Useful Links

Whitewater Valley Railroad Main Website
www.whitewatervalleyrr.org

Whitewater Valley Railroading Merit Badge Website
www.wvrroutreach.org/bsa/

BSA Railroading Merit Badge Book
https://filestore.scouting.org/filestore/Merit_Badge_ReqandRes/Railroading.pdf

Railroading Merit Badge Workbook
https://meritbadge.org/wiki/images/4/47/Railroading.pdf

Operation Lifesaver Website
https://oli.org

Metamora Indiana Website
www.metamoraindiana.com

Connersville Indiana Website
www.tourconnersville.com

Robinson's Whitewater River Campground Facebook Page
www.facebook.com/wwrcg/?rf=104926916216632

Whitewater Valley Railroad BSA Railroading Merit Badge Program

Revision 25-3-C

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SPONSORING AND SUPPORTING

RAILROAD MERIT BADGE

IN CONJUCTION WITH

SCOUTING AMERICA

THE RAIL INDUSTRY IS ONE OF THE OLDEST INDUSTRIES IN THE UNITED STATES; IT LITERALLY "UNITED" THE EAST AND WEST, AS WELL AS THE NORTH AND SOUTH. THE RAIL INDUSTRY REMAINS A VITAL PART OF OUR NATION'S ECONOMY, PROVIDING UNIQUE SERVICES AND JOB OPPORTUNITIES.

NAME:

PATROL:

TROOP#:

RAILROADING MERIT BADGE REQUIREMENTS

REVISED EFFECTIVE MARCH 31, 2018

1.a. Name 3 types of modern freight trains. Explain why unit trains are more efficient than mixed freight trains.

1.c. Using models or pictures, identify 10 types of railroad freight or passenger cars. Explain the purpose of each type of car.

1.d. Explain how a modern diesel or electric locomotive develops power. Explain the terms dynamic braking and radial steering trucks.

2.a. Explain the purpose and formation of Amtrak. Explain, by the use of a timetable, a plan for making a trip ry rail between 2 cities at least 500 miles apart. List the times of departure and arrival at your destination, the train number and name, and the type of service you want

2.b. List and explain the various forms of public/mass transit using rail.

3.a. Name four departments of a railroad company. Describe what each does.

4 Explain the purpose of Operation Lifesaver and its mission

5.a. List 5 safety precautions that help make trains safer for workers and passengers.

5.d. Tell your counselor about the guidelines for conduct that should be followed when you are near or on railroad property. Explain the dangers of trespassing on railroad property.

5.e. Tell what an automobile driver can do to safely operate a car at grade crossings, and list 3 things an automobile driver should never do at a grade crossing.

6. Explain the appearance and meaning of the following warning signs and devices: advance warning sign, pavement markings, crossbucks, flashing red lights, crossing gates.

7.a. Explain how railroad signals operate and show 2 basic signal types using color or configuration

7.b. Explain the meaning of 3 horn signals.

7.c. Describe a way to signal a train for an emergency stop.

7.d. Explain the use and function of the EOTD or FRED used on the last car of a train.

8.a.3 Name the scale of 4 popular model railroad gauges. Identify the scale of 4 model cars or locomotives.

8.a.7 Participate in a switching contest on a timesaver layout and record your time.

Notes

STATION FOURTEEN
MOTORCARS
Requirement Extra Activity

At this station, you will get to meet and listen to people with a very special railroad hobby. They own, restore and operate some historic railroad vehicles known as motorcars.

Railroad motorcars or 'Speeders' were used by the railroads to inspect the many miles of track for defects and to handle track maintenance. Speeders have been phased out by the railroads in favor of Hy-Rail Vehicles, which are standard road vehicles with retractable guide wheels that can operate on road or rail. Railfans bought the scrap speeders and organized NARCOA in the mid 1980's. Running a speeder costs considerably less than boating or golfing although some think it's a hot, noisy and smelly hobby!

Once you have heard some of the history of the motorcars, you'll be invited to take a ride in one of the vehicles. **Remember** that most of these speeders are owned by the operator who has volunteered their time and brought their equipment to the railroad at their own expense. **Please be careful not to track mud into the motorcar or do anything that would damage it.**

Show what it means to be a good scout!

STATION ONE
AIR BRAKES
Requirements 5a, 5g

Westinghouse Air Brake:

George Westinghouse invented a system wherein each piece of railroad rolling stock was equipped with an air reservoir and a *triple valve*.

The Westinghouse system uses a *reduction* in air pressure in the train line to apply the brakes.

If the pressure in the train line is lower than that of the reservoir, the brake cylinder exhaust portal is closed and air from the car's reservoir is fed into the brake cylinder. Pressure increases in the cylinder, applying the brakes, while decreasing in the reservoir. This action continues until equilibrium between the brake pipe pressure and reservoir pressure is achieved. At that point, the airflow from the reservoir to the brake cylinder is lapped off and the cylinder is maintained at a constant pressure.

