

ILLINOIS Railroad Surveying Basics RAILROAD SURVEYING 101 SPRINGFIELD, ILLINOIS – CROWNE PLAZA HOTEL FEBRUARY 7, 2025 – "GETTING IN THE GAME"



Powered by



ILLINOIS PROFESSIONAL
LAND SURVEYORS ASSOCIATION



JOB BRIEFING -

Safety considerations/RR standard briefing prior to starting task(s) in the office or the field...



- Safety Briefing
- Fire Exits / Place of Safety
- CPR/IED Use
- MEETING PLACE
- DESIGNATED GALLERY / 911
- Designate Known Hazards
- Changes During The Day



Subsidiary will always start with a job briefing. It's just good practice.

Qualifying caveat(s), 49CFR214 compliance course not taught here ... Try ContractorOrientation.com, e-Rail Safe or other designated instruction for that particular railroad...
What you should take away from this course today

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SAFETY SERMON (AREMA C-24)

Surveyors' Right of Entry vs. 49CFR214(d) On Track Safety

THERE IS NO EXEMPTION BY STATUTE FOR SURVEYORS IN ILLINOIS OR ANY OTHER STATE (FEDERAL SAFETY ISSUE) FOR BEING ON OPERATING RAILROAD R/W OR FOULING LIVE TRACK. (FEDERAL RULE WILL TRUMP STATE AND LOCAL RULE EVERY TIME – Federal Exemption)



– Security Camera Video Courtesy: FRA

WHY ON-TRACK-SAFETY:
IN THE UNITED STATES, A SURVEYOR IS KILLED ON THE TRACKS AT ROUGHLY THE RATE OF ONE PER YEAR.

THIS HAS GOT TO STOP

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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!
- You can be arrested for criminal trespass!
- You most likely are not insured to work on railroad lights/cars... (special risk area)
- OSHA/WPA can fine you \$10,000+
- THERE IS NO ILLINOIS STATUTE EXEMPTION FOR SURVEYORS ON RAILROAD PROPERTY

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Last FATAL Occurrence: Joliet, IL



APRIL 3, 2019
 NO PROTECTION
 NO SITUATIONAL AWARENESS
 NO PERMISSION (TRESPASSER)
 NO INSURANCE




THE SAD STATISTIC REMAINS THAT AT LEAST ONE SURVEYOR A YEAR IS KILLED ON OR AROUND MOVING TRAIN (AMTRAK) COMPLIANCE HILLS AND ANOTHER PRIVATE CROSSING STATISTIC ON THE BOOBS

This was AMTRAK/UP (SP/SL/CN) at a PRIVATE CROSSING, USING A RAILROAD R/W ROAD AS A SHORTCUT...5 Near Fatal Since!!!

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TO BE EXAMINED TODAY:

- Common Misconceptions & Blunders
- Basics of Railroad Survey Control
- Following in the Footsteps of The Railway Location Engineers (The ORIGINAL Surveyors)
- Evidence and Official Record
- Abandonment / Rails to Trails
- Federal Rule & Evidence



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TO BE EXAMINED TODAY:

- Federal Laws & Regulations
- Reference Material and Where to Find It
- The ABANDONMENT Issue (Incl. Rails to Trails)
- Right of Entry vs. Safety Regulation (49CFR214 On Track Safety)....Insurance Coverage
- Contact Sheet for Illinois Railroads



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THE DIRTY DOZEN (COMMON ERRORS)

- #1 Railroad curves (100 Ft Chord vs. Arc)
- #2 If in doubt, the Assessor's Map / GIS is WRONG!
- #3 Slope Chaining ! (ICC GO-1 and ICC GO-4)
- #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!!!



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Dirty Dozen (cont.)

- #5 All railroad R/W's are strip conveyances, right?
- #6 Pulling off a milepost (it's got legs!)
- #7 Misinterpreting Control Point
- #8 Equations and scaled items ("sc." and "pro")



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Dirty Dozen (cont.)

#9 Misinterpreting chaining and map calls

#10 T-Rails (Why was it set and where's the actual point?)

DEADLY BLUNDER: "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."

My insurance will cover me while working on the railroad....



