Presents

RAILROAD SURVEYING 101

PLSO CONFERENCE 2015
TRAVERSE TO THE FUTURE
JANUARY 21–23, 2015
SALEM CONVENTION CENTER
200 COMMERCIAL ST. SE, SALEM, OREGON

SALEM, OREGON
SPLIT SESSION THURSDAY/FRIDAY

www.f-w.com
SAFETY DRILL (RAILROAD OBSESSION)

- Safety Briefing
- Fire Exits
- CPR /IED Use
- Meeting Place
- Designated Caller (911)
- Designate Hazards
- Changes During Day
Safety (AREMA C-24)

MODULE 1

- Surveyor’s Right of Entry vs. 49CFR214
- Why “On Track Safety”

  - 1 surveyor (GA) last facility 2012
  - More than half pedestrian trespassers
  - 2 Surveyor Fatalities ND 2014

THERE IS NO EXEMPTION BY STATUTE FOR SURVEYORS IN CO/WY/UT/NM/KS BEING ON OPERATING RAILROAD R/W OR FOULING LIVE TRACK.
Response to Oregon State Statute/Code

- IF the surveyor is there **without** the knowledge and permission of the railroad, he/she is a **trespasser** at the federal level under 49 CFR 214....You can only be a roadway worker, an operating employee or a trespasser under the federal regulations (no exceptions shown in the rule)

- What qualifies him as a “roadway worker” under 49CFR214? (NOT Railroad Rules qualified, no evidence of annual training by a railroad common carrier)

- Homeland Security issue / you became a threat to Interstate Transportation? (like RailFans?)

- OSHA has limited jurisdiction on RR R/W, FRA assumes lead role (If no OSHA rule, FRA rule then holds where appropriate.) Injury on RR R/W becomes a railroad statistic.)
OREGON R-O-E STATUTE ORS 672.047

672.047¹
Right of entry by land surveyor
• compensation for damages caused
• notice
• removal of survey markers

(1) Subject to subsection (4) of this section, a registered professional land surveyor, or any employee or agent of the land surveyor, may enter on foot, where practicable, upon any land for the purpose of surveying or performing any survey work and may establish permanent survey monuments as allowed by rule of the State Board of Examiners for Engineering and Land Surveying.

* Subsection (4) and 49CFR214(c ) is the kicker (Notification)
Subpart (4)

• (4) A registered professional land surveyor, or any employee or agent of the land surveyor, may not enter upon land for the purpose of surveying, performing other survey work or establishing a permanent survey monument without first providing notice to the landowner by first class mail or by personal notice. If the land is occupied by a person other than the landowner, notice must also be given to the occupant by first class mail or by personal notice. Notice that is given by first class mail must be mailed at least seven days prior to the entry onto the land. Notice that is given by personal notice must be hand-delivered to the landowner or occupant or be posted in a conspicuous place where the landowner or occupant may reasonably be expected to see the notice. The notice shall give the professional land surveyors name, address, telephone number, purpose, availability of the survey and the presence of any temporary or permanent monuments or other markers to be left on the land.

• You find yourself at odds w/ ORS :164.255(1) (c) as a railroad trespasser:
  • “Enters or remains unlawfully upon railroad yards, tracks, bridges or rights of way”; The issue is SAFETY first, followed by Homeland Security and interference with interstate commerce.
Right of Entry vs. Safety

• 49 CFR 214 “ON TRACK SAFETY”
• Railroad Property is PRIVATE Property
• Railroad Police (Special Agents) are licensed federal marshals (complete w/ guns and badges!)…can arrest YOU! (and report you to FRA Compliance Officers)
• You can be arrested for criminal trespass!
• You most likely are not insured to work on railroad rights-of-way… (special risk area)
• OSHA/FRA can fine you $10,000 + (up to $27,000)
Opening Consideration: The “Dirty Dozen”

The TOP 12
STUMBLING BLOCKS, BLUNDERS, ASSUMPTIONS (BAD OR MISINFORMED) RAILROAD TECHNICAL PROFESSIONALS SEE ON AN ALMOST EVERYDAY BASIS
“The “Dirty Dozen”

#1 Railroad curves
#2 If in doubt, the Assessor’s Map is WRONG!
#3 Slope Chaining!
#4 Center of Track in mainline curve is NOT center of right-of-way, there is no such thing as parallel spirals and 3-point on curve solution is VERBOTEN!!
#5 All railroad R/W’s are strip conveyances, right?
#6 Pulling of a milepost (It’s got legs!!)
The “Dirty Dozen” continued

#7 Misinterpreting Control Point
#8 Equations and scaled items (“sc.” and “pro”)
#9 Misinterpreting chaining and map calls
#10 T-Rails (Why was it set and where’s the actual point?)