If the pressure in the train line is higher than that of the reservoir, the triple valve connects the train line to the reservoir feed, causing the air pressure in the reservoir to increase. The triple valve also causes the brake cylinder to be exhausted to the atmosphere, releasing the brakes.

As the pressure in the train line and that of the reservoir equalize, the triple valve closes, causing the air in the reservoir to be sealed in, and the brake cylinder is not pressurized.

The Westinghouse system is thus fail safe—any failure in the train line, including a separation ("break-in-two") of the train, will cause a loss of train line pressure, causing the brakes to be applied and bringing the train to a stop, thus preventing a runaway train.

Control handle and valve for a Westinghouse Air Brake

STATION THIRTEEN

TRACK WORK

Requirement 5a, 8a7

At this station, you will get to either help build, or repair actual railroad track that we will use at the Whitewater Valley Railroad. You will get to see some of the equipment we use to maintain our tracks, talk to the volunteers who maintain our tracks, and see how good you are a driving railroad spikes.

Bonded main line 6-bolt rail joint on a segment of rail. Note how adjacent bolts are oppositely oriented to prevent complete separation of the joint in the event of being struck by a wheel during a derailment.

By Sturmovik at English Wikipedia, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=7309610

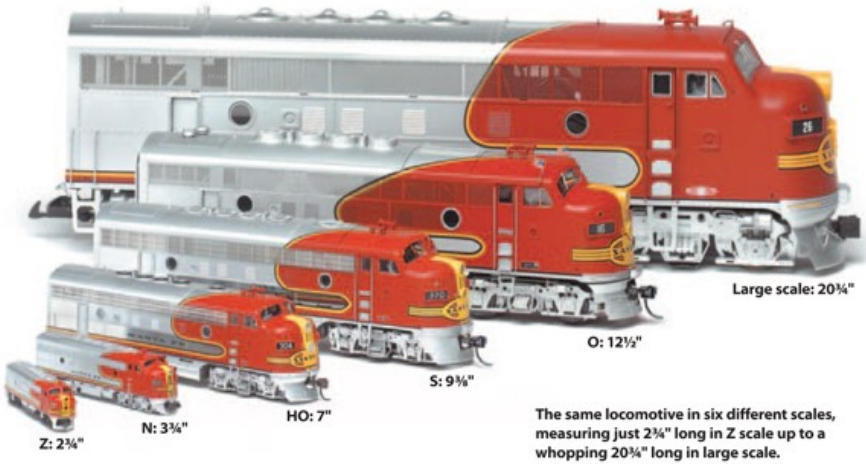
STATION TWELVE

MODEL TRAINS

Requirement 8a3

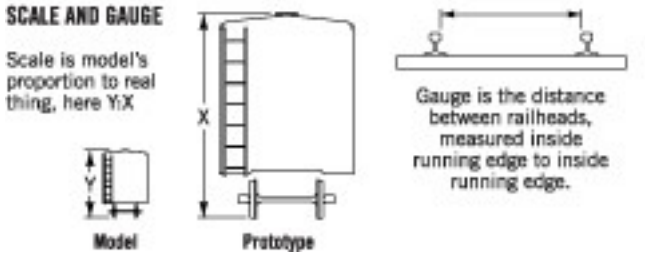
Take a look at some model railroad displays. Note the different *scales* of model equipment available. Think about the advantages and disadvantages of each scale.

Be ready to ask questions of the volunteers who have brought their displays to share with you why they like this hobby.



The same locomotive in six different scales, measuring just 2¾" long in Z scale up to a whopping 20¾" long in large scale.

Scale/gauge designation	Proportion to prototype	Track gauge	Approximate length of 50' boxcar	Minimum radius
Z	1:220	6.5mm	2¾"	5¾"
N	1:160	9.0mm	3¾"	7½"
HO	1:87	16.5mm	7"	15"
S	1:64	⅞"	9¼"	22½"
O	1:48	1¼"	12½"	24"
Gn3	1:22.5	1¾"	19"	24"



STATION TWO

OPERATION LIFESAVER

Requirement 4, 5d,e,g,6

Trains deliver cars, building materials, clothes, etc. to all parts of the country. Highways often cross tracks. Public highway-rail crossings are the only safe place to walk or drive across the tracks. Public crossings are places specifically engineered for the highway to cross over the railway. So that you are able to identify them, public crossings are marked with signs, pavement markings and signals. Passive warning devices are signs and pavement markings that warn you to slow down, look, and listen for a train. Other signs that tell you that you must stop to look and listen for a train before crossing the tracks. Active warning devices are bells, lights, and gates; they tell you a train is coming. You must stop and wait until all trains have passed by before going through a public crossing. You must always yield to a train. The train always has the right of way, and...

ANY TIME IS TRAIN TIME!

