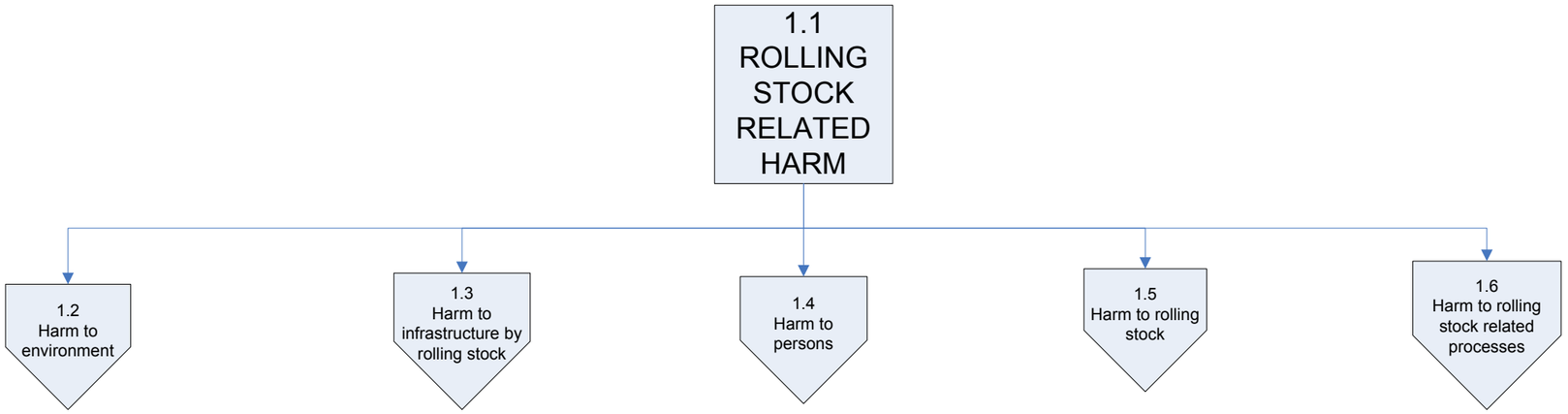
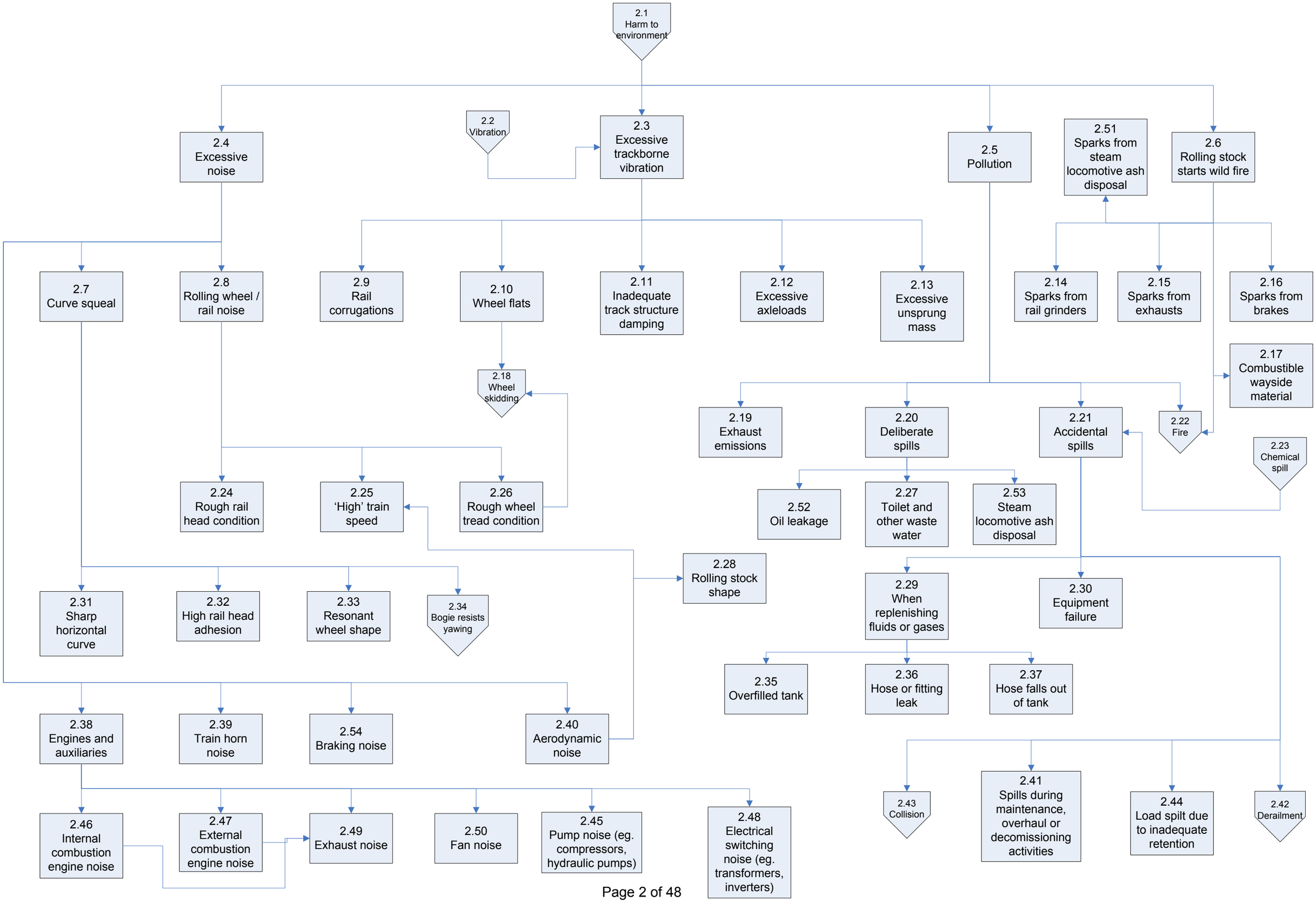
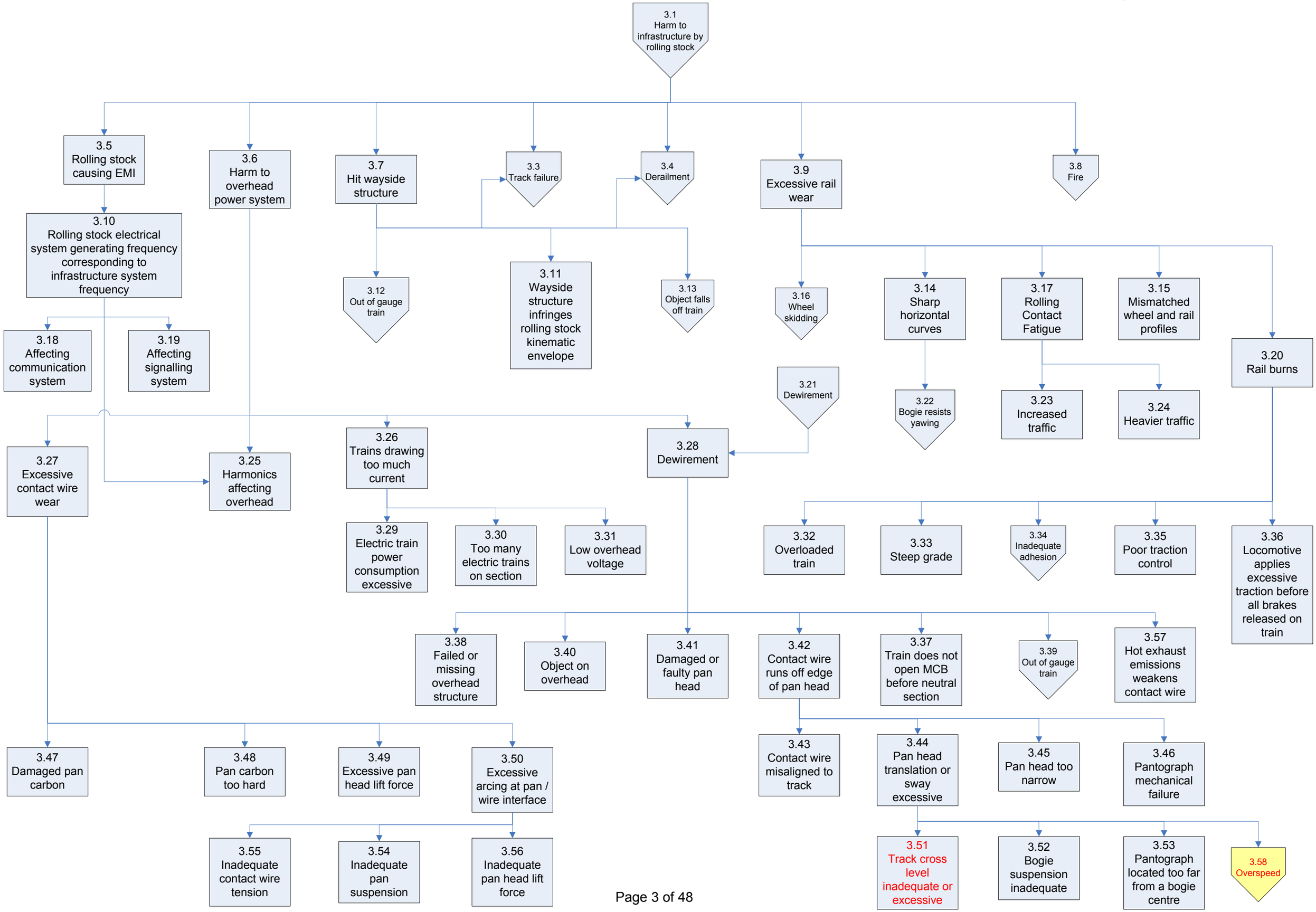
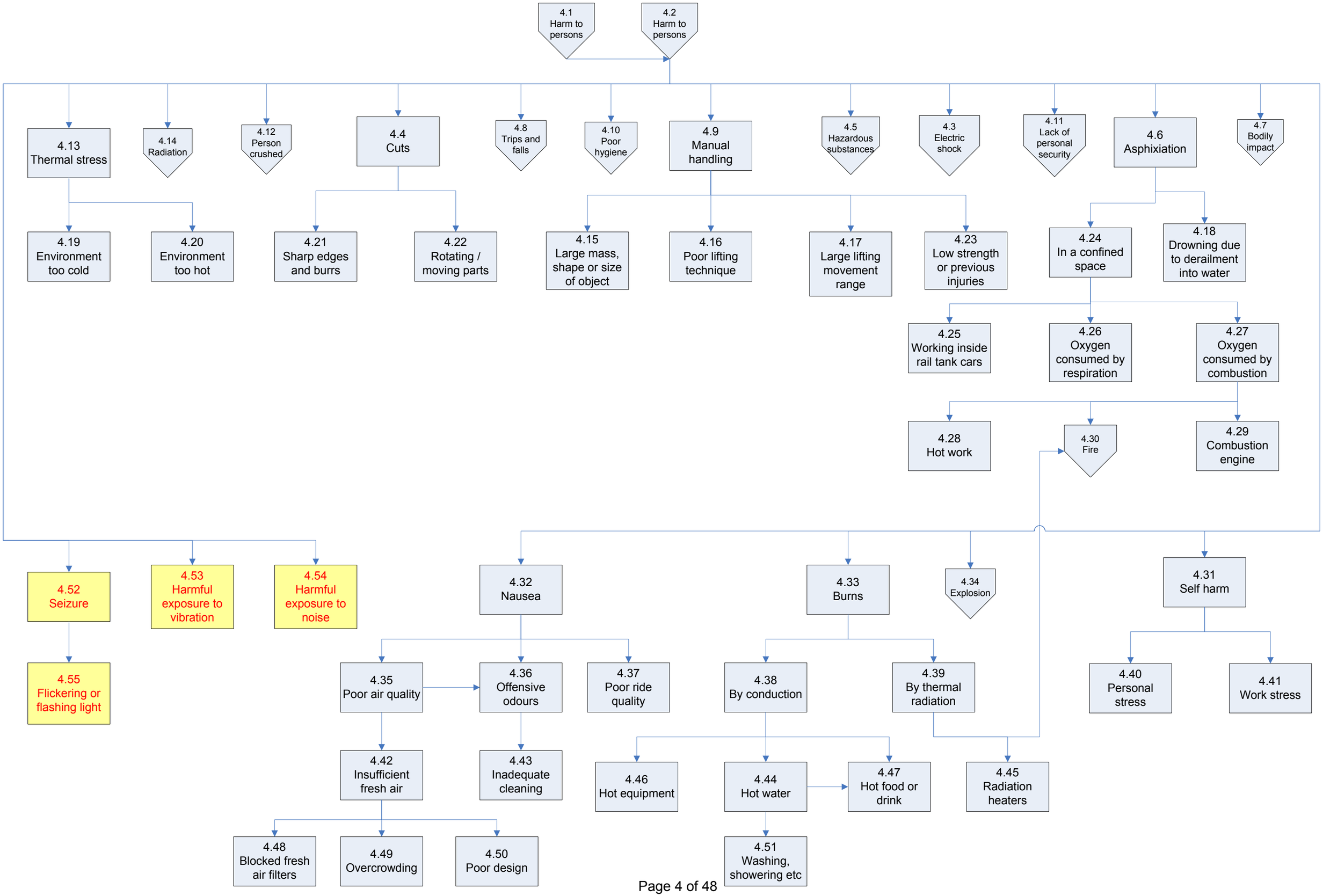
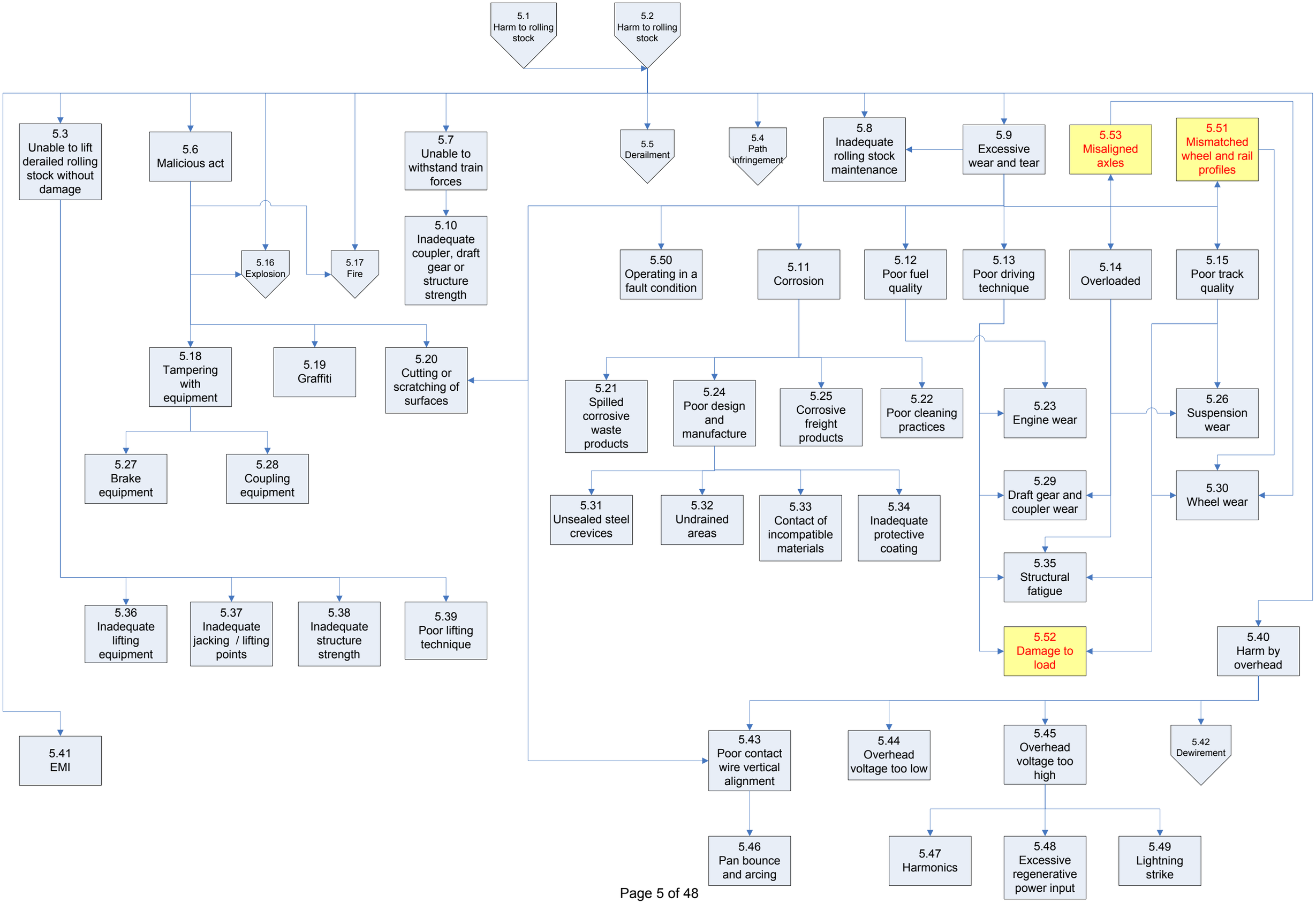
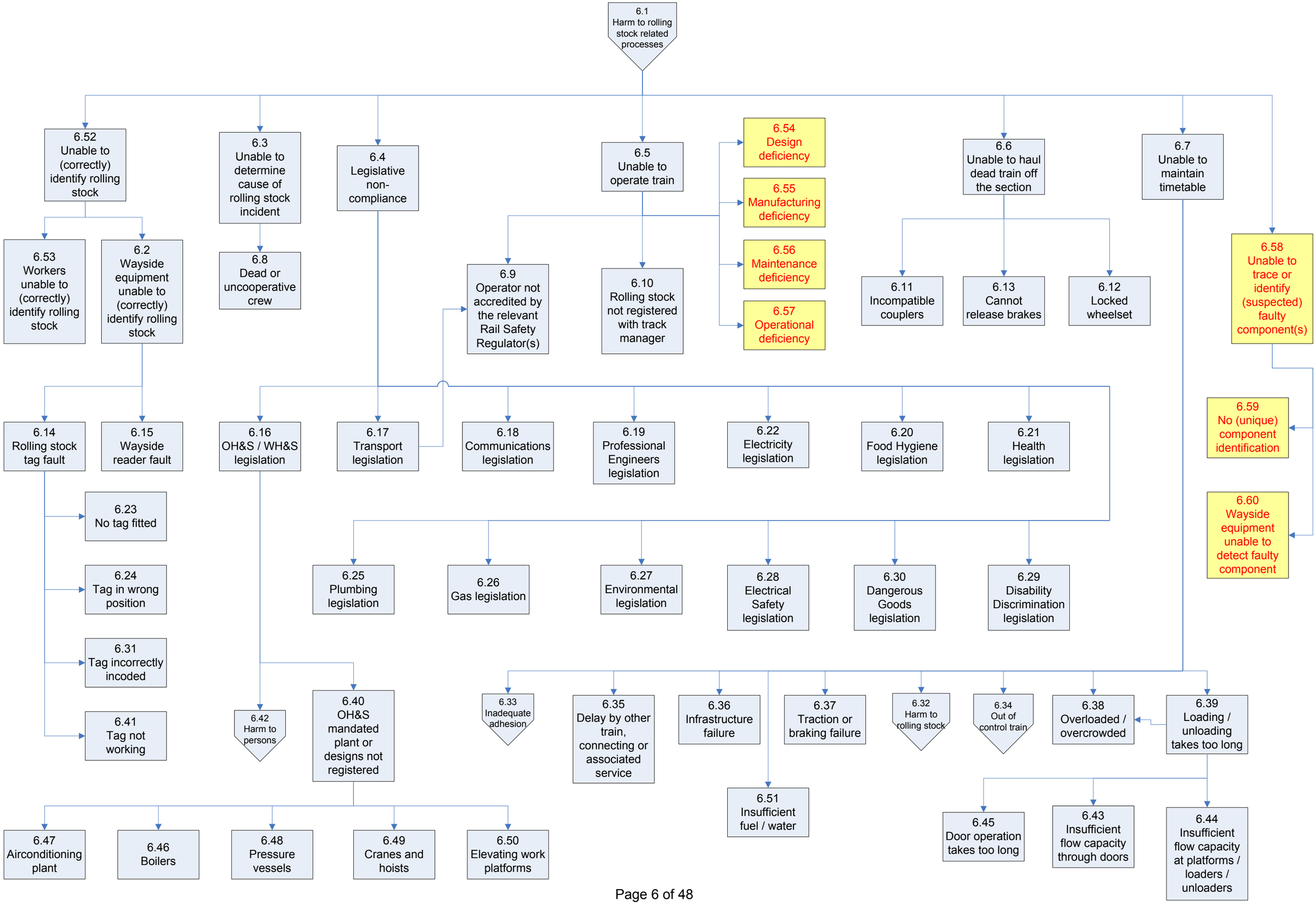