Potentially deadly blunders...“I’m a surveyor and I don’t need any permission to send my crews out on the tracks and besides: (1) the trains go slow here and I can always get a schedule”
- or -
“My insurance will cover me while working on the railroad”
The “Dirty Dozen” continued

#11 Fenceline = Right-of-Way Line?
#12 The only public record is found in the county courthouse?
TYPICAL BLUNDER (Made the Papers!)

Former UP “Northern District” 1905-1972

www.f-w.com
Mapping Instructions

• ICC General Order #1 (1914) mapping instructions
• ICC General Order #4 (1915) field survey parties
• ICC General Order #7 (1916) land schedules
• Please download David Pfieffer’s excellent research text at: [http://www.rrhistorical-2.com/rlhs/research.htm](http://www.rrhistorical-2.com/rlhs/research.htm) (ALIAS RIP-91) Excellent description of what can be found at archives-2 (Rockville, MD)……..
• PDF’s Downloadable on the web via National Archives
PLEASE AVOID THE
“STUPID ZONES”!
“Stupid Zones”

- New Roads and Highways Crossing Railroad Curves at Grade…
- Vertical Curves within 30 Ft. Of the Nearest Rail at an At-Grade Crossing (AASHTO/AREMA JOINT STANDARD)
- “FOULING” the std. clearance envelope
- Utilities too shallow or too close to railroad switches, bridges and structures
- Creating sight distance problems
“Stupid Zones”

- New Roads and highways crossing railroad curves at grade…
- Vertical curves within 30 Ft. of the nearest rail at an at-grade crossing (AASHTO/AREMA JOINT STANDARD)
“Stupid Zones”

• “FOULING” the standard clearance envelope
• Utilities too shallow or too close to railroad switches, bridges and structures
• Creating sight distance problems
OK, where am I on the RR?

• Learn to communicate with the railroad in terms that they more readily understand

I’m interested in finding map data at:

State: WYOMING
Region: Northern
Division: Powder River
Subdivision: CASPER LS-5
Between: STATION and STATION: Casper (202.2) & Bishop (213.0)
Between: Milepost and Milepost: MP 202 and MP (213)
Near Crossing: (DOT Number): 064 978M (1st Street in Casper)
US-DOT/ AAR Crossing Numbering System

- Typical DOT number tag found attached to poles, cross-bucks, mast-mounted flashing lights/gate/bells, bridges and also stenciled on signal department instrument cases.
- UP & BNSF Now include those numbers on the “Panic” signs found at all crossings (UP is 4” x 8” Blue & White, BNSF’s are 14” x 18” Black and White steel signs...
US-DOT/ AAR Crossing Numbering System

- Tags can be gray-metal license plates (4” x 9”) and/or 5” x 9” laminated cardboard tag.
- DOT Numbers are unique to a particular crossing in the USA. Number is a 6-digit number and a check code letter. Tag also shows track owner!
If All Else Fails, Before You Panic:

EMERGENCY NUMBERS

- UNION PACIFIC 1-800-848-8715 Dispatcher
  1-800-877-7267 UP Police
- BNSF 1-800-832-5452 Emergency
- OMNITRAX (GWR & NKCR) 1-800-533-9416 Emergency (24/7)
- Genessee & Wyoming Company (CORP; PNWR) 1-866-527-3499 (Central Dispatch)
- MAX/TriMet /WES 9-1-1 (800# Published Soon 4/15?)
- Others at: Oregon Operation Lifesaver Facebook page or www.oregonoli.org

Please do not call these numbers looking for mapping or survey information, you are talking to the dispatchers or police desks in the dispatch centers…

By law, all operating railroads have a posted emergency number, by July 2015 that number must be toll-free if the railroad extends outside the limits of a single local toll zone. (6” x 9” ENS SIGNS MUST BE POSTED)
Panic Signs Look Like...