Always stay away from railroad rights-of-way so you do not risk being killed or injured by a train. If you are on railroad property without permission you are trespassing.

Never trespass by:

- Ducking under or around lowered grade-crossing gates
- Taking shortcuts across tracks, train bridges, or trestles
- Walking on or near tracks, or hopping rides on trains
- Playing around train cars or locomotives; putting debris on tracks
- Riding ATVs, snowmobiles, dirt bikes on right-of-way

ALWAYS EXPECT A TRAIN

STATION TWO (continued)

OPERATION LIFESAVER

Requirement 4, 5d, e, g, 6

OPERATION LIFESAFER SAFETY TIPS

Railroad tracks (right-of-way) are not safe places to be; they are intended only for trains. The land which extends out on both sides of the tracks is also part of the railroad right-of-way. As well as being dangerous, the right-of-way is private property. Each year, 3,000 people are killed or injured in collisions with trains. Be a live Scout rather than a tragic statistic .

THINGS YOU WANT TO KNOW ABOUT TRAINS

- A train is much wider than the tracks. It extends 3 feet beyond the rail on each side.
- A freight train of 100 cars traveling 55 mph takes more than a mile to stop.
- A freight train traveling 55 mph travels 81 feet each second.
- An optical illusion prevents you from accurately judging the speed and distance of a train that you see coming down the track.

The only safe way to be on railroad property is to buy a ticket and be a passenger. But even as a passenger, riding on trains requires being alert.

KEEP YOUR BODY INSIDE THE CAR!

- Be careful when placing luggage or boxes in overhead racks/bins.
- Wait until the train comes to a complete stop before getting on or off the train.
- Make sure you are in a seat when the train is starting or stopping.
- When moving through the train, use seat backs and handrails for support.
- Be sure to step over the gap between the train and the platform.

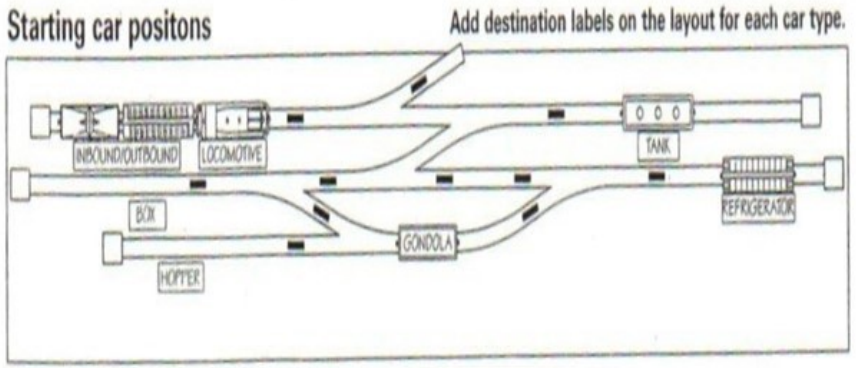
STATION ELEVEN

SWITCHING GAME (The Timesaver)

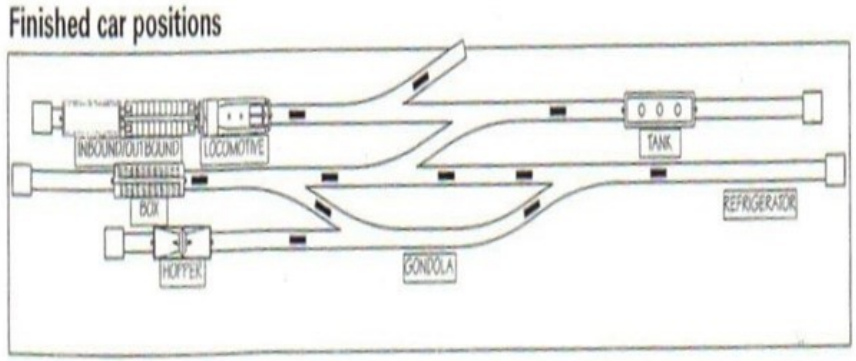
Requirement 8a7

The timesaver is a switching game that tests your problem solving skills to see who can deliver all of the freight cars to their proper destinations in the shortest time.

The game begins with the cars and locomotive positioned as shown in the diagram labeled "Starting car positions. The game ends when all of the cars have been delivered to the positions shown in the diagram labeled "finished car positions." The elapsed time is your score and the best time wins.



Three cars at labeled destinations.
Two cars are marked with tags for removal.

