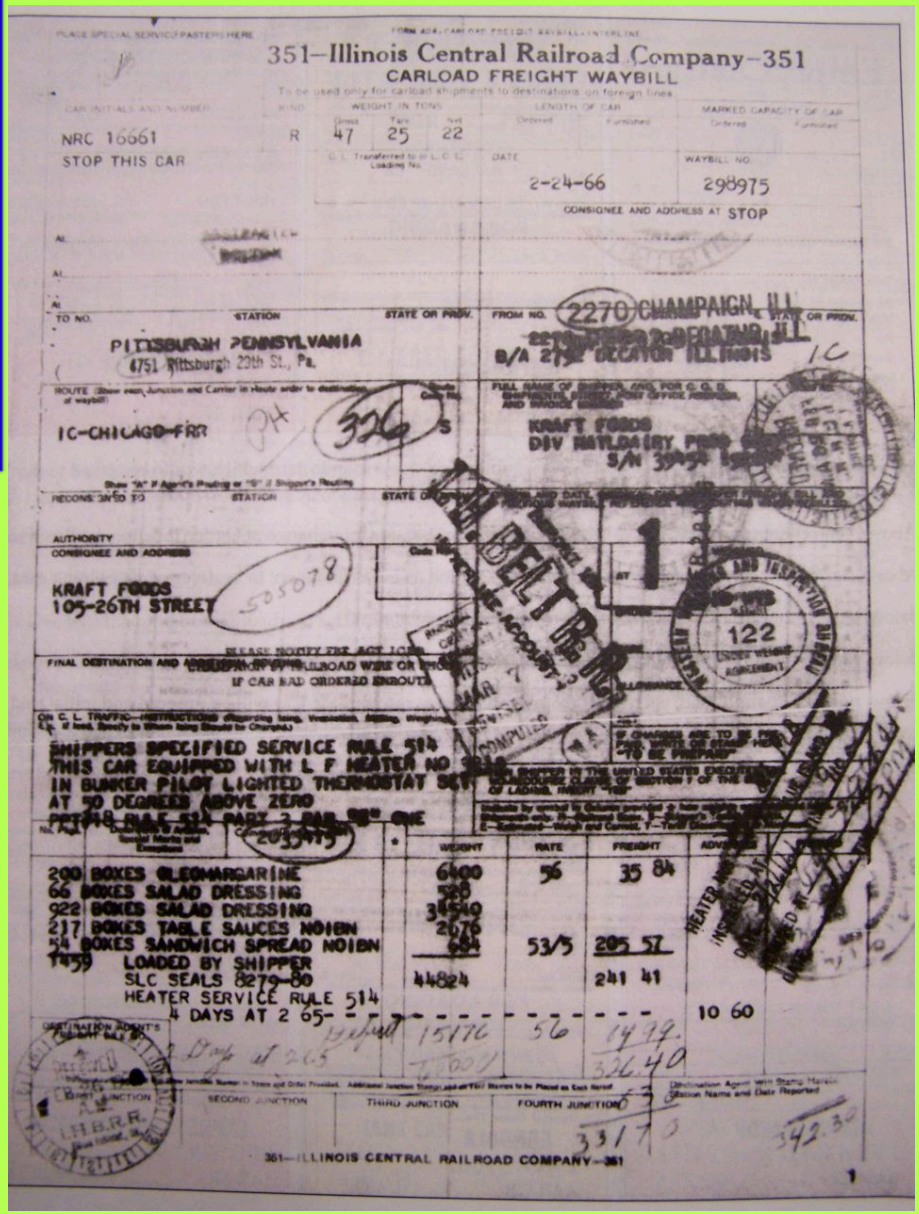
Bill of Lading information is transferred to a Waybill, the “contract document” for the requested shipment specifying pricing, standards, routing, and special instructions.

Before computers, railroads employed armies of Clerks to prepare, process, and maintain records on each and every car movement.

The local Agent might identify a car available locally, or the Car Distribution Department may need to find an appropriate car.

During the Regulated era the shippers typically had many choices of route from origin to destination. Even if the shipper was “captive” to a single railroad there were many “Gateways”.

Bill of Lading to Waybill


351—Illinois Central Railroad Company—351
CARLOAD FREIGHT WAYBILL
NRC 16661
STOP THIS CAR
2-24-66
298975
PITTSBURGH PENNSYLVANIA
4751 Pittsburgh 20th St., Pa.
IC-CHICAGO-FRR
KRAFT FOODS
105-26TH STREET
SHIPPERS SPECIFIED SERVICE RULE 514
THIS CAR EQUIPPED WITH L F HEATER NO
IN BUNKER PILOT LIGHTED THERMOSTAT SET
AT 50 DEGREES ABOVE ZERO
200 BOXES OLEOMARGARINE 6400 56 35 84
66 BOXES SALAD DRESSING 528
922 BOXES SALAD DRESSING 36540
217 BOXES TABLE SAUCES NOIBN 2670
54 BOXES SANDWICH SPREAD NOIBN 684
53/5 285 57
LOADED BY SHIPPER 44824 241 41
SLC SEALS 8279-80
HEATER SERVICE RULE 514
4 DAYS AT 2 65 10 60
15176 56
336 40
342 30
331 70
351—ILLINOIS CENTRAL RAILROAD COMPANY—351

Much like the military, nothing moves on a railroad without written instructions.

In either case the Commodity-Origin, Receiver-Destination, Routing, and special instructions are documented. This initial paperwork or Bill of Lading is transferred to a Waybill, which becomes the “contract document” for the requested shipment specifying pricing, standards, routing, and special instructions.

The Railroad's Role

The first step is to move the car to the shipper's siding, a local warehouse, or common loading track

The shipper typically has three to five days to load the car without penalty.

Once a car is loaded and released, the railroad moves those cars to a nearby Yard.

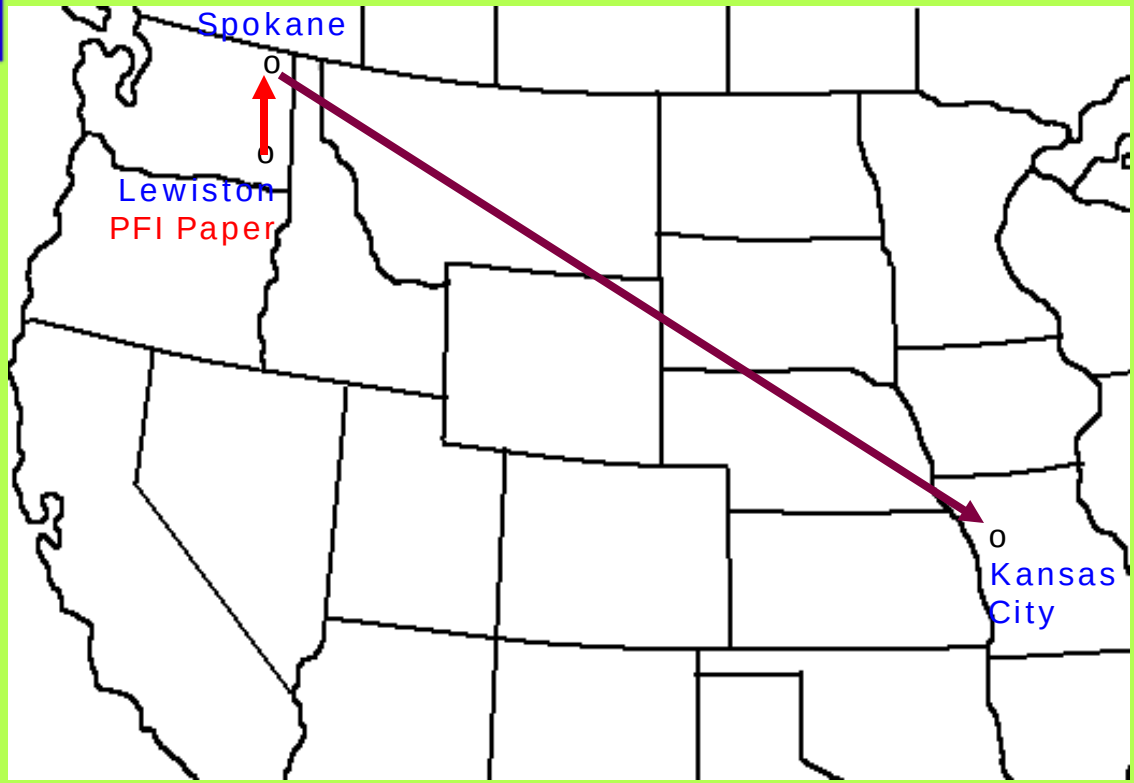
Railroad tariffs (Regulated Era) and contract rates/agreements (post-Stagger's Act) establish how much a railroad is paid for moving a specified weight of a commodity from origin to destination.

Railroad scales can be found in most substantial yards. In the Regulated Era, scales would certainly be found in every division point yard, and near major shippers in lesser yards.

Mainline Train Movements

PFI's Lewiston mill also produces coated printing paper (the slick stuff) used in magazines.

Many magazine printing plants cluster around Mid-West cities such as Kansas City or St. Louis.



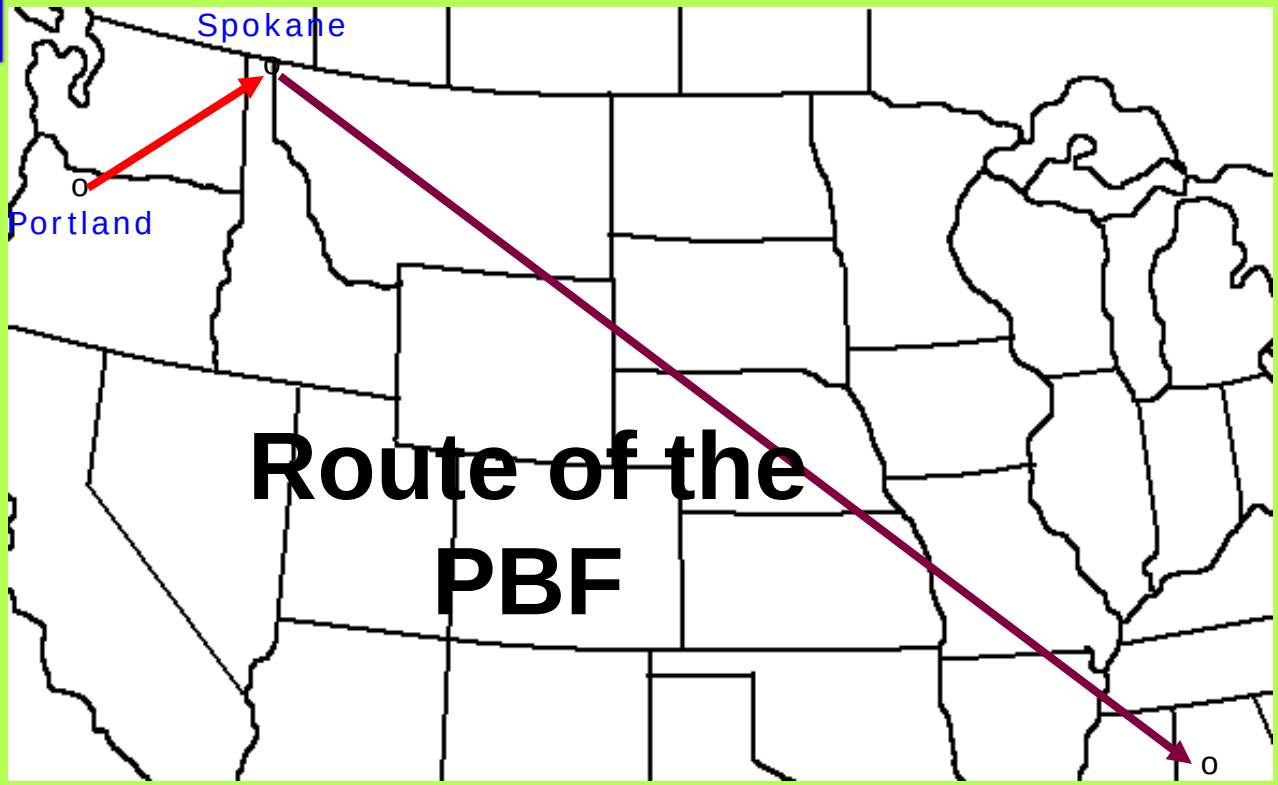
A 50-foot boxcar of PFI magazine paper comes off the NP (pre-BN) Highball at Yardley Yard in East Spokane.