1.1 ROLLING STOCK RELATED HARM
1.2 Harm to environment
1.3 Harm to infrastructure by rolling stock
1.4 Harm to persons
1.5 Harm to rolling stock
1.6 Harm to rolling stock related processes

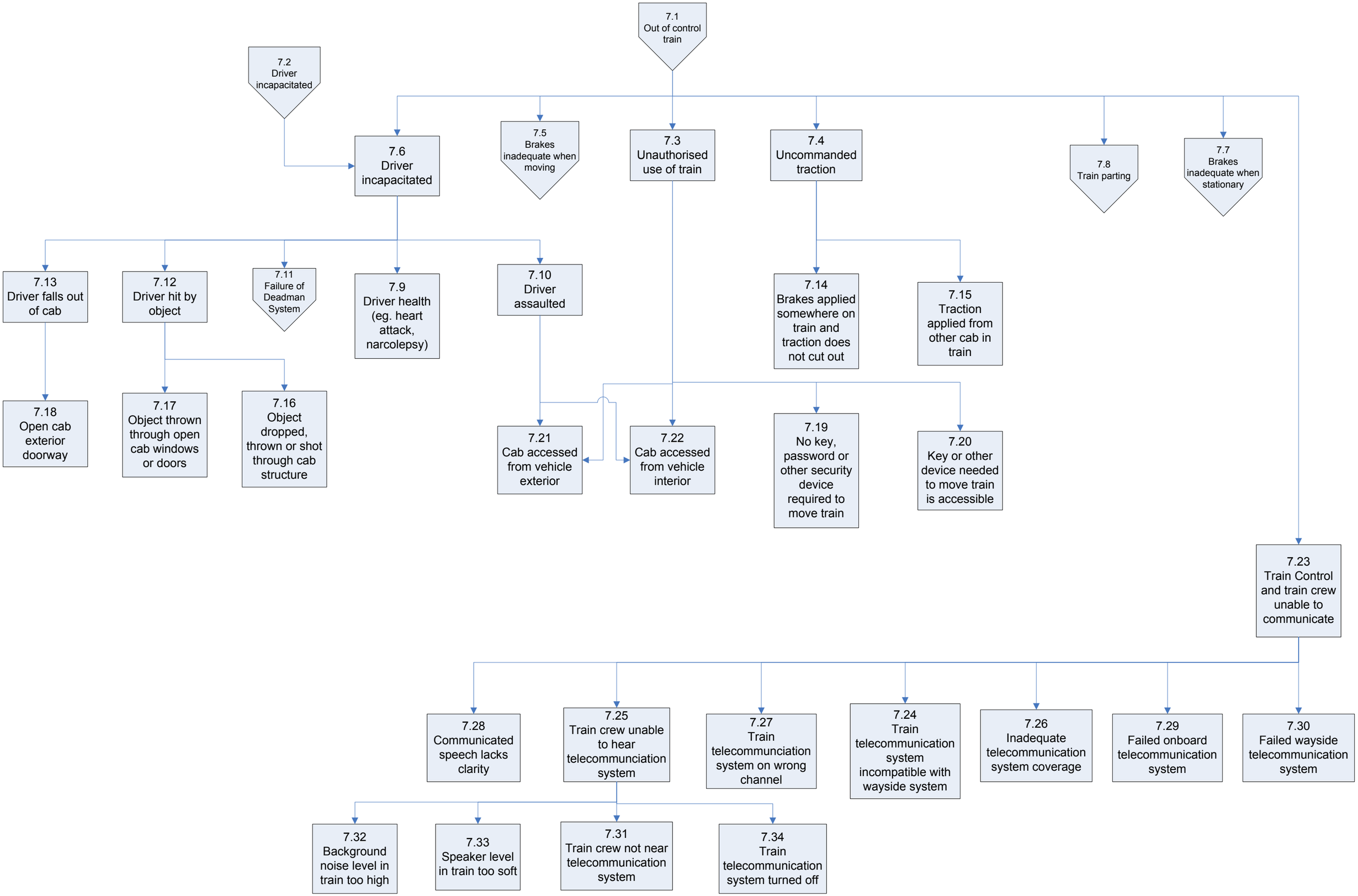

2.1 Harm to environment
2.2 Vibration
2.3 Excessive trackborne vibration
2.4 Excessive noise
2.5 Pollution
2.51 Sparks from steam locomotive ash disposal
2.6 Rolling stock starts wild fire
2.7 Curve squeal
2.8 Rolling wheel / rail noise
2.9 Rail corrugations
2.10 Wheel flats
2.11 Inadequate track structure damping
2.12 Excessive axleloads
2.13 Excessive unsprung mass
2.14 Sparks from rail grinders
2.15 Sparks from exhausts
2.16 Sparks from brakes
2.17 Combustible wayside material
2.18 Wheel skidding
2.19 Exhaust emissions
2.20 Deliberate spills
2.21 Accidental spills
2.22 Fire
2.23 Chemical spill
2.24 Rough rail head condition
2.25 'High' train speed
2.26 Rough wheel tread condition
2.52 Oil leakage
2.27 Toilet and other waste water
2.53 Steam locomotive ash disposal
2.28 Rolling stock shape
2.29 When replenishing fluids or gases
2.30 Equipment failure
2.31 Sharp horizontal curve
2.32 High rail head adhesion
2.33 Resonant wheel shape
2.34 Bogie resists yawing
2.35 Overfilled tank
2.36 Hose or fitting leak
2.37 Hose falls out of tank
2.38 Engines and auxiliaries
2.39 Train horn noise
2.54 Braking noise
2.40 Aerodynamic noise
2.43 Collision
2.41 Spills during maintenance, overhaul or decomissioning activities
2.44 Load spilt due to inadequate retention
2.42 Derailment
2.46 Internal combustion engine noise
2.47 External combustion engine noise
2.49 Exhaust noise
2.50 Fan noise
2.45 Pump noise (eg. compressors, hydraulic pumps)
2.48 Electrical switching noise (eg. transformers, inverters)

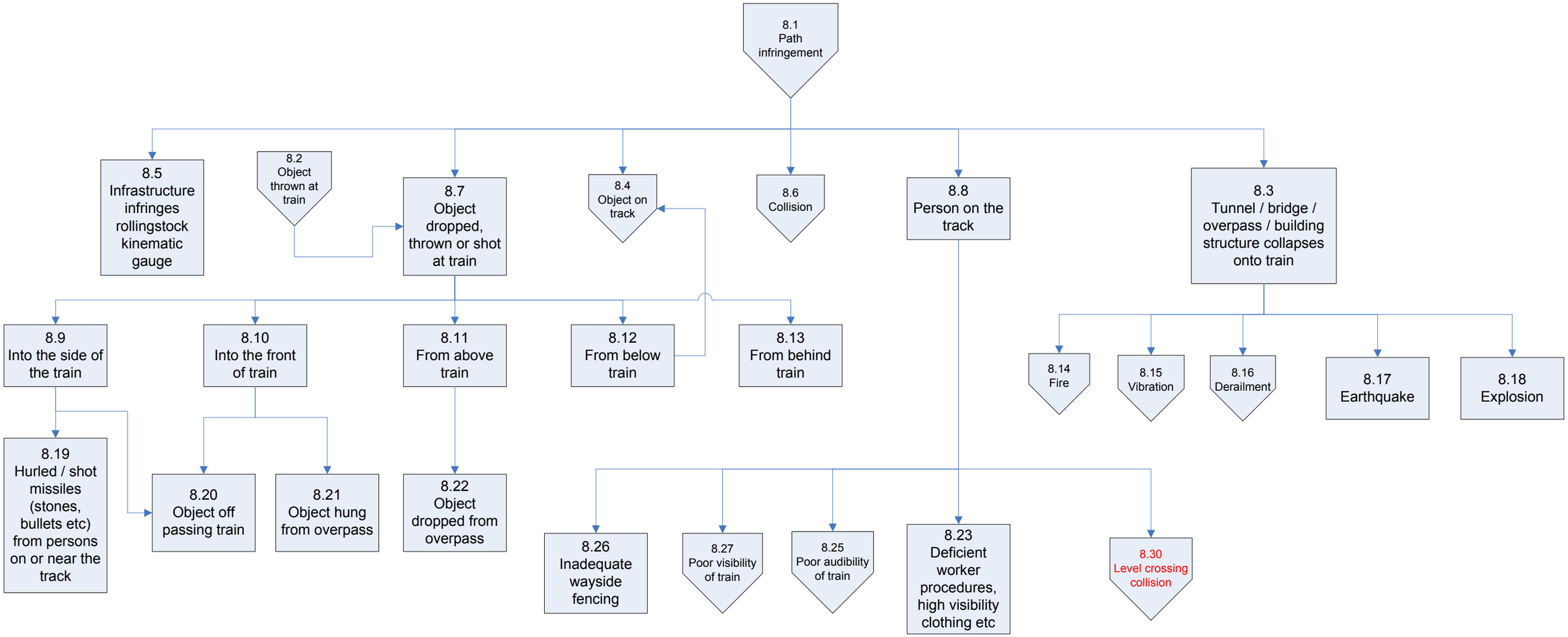

3.1 Harm to infrastructure by rolling stock
3.5 Rolling stock causing EMI
3.6 Harm to overhead power system
3.7 Hit wayside structure
3.3 Track failure
3.4 Derailment
3.9 Excessive rail wear
3.8 Fire
3.10 Rolling stock electrical system generating frequency corresponding to infrastructure system frequency
3.12 Out of gauge train
3.11 Wayside structure infringes rolling stock kinematic envelope
3.13 Object falls off train
3.16 Wheel skidding
3.14 Sharp horizontal curves
3.17 Rolling Contact Fatigue
3.15 Mismatched wheel and rail profiles
3.18 Affecting communication system
3.19 Affecting signalling system
3.20 Rail burns
3.21 Dewirement
3.22 Bogie resists yawing
3.23 Increased traffic
3.24 Heavier traffic
3.27 Excessive contact wire wear
3.25 Harmonics affecting overhead
3.26 Trains drawing too much current
3.28 Dewirement
3.29 Electric train power consumption excessive
3.30 Too many electric trains on section
3.31 Low overhead voltage
3.32 Overloaded train
3.33 Steep grade
3.34 Inadequate adhesion
3.35 Poor traction control
3.36 Locomotive applies excessive traction before all brakes released on train
3.38 Failed or missing overhead structure
3.40 Object on overhead
3.41 Damaged or faulty pan head
3.42 Contact wire runs off edge of pan head
3.37 Train does not open MCB before neutral section
3.39 Out of gauge train
3.57 Hot exhaust emissions weakens contact wire
3.47 Damaged pan carbon
3.48 Pan carbon too hard
3.49 Excessive pan head lift force
3.50 Excessive arcing at pan / wire interface
3.43 Contact wire misaligned to track
3.44 Pan head translation or sway excessive
3.45 Pan head too narrow
3.46 Pantograph mechanical failure
3.55 Inadequate contact wire tension
3.54 Inadequate pan suspension
3.56 Inadequate pan head lift force
3.51 Track cross level inadequate or excessive
3.52 Bogie suspension inadequate
3.53 Pantograph located too far from a bogie centre
3.58 Overspeed

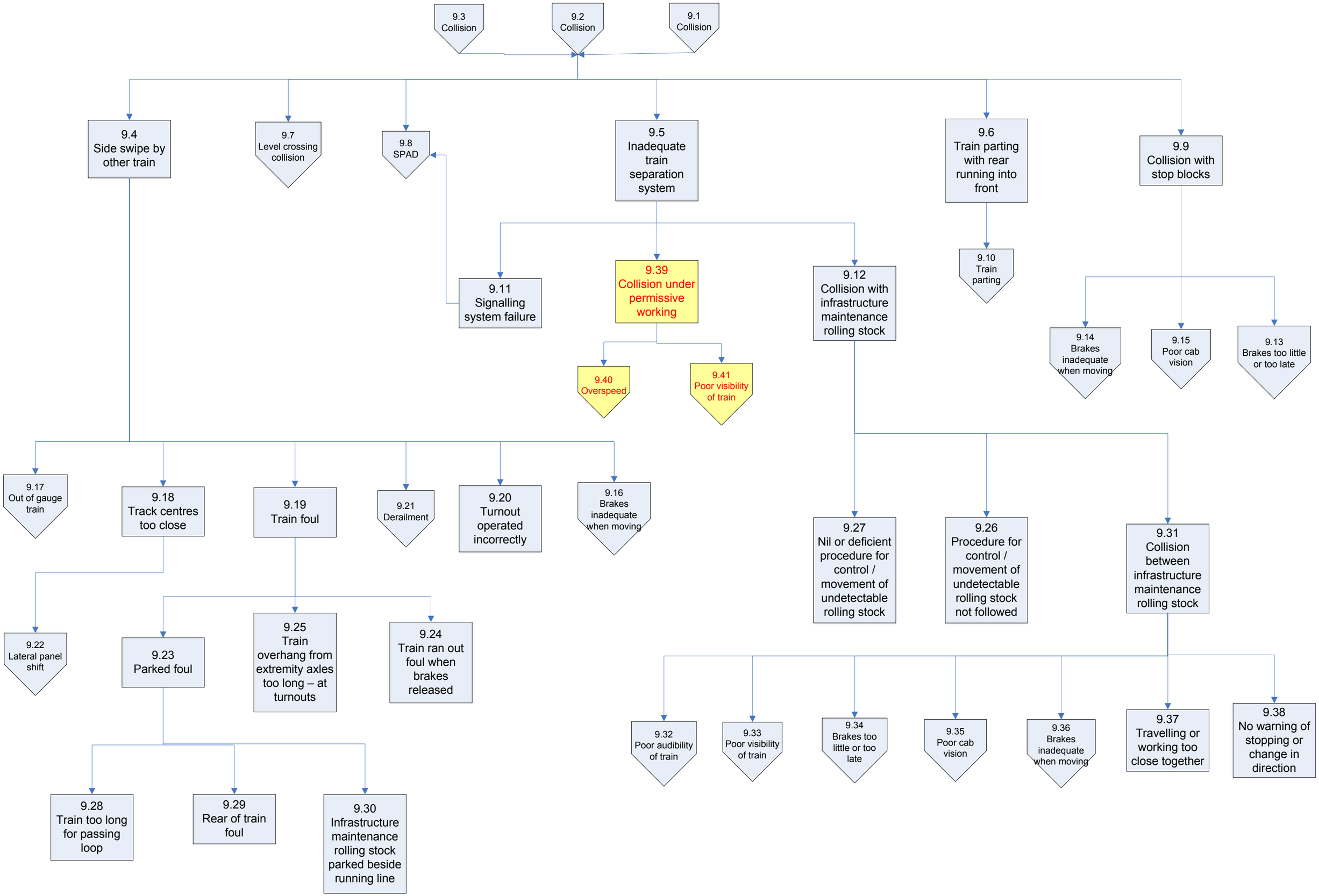

4.1 Harm to persons
4.2 Harm to persons
4.13 Thermal stress
4.14 Radiation
4.12 Person crushed
4.4 Cuts
4.8 Trips and falls
4.10 Poor hygiene
4.9 Manual handling
4.5 Hazardous substances
4.3 Electric shock
4.11 Lack of personal security
4.6 Asphixiation
4.7 Bodily impact
4.19 Environment too cold
4.20 Environment too hot
4.21 Sharp edges and burrs
4.22 Rotating / moving parts
4.15 Large mass, shape or size of object
4.16 Poor lifting technique
4.17 Large lifting movement range
4.23 Low strength or previous injuries
4.24 In a confined space
4.18 Drowning due to derailment into water
4.25 Working inside rail tank cars
4.26 Oxygen consumed by respiration
4.27 Oxygen consumed by combustion
4.28 Hot work
4.30 Fire
4.29 Combustion engine
4.52 Seizure
4.53 Harmful exposure to vibration
4.54 Harmful exposure to noise
4.32 Nausea
4.33 Burns
4.34 Explosion
4.31 Self harm
4.55 Flickering or flashing light
4.35 Poor air quality
4.36 Offensive odours
4.37 Poor ride quality
4.38 By conduction
4.39 By thermal radiation
4.40 Personal stress
4.41 Work stress
4.42 Insufficient fresh air
4.43 Inadequate cleaning
4.46 Hot equipment
4.44 Hot water
4.47 Hot food or drink
4.45 Radiation heaters
4.48 Blocked fresh air filters
4.49 Overcrowding
4.50 Poor design
4.51 Washing, showering etc

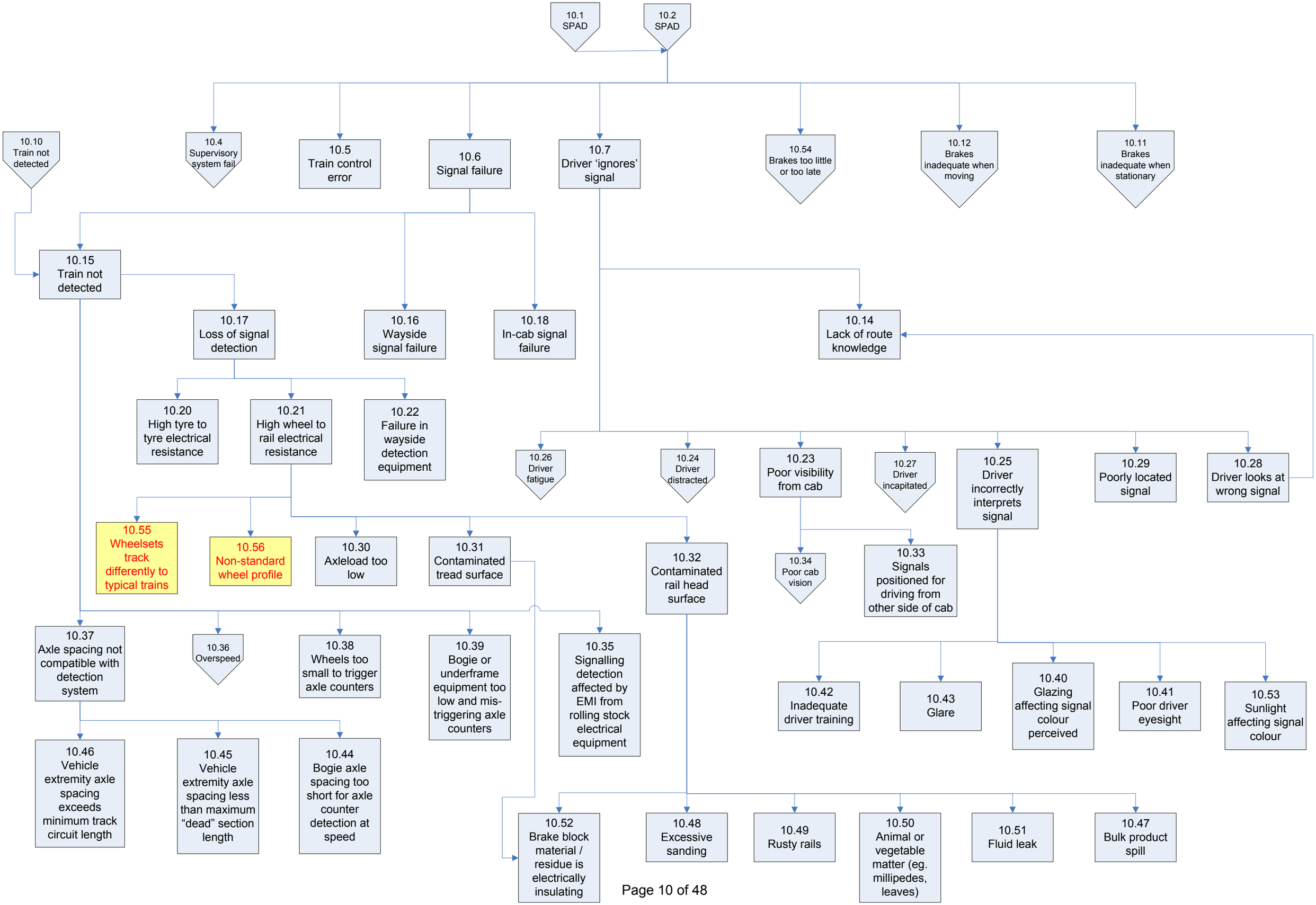

5.1 Harm to rolling stock
5.2 Harm to rolling stock
5.3 Unable to lift derailed rolling stock without damage
5.6 Malicious act
5.7 Unable to withstand train forces
5.5 Derailment
5.4 Path infringement
5.8 Inadequate rolling stock maintenance
5.9 Excessive wear and tear
5.53 Misaligned axles
5.51 Mismatched wheel and rail profiles
5.16 Explosion
5.17 Fire
5.10 Inadequate coupler, draft gear or structure strength
5.50 Operating in a fault condition
5.11 Corrosion
5.12 Poor fuel quality
5.13 Poor driving technique
5.14 Overloaded
5.15 Poor track quality
5.18 Tampering with equipment
5.19 Graffiti
5.20 Cutting or scratching of surfaces
5.21 Spilled corrosive waste products
5.24 Poor design and manufacture
5.25 Corrosive freight products
5.22 Poor cleaning practices
5.23 Engine wear
5.26 Suspension wear
5.27 Brake equipment
5.28 Coupling equipment
5.29 Draft gear and coupler wear
5.30 Wheel wear
5.31 Unsealed steel crevices
5.32 Undrained areas
5.33 Contact of incompatible materials
5.34 Inadequate protective coating
5.35 Structural fatigue
5.36 Inadequate lifting equipment
5.37 Inadequate jacking / lifting points
5.38 Inadequate structure strength
5.39 Poor lifting technique
5.52 Damage to load
5.40 Harm by overhead
5.41 EMI
5.43 Poor contact wire vertical alignment
5.44 Overhead voltage too low
5.45 Overhead voltage too high
5.42 Dewirement
5.46 Pan bounce and arcing
5.47 Harmonics
5.48 Excessive regenerative power input
5.49 Lightning strike