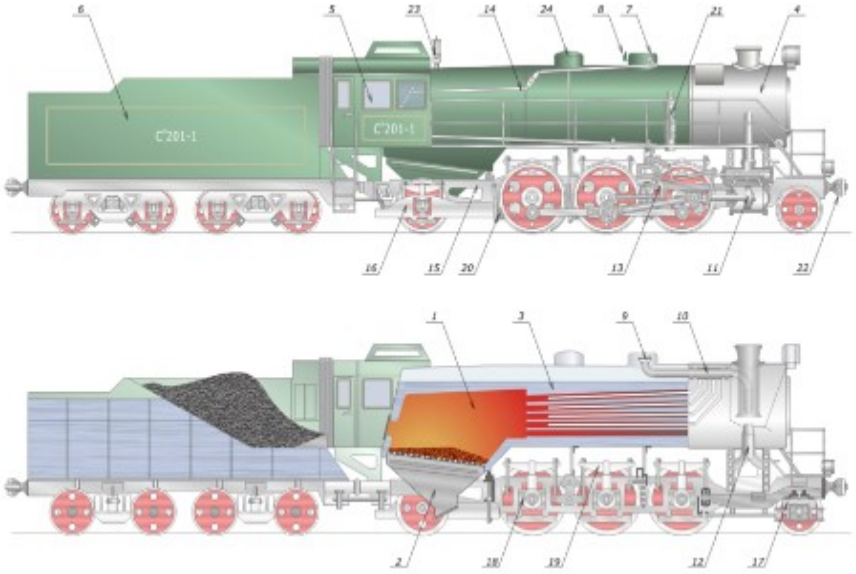


STATION TEN

STEAM LOCOMOTIVE

Requirement Extra Activity

A **steam locomotive** is a type of railway locomotive that produces its pulling power through a steam engine. These locomotives are fueled by burning combustible material – usually coal, wood, or oil – to produce steam in a boiler. The steam moves reciprocating pistons which are mechanically connected to the locomotive's main wheels (drivers). Both fuel and water supplies are carried with the locomotive, either on the locomotive itself or in wagons (tenders) pulled behind.



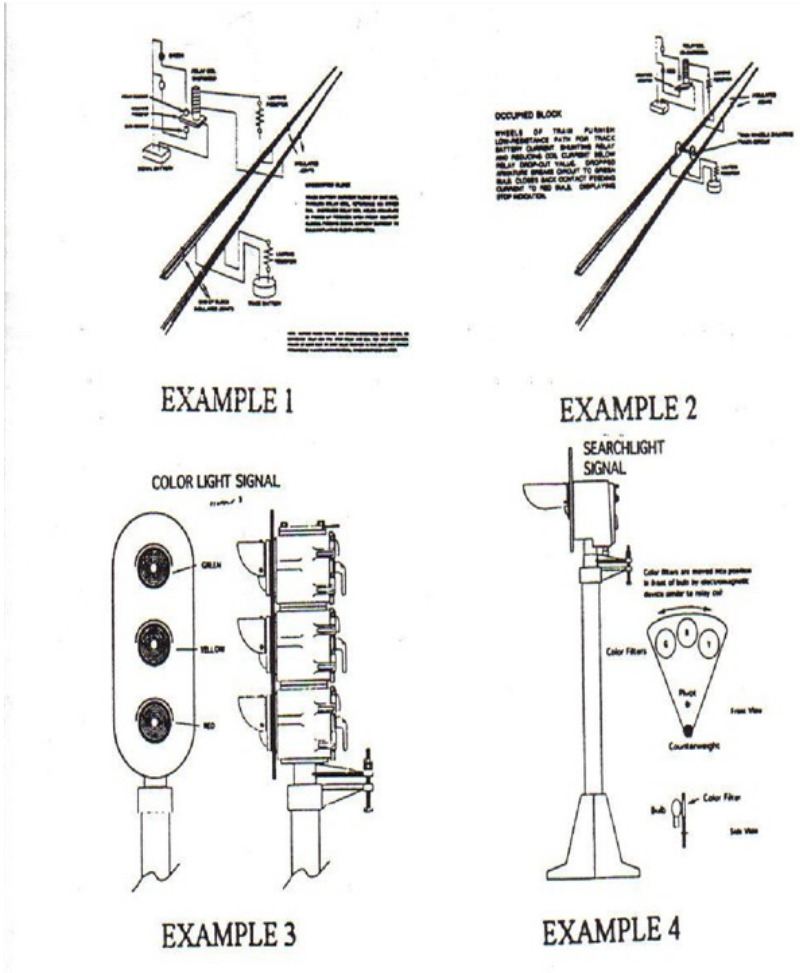
01. Fire chamber
02. Ashpan
03. Water (inside the boiler)
04. Smoke Box
05. Cab
06. Tender
07. Steam dome
08. Safety valve
09. Regulator valve
10 Super heater (in smoke box)
11. Piston
12. Blast pipe
13. Valve gear
14. Regulator rod
15. Drive frame
16. Rear Pony truck
17. Front Pony truck
18. Bearing and axle box
19. Leaf spring
20. Brake shoe
21. Air brake pump
22. (Front) Center coupler
23. Whistle
24. Sandbox

STATION THREE

SIGNALS

Requirement 7a, b, c, d

In order for signals to work the track circuit must indicate if a train is present .
Example 1. Shows a track circuit with no train present in the "block".
Example 2. Shows a track circuit with a train in the "block".
Example 3. Shows a three-light signal mast.
Example 4. Shows a searchlight signal and how it works.