The car would be combined with other cars destine to the Mid-West, including Kansas City.

Mainline Train Movements

The BN run-through priority freight train originated at Portland, Oregon's Lake Yard destine for Birmingham, Alabama.

The PBF (Portland Birmingham Forwarder) became one of the BN's primary train movements.



Over the years, the PBF saw refrigerator cars with seasonal fruit, then larger and larger numbers of piggyback flatcars tacked on just ahead of the caboose.

Train Selection

Every railroad develops a broad operating plan.

A “single horse” shortline may simply have the General Manager “direct traffic” each day.

But, larger railroads, those moving dozens if not hundreds of different trains on a daily basis, have a plan or schedule or timetable.

Back in the Regulated era, the Union Pacific issued Manifest and Perishable Train Schedules and

the Southern Pacific published Perishable, Merchandise and Manifest Train Schedule documents

Train Selection

The SP Perishable, Merchandise and Manifest Train Schedule describes the role of specific trains.

Condensed Perishable, Merchandise, and Manifest Train Schedule No. 15

SHASTA ROUTE

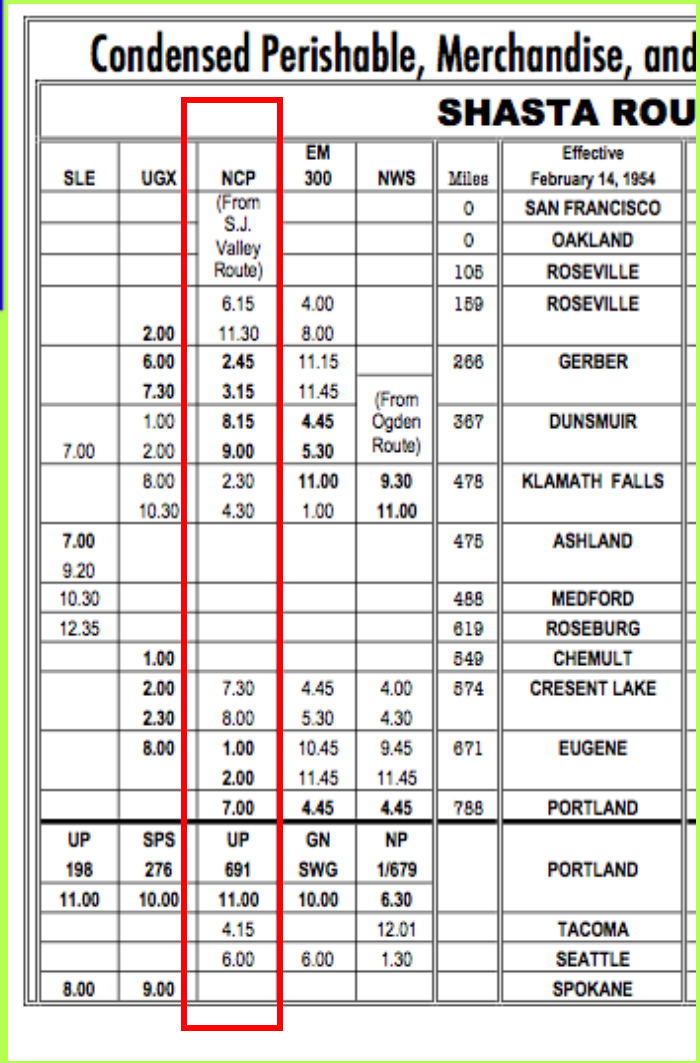
Issued March 5, 1954

SLE	UGX	NCP	EM 300	NWS	Miles	Effective February 14, 1954	Miles	WM 300	OS	SOX	PSS	SLW	
		(From S.J. Valley Route)			0	SAN FRANCISCO	788				(To S.J. Valley Route)		
					0	OAKLAND	734						
					106	ROSEVILLE	629						
		6.15	4.00		169	ROSEVILLE	629				2.30		
	2.00	11.30	8.00					11.00		4.15	6.30		
	6.00	2.45	11.15		266	GERBER	522	7.00		11.45	2.30		
	7.30	3.15	11.45	(From Ogden Route)				6.00	(To Ogden Route)	9.15	1.30		
	1.00	8.15	4.45		367	DUNSMUIR	422	1.00		4.15	8.30		
7.00	2.00	9.00	5.30					11.59		2.00	7.30	9.00	
	8.00	2.30	11.00	9.30	478	KLAMATH FALLS	314	6.00	9.00		1.30		
	10.30	4.30	1.00	11.00				3.00	6.30		11.30		
7.00					476	ASHLAND	336			3.00		9.00	
9.20										11.59		11.30	
10.30					488	MEDFORD	325			11.00		10.00	
12.35					619	ROSEBURG	195					1.30	
	1.00				649	CHEMULT	240				7.30		
	2.00	7.30	4.45	4.00	674	CRESENT LAKE	215	10.30	1.30		6.30		
	2.30	8.00	5.30	4.30				10.00	1.00		6.00		
	8.00	1.00	10.45	9.45	671	EUGENE	118	12.01	3.00		9.00		
		2.00	11.45	11.45				9.30			6.30		
		7.00	4.45	4.45	788	PORTLAND	0	4.00			1.00		
UP 198	SPS 276	UP 691	GN SWG	NP 1/679		PORTLAND		GN SCX	NP 2/680	GN GWS	UP 692	SPS 275	UP 151
11.00	10.00	11.00	10.00	6.30				1.30	10.30	8.00	6.00	7.00	11.00
		4.15		12.01		TACOMA			4.00				
		6.00	6.00	1.30		SEATTLE		5.30	5.00	2.00	3.00		
8.00	9.00					SPOKANE						7.00	12.45

Light Figures AM.
Dark Figures **PM**.

Train Selection

The SP Perishable, Merchandise and Manifest Train Schedule describes the role of specific trains.



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UP	SPS	UP	GN	NP		
198	276	691	SWG	1/679		PORTLAND
11.00	10.00	11.00	10.00	6.30		
		4.15		12.01		TACOMA
		6.00	6.00	1.30		SEATTLE
8.00	9.00					SPOKANE

On the Shasta Route (San Francisco/ Roseville to Portland) the NCP (North Coast Perishable – Los Angeles to Portland) is described as follows:

Originates at Los Angeles (see San Joaquin Valley Route). NCP handles perishable and manifest for points Fresno and beyond. Operates through to Portland. Shasta Route traffic in OVE (Overland East) and SJR (San Jose Roseville Extra) connects with NCP and UGX at Roseville. NCP from Roseville will handle only traffic for Eugene and beyond. Cut-off time for delivery of perishable to connections at Portland is

Train Selection

Yardmaster's and Clerks, Car Distributors, and customers use these tools to decide how to route a particular carload.

"Hotter cars", such as perishable traffic, will be directed to priority trains heading in the direction the carload needs to move.

On smaller railroads, or routes with fewer train options carloads may be held for the next available train or even "tomorrow's" train.

The Milwaukee Road mainline from the Mid-West to the Puget Sound typically had just three trains in each direction each day.

Two of those trains had published schedules with the third being little more than a Drag cleaning up what was left across the system.

Train Selection

When a particular car arrives in a yard may affect the “which train” consideration.

In our PFI coated paper example, if the car arrives at Yardley Yard in Spokane after the ‘first choice” train has already gone,

the Yardmaster must decide whether to hold the car for “tomorrow”, or forward the car in the desired direction on some other train.

Capacity of the yard, congestion on the system, and how many cars are headed in a particular direction all affect train selection.

Additional sections of a particular train may be needed to “keep the traffic moving”. On the other hand, a small overflow may not warrant an additional crew or motive power, leaving traffic for “the next train”, or even until “tomorrow”.

Other Types of Trains

Local freights

Through trains handle long-distance movements, frequently from origin to distant destination or interchange with another railroad(s).

These “premier” trains get all the glory, but the lesser trains make the through trains possible.

Any division with multiple origins and destinations will have one or more local freights making pick-ups (retrieving cars) or set-outs (delivering cars).

Some local freights operate over the length of the division, typically one direction today, returning the next.

On the Camas Prairie Railroad, the Grangeville Local ran about 80-miles from Lewistion to Grangeville on Monday, Wednesday, and Friday, returning Tuesday, Thursday, and Saturday.

Other Types of Trains

Local freights

A local train crew may leave one point, or yard working in one direction, and return home on the same day.

Most of these trains are known as Turns – as in “turn-around”.

Their route may cover only few miles of mainline (or branch line) serving their customers, delivering cars and picking up cars.

Where the density of customers is smaller, a Turn might serve 50- or 60-miles of mainline.

In the 1970’s WP’s Milpitas Turn ran from Stockton to Milpitas, California and back, about 80-miles each way each day.

Other Types of Trains

Drag freights or Haulers

On the Southern Pacific's Cal-P line from Oakland to Roseville, the SP fielded numerous local freights at intermediate points.

These "premier" trains get all the glory, but the lesser trains make the through trains possible.

To "feed" these local trains, the SP deployed a pair of drag-type freights know as "The Broom".

The eastward Broom originated in Oakland picking-up traffic at Port Costa (such as Shell, Union Oil and Standard Oil, Holly Sugar, and Hercules Chemicals explosives),

picking up at Cordelia Jct. near Suisun-Fairfield and finally at Davis from local crews working the West Valley Line food processors and farmers from Woodland north.

Some Specialized Services

Less than Carload (LCL) Service

Many shippers need less than a full carload of a particular product.

From 1917 until 1975 rail parcel delivery was provided by the Railway Express Agency much like the UPS service of today.

During the Regulated Era, items larger than a simple parcel (but less than a full carload) moved in less than carload (LCL) service.

Railroads created receiving stations and sorting facilities.

As industrialization blossomed in the 1900's, railroads constructed extensive networks of freight houses near manufacturing centers, and large population centers.

Railroads developed expedited service in major corridors: New York to Chicago on the New York Central's Pacemaker Service, or the SP's Los Angeles to San Francisco Overnight Service.

Some Specialized Services

Piggy-back, one Solution for LCL shipments

By the 1960's the interstate highway system had eaten into LCL service, many converted to less than truckload services.

Today companies like JB Hunt, Swift and choose rail intermodal services for movements, typically those beyond about 750 miles.

The concept of loading a trailer on a railroad flat car goes back to mid-1950's experiments by the Pennsylvania Railroad.

Initially, piggyback cars were loaded "circus style" from end of track ramps.

Although a few end of track ramps remained in service until as late as the 1980's, most were abandoned as pick-up and delivery truck hauls from more distant locations became the norm.

Some Specialized Services

Containers

SeaLand, the ocean container hauling company, was one of the early adopter of containers on piggyback flat cars.

I recall near trainloads of SeaLand trailers and containers plying the Burlington Northern in the1970’s.

Southern Pacific introduced one of the earliest container well cars, a stand-alone car capable of carrying stacked containers.

The tare or empty weight of well cars is roughly half the tare of a typical piggyback flat. Ultimately, articulation (five wells supported by six heavy duty trucks) further improved the tare to lading ratio.

Some Specialized Services

Coal - “loose car”, multiple origins

Coal was one of the earliest commodities moved by rail – first by horse drawn carts, then steam, diesel, or electric locomotives.

Here in the US, coal traffic falls into two broad categories –

first, Eastern and Mid-Western coal is typically collected from multiple coal producing tipples.

Once consolidated into solid trains, shipments went to river or coastal ports, to the furnaces of industry, electric power plants, or for home or business heating depending on the time period.

The Norfolk & Western, Chesapeake & Ohio, Southern, Baltimore & Ohio, Louisville & Nashville, Western Maryland, Pennsylvania, and dozens of others were significant “loose car” coal haulers.

Some Specialized Services

Coal - Unit trains

The second general category of coal traffic is unit trains originating at a single coal mine

and moving as a solid train to a power plant or port destination.

At both locations, the locomotives remain on the train during loading or unloading.