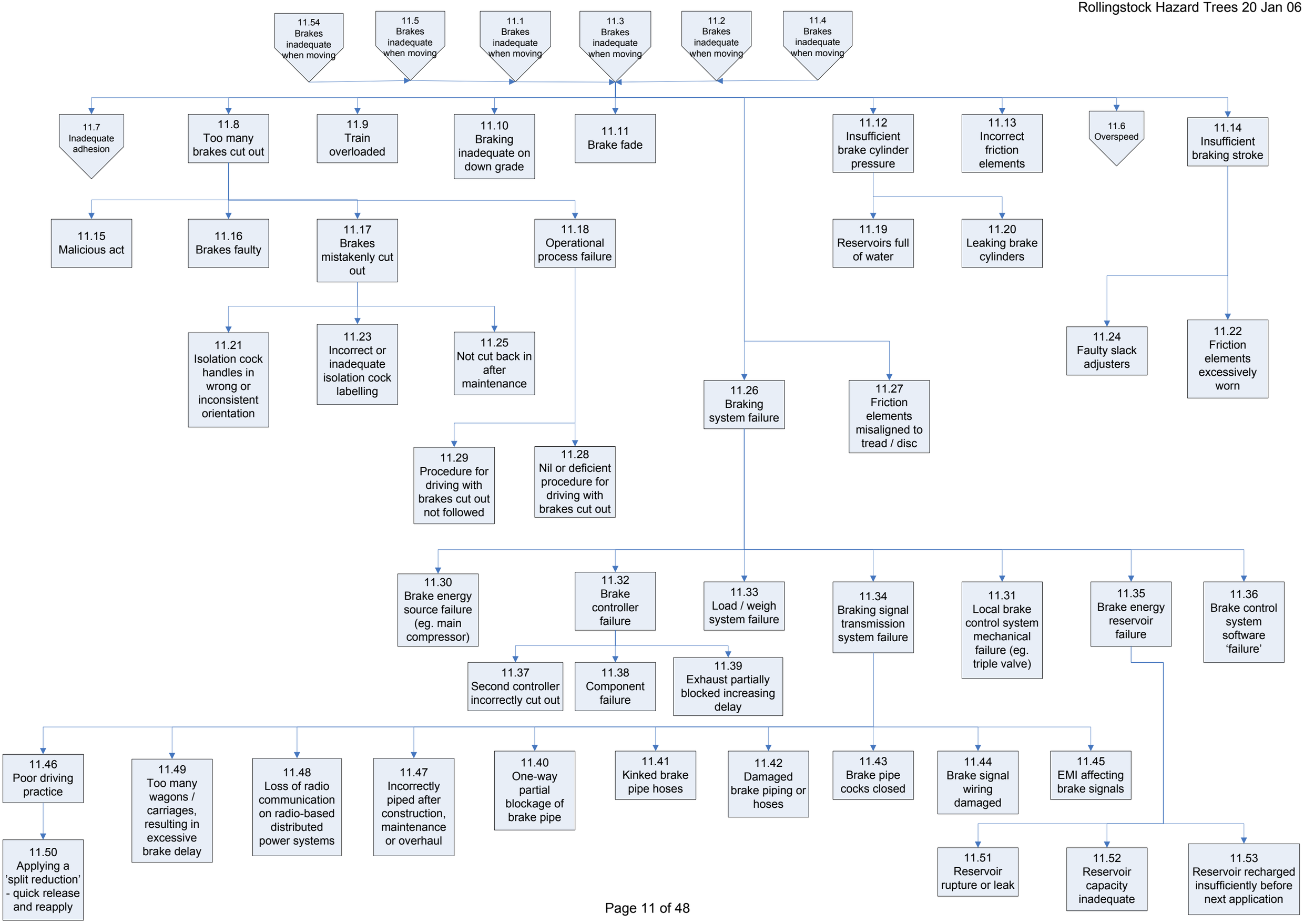

6.1 Harm to rolling stock related processes
6.52 Unable to (correctly) identify rolling stock
6.3 Unable to determine cause of rolling stock incident
6.4 Legislative non-compliance
6.5 Unable to operate train
6.54 Design deficiency
6.55 Manufacturing deficiency
6.56 Maintenance deficiency
6.57 Operational deficiency
6.6 Unable to haul dead train off the section
6.7 Unable to maintain timetable
6.58 Unable to trace or identify (suspected) faulty component(s)
6.53 Workers unable to (correctly) identify rolling stock
6.2 Wayside equipment unable to (correctly) identify rolling stock
6.8 Dead or uncooperative crew
6.9 Operator not accredited by the relevant Rail Safety Regulator(s)
6.10 Rolling stock not registered with track manager
6.11 Incompatible couplers
6.13 Cannot release brakes
6.12 Locked wheelset
6.59 No (unique) component identification
6.60 Wayside equipment unable to detect faulty component
6.14 Rolling stock tag fault
6.15 Wayside reader fault
6.16 OH&S / WH&S legislation
6.17 Transport legislation
6.18 Communications legislation
6.19 Professional Engineers legislation
6.22 Electricity legislation
6.20 Food Hygiene legislation
6.21 Health legislation
6.23 No tag fitted
6.24 Tag in wrong position
6.31 Tag incorrectly incoded
6.41 Tag not working
6.25 Plumbing legislation
6.26 Gas legislation
6.27 Environmental legislation
6.28 Electrical Safety legislation
6.30 Dangerous Goods legislation
6.29 Disability Discrimination legislation
6.42 Harm to persons
6.40 OH&S mandated plant or designs not registered
6.33 Inadequate adhesion
6.35 Delay by other train, connecting or associated service
6.36 Infrastructure failure
6.37 Traction or braking failure
6.32 Harm to rolling stock
6.34 Out of control train
6.38 Overloaded / overcrowded
6.39 Loading / unloading takes too long
6.51 Insufficient fuel / water
6.47 Airconditioning plant
6.46 Boilers
6.48 Pressure vessels
6.49 Cranes and hoists
6.50 Elevating work platforms
6.45 Door operation takes too long
6.43 Insufficient flow capacity through doors
6.44 Insufficient flow capacity at platforms / loaders / unloaders

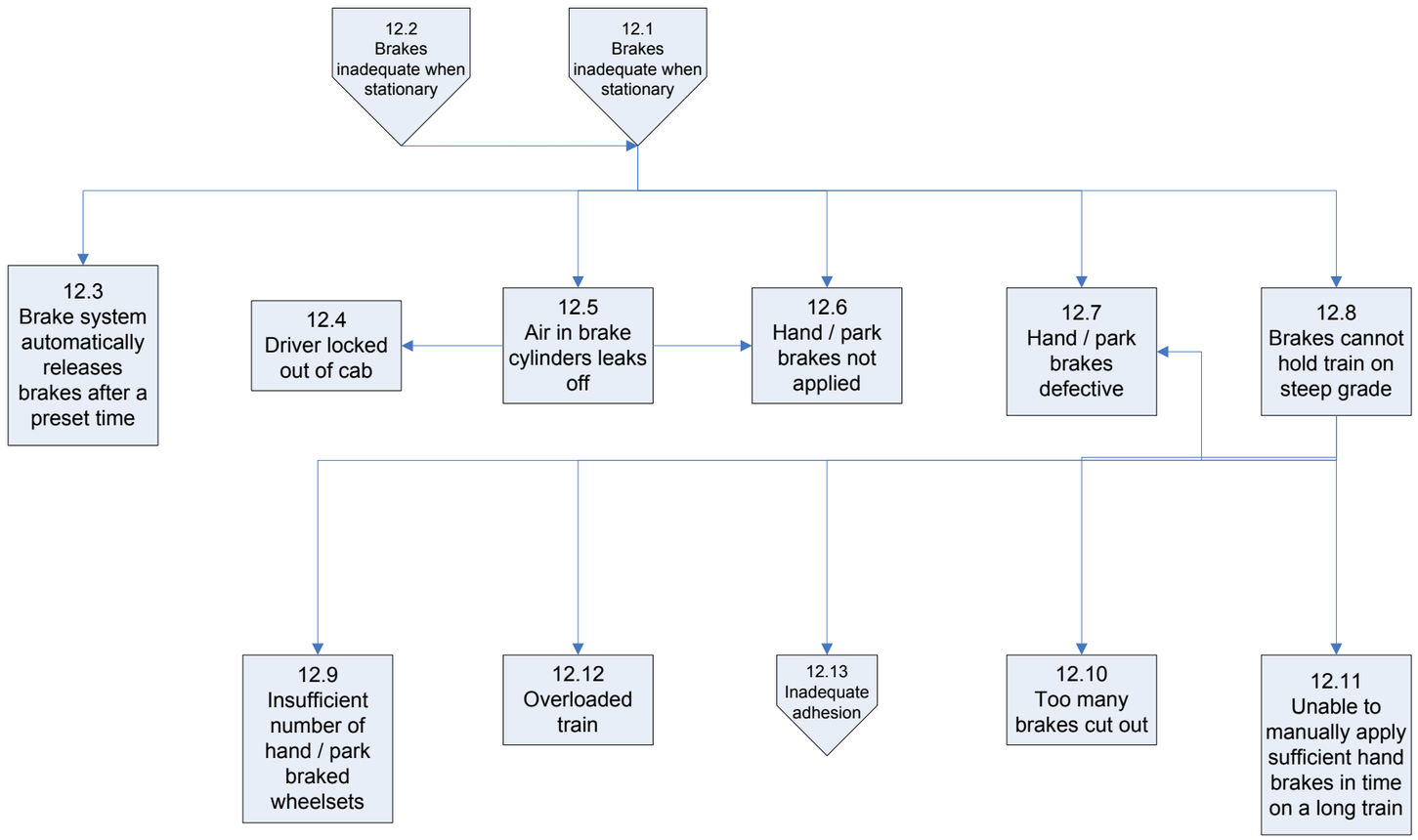

7.1 Out of control train
7.2 Driver incapacitated
7.6 Driver incapacitated
7.5 Brakes inadequate when moving
7.3 Unauthorised use of train
7.4 Uncommanded traction
7.8 Train parting
7.7 Brakes inadequate when stationary
7.13 Driver falls out of cab
7.12 Driver hit by object
7.11 Failure of Deadman System
7.9 Driver health (eg. heart attack, narcolepsy)
7.10 Driver assaulted
7.14 Brakes applied somewhere on train and traction does not cut out
7.15 Traction applied from other cab in train
7.18 Open cab exterior doorway
7.17 Object thrown through open cab windows or doors
7.16 Object dropped, thrown or shot through cab structure
7.21 Cab accessed from vehicle exterior
7.22 Cab accessed from vehicle interior
7.19 No key, password or other security device required to move train
7.20 Key or other device needed to move train is accessible
7.23 Train Control and train crew unable to communicate
7.28 Communicated speech lacks clarity
7.25 Train crew unable to hear telecommunciation system
7.27 Train telecommunciation system on wrong channel
7.24 Train telecommunication system incompatible with wayside system
7.26 Inadequate telecommunication system coverage
7.29 Failed onboard telecommunication system
7.30 Failed wayside telecommunication system
7.32 Background noise level in train too high
7.33 Speaker level in train too soft
7.31 Train crew not near telecommunication system
7.34 Train telecommunication system turned off

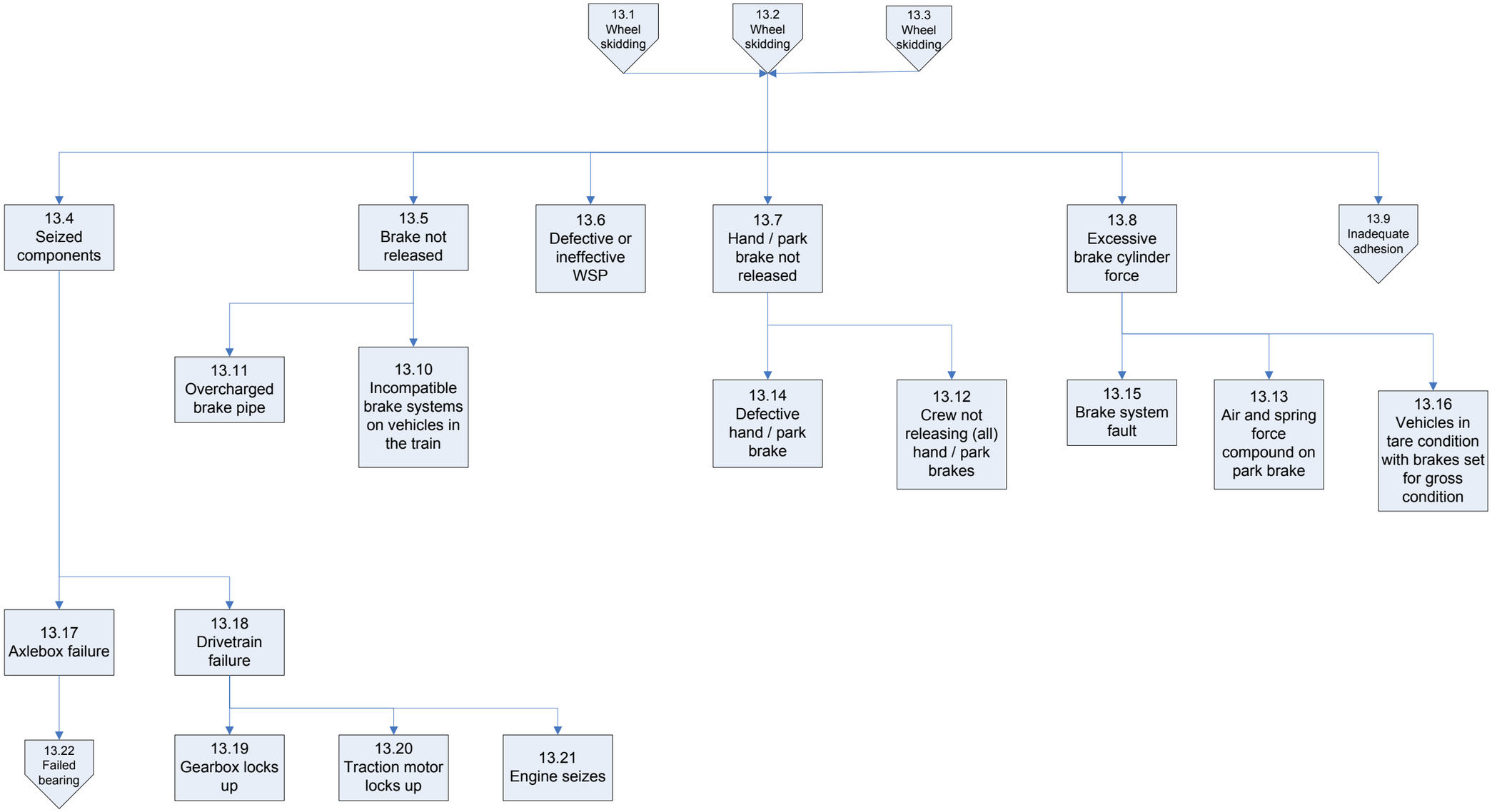

8.1 Path infringement
8.5 Infrastructure infringes rollingstock kinematic gauge
8.2 Object thrown at train
8.7 Object dropped, thrown or shot at train
8.4 Object on track
8.6 Collision
8.8 Person on the track
8.3 Tunnel / bridge / overpass / building structure collapses onto train
8.9 Into the side of the train
8.10 Into the front of train
8.11 From above train
8.12 From below train
8.13 From behind train
8.14 Fire
8.15 Vibration
8.16 Derailment
8.17 Earthquake
8.18 Explosion
8.19 Hurled / shot missiles (stones, bullets etc) from persons on or near the track
8.20 Object off passing train
8.21 Object hung from overpass
8.22 Object dropped from overpass
8.26 Inadequate wayside fencing
8.27 Poor visibility of train
8.25 Poor audibility of train
8.23 Deficient worker procedures, high visibility clothing etc
8.30 Level crossing collision