STATION THREE

SIGNALS (continued)

Requirement 7a, b, c, d

Whistle signals are used to warn people about the presence of a train.

They are also used instead of radios to communicate with other trains and railroad employees.

See the table below for commonly used whistle signals.

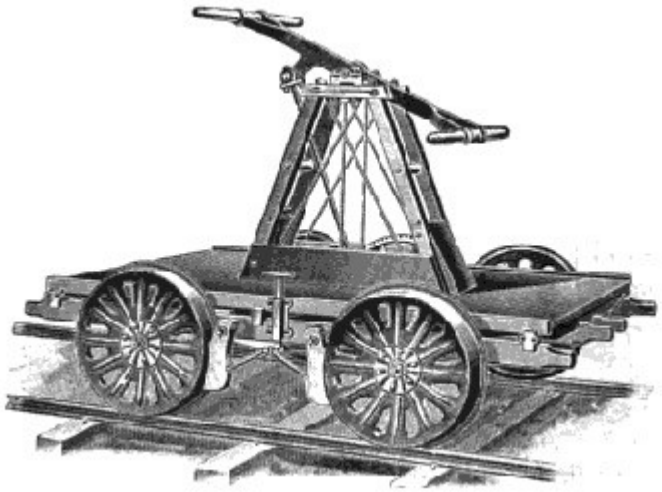
Engine whistle signals

SOUND	INDICATION
O (one short blast)	Brakes applied, stopped.
---- ---- (two long)	Release brakes, proceed.
---- O O O	Flagman protect rear of train.
O O O -----	Flagman protect front of train.
---- ---- ---- ----	Flagman return from west or south.
---- ---- ---- ---- ----	Flagman return from east or north.
O O	Answer to any signal not otherwise provided for.
O O O	When standing, back up.
O O O O	Call for signals.
----- O O	To call the attention of engines, other trains, or track workmen, to signals displayed for a following section.
---- ---- O ----	Approaching public grade crossings.
----------	Approaching stations.
----- ---- O	Approaching meeting or waiting point.
O ----	Inspect train line for leak or for brake
short blasts	Alarm for persons or livestock on tracks.

STATION NINE

HAND CARS

Requirement 7b



Invention

Handcars came onto the railroad scene in the 1860's built by individual railroads in their shops. Early models used a hand crank that was spun to propel the car. These cars were dangerous and killed men. By 1887 most of these cars were out of service.

The handcar has a brake that is activated by a foot pedal. The brake was made of wood, though to increase its stopping ability it was often covered with a leather pad.

Uses

Handcars were mainly used by section gangs. They maintained a section of track that for mainline use was 4-5 miles long, or for branch lines was 10-12 miles long. A typical gang consisted of 6 men who rode the car.

Equipment

Handcars carried tools that included a spike removal claw, spike hammer, shovels, picks, track wrench, rail cutting chisels, signal flags, water, and oil cans. They had a small tool box in the gallows where smaller tools such as a hack saw, files, monkey wrench, and other small tools were kept.

STATION EIGHT
RAILROAD JOBS
Requirement 3a

A railroad needs more than engineers and conductors to operate. There are many different kinds of jobs, requiring lots of different skills to run a railroad.

Jobs are grouped together in departments. Below are some of the departments you will find at a railroad and the kinds of things those departments do for the company.

So in the future, when you are looking for a job, don't forget to see if a railroad is hiring people with the training that you have.

1. **Marketing:** Sells freight services to the shippers.

2. **Finance and Accounting:** Keeps track of revenue and expenses. Raises funds for improvements.

3. **Law**: Handles legal matters for the railroad.

4. **Information Systems**: Designs and maintains computer systems that provide needed information for the railroad and its customers.

5. **Human Resources**: Hires, trains, and provides employee benefit programs.

6. **Executive**: Bears responsibility for the successful operation of the railroad.

7. **Operations**: Runs and controls the trains.

8. **Communications and Signals**: Provides communication systems and maintains the signals that control train movements.

Other departments include Public Relations, Purchasing, and Mechanical

STATION THREE
SIGNALS (continued)
Requirement 7a, b, c, d

The chart below describes hand signals once used to communicate with the train engineer. Today hand-held two-way radios make hand signaling rare, but it may be used if radios fail. Item "g" in the chart is required knowledge for the railroading merit badge. To stop a train, you might need to signal from a location up to a mile from the point where the train actually stops.

While hand signals may be rare on some railroads, the Whitewater Valley Railroad uses them routinely in our operations.