Norfolk Southern

CSX
Panic Signs Look Like…

UNION PACIFIC

BNSF
DOT # Information from Panic Signs

http://cabernet.caliper.com

Example of web page
DOT # Information from Panic Signs

http://cabernet.caliper.com

Example of web page
New Signs to Look for...
Information on New or Modified Crossings

• The ONLY arbiter of what crossing is public or private in Oregon is the ODOT - Rail Safety Section, under its application/decision process. (OR Revised Statute & Administrative Rule OAR 741-120-0010)

(You cannot turn a private crossing into a public crossing w/o ODOT-RSS’s OVERVIEW!!)

• The ONLY agency that can permit placement of, change width of or dictate change type of crossing protection of a public crossing is the ODOT Rail Safety Section.

• http://www.oregon.gov/ODOT/RAIL/Pages/OAR_ORS.aspx
  – ODOT Railroad Section now administers the DOT Crossing Number database for their states (Issues new numbers and does record corrections)
STATE JURISDICTION OVER CROSSINGS

• BY AGREEMENT & LETTERS OF UNDERSTANDING DATING BACK OVER THE YEARS

• RAILROAD CROSSING DESIGN & PLACEMENT GOVERNED BY THE STATE

• INSPECTION AND COMPLIANCE IS BY FEDERAL RULE, STATE CAN INSPECT USING FEDERAL (FRA) RULE.

• OPERATING INSPECTION AND COMPLIANCE IS PER FEDERAL RULE, STATES CAN PROVIDE INSPECTORS AS LONG AS THEY ABIDE BY FEDERAL RULE.

• INTRA-STATE VS. INTERSTATE REGULATION

• CLEARANCE REGULATION IS LEFT TO THE STATES UNLESS THERE IS A SUPERCEEDING FEDERAL RULE (Example: Main track & switching lead clearances, soon to be coming are rules regarding private crossings)

• WHO ASSUMES THE ROLE OF ADMINISTRATIVE LAW JUDGE?
Basics of Railroad Survey Control

HIERARCHY (best to least)

(1) T-Rails (called out in mapping)
(2) Crossing frogs
(3) Bridges & Tunnel Portals (including stone arches)
(4) Pipes, Culverts & Treated Timber Boxes
(5) Headblock / Point of Switch (Turnouts)
(6) Centerline of road crossings
(7) Signage
(8) Map Calls to land lines (PRO & SC Standard Warning)
Basics of Railroad Survey Control

(1) T-Rails (called out in mapping)

REMEmBER: Point is where center of web meets the base of the rail!
(Crash course condensed version)

- Charters
  - (A) Initial Regulation
- Regulation (pre & post Staggers Act, 1983)
- Common Carriers Defined (Class 1’s, Regionals, Shortlines, Industrials)
  - (A) ICC vs. AAR Classification
- Interurban & Transit
- Logging & Mining Railroads
- Funiculars / Inclined Railways
- Mileage of all gauges in the US “tops out” between 1915-1923 (254,000 miles in 1916)
  - Current mileage is just short of 183,000 miles (check figure, Standard & Poors’)
- Railroad genealogy / Chain of Title (Understanding History & Finance)
Railroad Operating Structure

Typical, Military Origins to Today

• Operating
  – Trainmaster, Yardmaster, Superintendent, Train Crews, Dispatcher, Management Asset Management, LAW, Lease & Contract, Accounting, Billing

• Maintenance / Engineering (M/W)
  – Division Engineer, Roadmaster, Chief Engineer, Trackman, Field Engineer, Signal and Communication Functions

• Equipment / Mechanical
  – Mechanical Foremen, Carmen, Shops
Railroad Orientation

MODULE 5

• Timetable vs. Geographic / Compass Direction
• District / Division / Subdivision / Line Segment
• Railroad Slang (Skip)
• Safety Rules / Testing / Requirements
Evidence and Official Record

- Looking Beyond the Courthouse
- Surveyors collect, examine & evaluate “EVIDENCE”, they are not “Judge and Jury” (Even though at times we ought to be)
- The assessors map is “a best guess estimate” - It should not be gospel!
- Official record does not automatically imply that it will be found in the local courthouse!
The **Original Surveyors**

- Most were trained by the U.S. Military
- Vernier Transits, Wye Levels, Chains, Books, tables and slide rules (walk a mile in the shoes of these folks!)
Atchison Topeka & Santa Fe