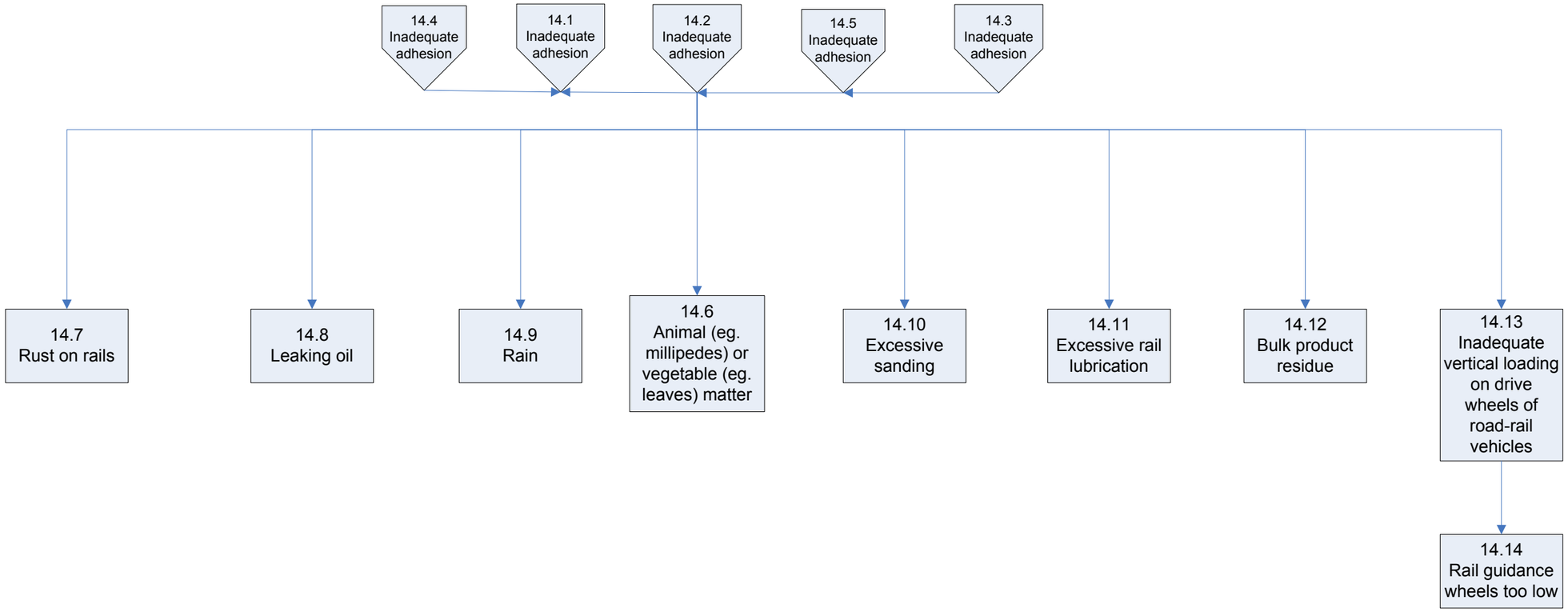

9.3 Collision
9.2 Collision
9.1 Collision
9.4 Side swipe by other train
9.7 Level crossing collision
9.8 SPAD
9.5 Inadequate train separation system
9.6 Train parting with rear running into front
9.9 Collision with stop blocks
9.10 Train parting
9.11 Signalling system failure
9.39 Collision under permissive working
9.12 Collision with infrastructure maintenance rolling stock
9.40 Overspeed
9.41 Poor visibility of train
9.14 Brakes inadequate when moving
9.15 Poor cab vision
9.13 Brakes too little or too late
9.17 Out of gauge train
9.18 Track centres too close
9.19 Train foul
9.21 Derailment
9.20 Turnout operated incorrectly
9.16 Brakes inadequate when moving
9.27 Nil or deficient procedure for control / movement of undetectable rolling stock
9.26 Procedure for control / movement of undetectable rolling stock not followed
9.31 Collision between infrastructure maintenance rolling stock
9.22 Lateral panel shift
9.23 Parked foul
9.25 Train overhang from extremity axles too long – at turnouts
9.24 Train ran out foul when brakes released
9.32 Poor audibility of train
9.33 Poor visibility of train
9.34 Brakes too little or too late
9.35 Poor cab vision
9.36 Brakes inadequate when moving
9.37 Travelling or working too close together
9.38 No warning of stopping or change in direction
9.28 Train too long for passing loop
9.29 Rear of train foul
9.30 Infrastructure maintenance rolling stock parked beside running line

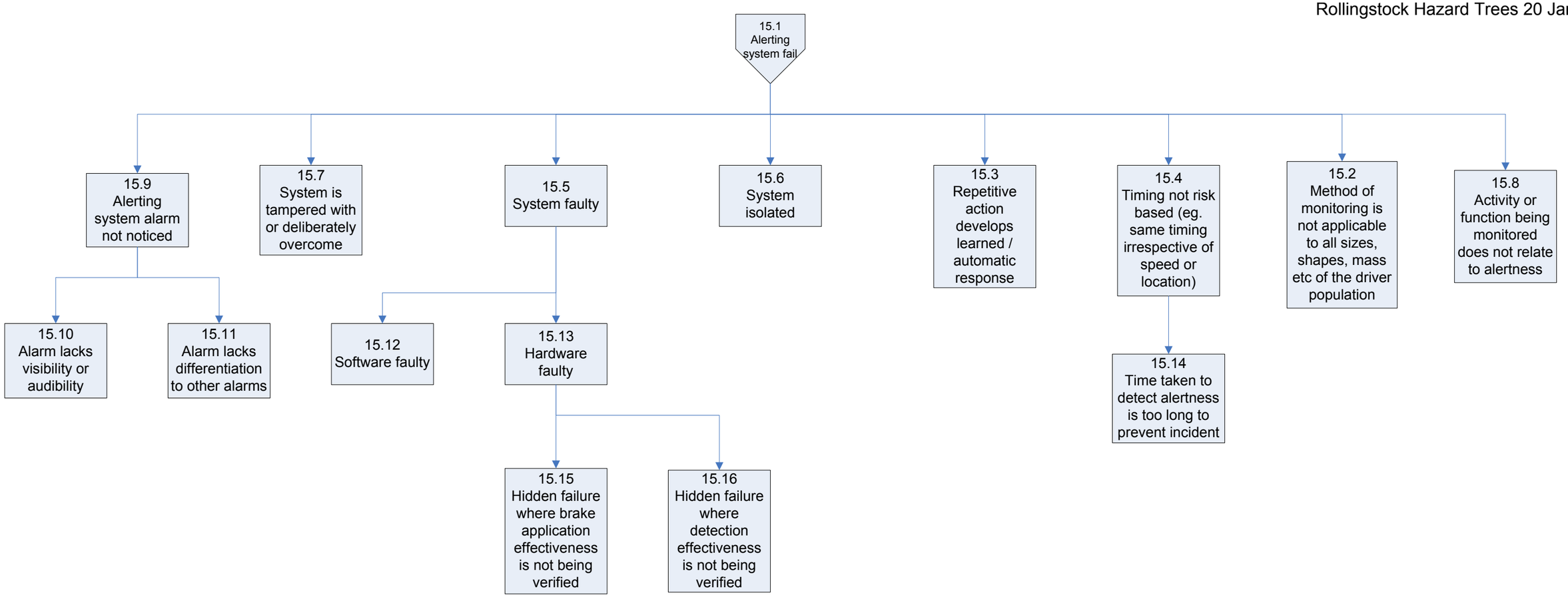

10.1 SPAD
10.2 SPAD
10.10 Train not detected
10.4 Supervisory system fail
10.5 Train control error
10.6 Signal failure
10.7 Driver 'ignores' signal
10.54 Brakes too little or too late
10.12 Brakes inadequate when moving
10.11 Brakes inadequate when stationary
10.15 Train not detected
10.17 Loss of signal detection
10.16 Wayside signal failure
10.18 In-cab signal failure
10.14 Lack of route knowledge
10.20 High tyre to tyre electrical resistance
10.21 High wheel to rail electrical resistance
10.22 Failure in wayside detection equipment
10.26 Driver fatigue
10.24 Driver distracted
10.23 Poor visibility from cab
10.27 Driver incapitated
10.25 Driver incorrectly interprets signal
10.29 Poorly located signal
10.28 Driver looks at wrong signal
10.55 Wheelsets track differently to typical trains
10.56 Non-standard wheel profile
10.30 Axleload too low
10.31 Contaminated tread surface
10.32 Contaminated rail head surface
10.34 Poor cab vision
10.33 Signals positioned for driving from other side of cab
10.37 Axle spacing not compatible with detection system
10.36 Overspeed
10.38 Wheels too small to trigger axle counters
10.39 Bogie or underframe equipment too low and mis-triggering axle counters
10.35 Signalling detection affected by EMI from rolling stock electrical equipment
10.42 Inadequate driver training
10.43 Glare
10.40 Glazing affecting signal colour perceived
10.41 Poor driver eyesight
10.53 Sunlight affecting signal colour
10.46 Vehicle extremity axle spacing exceeds minimum track circuit length
10.45 Vehicle extremity axle spacing less than maximum "dead" section length
10.44 Bogie axle spacing too short for axle counter detection at speed
10.52 Brake block material / residue is electrically insulating
10.48 Excessive sanding
10.49 Rusty rails
10.50 Animal or vegetable matter (eg. millipedes, leaves)
10.51 Fluid leak
10.47 Bulk product spill

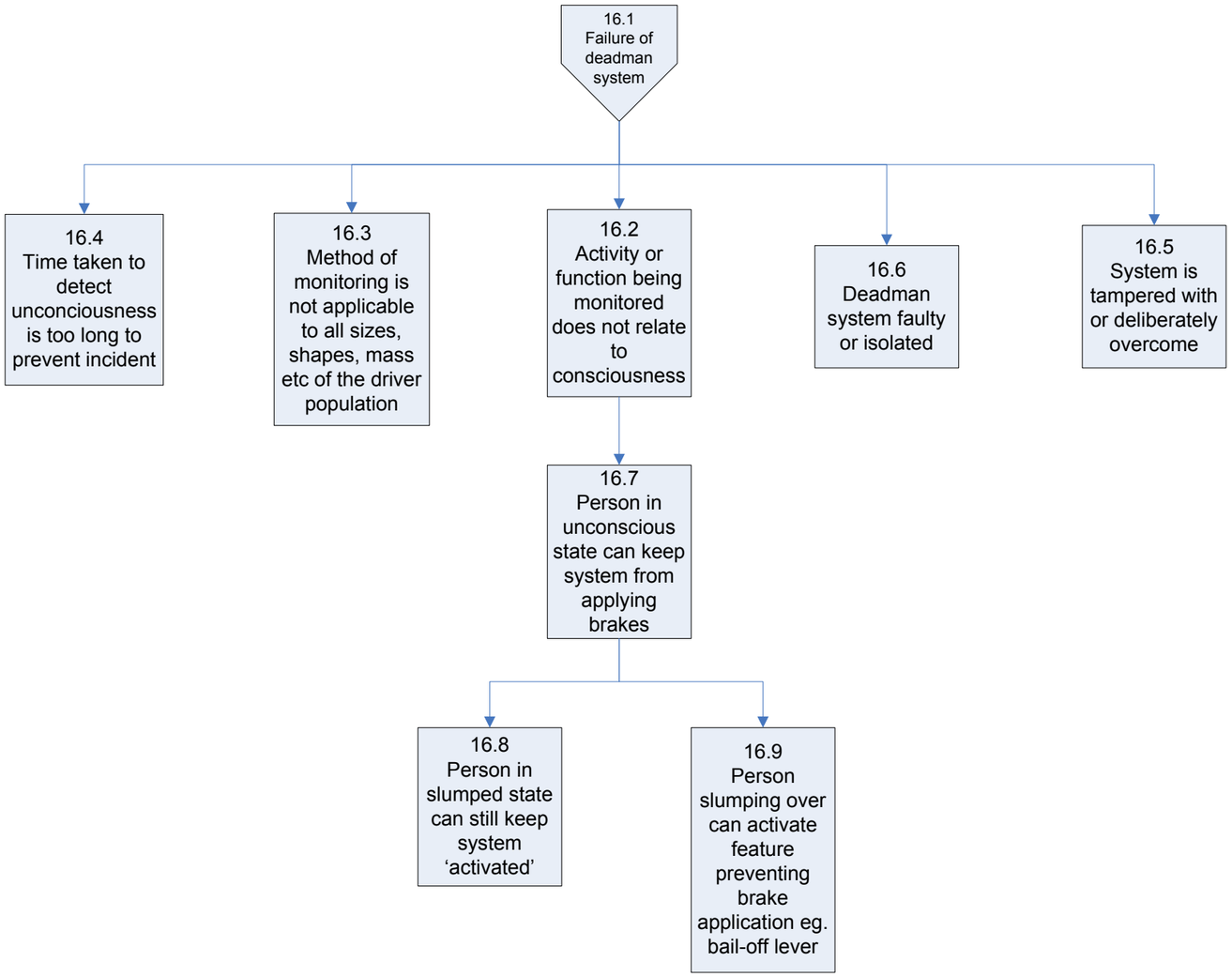

11.54 Brakes inadequate when moving
11.5 Brakes inadequate when moving
11.1 Brakes inadequate when moving
11.3 Brakes inadequate when moving
11.2 Brakes inadequate when moving
11.4 Brakes inadequate when moving
11.7 Inadequate adhesion
11.8 Too many brakes cut out
11.9 Train overloaded
11.10 Braking inadequate on down grade
11.11 Brake fade
11.12 Insufficient brake cylinder pressure
11.13 Incorrect friction elements
11.6 Overspeed
11.14 Insufficient braking stroke
11.15 Malicious act
11.16 Brakes faulty
11.17 Brakes mistakenly cut out
11.18 Operational process failure
11.19 Reservoirs full of water
11.20 Leaking brake cylinders
11.21 Isolation cock handles in wrong or inconsistent orientation
11.23 Incorrect or inadequate isolation cock labelling
11.25 Not cut back in after maintenance
11.24 Faulty slack adjusters
11.22 Friction elements excessively worn
11.26 Braking system failure
11.27 Friction elements misaligned to tread / disc
11.29 Procedure for driving with brakes cut out not followed
11.28 Nil or deficient procedure for driving with brakes cut out
11.30 Brake energy source failure (eg. main compressor)
11.32 Brake controller failure
11.33 Load / weigh system failure
11.34 Braking signal transmission system failure
11.31 Local brake control system mechanical failure (eg. triple valve)
11.35 Brake energy reservoir failure
11.36 Brake control system software 'failure'
11.37 Second controller incorrectly cut out
11.38 Component failure
11.39 Exhaust partially blocked increasing delay
11.46 Poor driving practice
11.49 Too many wagons / carriages, resulting in excessive brake delay
11.48 Loss of radio communication on radio-based distributed power systems
11.47 Incorrectly piped after construction, maintenance or overhaul
11.40 One-way partial blockage of brake pipe
11.41 Kinked brake pipe hoses
11.42 Damaged brake piping or hoses
11.43 Brake pipe cocks closed
11.44 Brake signal wiring damaged
11.45 EMI affecting brake signals
11.50 Applying a 'split reduction' - quick release and reapply
11.51 Reservoir rupture or leak
11.52 Reservoir capacity inadequate
11.53 Reservoir recharged insufficiently before next application

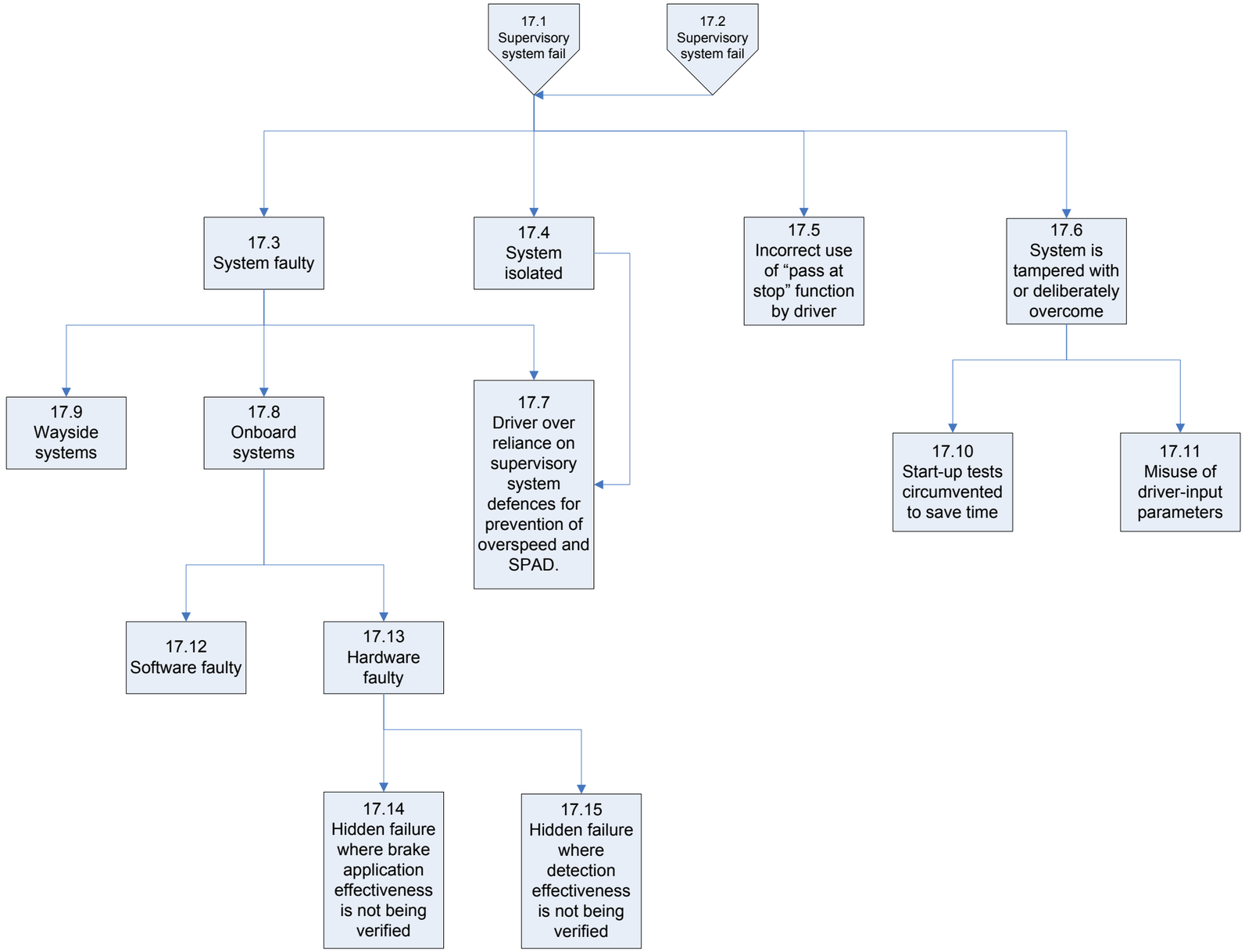

12.2 Brakes inadequate when stationary
12.1 Brakes inadequate when stationary
12.3 Brake system automatically releases brakes after a preset time
12.4 Driver locked out of cab
12.5 Air in brake cylinders leaks off
12.6 Hand / park brakes not applied
12.7 Hand / park brakes defective
12.8 Brakes cannot hold train on steep grade
12.9 Insufficient number of hand / park braked wheelsets
12.12 Overloaded train
12.13 Inadequate adhesion
12.10 Too many brakes cut out
12.11 Unable to manually apply sufficient hand brakes in time on a long train

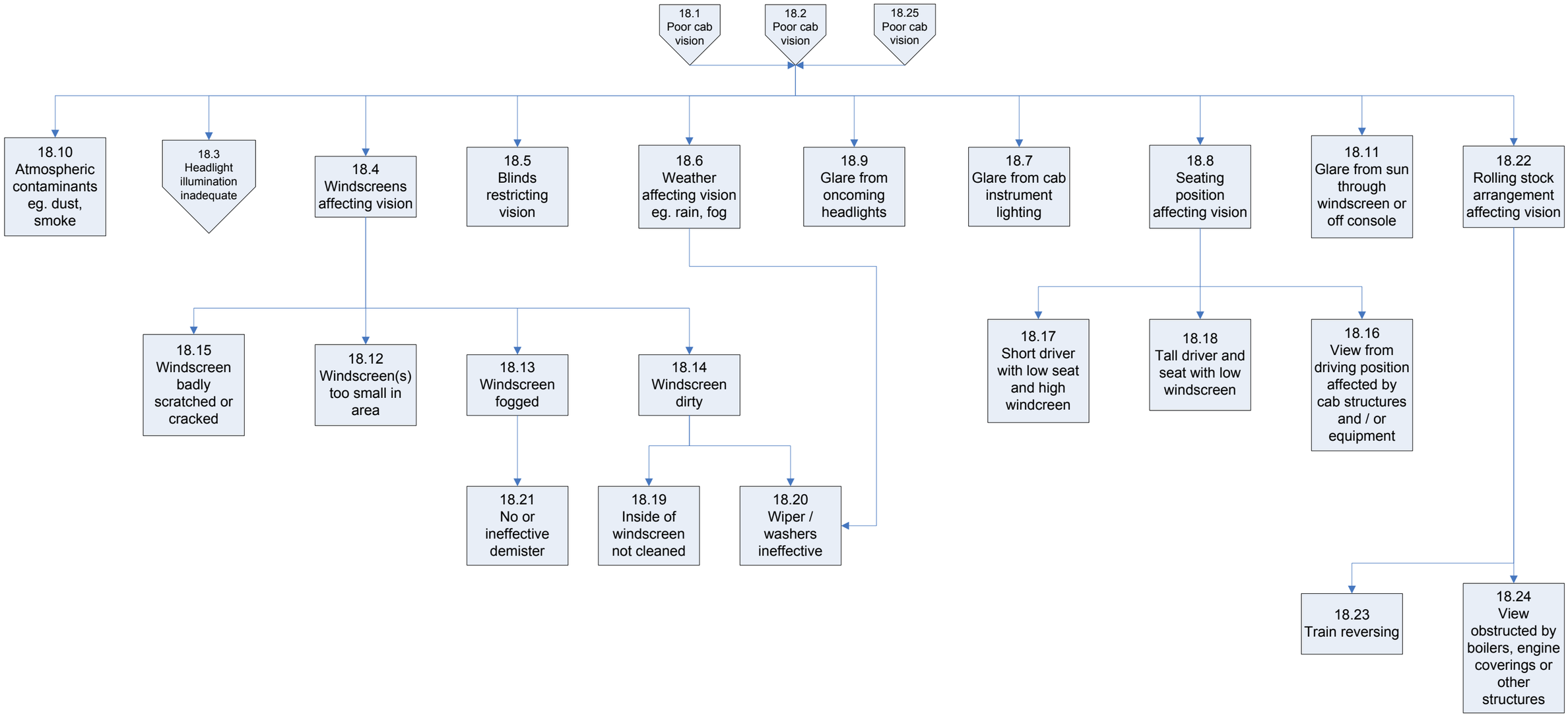

13.1 Wheel skidding
13.2 Wheel skidding
13.3 Wheel skidding
13.4 Seized components
13.5 Brake not released
13.6 Defective or ineffective WSP
13.7 Hand / park brake not released
13.8 Excessive brake cylinder force
13.9 Inadequate adhesion
13.11 Overcharged brake pipe
13.10 Incompatible brake systems on vehicles in the train
13.14 Defective hand / park brake
13.12 Crew not releasing (all) hand / park brakes
13.15 Brake system fault
13.13 Air and spring force compound on park brake
13.16 Vehicles in tare condition with brakes set for gross condition
13.17 Axlebox failure
13.18 Drivetrain failure
13.22 Failed bearing
13.19 Gearbox locks up
13.20 Traction motor locks up
13.21 Engine seizes