HAND SIGNALS

MANNER OF USING	INDICATION
(a) Swung horizontally at right angle to the track.	Stop
(b) Slight horizontal movement at arm's length.	Reduce speed
(c) Raised and lowered vertically.	Proceed
(d) Swung vertically in a circle at right angle to the track.	Back
(e) Swung horizontally.	Apply air brakes
(f) Held at arm's length above the head.	Release air brakes
(g) Any object waved violently by anyone on or near the track.	Stop

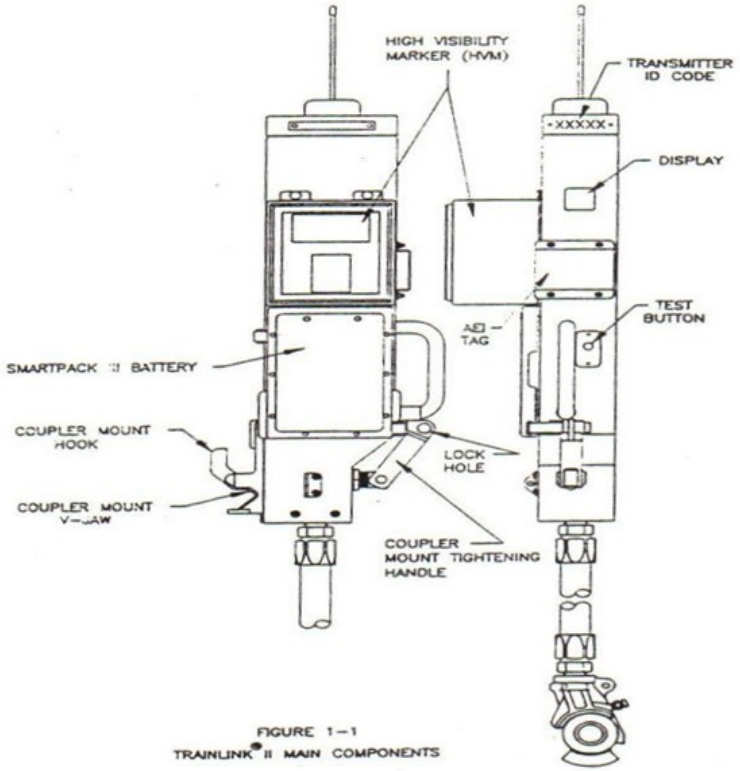
STATION THREE

SIGNALS (continued)

Requirement 7a, b, c, d

The **end of train device** (**EOTD**), sometimes referred to as an **EOT**, is an electronic device mounted on the end of freight trains in lieu of a caboose. They are divided into three categories: "dumb" units, which only provide a visible indication of the rear of the train with a flashing red taillight (**flashing rear-end device** (**FRED**)); "average intelligence" units with a brake pipe pressure gauge; and "smart" units, which send back data to the crew in the locomotive via radio-based telemetry.

Below is a drawing of a smart end of train device (EOTD).



EOTD - End Of Train Device

STATION SEVEN

TIMETABLES (continued)

Requirement 2a, b

What is the train number back to New York? _____

What is the name of the train? _____

If you leave New Orleans on Saturday, what day will you arrive in New York?

_____

What time will you arrive at Penn Station ? _____

If you are in a sleeping car, what can you eat in the diner without paying?

_____

Extra Credit:: How many Train 19's will Train 20 pass between New Orleans

and New York City?_____

Service on the Crescent®

- **Coaches: Reservations required.**
- **Business class:** Seating in dedicated car, two bottles of water, Wi-Fi access and entrance to Amtrak ClubAcela First class Lounge in New York, Philadelphia and Washington, DC and Magnolia Room in New Orleans.
- **Sleeping cars:** Viewliner sleeping accommodations.
  - Amtrak ClubAcela First class Lounge available in New York, Philadelphia and Washington, DC, and the Magnolia Room in New Orleans for Sleeping car passengers.
- **Dining:** Full meal service.
- **Lounge:** Sandwiches, snacks and beverages.
- Checked baggage at select stations.
- Wi-Fi available.
- Trains 19 and 20: trainside checked bicycle service offered between staffed locations handling checked baggage. Customers will check in with the station agent, get a claim check/baggage tag for their bike, and hand up to a crew member inside the baggage car. Visit Amtrak.com/bikes for more information.
- On Saturdays and Sundays, Train 20 arrives New York 1:48 p.m.