The world's biggest examples are the dozens of coal trains each day originating in the Wyoming Powder River Basin.

The entire system of mines to power plant is built on the efficiency of moving solid trains, rather than relying on individual cars and multiple points of origin.

Some Specialized Services

Iron Ore

Another “heavy haul” commodity is iron ore. The biggest US examples originate in the Minnesota Iron Range.

The Iron Range railroads would collect ore jenny’s (typically 30- to 36-foot ore cars), and forward them in up to 200-car trains to the Lake Superior ports to be transloaded to lake ships.

After the journey across Lake Superior and Lake Huron, then down the Detroit River into Lake Erie or Lake Ontario, most ships would off-load at ports between Cleveland, Ohio and Buffalo, NY.

From there, the rail journey would begin anew with a final destination in the steel furnaces in and around Pittsburg, PA.

Other iron or movements move by rail as far as Birmingham, Alabama, from Eagle Mountain to Fontana, California

Some Specialized Services

Autos

‘Til the 1950’s the auto industry was both a refiner of raw materials, steel, aluminum and plastic, and a producer of finished automobiles.

Since the 1970’s, the Detroit brands have been joined by European and Asian manufacturers, and the number of Ford, General Motors and Chrysler manufacturing plants has shrunk dramatically.

Since the 1980’s auto parts traffic traditional boxcars has declined significantly, supplanted by truck and container movements.

In the mid-century period, new cars moved in 50-foot boxcars fitted with special racks holding perhaps four autos.

By about 1960, railroads began offering bi- or tri-level auto rack service carrying eight to 12, or even 15 autos per car.

Gathering Prototype Data

Freight Car Counting for fun

in 1973 my wife introduced me to railroading near her parent's home in Spokane, Washington.

Experiencing early Burlington Northern "rainbow" post-merger motive power on their steady stream of trains was a revelation.

I began the obsession with cataloguing "what cars were moving" in order to guess what commodities they were carrying.

While sitting hour upon hour at BN's Spokane Yardley Yard I would watch the activity, photograph interesting movements, and also make an audio tape recording of the cars passing before me.

Each trip collected more than 1,000 entries – train ID (listening to the scanner) car type, road, and loaded or empty for open cars.

Gathering Prototype Data

Freight Car Counting for fun

Here's a snapshot of BN seen trackside in 1976 Spokane.

SEPTEMBER 1976 at SPOKANE, WASHINGTON on BURLINGTON NORTHERN

Rolling Stock by Railroad

		BN	CS	CBQ	GN	NP	SPS	CN	East	Lease	MW	MILW	SE	SF	SP	TTX	UP	WS	TOTAL	
DD 50 Box	XA	37	0	6	16	25	5	11	5	2	8	2	6	7	6	0	1	2	139	13%
SD 50 ExtPost	XML	2	0	1	1	6	0	0	0	1	0	1	4	0	0	3	0	0	19	2%
PlugSldrBox	XAP	4	0	1	7	0	0	2	0	0	0	0	0	0	0	0	0	0	14	1%
SD 50 Box	XAS	0	0	2	1	1	0	0	0	0	1	0	1	0	0	0	1	2	9	1%
Grain Box 40	XF	3	0	0	7	0	0	0	0	0	1	0	0	0	0	0	0	0	11	1%
Plug Door 50	XL	37	0	16	25	8	0	1	1	12	6	0	3	7	1	0	2	0	119	12%
40 Foot Box	XM	31	0	10	25	17	3	3	4	2	9	4	1	23	0	0	1	0	133	13%
40 Foot DD	XMD	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0%
40 Foot PlugD	XMP	1	0	0	3	2	0	0	1	0	0	0	0	0	0	0	0	0	7	1%
Dbl.Plug 50	XP	7	0	4	4	1	0	2	0	21	0	0	0	2	4	0	1	0	46	4%
		122	**0**	**40**	**89**	**60**	**8**	**19**	**11**	**38**	**26**	**7**	**15**	**39**	**11**	**3**	**6**	**4**	**498**	**48%**
						BN	**319**													
Flatcar	F	12	0	3	4	5	0	1	0	11	1	0	1	1	3	2	0	0	44	4%
Autorack-Covd	FA	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	5%
Autorack-Open	FAO	15	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	19	2%
Bulkhead	FB	30	0	1	3	7	0	16	1	8	0	0	0	0	1	3	0	3	73	7%
Pig Flat-89	FC	0	0	0	0	1	0	0	0	0	0	0	0	0	0	46	0	0	47	5%
Pig Flat-Sngl	FC1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0%
		107	**0**	**5**	**9**	**14**	**0**	**17**	**1**	**19**	**1**	**0**	**1**	**1**	**4**	**52**	**0**	**3**	**234**	**23%**
						BN	**135**													
Gondola	GB	6	0	1	1	2	0	0	0	0	1	0	0	0	0	0	0	0	11	1%
GS Gondola	GS	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0%
Chip Gondola	GTS	1	0	0	1	1	3	0	0	0	0	0	0	0	0	0	0	0	6	1%
70Ton Hopper	HM	4	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	6	1%
100Ton Hopper	HT	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0%
Cement Hopper	LOC	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3	0%
Flour Hopper	LOF	2	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	5	0%
Covd.Hopr-ACF	LOAC	42	0	3	1	1	0	0	0	8	4	0	0	0	1	0	0	0	60	6%
Covd.Hopr-PS	LOPS	46	0	3	10	1	0	0	0	18	3	0	2	1	0	0	0	0	84	8%
All-Door	LU	0	0	0	0	0	0	4	0	17	0	0	0	0	0	0	0	0	21	2%
Mech.Reefer	RPL	64	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	67	6%
Tank-40 Foot	TA40	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	12	1%
Tank-50 Foot	TA50	0	0	0	0	0	0	0	0	18	0	0	0	0	0	0	0	0	18	2%
Tank-60 Foot	TA60	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	4	0%
		166	**0**	**9**	**18**	**8**	**3**	**4**	**0**	**79**	**8**	**0**	**2**	**1**	**3**	**0**	**1**	**0**	**302**	**29%**
						BN	**204**													
TOTAL		**395**	**0**	**54**	**116**	**82**	**11**	**40**	**12**	**136**	**35**	**7**	**18**	**41**	**18**	**55**	**7**	**7**	*******	1034
		38%	0%	5%	11%	8%	1%	4%	1%	13%	3%	1%	2%	4%	2%	5%	1%	1%	1034	
						BN	**658**													

Commodity Estimate by Car Type

	Food	Lumbr	Paper	Chem	Stone	Grain	Auto	Pigs
		119	20					
			19					
			14					
	9							
						11		
	10	99	10					
	20					113		
	1							
	7							
		46						
	47	**264**	**63**			**124**		
		44						
							50	
							19	
		73						
								47
								1
		117					**69**	**48**
					11			
					3			
			6					
					6			
					2			
				3				
	5							
						60		
						84		
		21						
	67							
				12				
				18				
				4				
	72	**21**	**6**	**37**	**22**	**144**		
	1034	1034						
	12%	39%	7%	4%	2%	26%	7%	5%

Gathering Prototype Data

Collecting the data

Going trackside for the information is my preferred route, but if you are modeling an era gone by, the task gets more complicated.

The Fall 2012 issue of ***The Streamliner*** covers the incredible data available in conductor trip books. The cars and commodities are listed for all to see.

Railroad historical organizations, local museums, and former (and current) railroaders are all great resources.

The NMRA has a vast trove of information, which will eventually be in the incredible California State Railroad Museum library.

Major college and university libraries cover similar information. I've used the University of Washington, University of Idaho, and earlier San Jose State University libraries.

Gathering Prototype Data

Ebb and Flow of Freight Traffic

No matter how hard former Canadian National, now Canadian Pacific CEO Hunter Harrison would love traffic to flow consistently day in and day out, there is an ebb and flow to freight traffic.

Commodities have natural variations.

Fruit, vegetables, grains, and livestock tend to move at or near the end of the harvest season – typically late summer, early fall.

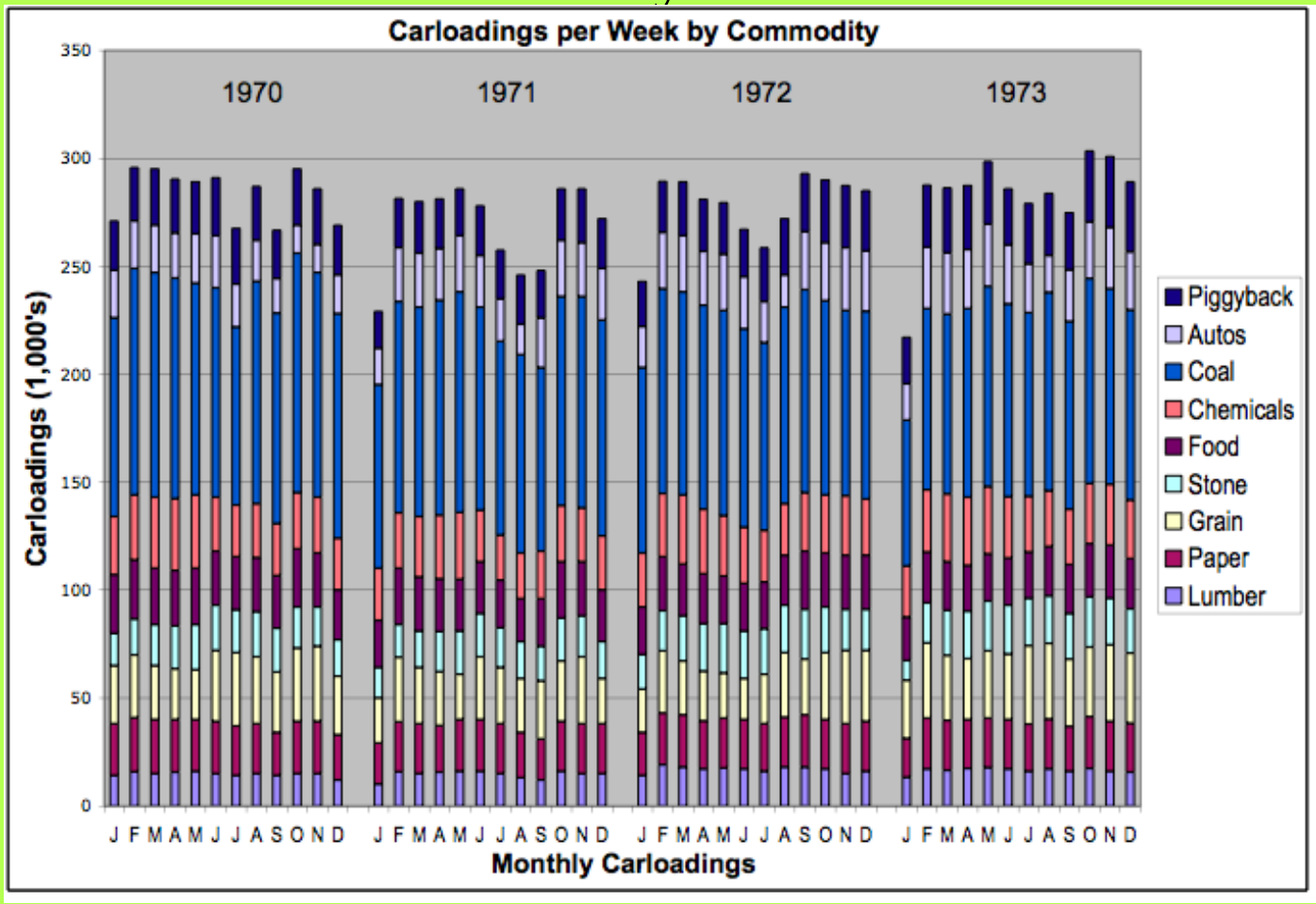
Manufactured and consumer goods peak at the end of the year approaching the Holiday season.

Construction materials, particularly for housing will rise in the spring then taper off into the winter construction doldrums. So lumber and plywood, sheetrock, and concrete follow this pattern.

Gathering Prototype Data

Ebb and Flow of Freight Traffic

The monthly averages fluctuate through the year, but the weekly totals vary much more.