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OTHER CURRENT PET PEEVES

WHAT RAILROADERS SEE FROM THEIR SIDE OF THE FENCE (GUESSING GAMES)

- "TAKENENTS" (REMAINS A DIRTY WORD AROUND RAILROADERS)
- CONTRACTS (FAILURE TO DOCUMENT OR KEEP OR ASSON, TITLE COMPANY BLUNDERS - REPEATED IGNORANCE OF THE TITLE INDUSTRY)
- WAITING UNTIL CONSTRUCTION BEGINS TO START PERMITTING, THERE IS NO INSTANT RUBBER STAMP
- LABELING OF PLATS (CURRENT OWNER vs. TITLE COMPANIES OPINION)
- MISUNDERSTANDING OF WHAT FEDERAL GRANT RIGHT OF WAY (GROW) IS
- UTILITIES CROSSING RAILROADS (PEEKLESS IN A HURRY, NOT THINKING, CHEAP)
- WHEN IS A ROAD CROSSING PUBLIC (LOCAL GOVERNMENT FAILS)
- ASSESSOR WORKING AND OUNDERSHIP (HURRO), FENCE LIDMANKS
- TRACKING NOT BE AGAINST EAVS, Grades & Slopes
- MONUMENTS SET IN TRACK OR TOO CLOSE (Include 25 feet or in Rail Road)
- COUNTY ASSESSOR MAPPING/GIS DATA THAT WON'T LOOK BEYOND COURTHOUSE
- COUNTY PROFESSIONAL STATE RECORDS
- ADJACENT PROPERTY OWNERS
- ABANDONMENT - "THE FAIRTALES, WHITES TALES, BAD GUESSES, ETC. HAS TO CEASE.... EXPENSIVE PROFESSIONALS (DON'T GUESS!!)



WORLD MAPPER/OPEN DATA OPERATIONS
MAPBOX (Mapbox.com) (p. 204, 194)

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PLEASE AVOID THE STUPID ZONES!

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"STUPID ZONES"

—ED QUIJEN (1990-2023) - Denver Post & Mountain Mail (Salida CO)



- New Roads and highways crossing railroad curves at grade... (Really bad assumptions happen here.)
- Vertical curves within 30 Ft. of the nearest rail at an at-grade crossing (+/- 3' RULE) (AAASHTO/AREMA JOINT STANDARD FOR GEOMETRY AT ROAD CROSSINGS - 2019 Edition) (The current standard for Geometric Design of Highways and Streets; 2019 is the current version [7] See Pg. 9-160 / Manual Part 9.12.2 Vertical Alignment (figure 9-66))



ROUGH CROSSING

Requires the approval of the owner to be
crossed. See FHWA (1990) (1990) (1990)

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STUPID ZONES

- "FOULING" the standard clearance envelope
- Utilities too shallow or too close to railroad switches, bridges and structures
- Creating sight distance problems (FRA & FHWA VISION DISTANCE RULE)



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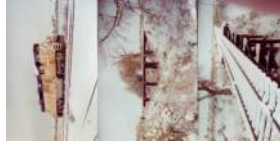
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2. Basics of Railroad Survey Control

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)



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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: Illinois
 Region: Northern
 Division: Illinois
 Subdivision: Beardstown LS-13
 Between: STATION and STATION: Piggish (17.22) & Jacksonville (11.00)
 Between: Milepost and Milepost: MP 13 and MP 14
 Near Crossing: (DOT Number) 069 2981 (I-72 or US-36 / near IL Hwy 408 at MP 13.13 / Overpass (twin bridges)
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US-DOT/ AAR Crossing Numbering System

- Typical DOT number tag found attached to poles, cross-overs, and grade separations. They are also stenciled on signal department instrument cases.
- UP & BNSF Now include those numbers on the ENS "panic" signs found at all crossings (UP is 4", 8" Blue & White, BNSFs are 14", 18" Black and White steel signs...Standard PMA sign is Blue 9" X 12" mini)
- PMA signs are green and license plates (4'x 9") and/or 5'x9" signs can be attached to tag.
- DOT Numbers are unique to a particular crossing in the USA. Number is a 6-digit number and a check code letter...Tag / ENS sign also shows track owner!
- FEDERAL STATUTE 49CFR2234.309
- EVERY CROSSING (PUBLIC/PRIVATE/RR COMPANY USE) has a UNIQUE NUMBER with a check code letter that has a specific letter defined by an PMA derived formula/routine