- A. A. (Albert Alonzo) Robinson
- Louis Kingman
- A.R. (Ray) Morley
- W. B. Strong
- Henry Randolph Holbrook
- Richard B. Coleman
  “The BIG-6”
- J. A. Noble (DC & CV RR 1913-1936)
“Location Engineer” = Original Surveyor

- TED JUDAH (Central Pacific)
- Isaac I Stevens (1853 Pacific RR Surveys)
- Henry Larcom Abbot (under Williamson, 1853 Survey)
- John F. Stevens (NP)
- W.F. “Billy” Nelson (Oregon Trunk/ Hill Lines)
- F.S. Gordon (Oregon Trunk/ Hill Lines)

- INTERESTING READING: *THE DESCHUTES RIVER RAILROAD WAR*; LEON SPERLOFF
  - ARNICA PUBLISHING 2007
UNION PACIFIC

- General Grenville Dodge
- James Evans
- Robert Blickensderfer
- Samuel B. Reed
- L.L. Hill (Arapaho Indians 6-18-1867)
- Percy Brown (Sioux Indians 7-8-1867)
- J. M. Eddy
- Charles Adams
DENVER & RIO GRANDE

- William Jackson Palmer (via KP)
- John McMuirrie
- J.A. DeReymer
- Thomas Wigglesworth
- Frank King

- General William J. Palmer was trained on the PRR, served with Union General George H. Thomas (and Dodge + others in the Union Transportation Corps) in the Civil War, worked on the Kansas Pacific 1866-1869 from Kit Carson To Denver as Location Engineer and Managing Director building 150 miles in 152 days. After the disaster with the Arkansas Valley Railway, Palmer was a better manager than a surveyor, he concentrated on building the D&RG. Palmer brought the narrow gage era in July 1871 to Colorado after studying Fairlie’s methods in Great Britain.
Colorado Central RR

- Edward Berthoud
- Robert Blickensdorfer
  (conceived the now famous Georgetown Loop....Georgetown to Silver Plume, Colorado)
- Both worked under W.A.H. Loveland, GM
Colorado & Southern / FW&DC

- Grenville Dodge (post UPRR w/ connections to U.S. Grant & W. T. Sherman)
- Harvie C. Lowrie
- John Tritch
- C. J. Stopplecamp
Hagerman Pass was originally named Wigglesworth Pass, slight name change after a notable power struggle....
Moffat Road / Denver Northwestern & Pacific / Denver & Salt Lake RR

- Horace A. Sumner...Later to design the “Cloudcroft Curve & Trestle” in New Mexico and worked for Charles Eddy’s El Paso & Northeastern (Southern Pacific RR in Southern New Mexico)
- LOUIS BLAVELDT
- ARGO, MERIDETH, MILNER, REED,
J. A. De Reymer

- Denver & Rio Grande RR (1874-1902)
- Colorado & Wyoming RR (1903)
- San Luis Central RR (1908)
- Southern San Luis Valley RR
- Followed Palmer to Mexico 1893-1903

- (McMurtrie went into the railroad contracting and construction business, headquartered in Pueblo)
RIO GRANDE SOUTHERN

- Otto Mears
- Charles W. Gibbs (superstar!)
Federal Laws and Regulations

- Acts of 1862, 1866, 1872, 1875
- Interstate Commerce Act of 1913
- Staggers Act of 1983
- ICCTEA and TEA-21
- Titles 16, 43 and 49 of the Federal Revised codes (CFR’s)
State Laws

- Fence & Livestock (Title 48; Chapter 607; Divisions 310-330)
- Statute Side Clearance (OAR Chapter 741, Divisions 300 through 335)
- AREMA Chapter 28 (Clearance Tables by state)
- The Ag Industry Issue (Ethanol Plants, Mines, quarries, etc.)
State Laws

- Fence & Livestock (Discussed Earlier …Fences DO NOT reference property lines, barrier only)
- PUC/ DOT Side Clearance (AREMA Chapter 28 and ORS 608.310-608.330 (Clearance Tables by state)
- REMEMBER THIS WHEN WRITING EASEMENTS !!!

www.f-w.com
This single government regulation gave today’s surveyor the following to use as evidence:

- ICC CADASTRE (Valuation maps, station, R/W, Land & other maps)
- VAL map index maps and overview to railroad in 1918
- ICC Valuation Order #7 …land schedules
- ICC Corporate structure valuation statements (family tree)
- ICC Field notes (title, improvements, audits, appraisal)
- Uniform standards between railroads
- Collection of applicable maps & records of the time
ICC Uniform System of Accounts

49CFR1201

- Impetus for railroads to catalog all improvements to verify
- Addition and betterments accounting system
- Depreciation was not allowed 1913 until 1983 & Staggers Act!!
- Those railroads so valuated
  - (Turned in a complete set of maps schedules & accounting)
    - HTTP://WWW.NHRS.ORG (pfieffer nara paper)
Direct outcome of ICC Act of 1913

VAL Maps (under ICC General Order #1) were created as an “accounting tool”

Accountants make lousy surveyors, the rules under ICC G.O. #1 have come to haunt surveyors relating to these maps ever since

The Act (under 49-CFR-1201) is more to level the playing fields in a tax sense than for the benefit of surveyors and mappers… “VALUATION”!
ICC General Order #1

Specifications for Maps and Profiles
As prescribed by the Interstate Commerce Commission in accordance with Section 33 of the Act to Regulate Commerce

First Issue
Effective as of December 1, 1914

Note: Curves with Easements or Spirals to be shown.

IV. Form of Maps and Profiles

The Right-of-Way and Track Map shall be made in sheets 24 by 36 inches. A plain, single-line border shall be drawn on each sheet, dimensions inside of which shall be 23 by 35 inches.
The Station Maps shall be made in sheets 24 by 36 inches, with border line as above. When more than one sheet is required to show a station property, the plot shall be made upon “matched marked” sheets in such manner as to require a minimum number.
The profile shall be made in sheets 12 by 16 inches with border. The size inside of border line shall be 10 by 15 inches.

7. Scale.
The Right-of-Way and Track Map shall be made on a scale of 1 inch equals 400 feet, or 1 inch equals 300 feet.
The Station Maps shall be made on a scale of 1 inch equals 200 feet, or in complicated situations 1 inch equals 50 feet.
The Profile shall be made on standard grid A, and on scales of: Vertical, 1 inch equals 20 feet; horizontal, 1 inch equals 400 feet.

8. Symbols.
The symbols used on all maps and profiles shall be the standards recommended by the American Railway Engineering Association, so far as they may be applicable.

9. Lettering.
All lettering on maps and profiles shall be in plain, simple style.

10. Arrangement of Data.
The Right-of-Way and Track Map sheets shall be made with the new or...
ABOUT THE VALUATION NUMBERING SCHEME

CADASTRE
SET OF HIGHLY ORGANIZED OVERLAYING MAPS
(GIS BEFORE THE ADVENT OF COMPUTERS)

IF ALL YOU EVER SAW WAS THE RAILROAD R/W MAP, THEN
YOU ONLY SAW THE TIP OF THE ICEBERG

THE WEALTH OF INFORMATION THAT STILL EXISTS IS
TRULY STAGGERING

LAND SCHEDULES – FIELD NOTES – ACCOUNTING
(ADVENT OF RAILROAD “LINE SEGMENTS”)
VALUATION SECTION NUMBERING

V1
SL-22a

VALUATION SECTION
MAP SHEET NUMBER

ALL DRAWINGS 24” x 56” FORMAT
Two Inch Circle / Lower RH Corner
NO LETTER = Base Map Sheet
=1”=200’ or 1”=400’
= Right of Way & Track Map
S = STATION (1’=100’ Generally)
T = TERMINAL
L = LAND
I = Index (key)

P = Profile *** All Railroads provided a 24” x 56” sheet set showing to
corporate make-up at date of valuation (corporate family tree)... Plus Key
maps of the assembled valuation sections (map mosaics)
Valuation Map Key Index (typical)
FIRST TENTATIVE DRAFT

INSTRUCTIONS
FOR
ROADWAY AND TRACK FIELD PARTIES
OF THE
INTERSTATE COMMERCE
COMMISSION

DIVISION OF VALUATION

WASHINGTON
GOVERNMENT PRINTING OFFICE

www.f-w.com
ICC General Order No. 7

Land Schedules, Form DV-107
Before GIS there was still cadastre. Form DV 107

COURTESY OF ICC GENERAL ORDER No. 7