STATION SEVEN

TIMETABLES (continued)

Requirement 2a, b

19	‹ Train Number ›					20
Daily	‹ Normal Days of Operation ›					Daily
	‹ On Board Service ›					
Read Down	Mile			Symbol		Read Up
2 15P	0	Dp	**NEW YORK, NY** (ET) –Penn Station		Ar	1 46P
R2 37P	10		Newark, NJ			D1 25P
R3 18P	58		Trenton, NJ			D12 41P
R3 55P	91		**PHILADELPHIA, PA** –30th Street Station			D12 08P
R4 19P	116		Wilmington, DE			D11 44A
R5 12P	185		Baltimore, MD-Penn Station			D10 55A
R6 30P	225	Ar Dp	**WASHINGTON, DC** –Union Station		Dp Ar	D9 53A
6 49P	233		Alexandria, VA			D9 32A
7 22P	258		Manassas, VA			8 35A
7 55P	293		Culpeper, VA			8 01A
8 52P	337		Charlottesville, VA Richmond—see right			7 09A
10 00P 10 06P	368	Ar Dp	Lynchburg, VA (Roanoke)		Dp Ar	6 56A 6 52A
11 14P	461	Ar	Danville, VA		Dp	4 43A
12 15A 12 22A	512	Ar Dp	Greensboro, NC (Winston-Salem)		Dp Ar	3 44A 3 37A
12 39A	524		High Point, NC			3 16A
1 17A	559		Salisbury, NC			2 32A
2 20A 2 45A	601	Ar Dp	**CHARLOTTE, NC**		Dp Ar	1 46A 1 21A
3 12A	623		Gastonia, NC			12 39A
4 14A	678		Spartanburg, SC			11 39P
4 54A 5 01A	709	Ar Dp	Greenville, SC		Dp Ar	10 58P 10 53P
5 39A	739		Clemson, SC			10 16P
6 15A	773		Toccoa, GA			9 40P
6 58A	810		Gainesville, GA			8 59P
8 13A 8 38A	859	Ar Dp	**ATLANTA, GA** (ET)		Dp Ar	8 04P 7 35P
10 00A	959	Dp	Anniston, AL (CT)		Dp	3 59P
11 50A 12 08P	1023	Ar Dp	**BIRMINGHAM, AL**		Dp Ar	2 24P 2 15P
1 07P	1078	Dp	Tuscaloosa, AL		Dp	12 44P
2 58P 3 04P	1175	Ar Dp	Meridian, MS Dallas—see right		Dp Ar	11 07A 11 02A
4 01P	1231		Laurel, MS			10 05A
4 38P	1260		Hattiesburg, MS			9 30A
5 42P	1324		Picayune, MS			8 22A
6 07P	1342		Slidell, LA			7 57A
7 32P	1377	Ar	**NEW ORLEANS, LA** (CT) –Union Passenger Terminal		Dp	7 00A

SCHEDULES EFFECTIVE XXXX

STATION FOUR

BSA RAILROAD VIDEO

Requirement 1a, c

You will watch a video produced by the BSA and the BNSF railroad. Pay lots of attention to this video. It answers many questions on the test you will take Sunday.

Look for the different types of railroad cars and different types of trains.

Pay attention to the kinds of jobs that are needed on a railroad.

This video does a great job of describing the signals an engineer looks for.

It talks about railroading hobbies, like model trains, and gives some details.

Finally, like about everything you will do today, it talks about safety. Please pay attention, it could save your life!

STATION FIVE

RAILROAD SAFETY

Requirement 5, 6

At this station, you will get to listen to one of our railroad volunteers discuss some of the obvious dangers of being around railroad equipment as well as some things that you likely have not considered.

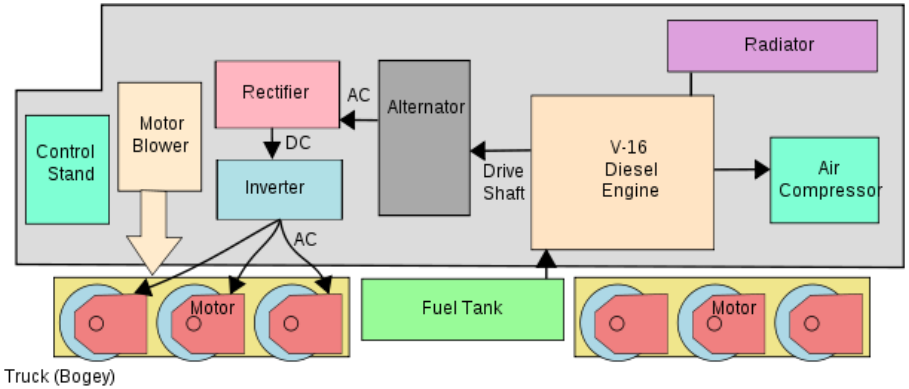
You will also get to ask questions of this volunteer. Be ready with good questions about his/her experiences at the railroad and why they like being a volunteer railroader.

STATION SIX
LOCOMOTIVE TOUR
Requirement 1d

Notes

Here you will get the opportunity to get in the cab of 2 or more locomotives. A volunteer engineer will be in the cab to answer your questions about the controls, how the engine develops power to drive the wheels and how that power gets to those wheels.

Sit in the engineer's seat, see how much (or how little) the engineer can actually see when they are operating the train.