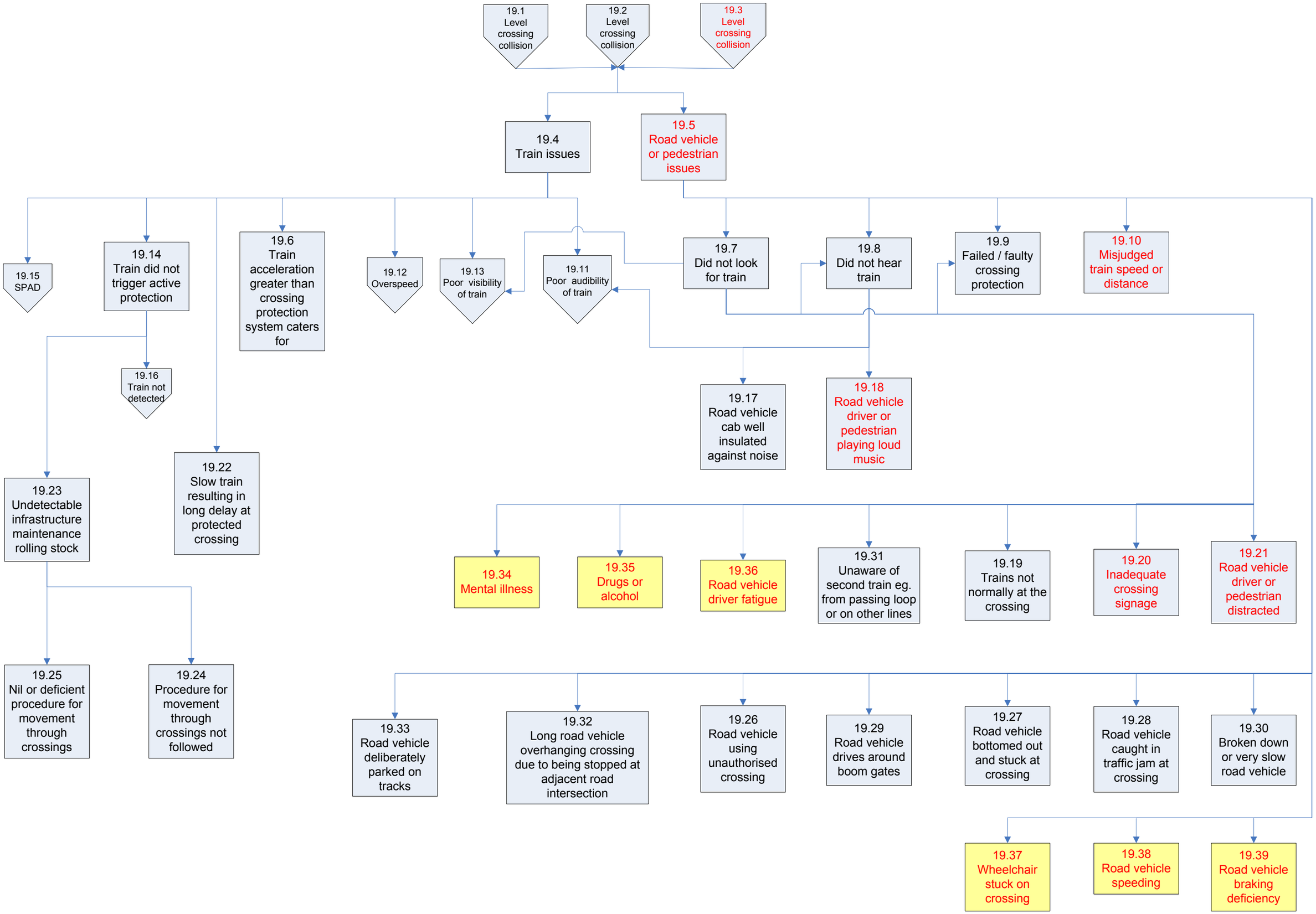

14.4 Inadequate adhesion
14.1 Inadequate adhesion
14.2 Inadequate adhesion
14.5 Inadequate adhesion
14.3 Inadequate adhesion
14.7 Rust on rails
14.8 Leaking oil
14.9 Rain
14.6 Animal (eg. millipedes) or vegetable (eg. leaves) matter
14.10 Excessive sanding
14.11 Excessive rail lubrication
14.12 Bulk product residue
14.13 Inadequate vertical loading on drive wheels of road-rail vehicles
14.14 Rail guidance wheels too low

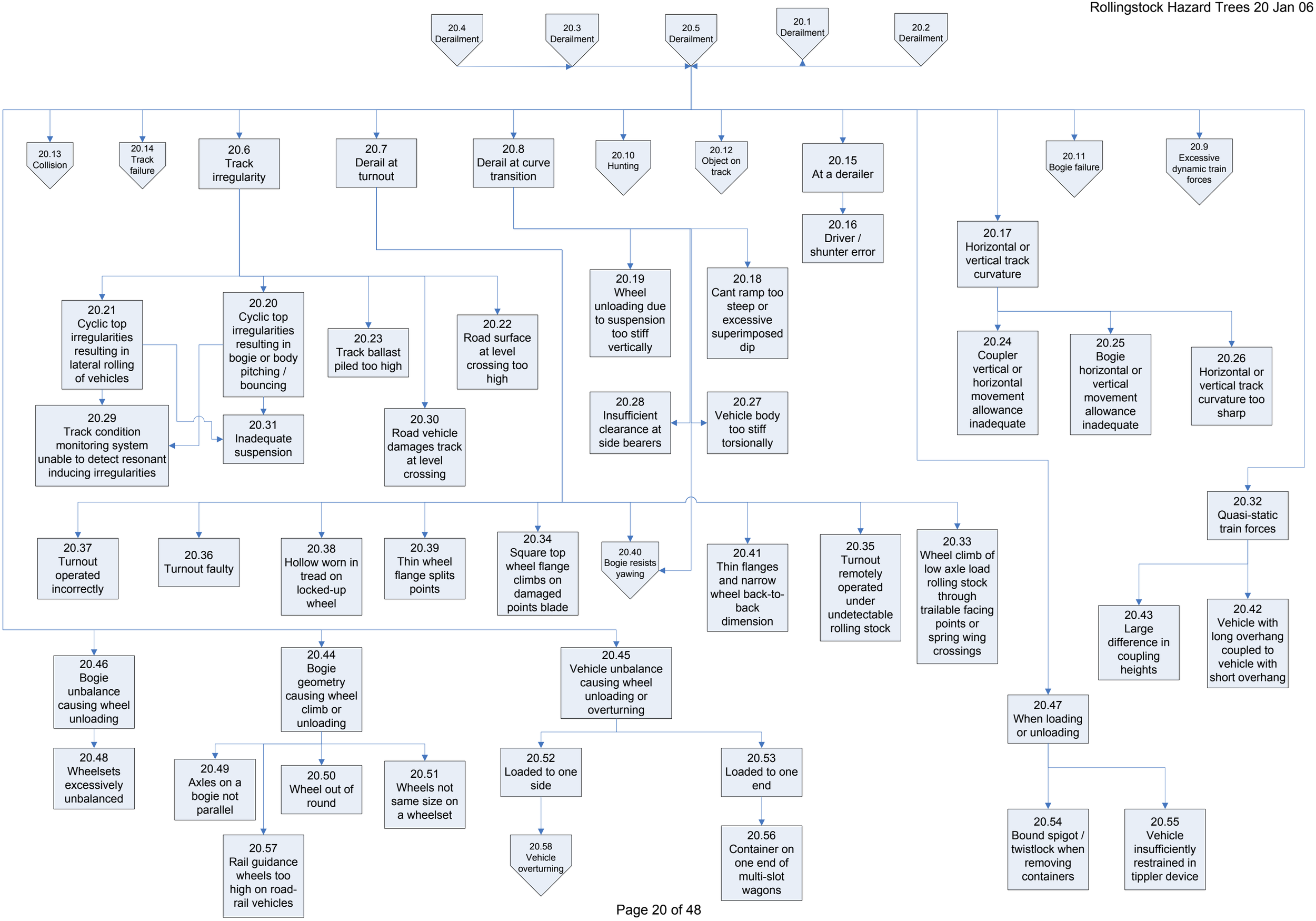

15.1 Alerting system fail
15.9 Alerting system alarm not noticed
15.7 System is tampered with or deliberately overcome
15.5 System faulty
15.6 System isolated
15.3 Repetitive action develops learned / automatic response
15.4 Timing not risk based (eg. same timing irrespective of speed or location)
15.2 Method of monitoring is not applicable to all sizes, shapes, mass etc of the driver population
15.8 Activity or function being monitored does not relate to alertness
15.10 Alarm lacks visibility or audibility
15.11 Alarm lacks differentiation to other alarms
15.12 Software faulty
15.13 Hardware faulty
15.14 Time taken to detect alertness is too long to prevent incident
15.15 Hidden failure where brake application effectiveness is not being verified
15.16 Hidden failure where detection effectiveness is not being verified

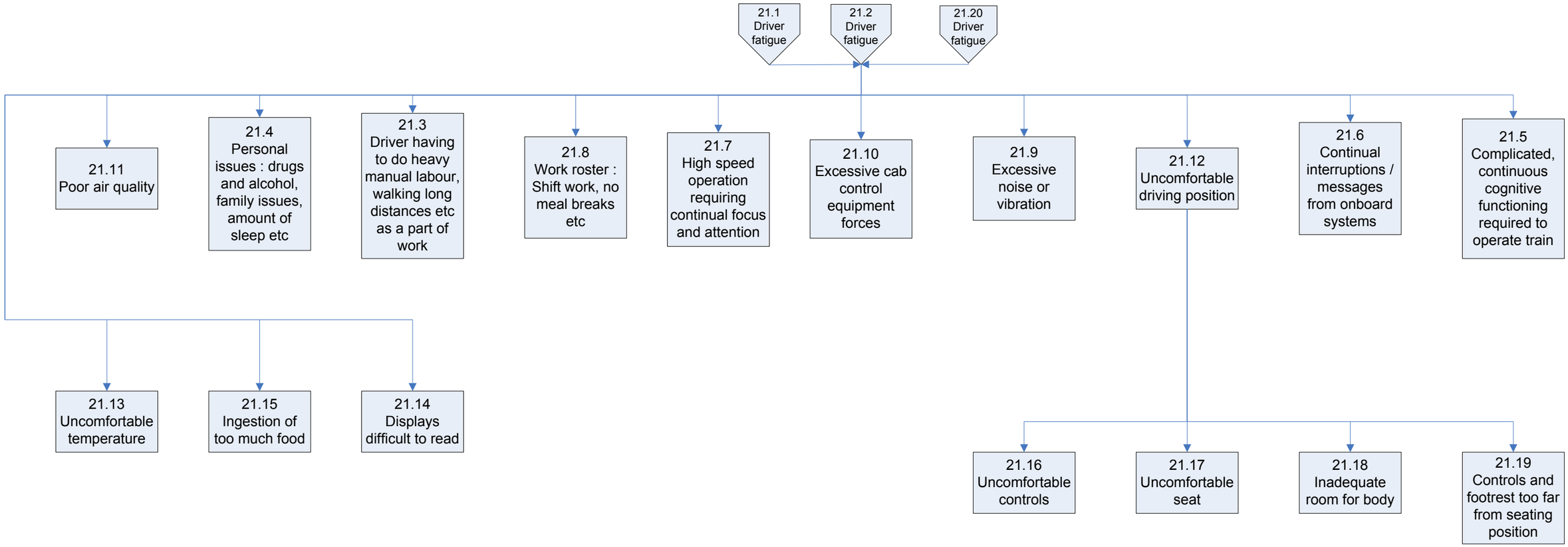

16.1
Failure of deadman system
16.4
Time taken to detect unconciousness is too long to prevent incident
16.3
Method of monitoring is not applicable to all sizes, shapes, mass etc of the driver population
16.2
Activity or function being monitored does not relate to consciousness
16.6
Deadman system faulty or isolated
16.5
System is tampered with or deliberately overcome
16.7
Person in unconscious state can keep system from applying brakes
16.8
Person in slumped state can still keep system 'activated'
16.9
Person slumping over can activate feature preventing brake application eg. bail-off lever

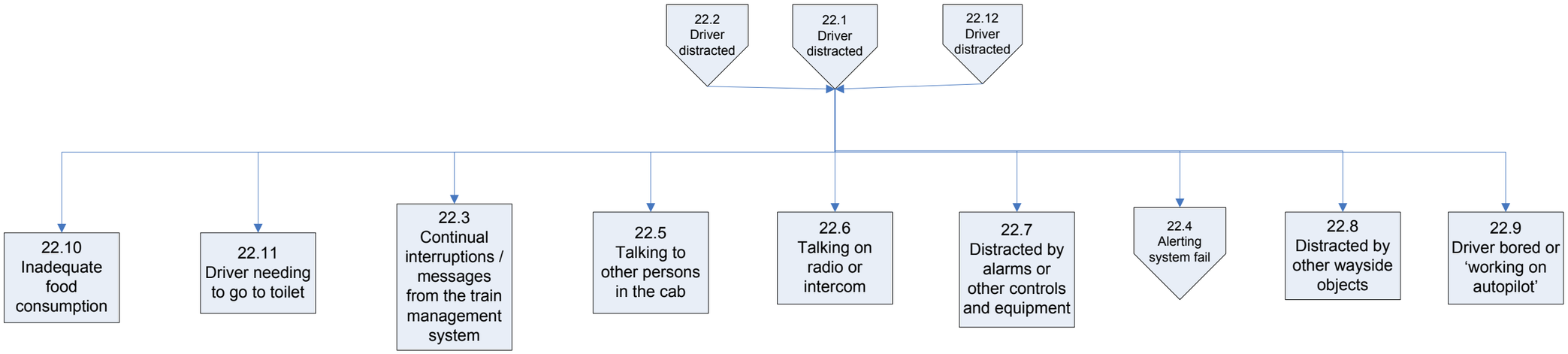

17.1 Supervisory system fail
17.2 Supervisory system fail
17.3 System faulty
17.4 System isolated
17.5 Incorrect use of “pass at stop” function by driver
17.6 System is tampered with or deliberately overcome
17.9 Wayside systems
17.8 Onboard systems
17.7 Driver over reliance on supervisory system defences for prevention of overspeed and SPAD.
17.10 Start-up tests circumvented to save time
17.11 Misuse of driver-input parameters
17.12 Software faulty
17.13 Hardware faulty
17.14 Hidden failure where brake application effectiveness is not being verified
17.15 Hidden failure where detection effectiveness is not being verified

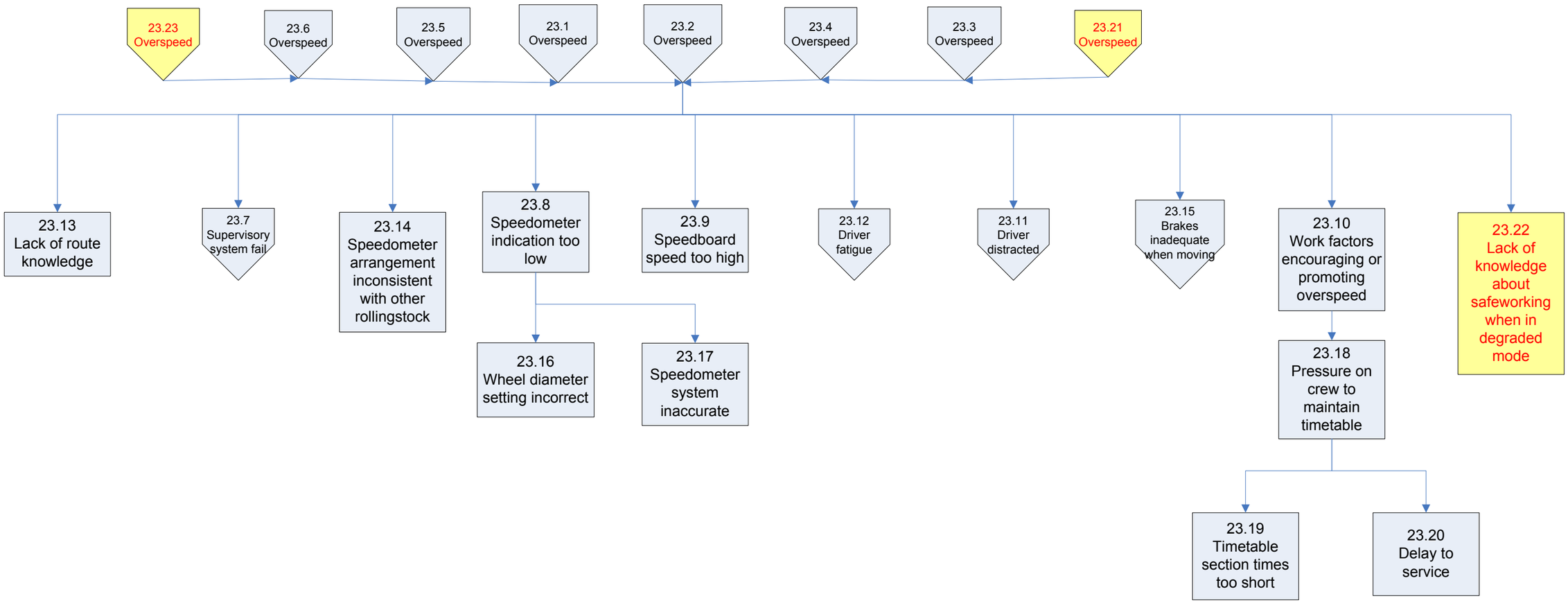

18.1 Poor cab vision
18.2 Poor cab vision
18.25 Poor cab vision
18.10 Atmospheric contaminants eg. dust, smoke
18.3 Headlight illumination inadequate
18.4 Windscreens affecting vision
18.5 Blinds restricting vision
18.6 Weather affecting vision eg. rain, fog
18.9 Glare from oncoming headlights
18.7 Glare from cab instrument lighting
18.8 Seating position affecting vision
18.11 Glare from sun through windscreen or off console
18.22 Rolling stock arrangement affecting vision
18.15 Windscreen badly scratched or cracked
18.12 Windscreen(s) too small in area
18.13 Windscreen fogged
18.14 Windscreen dirty
18.17 Short driver with low seat and high windcreen
18.18 Tall driver and seat with low windscreen
18.16 View from driving position affected by cab structures and / or equipment
18.21 No or ineffective demister
18.19 Inside of windscreen not cleaned
18.20 Wiper / washers ineffective
18.23 Train reversing
18.24 View obstructed by boilers, engine coverings or other structures