Gathering Prototype Data

Ebb and Flow of Freight Traffic

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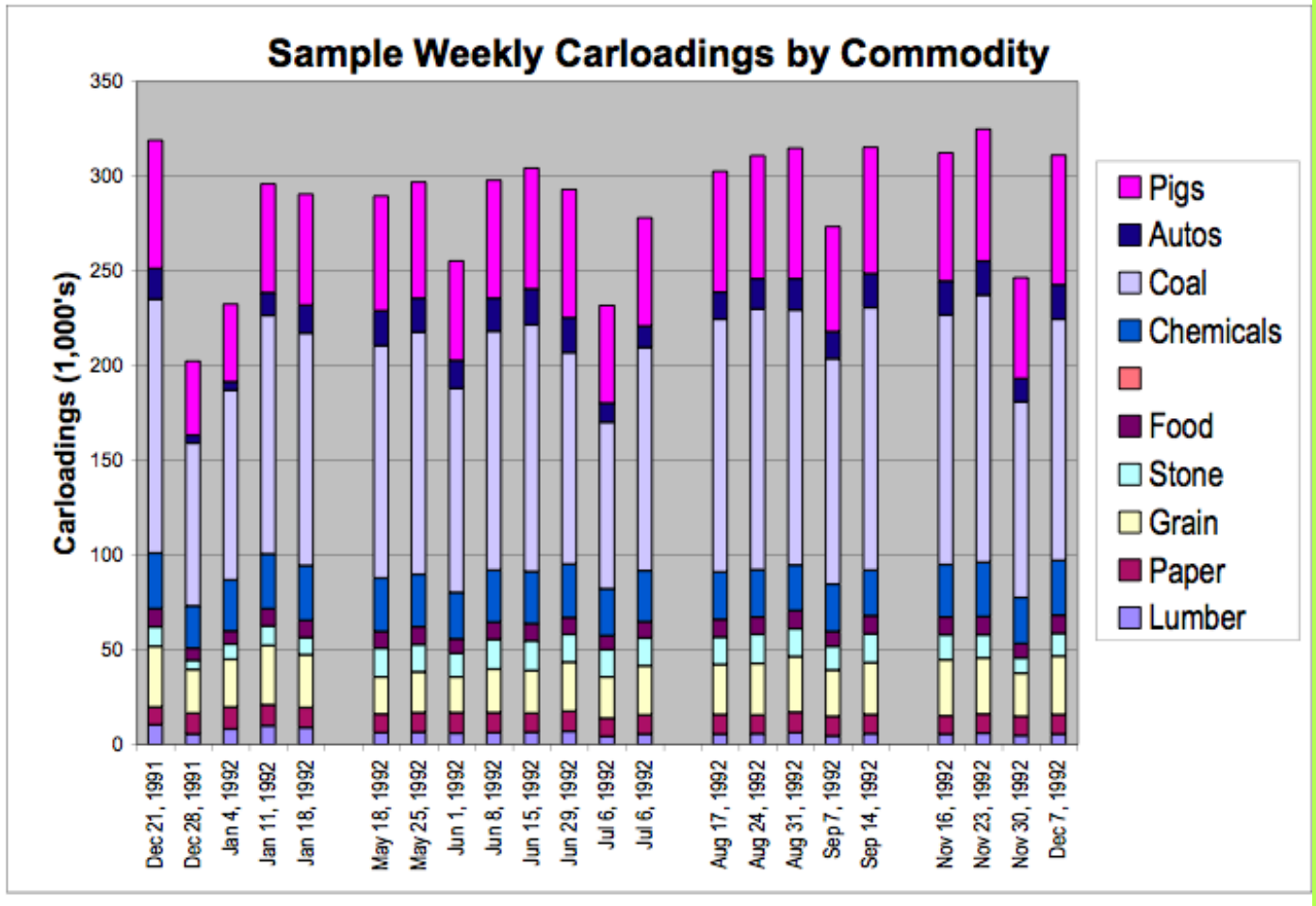


Enough Theory

Railroad modeling begins with selecting a prototype railroad to model directly or use as the basis for a fictional yet realistic freelanced railroad.

Next pin down where the railroad is located.

Yes, you can model the Union Pacific, but unless you have unlimited resources and space you need to pick just a portion

Utah’s Weber Canyon double track mainline climb through the Wasatch Mountains,

Washington’s Yakima Valley perishable branch, or the Camas Prairie subsidiary.

Enough Theory

But, then you need to narrow the timeframe. You don't have to select a single day, or month, but at least the year in question, and perhaps the season.

Next pin down where the railroad is located.

In the UP example, Weber Canyon was bustling with streamliner's, and the Yakima branch had late summer and fall perishable traffic.

The Camas Prairie was heavy with grain after the Fourth of July, but lumber and paper ran all year long.

With a date in mind you can simply pull the nearest prototype timetable to develop a credible operating scheme of freight and passenger trains.

Enough Theory

Developing a Roster - Applying Commodity Flows

Rolling stock for your railroad should reflect the commodities moving where your railroad is located.

Equipment Registers may be suitable for small railroads, but equipment selection for large railroads is more complicated.

As suggested earlier, the best information is first hand accounts.

From the railroad itself, conductor Trip Books for the period are a big help. For contemporary activity, simply going trackside and observing or documenting is a great solution.

If you can’t find information (or it doesn’t exist because your railroad isn’t a specific prototype), then what? AAR Commodity flows are a good place to start.

Enough Theory

Timetables, Manifest Schedules, Train Description

You need a **Manifest Schedule** comparable to the SP example, and a detailed Timetable for actually operating the railroad.

A “hot” LCL or piggyback train would average about 30-mph over the full route. SP’s NCP North Coast Perishable) runs the 267 miles from Roseville to Dunsmuir is 29-mph including stops at Gerber.

more traditional manifest trains will run the distance in about 22-mph, comparable to SP’s UGX over those 267 miles.

In the Regulated era, the primary traffic would be LCL, and in more contemporary times piggyback and container traffic.

And each division will have one or more local freights puttering from business to business.

Enough Theory

Timetables, Manifest Schedules, Train Description

Each trains roles should be described for shipper and Transportation employees something like the following SP Shasta Division trains.

Shasta Route

Train - Adv. NCP (Advance North Coast Perishable)

Roseville to Portland
(Daily)

Station		Time	Day
Roseville	Lv	600AM	1
Gerber	Ar	845AM	1
Gerber	Lv	900AM	1
Dunsmuir	Ar	145PM	1
Dunsmuir	Lv	215PM	1
Klamath Falls	Ar	715PM	1
Klamath Falls	Lv	845PM	1
Eugene	Ar	500AM	2
Eugene	Lv	530AM	2
Portland	Ar	1000AM	2

Adv. NCP (Advance North Coast Perishable originates at Roseville and handles both perishable and manifest traffic for Eugene and beyond.

Shasta Route

Train - RPS (Roseville-Portland Special)

Roseville to Portland
(Daily)

Station			Time	Day
San Francisco	(OVE)	Lv	(1100PM)	0
San Jose	(SJR)	Lv	(1201AM)	1
Oakland	(SME)	Lv	(1115PM)	0
Sacramento	(Local)	Lv	(1100PM)	0
Roseville		Lv	600AM	1
Gerber		Ar	845AM	1
Gerber		Lv	900AM	1
Dunsmuir		Ar	145PM	1
Dunsmuir		Lv	215PM	1
Klamath Falls		Ar	715PM	1
Klamath Falls		Lv	845PM	1
Eugene		Ar	500AM	2
Eugene		Lv	530AM	2
Portland		Ar	1000AM	2

Adv. NCP (Advance North Coast Perishable) originates at Roseville and handles both perishable and manifest traffic for Eugene and beyond.

Also picks up Pacific Northwest traffic destine Eugene and beyond available at WP Transfer at Marysville.

Enough Theory

Timetables, Manifest Schedules, Train Description

Each segment to be modeled needs to be identified, then all of the industries and businesses, should be mapped out, and detailed layout design can commence.

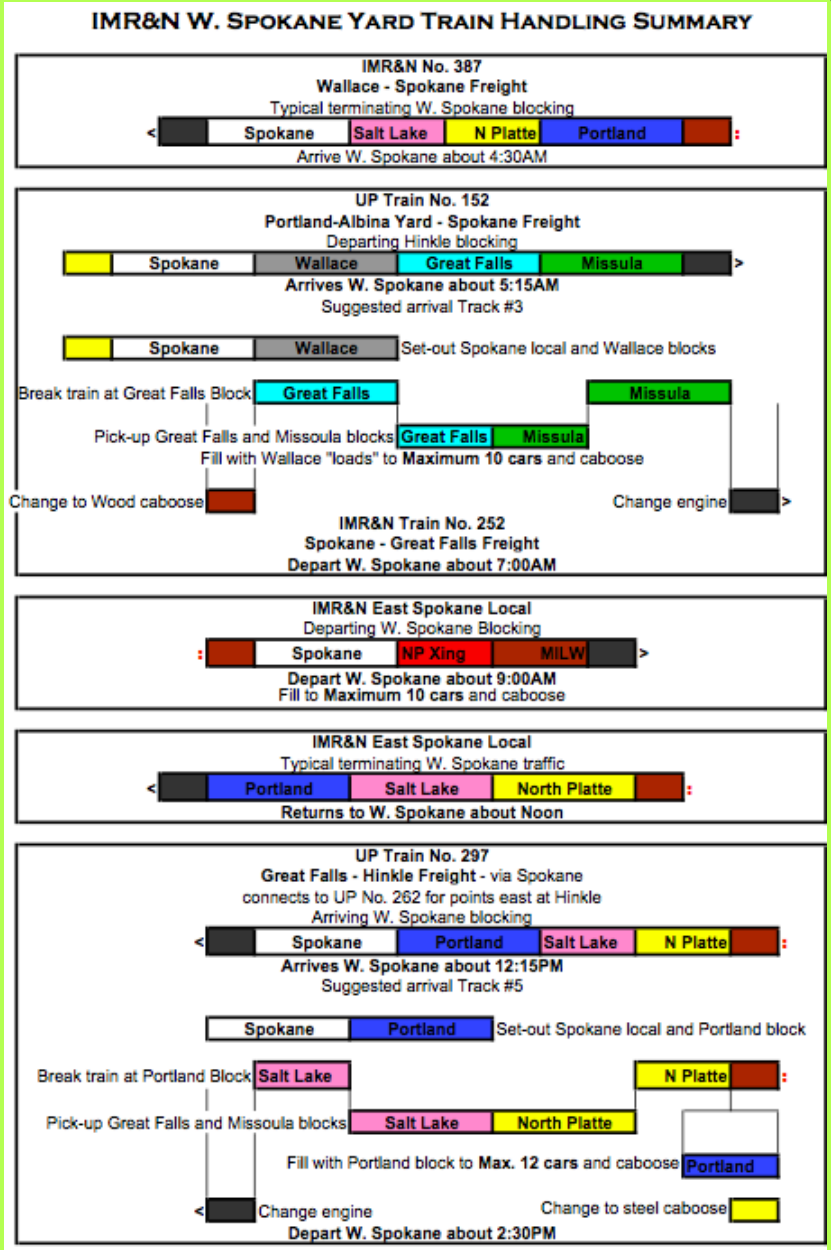
Each train needs a Blocking Diagram illustrating what traffic is intended to go where in the train.

The “hot” trains might have just one or two blocks, the ultimate destination, and perhaps some intermediate point.

Other trains might have blocks for the division point yards or important local yards.

The following is a portion of the blocking diagram I provide right on the facia for my W. Spokane Yardmaster and his crews:

Enough Theory



No. 387 would be the “perfect” if the arriving consist of this division covering freight really looked like “the plan”.

In reality, most crews picking up traffic in the field simply add cars to the head-end because it’s easy.

No. 152 on the other hand originates in UP’s Hinkle, OR yard and after intermediate setouts typically arrives in decent shape.

the “Spokane” block arrives on the rear (west end) where there is more yard lead room.

Enough Theory

Timetables, Manifest Schedules, Train Description

Remember, all of these items are “tools” intended to help your railroad function like the prototype you are emulating.

You don’t need all of these items, perhaps none at all, but the more “foundation” you lay for your railroad, the smoother your operating crews will find their activities.