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PANIC SIGNS LOOK LIKE:

- UNION PACIFIC
- BNSF



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If All Else Fails, Before You Panic:

- THOSE EMERGENCY NUMBERS AGAIN (PANIC NUMBERS)
- UNION PACIFIC
 - 1-800-848-8715 Dispatcher
 - 1-800-877-7267 POLICE
- BNSF
- CN-IC
- CPR-500
- NS
- CSX
- G&W System (866) 527-3499 / (802) 527-3499
- PIONEER LINES / Patriot Rail 800-914-3808 Emergency

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D.O.T. TAGS & ENS SIGNS

- 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 and are referenced as Public, Private, Pedestrian or Company (with exceptions) assigned since 1970 in the inventory.
- DOT Number also shows up on signs for "panic" emergency number posted at EVERY public crossing (Blue ENS Sign)
 - ENS = *Emergency Notification Sign*
 - www.fra.dot.gov (FRA safety homepage)
 - <https://safetydata.fra.dot.gov/OfficeofSAFETY/PUBLICSITE/CROSSING/CROSSING.aspx> (Inventory of tag and location)



ENS350N © CR 224.309



ORIGINAL 1970 RAST COLORED PHOTO TAG

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Information on New or Modified Crossings

The **ONLY** arbiter of what crossing is public or private in ILLINOIS is the ILLINOIS COMMERCE COMMISSION (ICC) under its applicatory decision process.



ILLINOIS Statutes: 625 ILCS 5 /Chapter 18C

The **ONLY** agency that can permit placement of change width of or dictate change type of crossing protection of a public crossing is the **ILLINOIS COMMERCE COMMISSION (ICC)**.

ILLINOIS DOT – Rail Section now administers the DOT Crossing Number database for Illinois (Issues new numbers and does record corrections along with the individual railroads and the FRA) (625 ILCS 5/Chapter 18C) (Works in close coordination with the ICC)

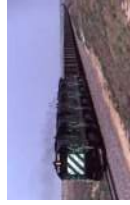


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Heritage: Burlington Northern

- Burlington Northern, Inc. (1970-1996)
- BN-NP-C&DQ-S&D-SLSP
- Chicago Burlington & Quincy Railroad 1853
- Winona, Alma & Northern RR 1882-1883
- Chicago, Burlington & Northern RR 1883-1899
- Winona Bridge Company (Minn.)
- 1/1/96 all BNSF per merger



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Canadian National / Illinois Central

- Illinois Central Gulf
- Chicago Madison & Northern (1886-1980)
- Wisconsin Central
- Duluth, Missabe & Iron Range
- Next door in Iowa, CN-IC just absorber Iowa Northern RR (IANR, see STB Docket FD-)



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Heritage: UNION PACIFIC

- Chicago & Northwestern Railroad (CNW)
- Chicago & Eastern Illinois (part, MP 1969)
- Chicago, St. Paul, Minneapolis & St. Paul RR
- Southern Pacific/ Chicago Short Line (SPCSL)
- Tomah & Chicago (NG* in SW Wisconsin)
- Missouri Pacific (MP)
- Chicago Great Western (CGW)



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CURVE TAGS / SPIRAL PARTS



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Track & Switch Geometry

- Headblock, Point of Switch HB/Pt Sw
- Point of Frog (PF) =PT-TO
- Turnout Lead
- Size of Turnout (Unit Triangle = Frog #)
- Equivalent Curve vs Switch & Lead Curves
- Rail Size
- Crossing Frogs / DIAMOND\$



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WHEN LOOKING AT THIS



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THINK LIKE THIS!