SCHEMATIC DIAGRAM OF MODERN U.S. DIESEL ELECTRIC LOCOMOTIVE
•Engines may be V-12, V-16 or V-20
•Engine drives either an alternator (AC) or generator (DC)
•Traction motors are either DC or AC
•Motor blower blows air over traction motors to cool them

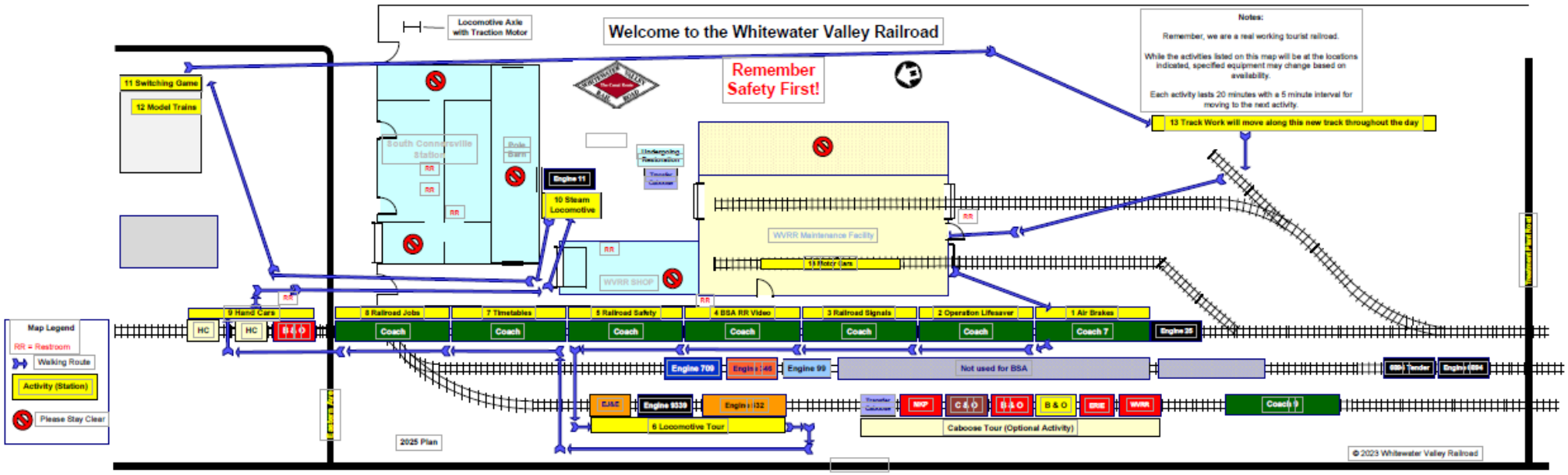
https://commons.wikimedia.org/wiki/
File:DieselElectricLocomotiveSchematic.svg

Notes

STATION SEVEN
TIMETABLES
Requirement 2a, b

Explain the use of a timetable by making a written plan for a trip by rail between two cities at least 500 miles apart. List the times of departure and arrival at your destination, the number of the train, and the service you want.

Most railroads wanted out of the passenger business in the 1960's and welcomed the federal government's formation of AMTRAK to carry passengers. Most of our nation's young people have never ridden a train. In order to understand train travel, it is necessary to read a timetable. The sample timetable is for Train 19 and 20, The Crescent. Train 19 is a daily train departing New York City at 2:15 P.M. Since the train originates in New York, it is referenced as mile post 0. If the train is on time, it will arrive in Washington D.C. at 6:30 P.M. A passenger travels 225 miles between New York and Washington D.C. If a passenger travels from New York to New Orleans, he would arrive at 7:32 P.M. the following day having traveled 1,377miles. According to the schedule for Train 19 and 20, a passenger may choose from the following services: coach, standard bedroom, or deluxe bedroom. Standard and deluxe bedroom accommodations include complimentary meals and other amenities.


Welcome to the Whitewater Valley Railroad
Locomotive Axle with Traction Motor
Remember Safety First!
Notes:
Remember, we are a real working tourist railroad.
While the activities listed on this map will be at the locations indicated, specified equipment may change based on availability.
Each activity lasts 20 minutes with a 5 minute interval for moving to the next activity.
13 Track Work will move along this new track throughout the day
11 Switching Game
12 Model Trains
South Connersville Station
Pole Barn
Engine 11
10 Steam Locomotive
Undergoing Restoration
WVRR Maintenance Facility
WVRR SHOP
9 Hand Cars
8 Railroad Jobs
7 Timetables
5 Railroad Safety
4 BSA RR Video
3 Railroad Signals
2 Operation Lifesaver
1 Air Brakes
Coach
Coach 7
Engine 25
Engine 709
Engine 99
Not used for BSA
Engine 9339
6 Locomotive Tour
Caboose Tour (Optional Activity)
Coach 9
Map Legend
RR = Restroom
Walking Route
Activity (Station)
Please Stay Clear
2025 Plan
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