Freight Operations – Synopsis

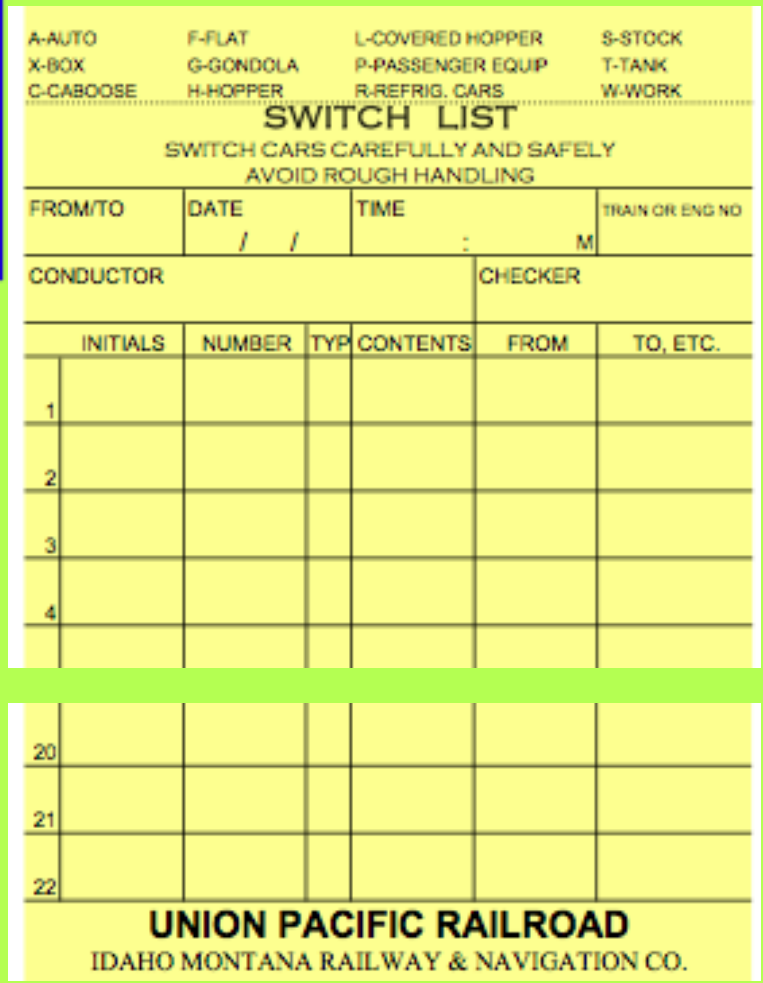
As a model railroader you don’t need to know, or even completely understand all nuances of prototype railroading.

What you do need is a willingness to “ground” your railroad model efforts in prototype practice, and historical foundation.

But, through it all, railroads no matter how competitive and dominant in their respective locales provide transportation service and volume like no other around the world.

Miniature Paperwork – Sampler

With the “Big Picture” defined, you need some form of car forwarding system to direct individual cars on your railroad.



A-AUTO F-FLAT L-COVERED HOPPER S-STOCK
X-BOX G-GONDOLA P-PASSENGER EQUIP T-TANK
C-CABOOSE H-HOPPER R-REFRIG. CARS W-WORK

SWITCH LIST

SWITCH CARS CAREFULLY AND SAFELY
AVOID ROUGH HANDLING

FROM/TO	DATE / /	TIME : M	TRAIN OR ENG NO
CONDUCTOR		CHECKER	

	INITIALS	NUMBER	TYP	CONTENTS	FROM	TO, ETC.
1						
2						
3						
4						
20						
21						
22						

UNION PACIFIC RAILROAD
IDAHO MONTANA RAILWAY & NAVIGATION CO.

Car Forwarding emulates prototype traffic movements in miniature. Here’s a sampling of approaches railroad modelers have employed over the last 70 or so years.

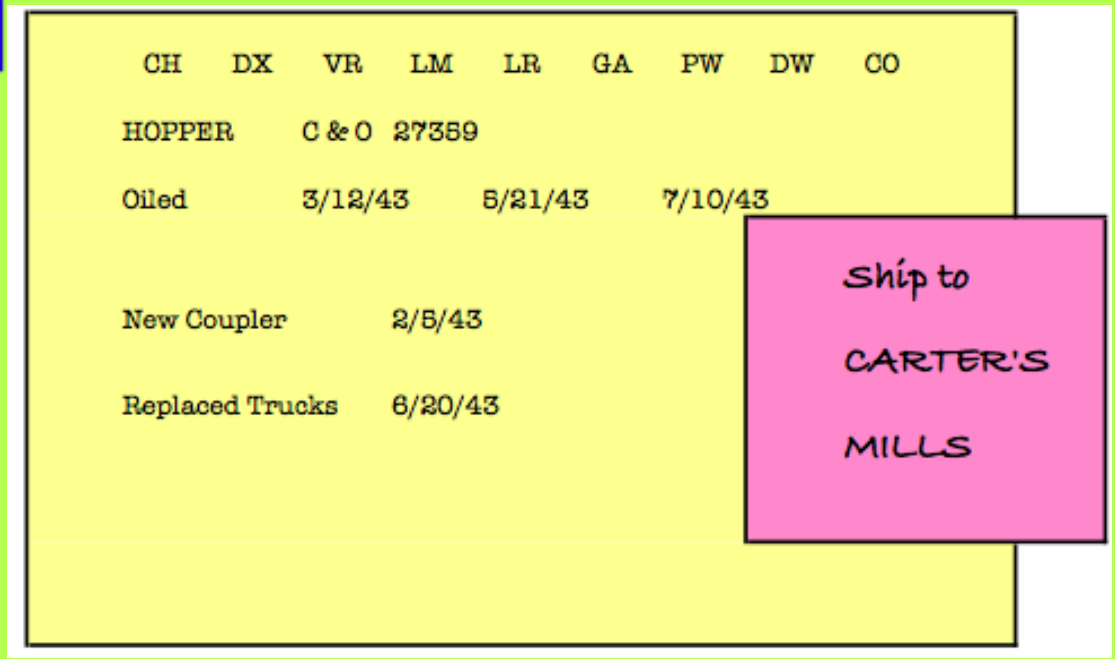
Some are really simple. Some are more prototypical, yet each offers approaches you may want to consider.

The simplest form of car forwarding is a switch list. Here’s my example based on a Great Northern format:

Miniature Paperwork – Sampler

Frank Ellison – The Art of Model Railroading, 1944

Ellison created car cards from simple 3x5 index cards with pertinent information on the car itself, such as lubrication and repair,



and colored waybill attached with a paper clip.

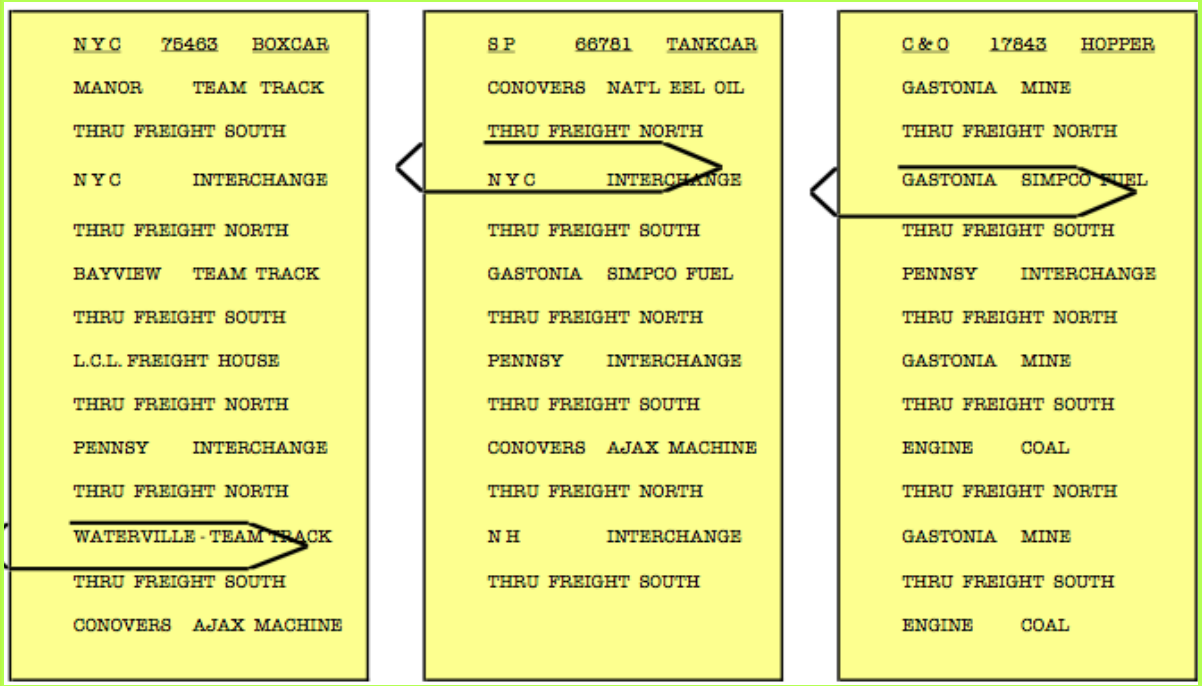
Ellison's system used color-coded "flags" attached to the top of the card to identify the car's location, direction of travel, and MTY or loaded status.

Miniature Paperwork – Sampler

T. Gerald Dyre – Card Order Operations 1952: Series car movement

In developing his system, Gerald wanted the following; 1) no paperwork, 2) infinite variations, 3) keep the user guessing,

4) be simple to use, and 5) be able to stop anywhere, and restart without additional intervention.



His waybills consist of 3x5 cards for each car listing every location the car type (boxcar, tank car, hopper, etc.) potentially serves, separated by a through train (north or south) movement

Miniature Paperwork – Sampler

T. Gerald Dyre – Card Order Operations 1952: Series car movement

A paper clip identifies the destination of the car, or the next train the car will move in the case of a through train movement.

When the paperclip reaches the bottom, the cycle moves to the top of the card to begin again.

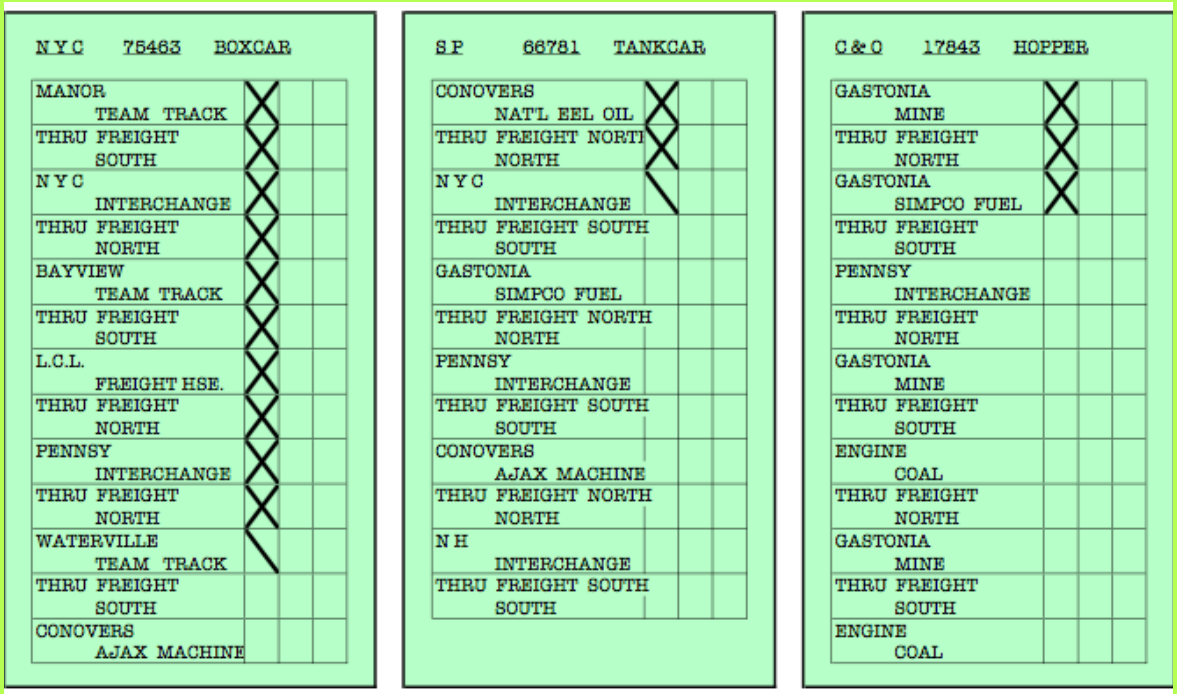
The NYC boxcar is headed for Waterville Team Track, the SP tankcar is headed to the NYC Interchange, and the C&O hopper is bound for Gastonia – Simpco Fuel.