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Narrow Gauge In Illinois (3'-0")

Toledo St. Louis & Western RR NKP/NS/EIRC
 Standard Gaged 6/1/1869
 Toledo, Cincinnati & St Louis RR GM&O/ CN-IC
 Cairo & St Louis RR Standard Gaged 11/15/1886
 Chicago Millington & Western Ry CB&Q/ AE&C
 Standard Gaged 5/18/79 (largely removed & never converted)
 Danville Olney & Ohio River RR FAILED 1937
 Standard Gaged 6/27/1883
 Fulton County Narrow Gauge Ry CB&Q/BNSF
 Standard Gaged 6/1/1870
 Havana Rantoul & Eastern RR/LeRoy & Eastern IC/BLMR
 Moline & Southeastern RR (3'-6") 1878-1885 FAILED 1885
 Springfield Effingham & Southeastern Ry ICC/INRD
 Standard Gaged 7/26/1887

Broad Gauge In Illinois (6'-0")

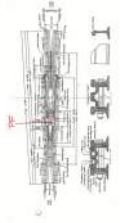
Erie RR (Chicago & Atlantic / Chicago & Erie) EL/CR/USRA/ERES
 Standard Gaged 7/26/1887
 1880 Gauge Changes to 4'-9.1/2"

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BASIC TURNOUT GEOMETRY



- SIMPLE CURVES, CHORD DEFINITION (Not Arc, What's Radius good for?)
- The typical boundary surveyor need only be concerned with HG (P/Sw), PF, measured lead, frog angle, frog size & description, degree of equivalent curve, switch point length and weight of rail. (This is what you need to communicate to the railroad with!)
- If elevation is important, please note end of long switch ties! (Defines plane)

MORE TO FOLLOW IN PART 4

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POP QUIZ:

- What goes on here?



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SEARLES SPIRAL NOTATION



- Curve in the field is not a curve on the map (USE 3-Point On-A-Curve Solution and be prepared to discuss with the detail in survey field)
- Searles vs. Arema/ AREA TO-Chord Spiral
- The track may show spiral data on the map. But the right-of-way is for the right-of-way spalled (99% of the time)....Look for the original intent!

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STRING LINE SOLUTION AND MACHINE CURVES

- Stringline solution and machine graphed curves smooth the curve given existing track conditions...
- These curves are not engineering, or survey correct.
- Over time, curves tend to get elongated, have doglegs, at the ends & main body of curve gets pulled to inside of cut/fill



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TYPICAL OF CURVE LINERS

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CURVE LINERS (TYPICAL)

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Following in the footsteps of the Railway Location Engineers

The *Original Surveyors*

- Most were trained by the U.S. Military (Jefferson Barracks – SL)
- Vernier Transits, Wye Levels, Chains, Books, Tables and slide rules (walk a mile in the shoes of these folks!)
- Many were also GLO Deputy Surveyors.
- J Edgar Thompson (PRR/PfW&C 1853)
- George B McClellan (Illinois Central)

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UNION PACIFIC SURVEYORS /LOCATING ENGINEERS

- 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



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The Railroad Surveyors

- Union Pacific/Kansas Pacific/ Denver Pacific/ LHP&P
- Colorado & Wyoming (CF&W)
- Chicago & Northwestern / F&MV
- CB&Q
- Milwaukee Road



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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 assessor's map is "a best guess estimate" - It should not be gospel! (GIS often takes this and makes things worse, neither assessor parcel numbers or GIS are official record (deed or survey plat maps vs. an approximate guess ... see what makes a proper legal/ property description in your state statutes)
- Official record does not automatically imply that it will be found in the local courthouse! (Especially with federal and state records)
- Title Companies struggle with this constantly and are frequently caused to stumble (causing the common exemptions of railroads in Schedule B of their title policies tied to ALTA Surveys)

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5. Federal Laws and Regulations



- Acts of 1862,1866,1872,1875
- (Illinois Central ... Act of 1851, Land Grant Act of 1850 (9 Stat:460) one of the railroad acts going back to 1832 1880 x ing coastal marshes)
- Interstate Commerce Act of 1913 (hint: Valuation Maps, GO-1)
- Staggers Act of 1983
- ICCTEA, NextEA and TEA-21 transportation Acts
- Titles 16, 43 and 49 of the Federal Revised codes (CFR's)

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WILL IT FIT?



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Can you see what scares the daylight's out of a trained railroad observer when he/she encounters something like this?

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Intermodal
mm.



ON TO PART 2

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