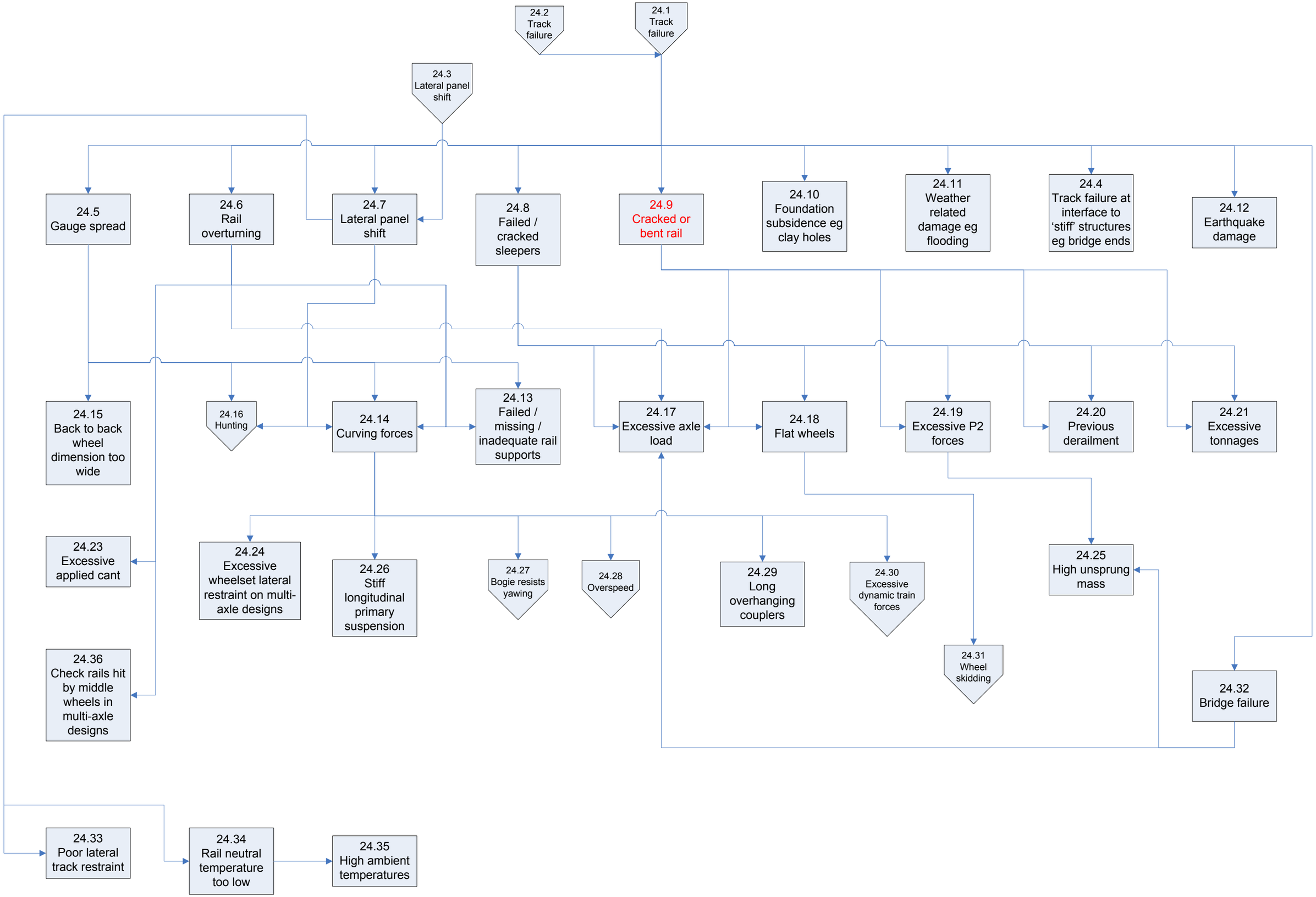

19.1 Level crossing collision
19.2 Level crossing collision
19.3 Level crossing collision
19.4 Train issues
19.5 Road vehicle or pedestrian issues
19.15 SPAD
19.14 Train did not trigger active protection
19.6 Train acceleration greater than crossing protection system caters for
19.12 Overspeed
19.13 Poor visibility of train
19.11 Poor audibility of train
19.7 Did not look for train
19.8 Did not hear train
19.9 Failed / faulty crossing protection
19.10 Misjudged train speed or distance
19.16 Train not detected
19.17 Road vehicle cab well insulated against noise
19.18 Road vehicle driver or pedestrian playing loud music
19.23 Undetectable infrastructure maintenance rolling stock
19.22 Slow train resulting in long delay at protected crossing
19.34 Mental illness
19.35 Drugs or alcohol
19.36 Road vehicle driver fatigue
19.31 Unaware of second train eg. from passing loop or on other lines
19.19 Trains not normally at the crossing
19.20 Inadequate crossing signage
19.21 Road vehicle driver or pedestrian distracted
19.25 Nil or deficient procedure for movement through crossings
19.24 Procedure for movement through crossings not followed
19.33 Road vehicle deliberately parked on tracks
19.32 Long road vehicle overhanging crossing due to being stopped at adjacent road intersection
19.26 Road vehicle using unauthorised crossing
19.29 Road vehicle drives around boom gates
19.27 Road vehicle bottomed out and stuck at crossing
19.28 Road vehicle caught in traffic jam at crossing
19.30 Broken down or very slow road vehicle
19.37 Wheelchair stuck on crossing
19.38 Road vehicle speeding
19.39 Road vehicle braking deficiency

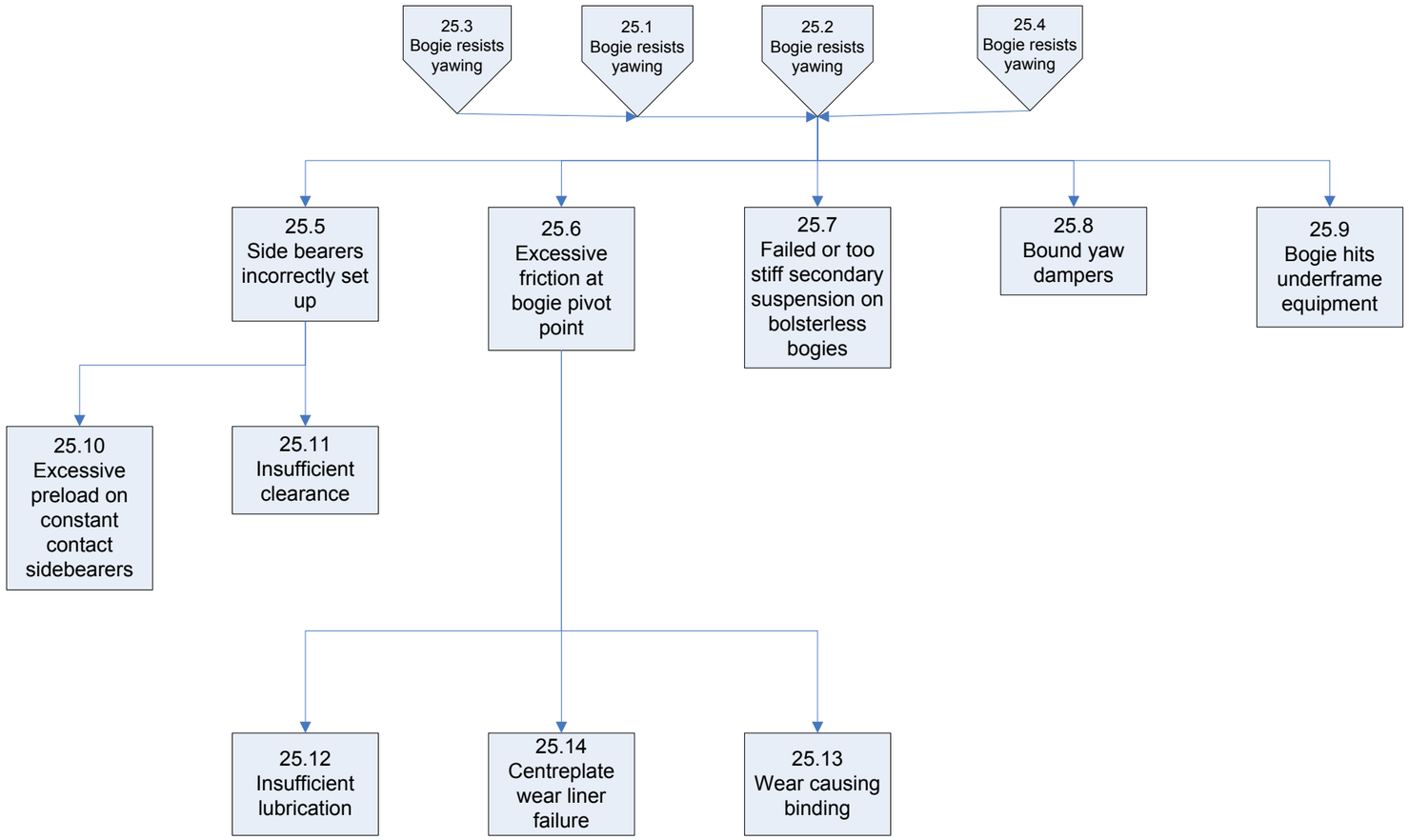

20.4 Derailment
20.3 Derailment
20.5 Derailment
20.1 Derailment
20.2 Derailment
20.13 Collision
20.14 Track failure
20.6 Track irregularity
20.7 Derail at turnout
20.8 Derail at curve transition
20.10 Hunting
20.12 Object on track
20.15 At a derailer
20.16 Driver / shunter error
20.11 Bogie failure
20.9 Excessive dynamic train forces
20.17 Horizontal or vertical track curvature
20.21 Cyclic top irregularities resulting in lateral rolling of vehicles
20.20 Cyclic top irregularities resulting in bogie or body pitching / bouncing
20.23 Track ballast piled too high
20.22 Road surface at level crossing too high
20.19 Wheel unloading due to suspension too stiff vertically
20.18 Cant ramp too steep or excessive superimposed dip
20.24 Coupler vertical or horizontal movement allowance inadequate
20.25 Bogie horizontal or vertical movement allowance inadequate
20.26 Horizontal or vertical track curvature too sharp
20.29 Track condition monitoring system unable to detect resonant inducing irregularities
20.31 Inadequate suspension
20.30 Road vehicle damages track at level crossing
20.28 Insufficient clearance at side bearers
20.27 Vehicle body too stiff torsionally
20.32 Quasi-static train forces
20.37 Turnout operated incorrectly
20.36 Turnout faulty
20.38 Hollow worn in tread on locked-up wheel
20.39 Thin wheel flange splits points
20.34 Square top wheel flange climbs on damaged points blade
20.40 Bogie resists yawing
20.41 Thin flanges and narrow wheel back-to-back dimension
20.35 Turnout remotely operated under undetectable rolling stock
20.33 Wheel climb of low axle load rolling stock through trailable facing points or spring wing crossings
20.43 Large difference in coupling heights
20.42 Vehicle with long overhang coupled to vehicle with short overhang
20.46 Bogie unbalance causing wheel unloading
20.44 Bogie geometry causing wheel climb or unloading
20.45 Vehicle unbalance causing wheel unloading or overturning
20.47 When loading or unloading
20.48 Wheelsets excessively unbalanced
20.49 Axles on a bogie not parallel
20.50 Wheel out of round
20.51 Wheels not same size on a wheelset
20.52 Loaded to one side
20.53 Loaded to one end
20.54 Bound spigot / twistlock when removing containers
20.55 Vehicle insufficiently restrained in tippler device
20.57 Rail guidance wheels too high on road-rail vehicles
20.58 Vehicle overturning
20.56 Container on one end of multi-slot wagons

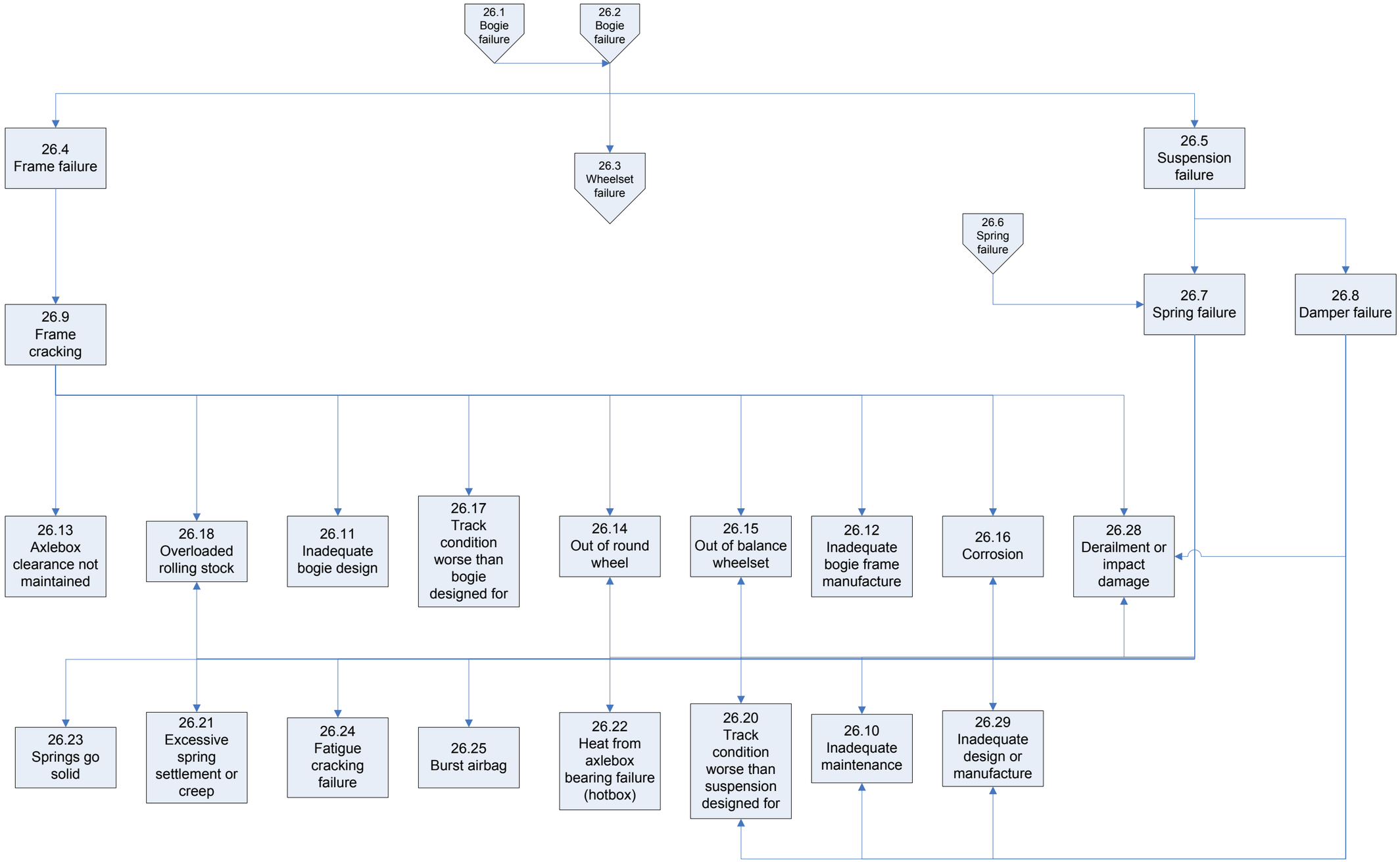

21.1 Driver fatigue
21.2 Driver fatigue
21.20 Driver fatigue
21.11 Poor air quality
21.4 Personal issues : drugs and alcohol, family issues, amount of sleep etc
21.3 Driver having to do heavy manual labour, walking long distances etc as a part of work
21.8 Work roster : Shift work, no meal breaks etc
21.7 High speed operation requiring continual focus and attention
21.10 Excessive cab control equipment forces
21.9 Excessive noise or vibration
21.12 Uncomfortable driving position
21.6 Continual interruptions / messages from onboard systems
21.5 Complicated, continuous cognitive functioning required to operate train
21.13 Uncomfortable temperature
21.15 Ingestion of too much food
21.14 Displays difficult to read
21.16 Uncomfortable controls
21.17 Uncomfortable seat
21.18 Inadequate room for body
21.19 Controls and footrest too far from seating position

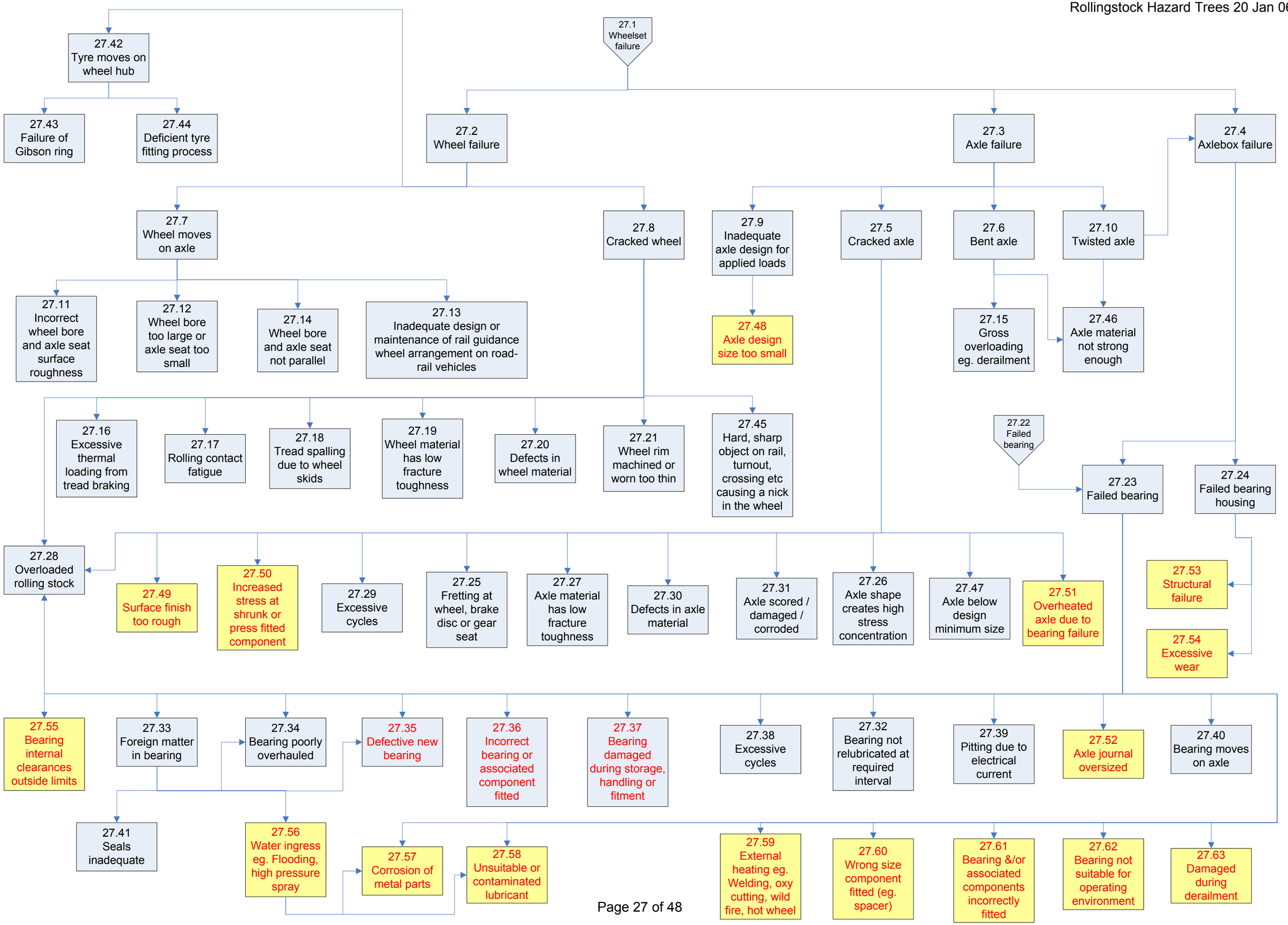

22.2 Driver distracted
22.1 Driver distracted
22.12 Driver distracted
22.10 Inadequate food consumption
22.11 Driver needing to go to toilet
22.3 Continual interruptions / messages from the train management system
22.5 Talking to other persons in the cab
22.6 Talking on radio or intercom
22.7 Distracted by alarms or other controls and equipment
22.4 Alerting system fail
22.8 Distracted by other wayside objects
22.9 Driver bored or 'working on autopilot'