Miniature Paperwork – Sampler

T. Gerald Dyre – Series car movement - Alternative

In the 1980's a friend suggested a variation on the Dyer approach.

Rather a paperclip (which can slip off, slide between destinations, or get hooked on other cards), the destinations have rows and columns of boxes.



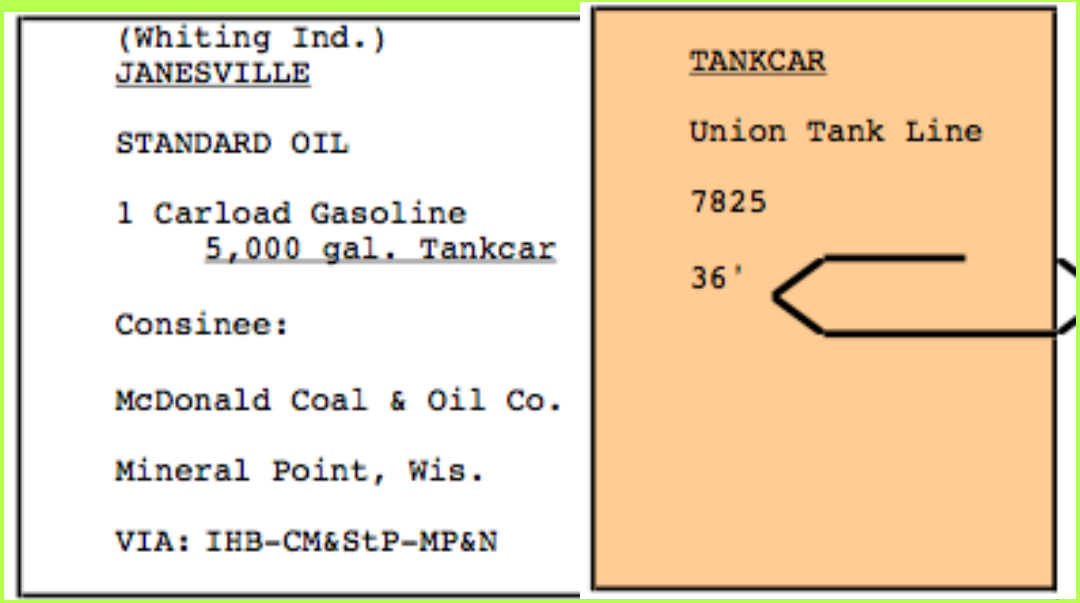
As each car movement is completed, the train crew places a "slash" (half of an "X") in the appropriate box. Between operating sessions, the owner completes the X for cars ready to move.

Miniature Paperwork – Sampler

Francis Adams – Car Distribution, a realistic way to generate traffic – 1960

The Adams system begins with a list of each industry on the railroad and the commodities the industry will ship or received, and where those shipments go or come from.

The industry lists create shipment cards



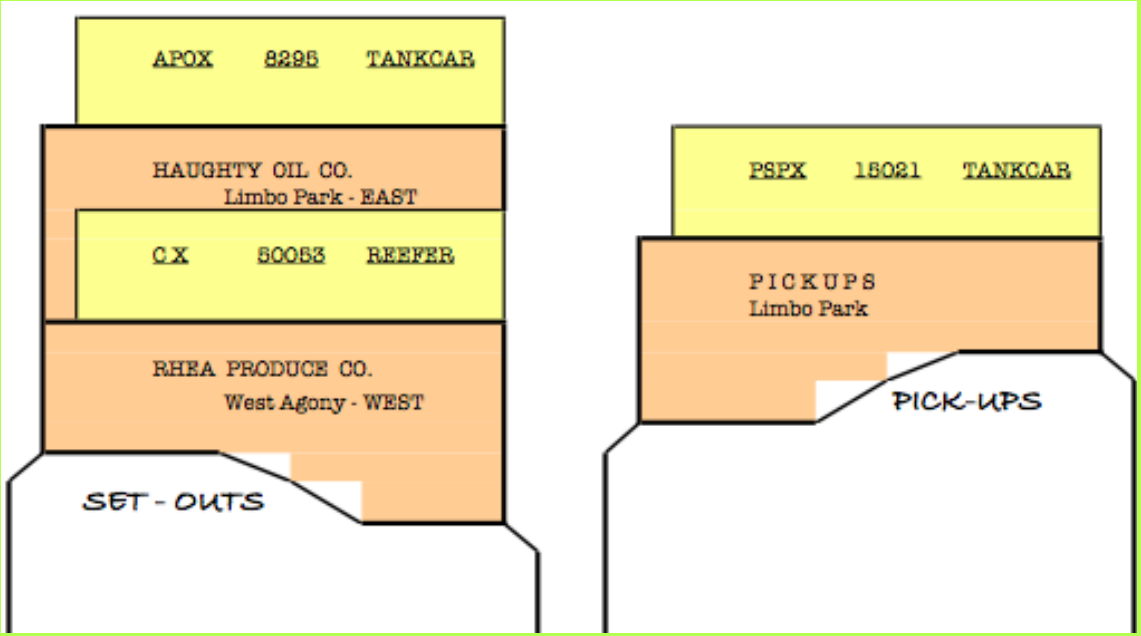
By adding the Car Card to the Shipment Card creates a Waybill providing all the information needed to move a specific car to the correct location.

Miniature Paperwork – Sampler

Terry Walsh – WAIbill Operation – August 1960

Terry used 3x5 cards with car information, and 3-1/4 by 5-14 envelops with an inch cut-off of the top listing destination/industry information.

The Yardmaster had a “master” file of destinations and cars by location.



To run a train, the Yardmaster pulled appropriate card/envelops to deliver or pick-up. Train crews received a packet with cars to be delivered, and cars to be picked up.

Miniature Paperwork – Sampler

W. Roy Dohn – Operations, Unlimited – Dec 1960

Roy Dohn created a system meeting eight criteria; 1) easy to use, 2) eliminate cards when possible, 3) be as prototypical as possible,

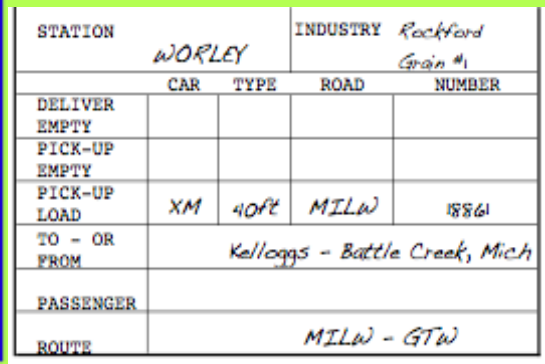
4) eliminate “chasing” cards if cars are moved between Ops sessions, 5) eliminate movable markers or paper clips,

6) provide personal involvement of each operators, 7) cut down on the owner paperwork, and 8) permit infinite variation.

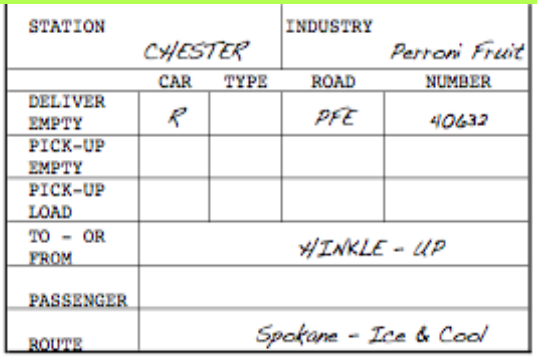
Roy’s approach has each of his operators be “managers” of a group of industries. Each manager is responsible for ordering cars providing raw materials, finished products, and empty cars to ship each industries finished products.

Miniature Paperwork – Sampler

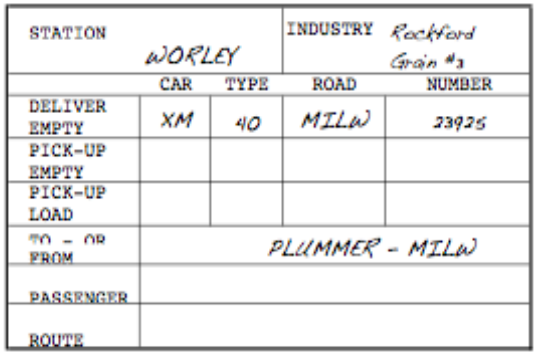
W. Roy Dohn – Operations, Unlimited – Dec 1960



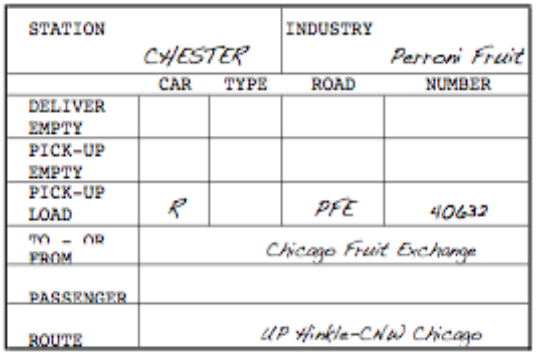
STATION	WORLEY	INDUSTRY	Rockford Grain #1	
	CAR	TYPE	ROAD	NUMBER
DELIVER EMPTY				
PICK-UP EMPTY				
PICK-UP LOAD	XM	40ft	MILW	18861
TO - OR FROM	Kelloggs - Battle Creek, Mich			
PASSENGER				
ROUTE	MILW - GTW			



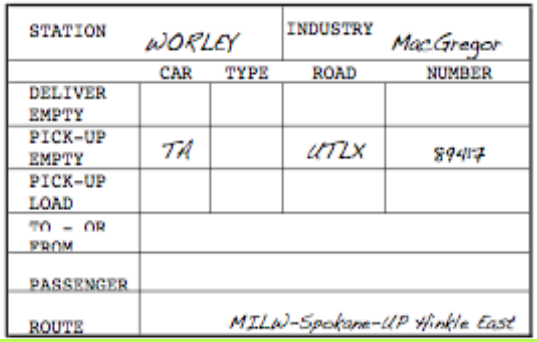
STATION	CHESTER	INDUSTRY	Perroni Fruit	
	CAR	TYPE	ROAD	NUMBER
DELIVER EMPTY	R		PFE	40632
PICK-UP EMPTY				
PICK-UP LOAD				
TO - OR FROM	HINKLE - UP			
PASSENGER				
ROUTE	Spokane - Ice & Cool			



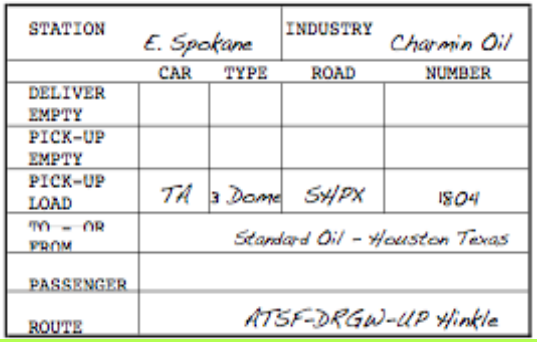
STATION	WORLEY	INDUSTRY	Rockford Grain #3	
	CAR	TYPE	ROAD	NUMBER
DELIVER EMPTY	XM	40	MILW	23925
PICK-UP EMPTY				
PICK-UP LOAD				
TO - OR FROM	PLUMMER - MILW			
PASSENGER				
ROUTE				



STATION	CHESTER	INDUSTRY	Perroni Fruit	
	CAR	TYPE	ROAD	NUMBER
DELIVER EMPTY				
PICK-UP EMPTY				
PICK-UP LOAD	R		PFE	40632
TO - OR FROM	Chicago Fruit Exchange			
PASSENGER				
ROUTE	UP Hinkle-CNW Chicago			