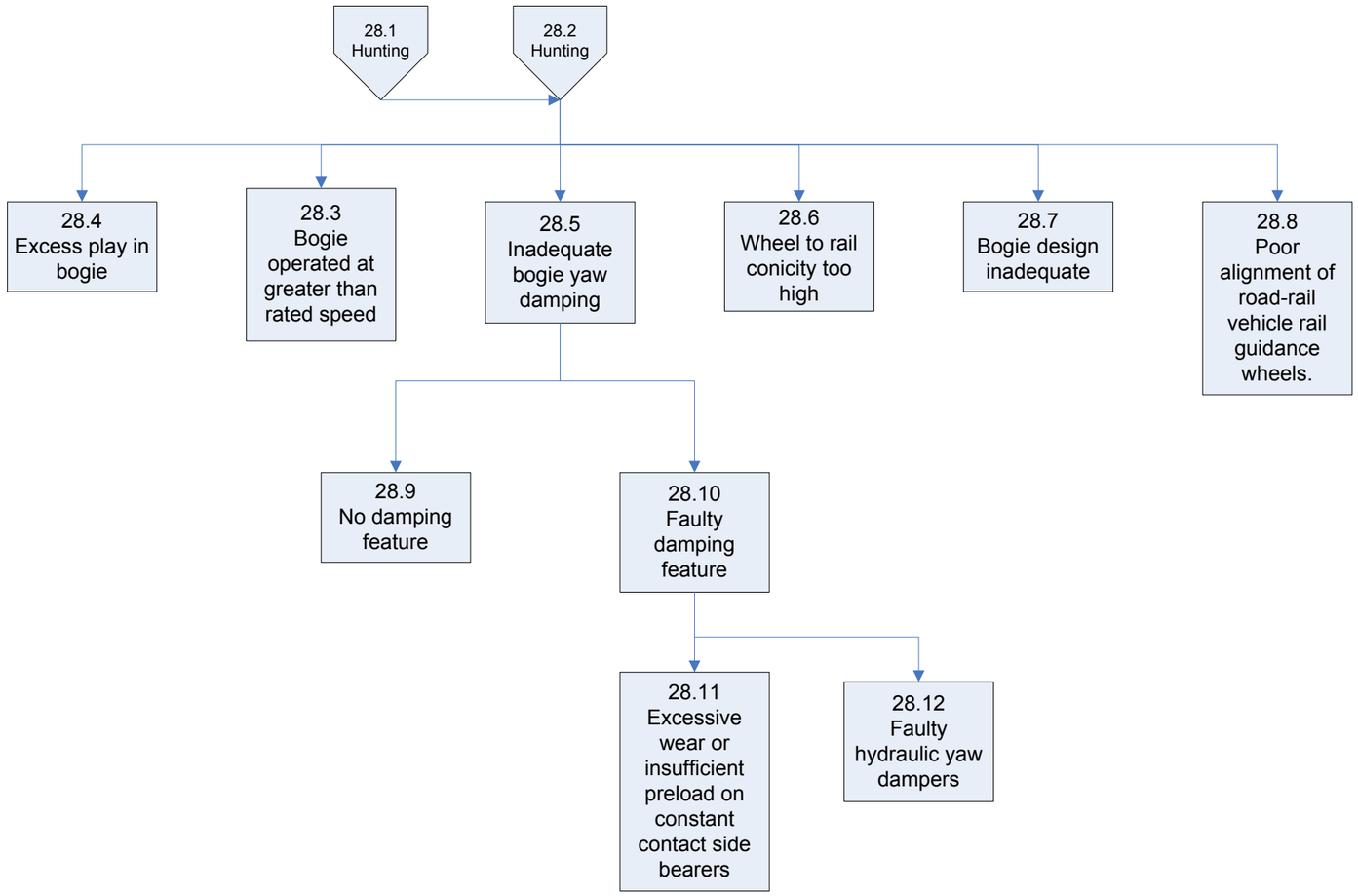

23.23 Overspeed
23.6 Overspeed
23.5 Overspeed
23.1 Overspeed
23.2 Overspeed
23.4 Overspeed
23.3 Overspeed
23.21 Overspeed
23.13 Lack of route knowledge
23.7 Supervisory system fail
23.14 Speedometer arrangement inconsistent with other rollingstock
23.8 Speedometer indication too low
23.9 Speedboard speed too high
23.12 Driver fatigue
23.11 Driver distracted
23.15 Brakes inadequate when moving
23.10 Work factors encouraging or promoting overspeed
23.22 Lack of knowledge about safeworking when in degraded mode
23.16 Wheel diameter setting incorrect
23.17 Speedometer system inaccurate
23.18 Pressure on crew to maintain timetable
23.19 Timetable section times too short
23.20 Delay to service

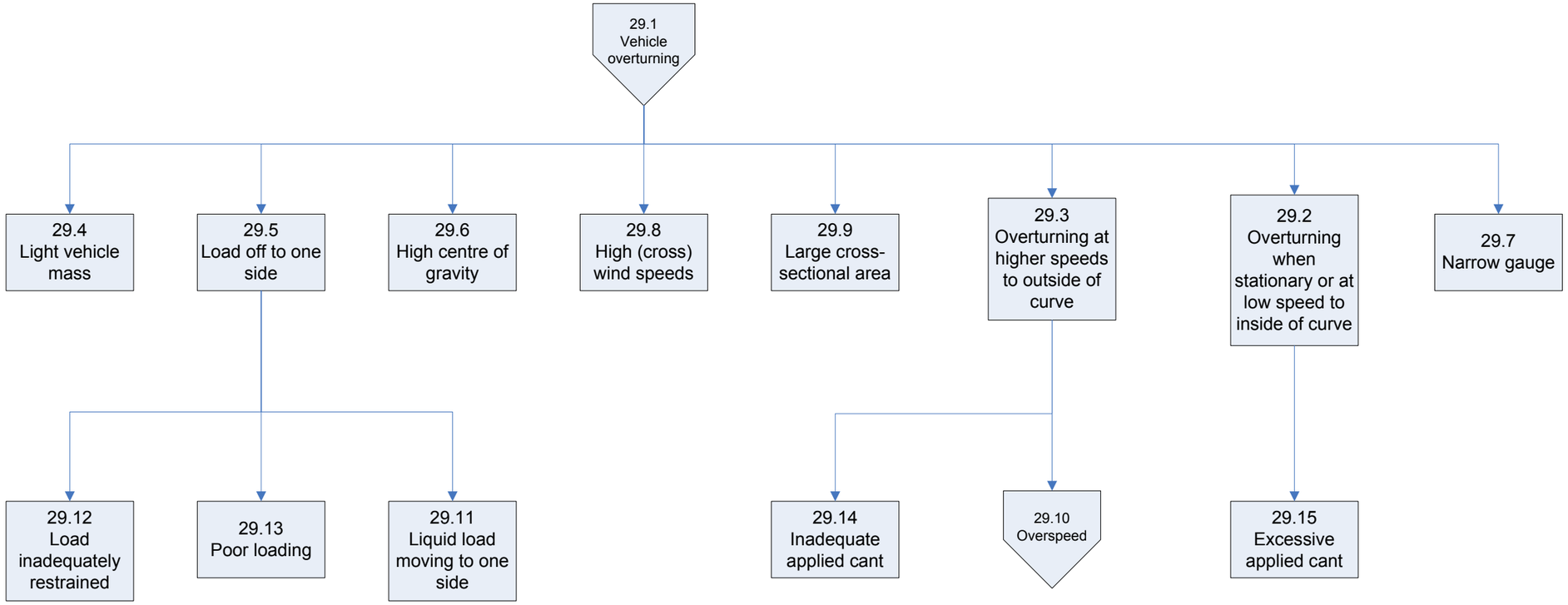

24.2 Track failure
24.1 Track failure
24.3 Lateral panel shift
24.5 Gauge spread
24.6 Rail overturning
24.7 Lateral panel shift
24.8 Failed / cracked sleepers
24.9 Cracked or bent rail
24.10 Foundation subsidence eg clay holes
24.11 Weather related damage eg flooding
24.4 Track failure at interface to 'stiff' structures eg bridge ends
24.12 Earthquake damage
24.15 Back to back wheel dimension too wide
24.16 Hunting
24.14 Curving forces
24.13 Failed / missing / inadequate rail supports
24.17 Excessive axle load
24.18 Flat wheels
24.19 Excessive P2 forces
24.20 Previous derailment
24.21 Excessive tonnages
24.23 Excessive applied cant
24.24 Excessive wheelset lateral restraint on multi-axle designs
24.26 Stiff longitudinal primary suspension
24.27 Bogie resists yawing
24.28 Overspeed
24.29 Long overhanging couplers
24.30 Excessive dynamic train forces
24.25 High unsprung mass
24.31 Wheel skidding
24.32 Bridge failure
24.36 Check rails hit by middle wheels in multi-axle designs
24.33 Poor lateral track restraint
24.34 Rail neutral temperature too low
24.35 High ambient temperatures

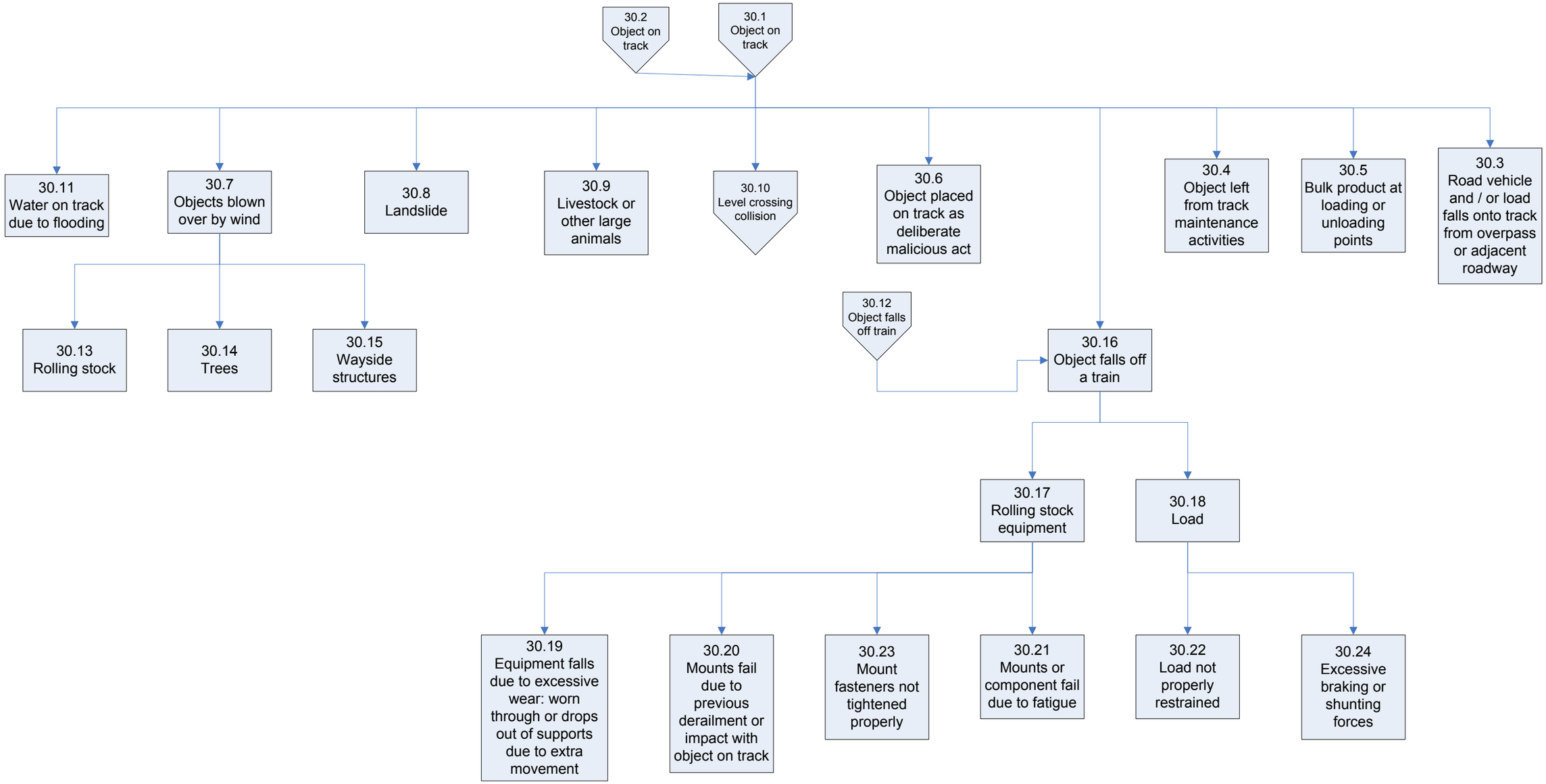

25.3 Bogie resists yawing
25.1 Bogie resists yawing
25.2 Bogie resists yawing
25.4 Bogie resists yawing
25.5 Side bearers incorrectly set up
25.6 Excessive friction at bogie pivot point
25.7 Failed or too stiff secondary suspension on bolsterless bogies
25.8 Bound yaw dampers
25.9 Bogie hits underframe equipment
25.10 Excessive preload on constant contact sidebearers
25.11 Insufficient clearance
25.12 Insufficient lubrication
25.14 Centreplate wear liner failure
25.13 Wear causing binding

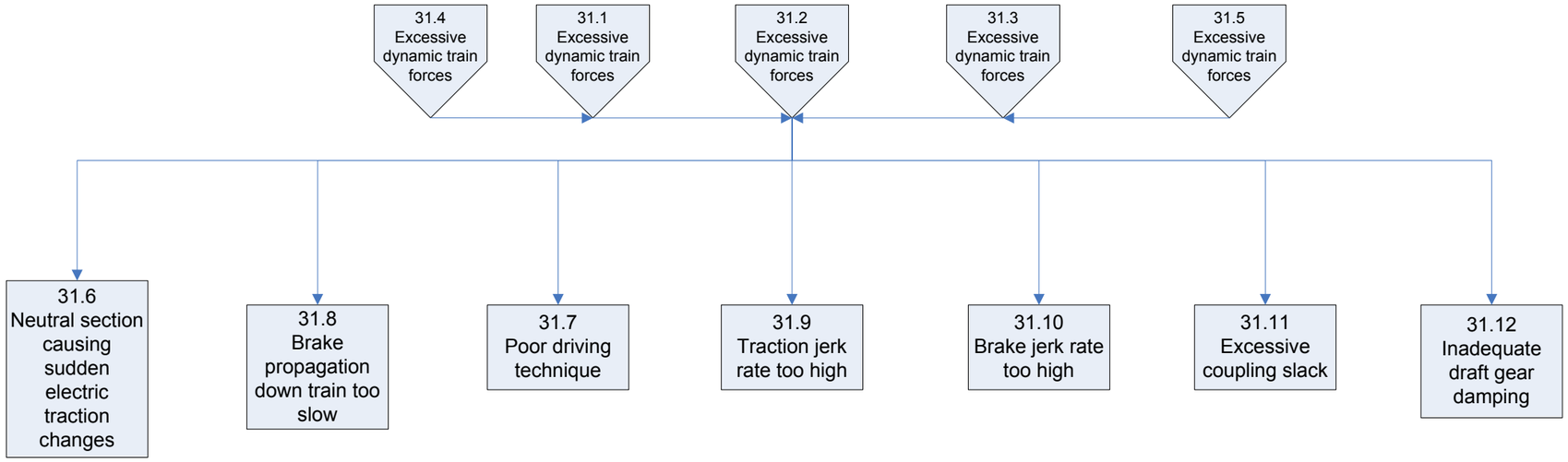

26.1 Bogie failure
26.2 Bogie failure
26.3 Wheelset failure
26.4 Frame failure
26.5 Suspension failure
26.6 Spring failure
26.7 Spring failure
26.8 Damper failure
26.9 Frame cracking
26.10 Inadequate maintenance
26.11 Inadequate bogie design
26.12 Inadequate bogie frame manufacture
26.13 Axlebox clearance not maintained
26.14 Out of round wheel
26.15 Out of balance wheelset
26.16 Corrosion
26.17 Track condition worse than bogie designed for
26.18 Overloaded rolling stock
26.20 Track condition worse than suspension designed for
26.21 Excessive spring settlement or creep
26.22 Heat from axlebox bearing failure (hotbox)
26.23 Springs go solid
26.24 Fatigue cracking failure
26.25 Burst airbag
26.28 Derailment or impact damage
26.29 Inadequate design or manufacture