STATION	WORLEY	INDUSTRY	MacGregor	
	CAR	TYPE	ROAD	NUMBER
DELIVER EMPTY				
PICK-UP EMPTY	TA		UTLX	89417
PICK-UP LOAD				
TO - OR FROM				
PASSENGER				
ROUTE	MILW-Spokane-UP Hinkle East			



STATION	E. Spokane	INDUSTRY	Charmin Oil	
	CAR	TYPE	ROAD	NUMBER
DELIVER EMPTY				
PICK-UP EMPTY				
PICK-UP LOAD	TA	3 Dome	SHPX	1804
TO - OR FROM	Standard Oil - Houston Texas			
PASSENGER				
ROUTE	ATSF-DRGW-UP Hinkle			

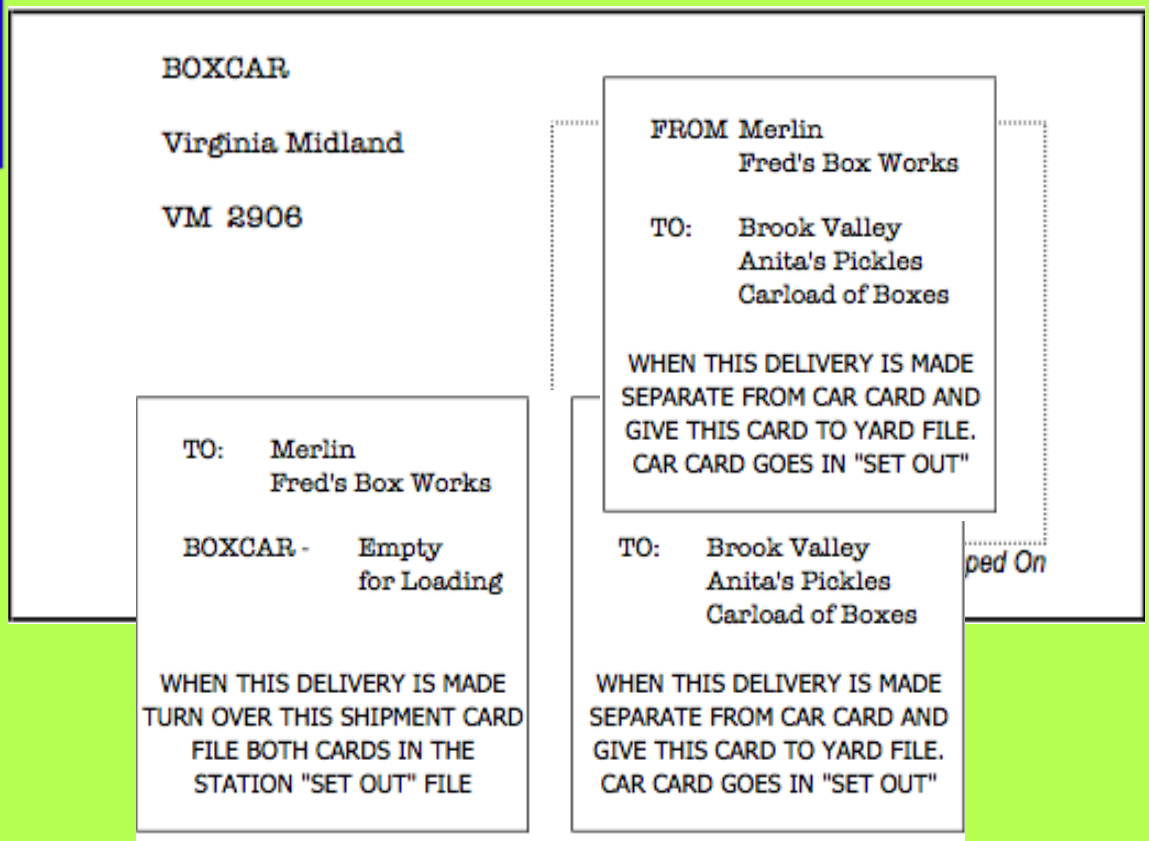
These examples include the pick-up of a boxcar of grain from my Rockford Grain Growers #1, ordering an empty boxcar for Rockford #3, and the pick-up of an empty fertilizer tankcar from MacGregor all at Worley.

Although an interesting approach, creating more handwritten paperwork adds to the workload.

Miniature Paperwork – Sampler

Doug Smith – Latest word on Card Operations – Dec 1961

Doug combined many of the systems already in use, while eliminating paper clips and such.



The Doug Smith system consists of a car card with a clear acetate pocket to contain a two-sided waybill.

The waybill includes directions on how to handle the car card/ waybill, or completed waybill delivery.

Miniature Paperwork – Sampler

Old Line Graphics - Four-sided Waybill

The system has been expanded and modified to a simpler pocket created by folding-up the bottom of the car card to hold a four-destination waybill supplied by Old Line Graphics and Micro Mark.

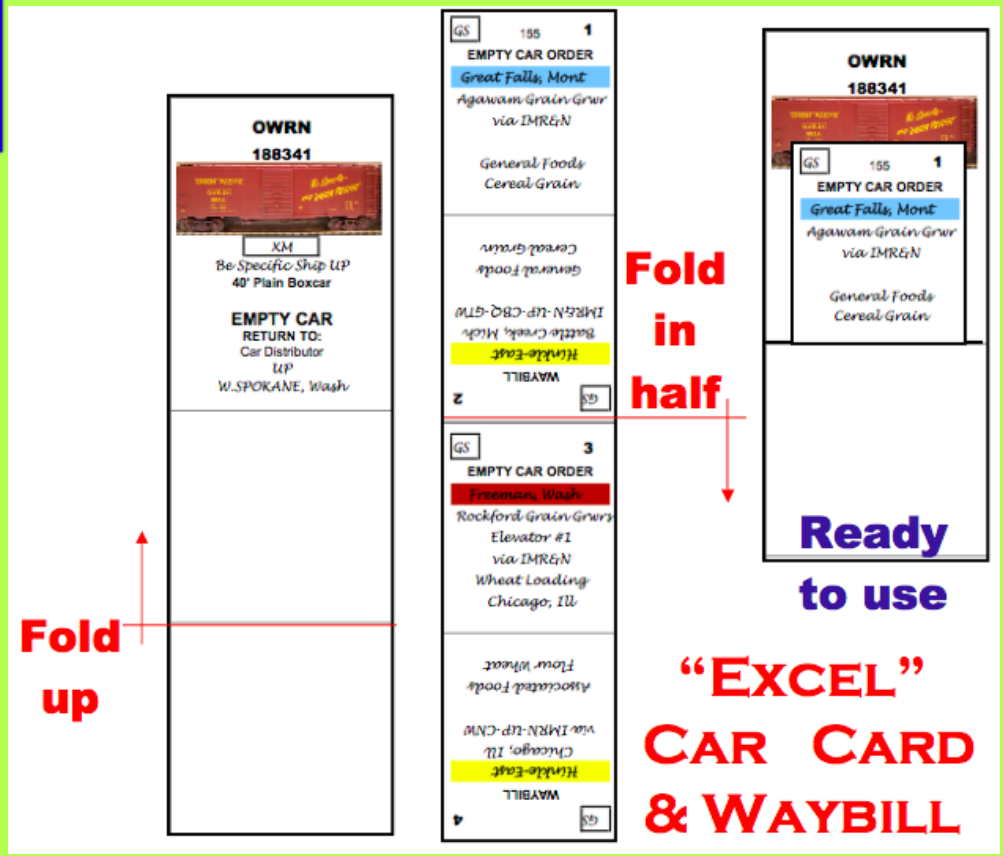
Tony Koester covers the system in the Kalmbach book *Realistic Model Railroad Operations*.

Micro Mark provides both the paperwork and waybill storage boxes.

Miniature Paperwork – Sampler

Four-sided Waybill - Option

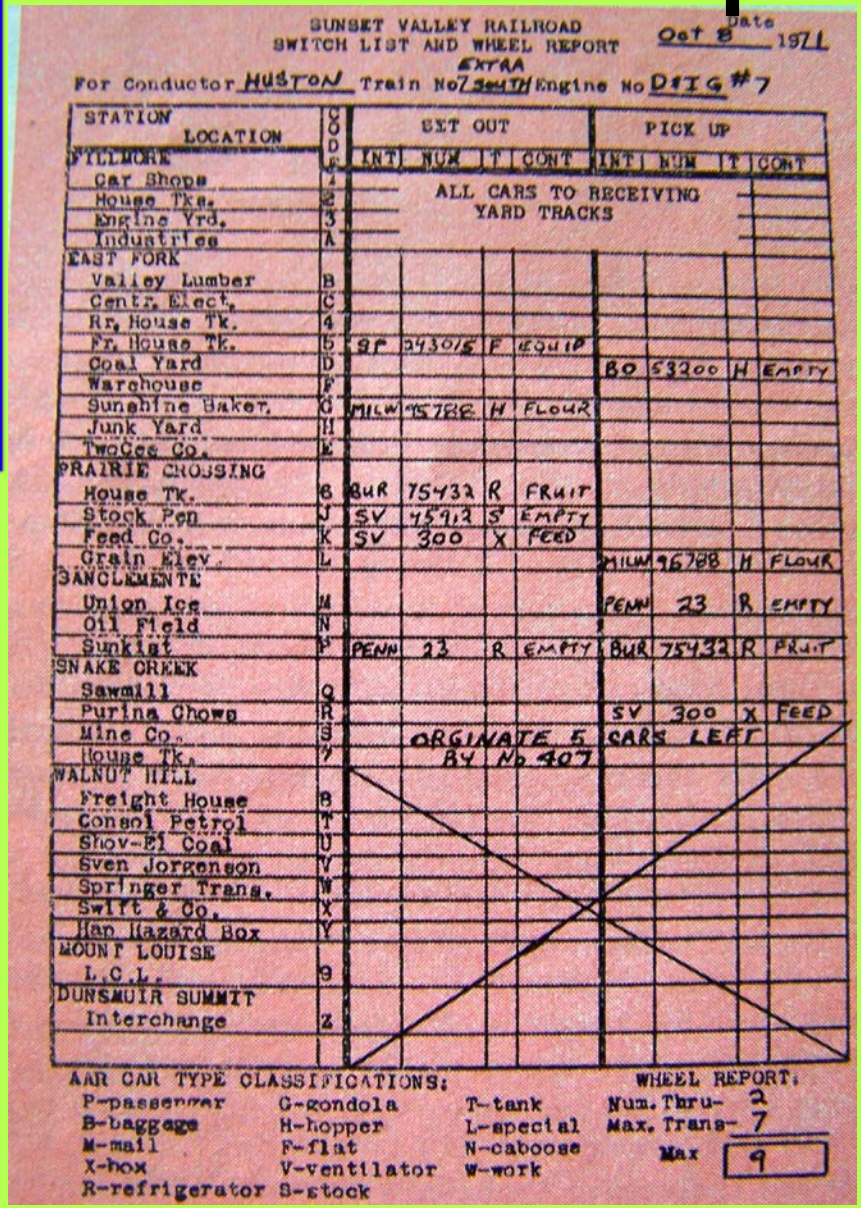
I created similar forms using Microsoft Excel spreadsheet software. The waybill is four sided when folded in half.



I use color-coding of the destinations to assist crews, and especially yardmasters with blocking trains and routing cars.

After experiencing Mark Lestico's similar version, I added photos of the actual car to my Car Card to aid in spotting.

Miniature Paperwork – Sampler



SUNSET VALLEY RAILROAD
SWITCH LIST AND WHEEL REPORT — Date Oct 8 1971
EXTRA
For Conductor HUSTON Train No 73 SOUTH Engine No DIG #7

STATION LOCATION	CODE	SET OUT INT	SET OUT NUM	SET OUT T	SET OUT CONT	PICK UP INT	PICK UP NUM	PICK UP T	PICK UP CONT
FILLMORE									
Car Shops	1	ALL CARS TO RECEIVING YARD TRACKS							
House Tks.	2								
Engine Yrd.	3								
Industries	A								
EAST FORK									
Valley Lumber	B								
Centr. Elect.	C								
Rr. House Tk.	4								
Fr. House Tk.	5	SF	243015	F	EQUIP				
Coal Yard	D					BO	53200	H	EMPTY
Warehouse	F								
Sunshine Baker.	G	MILW	15788	H	FLOUR				
Junk Yard	H								
TwoCee Co.	E								
PRAIRIE CROSSING									
House Tk.	6	BUR	75432	R	FRUIT				
Stock Pen	J	SV	75913	S	EMPTY				
Feed Co.	K	SV	300	X	FEED				
Grain Elev.	L					MILW	96788	H	FLOUR
SANCLEMENTE									
Union Ice	M					PENN	23	R	EMPTY
Oil Field	N								
Sunkist	P	PENN	23	R	EMPTY	BUR	75432	R	FRUIT
SNAKE CREEK									
Sawmill	Q								
Purina Chows	R					SV	300	X	FEED
Mine Co.	S	ORGINATE 5 BY No 407				CARS LEFT			
House Tk.	Y								
WALNUT HILL									
Freight House	B								
Consol Petrol	T								
Shov-El Coal	U								
Sven Jorgenson	V								
Springer Trans.	W								
Swift & Co.	X								
Han Hazard Box	Y								
MOUNT LOUISE									
L.C.L.	9								
DUNSMUIR SUMMIT									
Interchange	Z								

AAR CAR TYPE CLASSIFICATIONS:
P-passenger C-gondola T-tank
B-baggage H-hopper L-special
M-mail F-flat N-caboose
X-box V-ventilator W-work
R-refrigerator S-stock

WHEEL REPORT:
Num. Thru- 2
Max. Trans- 7
Max 9

Bruce Chubb – Switch List & Wheel Report form - Jan 1973

Bruce's form is a cross between a Switch List and a Conductor Trip Book.

The form consists of a list of towns and industry destinations followed by a column for identifying cars to set-out, or pick-up.

The form is then completed with the car reporting marks, car type, and commodity or MTY.

Miniature Paperwork – Sampler

Whit Towers – "Thinking Man's System" Operating the Alturas & Lone Pine – January/February 1983

Whit Towers was both railroad modeler and author of many articles on prototype railroad operations. Yet Whit was also a practical host.

Although he tried every "perfect" car forwarding system, he created the "**Thinking Man's System**".

The ALP's timetable specifies the quantities of cars in a train, and the train crew decides what cars to pick-up and set-out.

In general, the concept is to swap "like for like", such as boxcar for boxcar, but the crew chooses what to do, or work to perform.

For ALP management there is never a mistake, and management doesn't have to worry about maintaining paperwork.

Destination on Car Top

Roy Dohn – The DiGiT system of Operation – May 1964
Ed Ravenscroft – Operation with CCT (Color Coded Tacks) – July 1965
Other concepts – Plastuc channels and mini-waybills

Roy and Ed proposed converting car forwarding from a “you carry around information”, to the rolling stock carries the information.

Roy installs a thin, clear plastic “clip” to the roof of each car. A 1/4- by 1-1/2-inch color-coded slip is inserted in the clip

Ed drilled a hole in the roof of his cars and inserted a color-coded thumbtack (CCT). The color identifies the town or yard, and one or two letters (dry transfer) identify the exact destination.

Other variations of destinations applied to the rolling stock include Plastruc channels with destination information applied.

Contemporary Approaches

Car distribution software –
Pro Trak, Ship It, Rail Ops, and JMRI

These tools allow the owner to use contemporary prototype-style switch lists, train manifests, and many other scheduling and operating tools.

Some like Pro Trak can run “real time” in the background with train crews inserting information as cars are picked up or delivered.

The advantages of these software programs are reducing operating session workload for the owner and crews,

but require considerable time to input all the required information on your equipment and destination scheme.

Contemporary Approaches

As a former user of Pro Trak, I can attest to the power of the system, but also caution potential users of any of these systems to carefully consider the comments of the reviewers listed below.

Today companies like JB Hunt, Swift and choose rail intermodal services for movements, typically those beyond about 750 miles.

Like any tool, keep them sharp and they cut through the workload.

But, the moment you allow the blade to get the least bit dull, the value and utility diminishes rapidly.

Pro Trak – What it is, What it does; Jim Duncan, Dispatcher's Office July 2007

Ship It – Eric Lundberg, DO Jun 2008

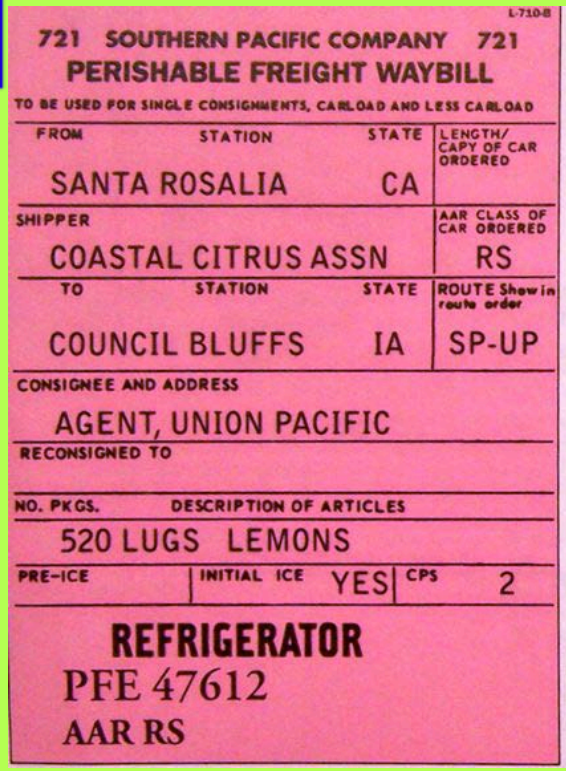
Rail Ops Software – Bill Wright, DO Oct 2008

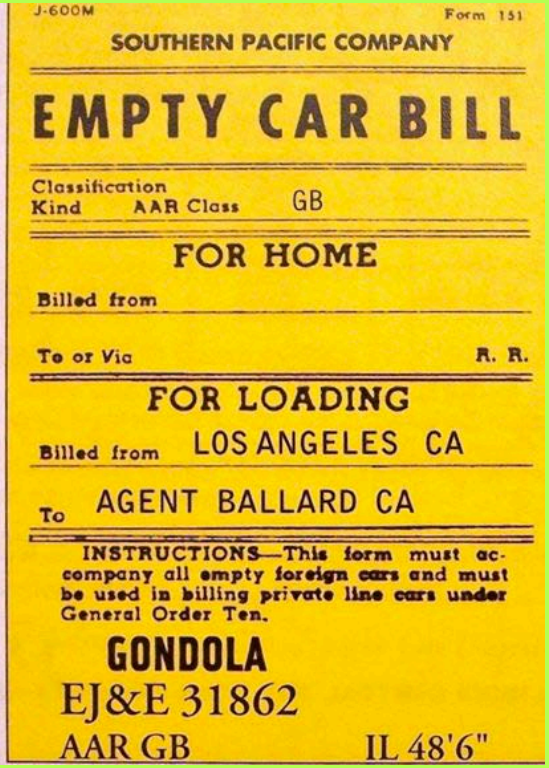
JMRI – Not just for Programming Decoders; Dennis Drury, DO July and Oct 2011

Contemporary Approaches

Tony Thompson – Prototypical Waybills for Car Card Operation – RMC Dec 2009

Contents of a Waybill – Ops SIG Dispatcher's Office – April 2010


721 SOUTHERN PACIFIC COMPANY 721
PERISHABLE FREIGHT WAYBILL
TO BE USED FOR SINGLE CONSIGNMENTS, CARLOAD AND LESS CARLOAD
FROM STATION: SANTA ROSALIA STATE: CA
SHIPPER: COASTAL CITRUS ASSN
AAR CLASS OF CAR ORDERED: RS
TO STATION: COUNCIL BLUFFS STATE: IA
ROUTE Show in route order: SP-UP
CONSIGNEE AND ADDRESS: AGENT, UNION PACIFIC
RECONSIGNED TO
NO. PKGS. DESCRIPTION OF ARTICLES: 520 LUGS LEMONS
PRE-ICE | INITIAL ICE YES | CPS 2
REFRIGERATOR
PFE 47612
AAR RS


J-600M Form 151
SOUTHERN PACIFIC COMPANY
EMPTY CAR BILL
Classification Kind AAR Class GB
FOR HOME
Billed from
To or Via R. R.
FOR LOADING
Billed from LOS ANGELES CA
To AGENT BALLARD CA
INSTRUCTIONS—This form must accompany all empty foreign cars and must be used in billing private line cars under General Order Ten.
GONDOLA
EJ&E 31862
AAR GB IL 48'6"

Rather than using computers to create and manage traffic movements, Tony uses computer software and his wealth of prototype knowledge to "scale down" the old fashion prototype paper waybill.

Contemporary Approaches

Combining waybills and switchlists

Chuck Hitchcock – Argentine Industrial District Railway – MR Feb 2007

Jim Providenza – Santa Cruz Northern, Agent Operators – DO ??

Bill Kaufman – San Francisco State Belt – RMC April 2007

Chuck, Jim and Bill among others continue to use car cards and waybills to manage car distribution,

but these items reside with a Car Clerk, just like the prototype.

The Car Clerk, or Agent/Operator in the case of Jim's SCN uses the waybills to prepare switch lists for their crews.

All three of these railroads pride themselves on "modeling jobs" performed by actual employees.

Freight Operations - Putting it all together

Follow your prototype

Whether you are modeling a specific prototype in a particular locale, or creatively launching a freelancing railroad in a similar location, delve into what the prototype did.

First of all, the process is fun and rewarding and the results of your efforts will bleed into the operation of your railroad.

Prototype practices should only “advise” how to make decisions.

Even if you are modeling a real place and time, you have the opportunity to model a full 24-hour day of train movements, or some portion of the day, perhaps the busy daylight hours.

The choices are yours. The decisions you make can be more or less “grounded” in what the prototype did/does.

Freight Operations - Putting it all together

Local, Era, Equipment

Your locale and era will help define the equipment your railroad will use.

The SP in the Central Valley in the early 1950's will have a smattering of diesels, but plenty of steam and 40-foot length freight cars, combined with speedy passenger service.

A contemporary Iowa short-line might use GP15's, Gensets, or hand-me-down Geeps of another era to move jumbo grain cars to elevator silos and oversized tank cars for ethanol loading.

No cabooses, of course.!

Freight Operations - Putting it all together

Adapt your prototype's practices

What trains/service were provided

By delving into the prototype activities in your area, how many of trains and types of services in your time frame can be pinpointed.

Capture or emulate prototype timetables and schedule documents in creating your operating documents.

Try to identify the types of commodities and industries serving the area in the period you are creating.

Look to AAR and railroad historical society documents, or local museums and resources. Getting there is half the fun.

Freight Operations - Putting it all together

Try one or more car distribution "tools" before adopting

Before settling on a car distribution system, try several,

either on your own railroad or those railroads you operate on.

Ask you friends what works for them and why.

Remember, all of the information in this book, and especially this chapter are just tools.

Some will work for you, while others will be enormous failures.

Freight Operations - Putting it all together

Rather than being a recipe book, the concepts discussed here are guidance to how the prototype sought to win and retain customers, and make some money in the process.

As a railroad entrepreneur, your job is to find the “sweet spot” in all this information.

Perhaps all you are interested in is having fun, and moving a few cars for just yourself and one or two friends.

Or maybe you are building, or helping to build, a large-scale, complex system needing many operators to function as intended.

The choices are yours. The decisions you make can be more or less “grounded” in what the prototype did/does.

Freight Operations - Putting it all together

As an advocate for prototype based operations, I suggest you collect all the information you can find on your railroad, locale and era.

Then pick and choose among the parts, which most interest you.

But, don't be afraid to change your mind, either because you found new and conflicting information,

or you find the "straight jacket" of "doing it there way" is too onerous.

Remember Rule No. 1: **It's my railroad!** Now go have fun.

Freight Train Operation -

and Model Car Forwarding Methods