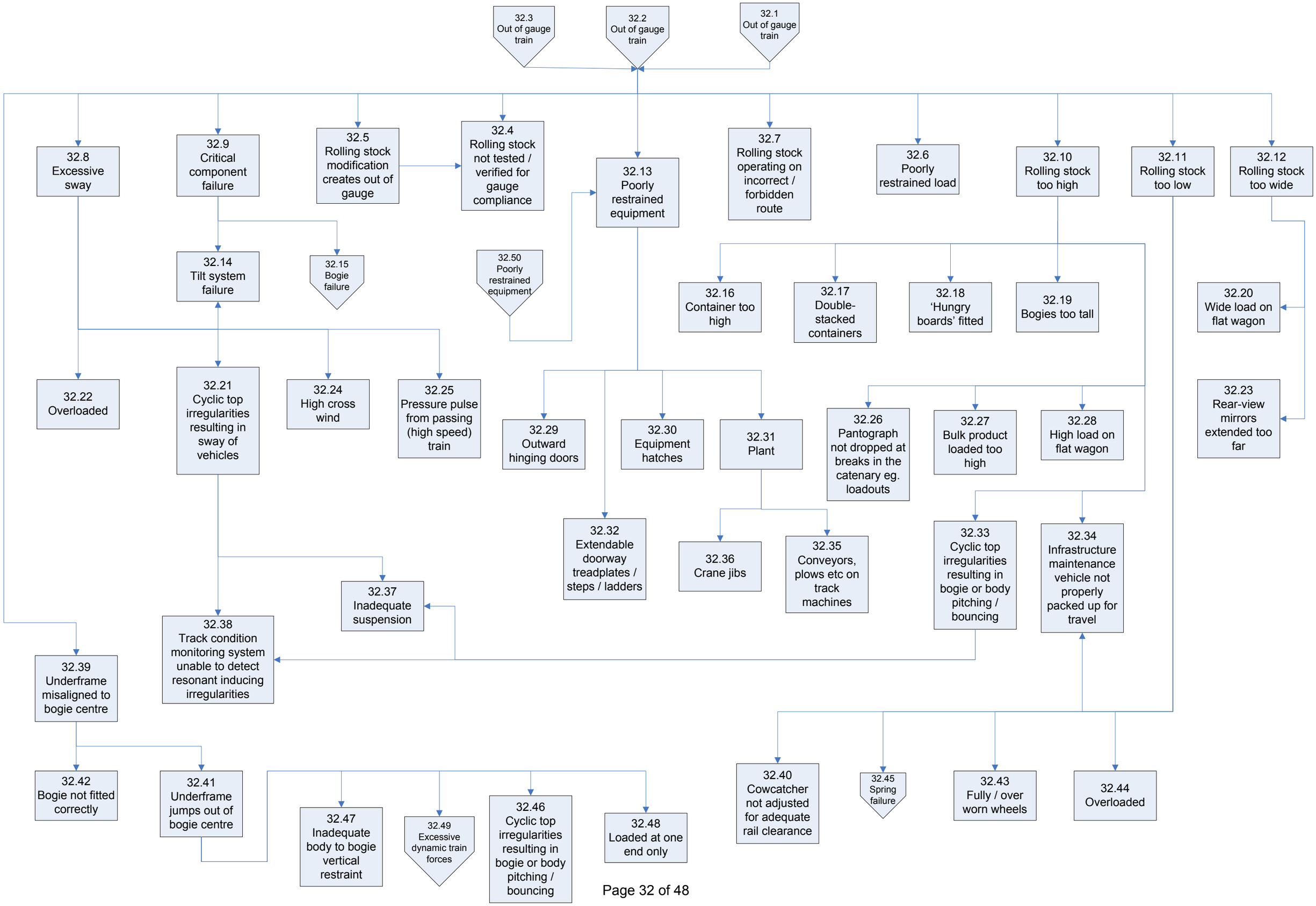

27.1 Wheelset failure
27.2 Wheel failure
27.3 Axle failure
27.4 Axlebox failure
27.42 Tyre moves on wheel hub
27.43 Failure of Gibson ring
27.44 Deficient tyre fitting process
27.7 Wheel moves on axle
27.8 Cracked wheel
27.9 Inadequate axle design for applied loads
27.5 Cracked axle
27.6 Bent axle
27.10 Twisted axle
27.11 Incorrect wheel bore and axle seat surface roughness
27.12 Wheel bore too large or axle seat too small
27.14 Wheel bore and axle seat not parallel
27.13 Inadequate design or maintenance of rail guidance wheel arrangement on road-rail vehicles
27.48 Axle design size too small
27.15 Gross overloading eg. derailment
27.46 Axle material not strong enough
27.16 Excessive thermal loading from tread braking
27.17 Rolling contact fatigue
27.18 Tread spalling due to wheel skids
27.19 Wheel material has low fracture toughness
27.20 Defects in wheel material
27.21 Wheel rim machined or worn too thin
27.45 Hard, sharp object on rail, turnout, crossing etc causing a nick in the wheel
27.22 Failed bearing
27.23 Failed bearing
27.24 Failed bearing housing
27.28 Overloaded rolling stock
27.49 Surface finish too rough
27.50 Increased stress at shrunk or press fitted component
27.29 Excessive cycles
27.25 Fretting at wheel, brake disc or gear seat
27.27 Axle material has low fracture toughness
27.30 Defects in axle material
27.31 Axle scored / damaged / corroded
27.26 Axle shape creates high stress concentration
27.47 Axle below design minimum size
27.51 Overheated axle due to bearing failure
27.53 Structural failure
27.54 Excessive wear
27.55 Bearing internal clearances outside limits
27.33 Foreign matter in bearing
27.34 Bearing poorly overhauled
27.35 Defective new bearing
27.36 Incorrect bearing or associated component fitted
27.37 Bearing damaged during storage, handling or fitment
27.38 Excessive cycles
27.32 Bearing not relubricated at required interval
27.39 Pitting due to electrical current
27.52 Axle journal oversized
27.40 Bearing moves on axle
27.41 Seals inadequate
27.56 Water ingress eg. Flooding, high pressure spray
27.57 Corrosion of metal parts
27.58 Unsuitable or contaminated lubricant
27.59 External heating eg. Welding, oxy cutting, wild fire, hot wheel
27.60 Wrong size component fitted (eg. spacer)
27.61 Bearing &/or associated components incorrectly fitted
27.62 Bearing not suitable for operating environment
27.63 Damaged during derailment

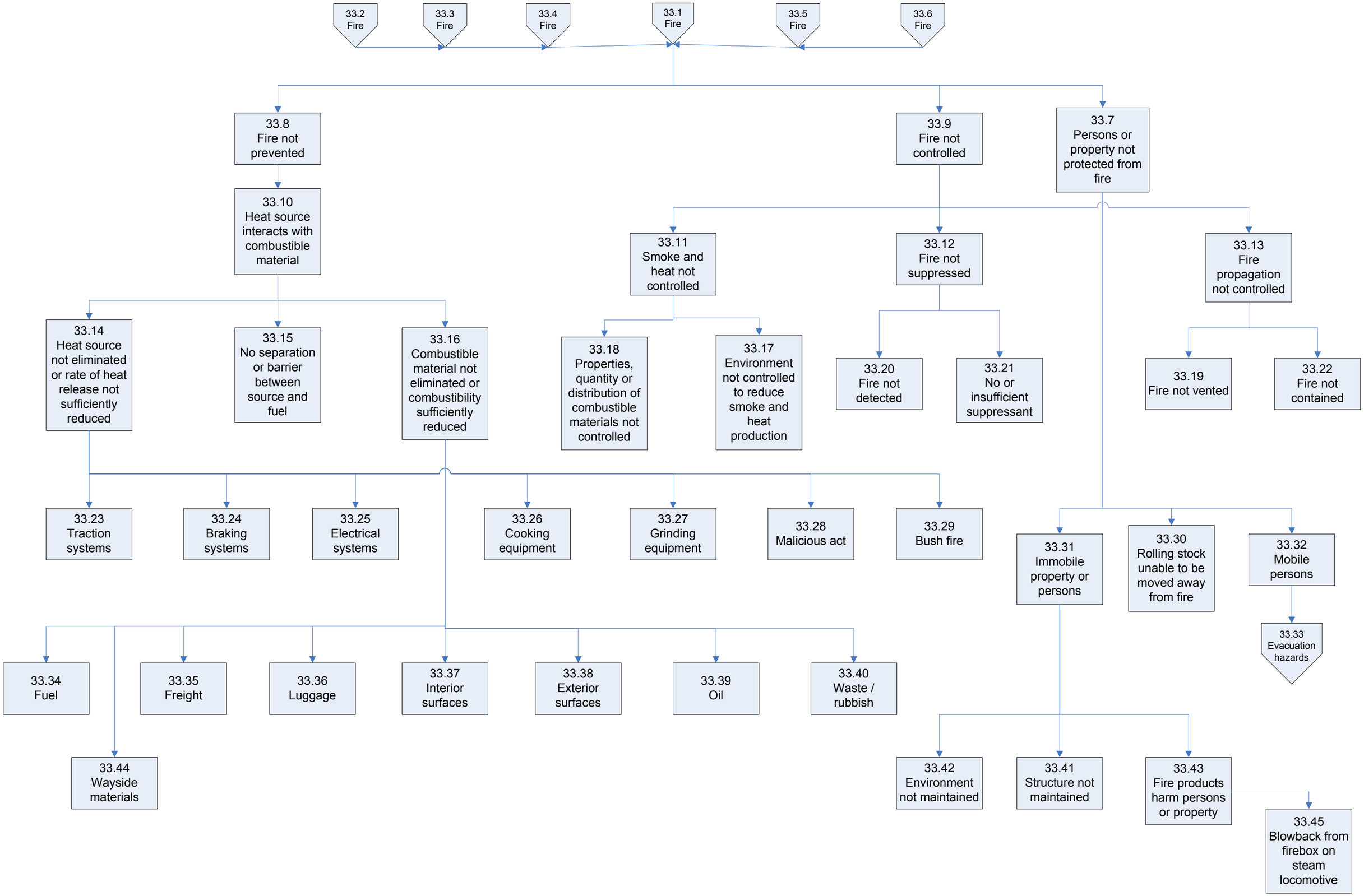

28.1 Hunting
28.2 Hunting
28.4 Excess play in bogie
28.3 Bogie operated at greater than rated speed
28.5 Inadequate bogie yaw damping
28.6 Wheel to rail conicity too high
28.7 Bogie design inadequate
28.8 Poor alignment of road-rail vehicle rail guidance wheels.
28.9 No damping feature
28.10 Faulty damping feature
28.11 Excessive wear or insufficient preload on constant contact side bearers
28.12 Faulty hydraulic yaw dampers

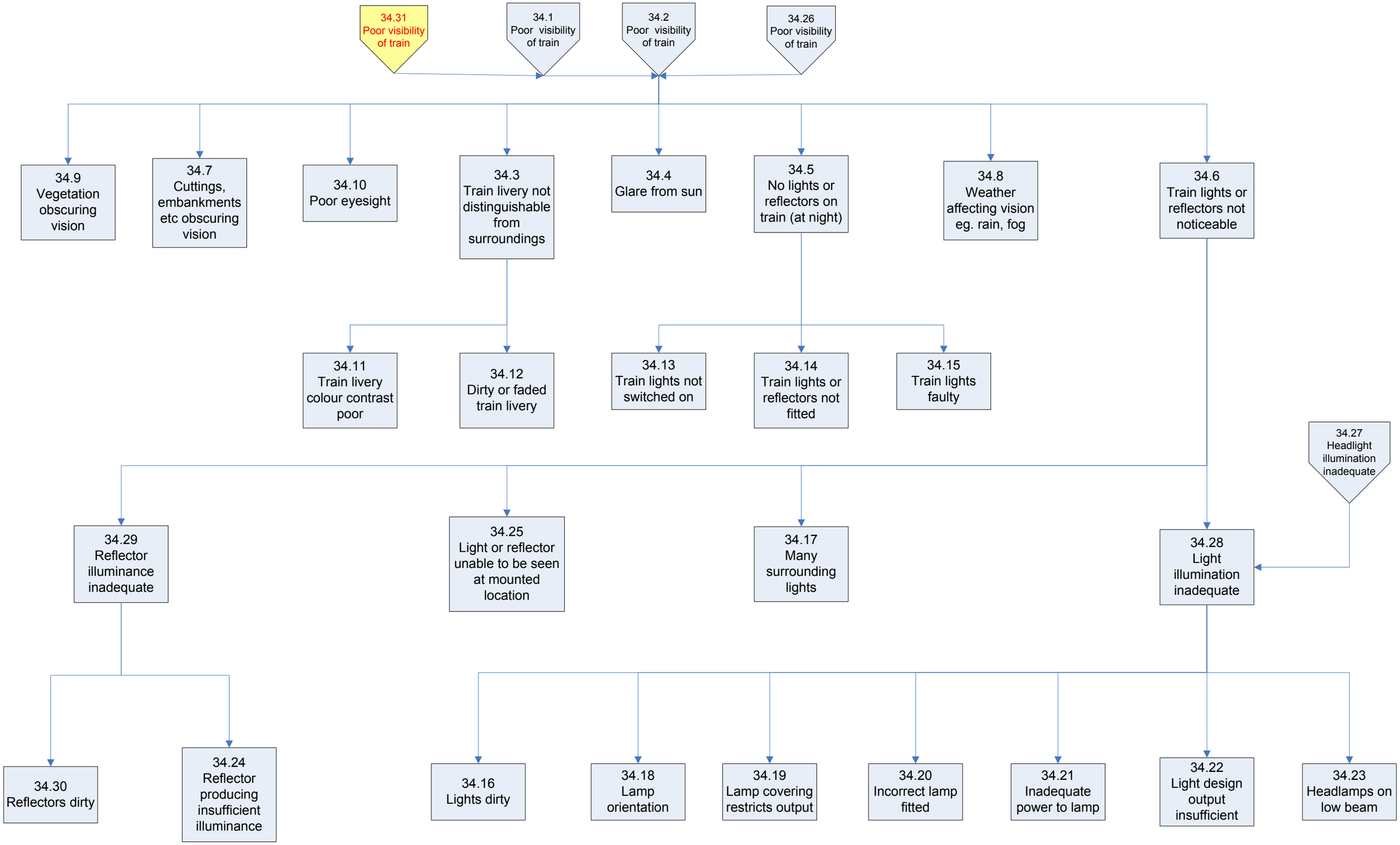

29.1 Vehicle overturning
29.4 Light vehicle mass
29.5 Load off to one side
29.6 High centre of gravity
29.8 High (cross) wind speeds
29.9 Large cross-sectional area
29.3 Overturning at higher speeds to outside of curve
29.2 Overturning when stationary or at low speed to inside of curve
29.7 Narrow gauge
29.12 Load inadequately restrained
29.13 Poor loading
29.11 Liquid load moving to one side
29.14 Inadequate applied cant
29.10 Overspeed
29.15 Excessive applied cant

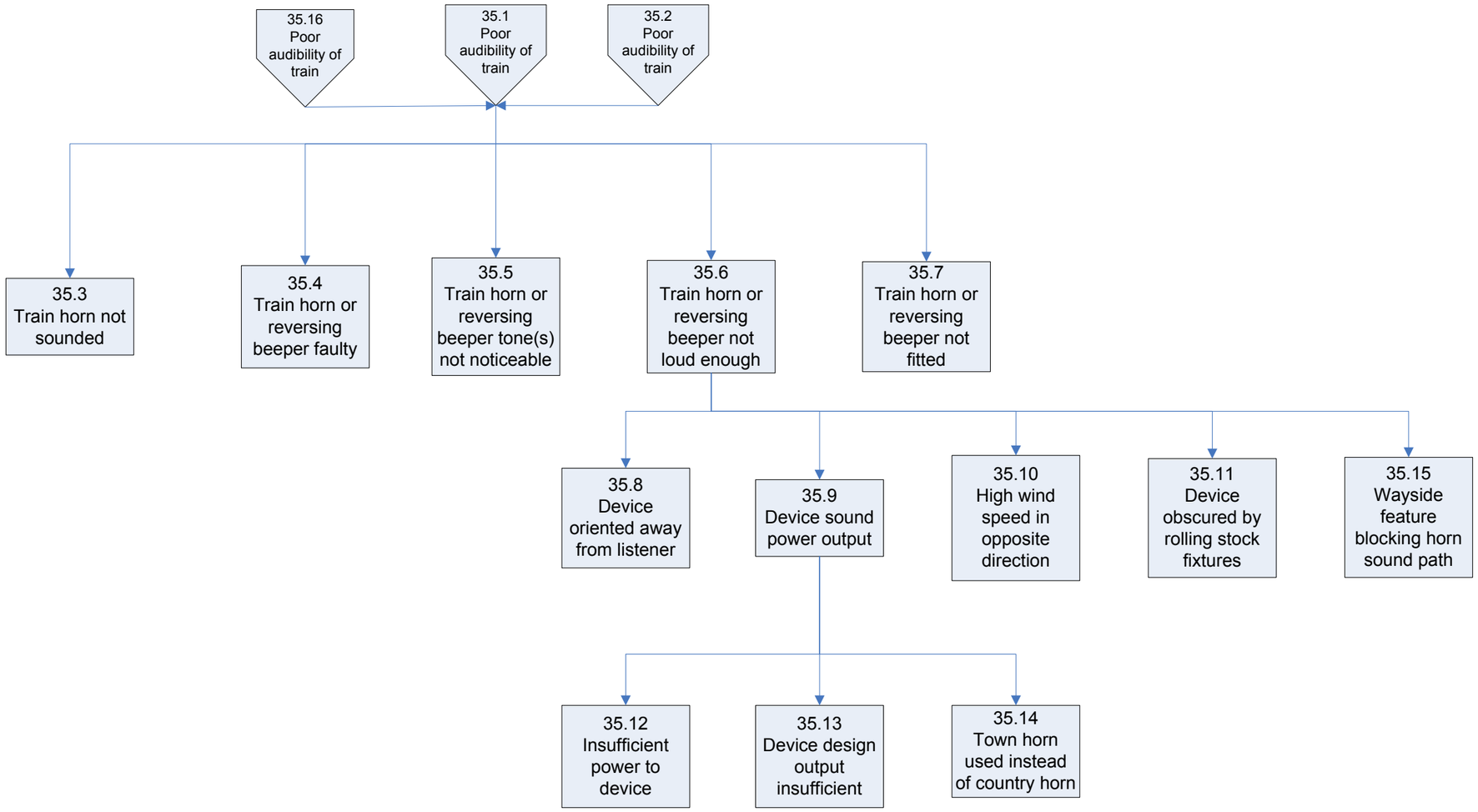

30.2 Object on track
30.1 Object on track
30.11 Water on track due to flooding
30.7 Objects blown over by wind
30.8 Landslide
30.9 Livestock or other large animals
30.10 Level crossing collision
30.6 Object placed on track as deliberate malicious act
30.4 Object left from track maintenance activities
30.5 Bulk product at loading or unloading points
30.3 Road vehicle and / or load falls onto track from overpass or adjacent roadway
30.13 Rolling stock
30.14 Trees
30.15 Wayside structures
30.12 Object falls off train
30.16 Object falls off a train
30.17 Rolling stock equipment
30.18 Load
30.19 Equipment falls due to excessive wear: worn through or drops out of supports due to extra movement
30.20 Mounts fail due to previous derailment or impact with object on track
30.23 Mount fasteners not tightened properly
30.21 Mounts or component fail due to fatigue
30.22 Load not properly restrained
30.24 Excessive braking or shunting forces

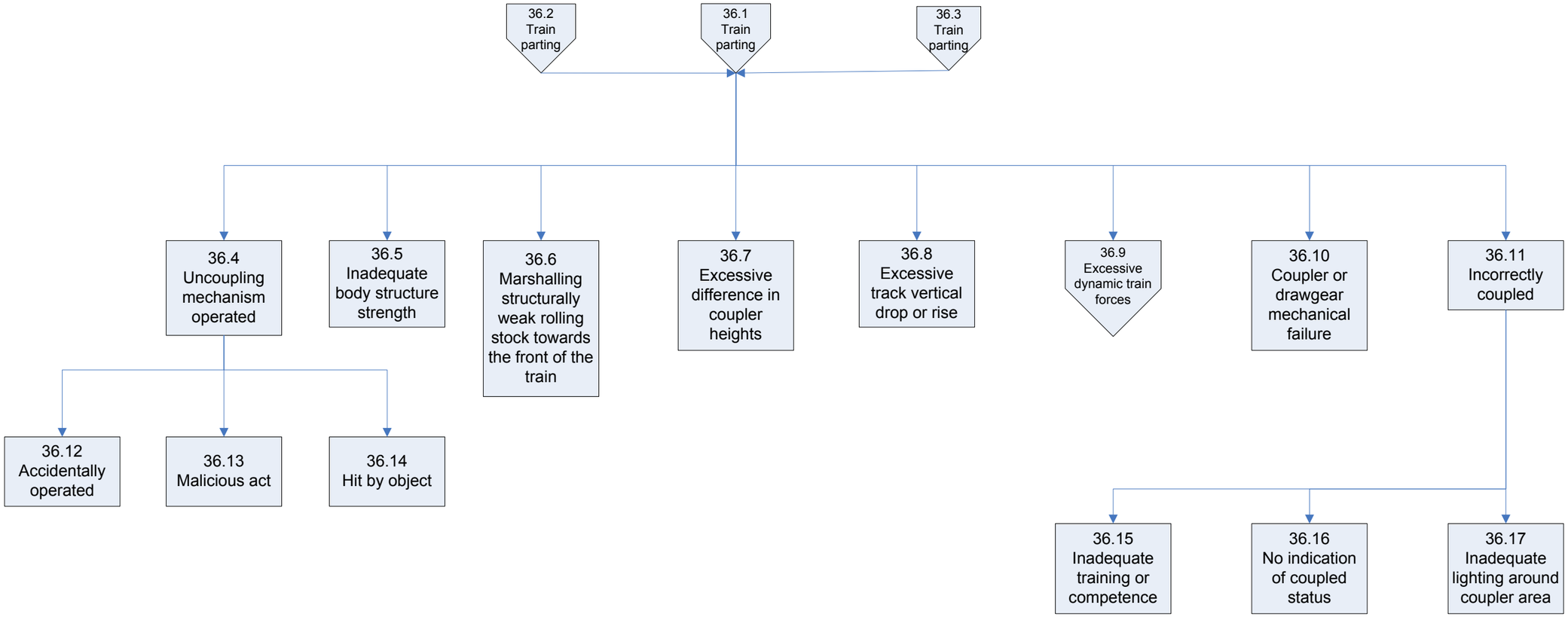

31.4 Excessive dynamic train forces
31.1 Excessive dynamic train forces
31.2 Excessive dynamic train forces
31.3 Excessive dynamic train forces
31.5 Excessive dynamic train forces
31.6 Neutral section causing sudden electric traction changes
31.8 Brake propagation down train too slow
31.7 Poor driving technique
31.9 Traction jerk rate too high
31.10 Brake jerk rate too high
31.11 Excessive coupling slack
31.12 Inadequate draft gear damping

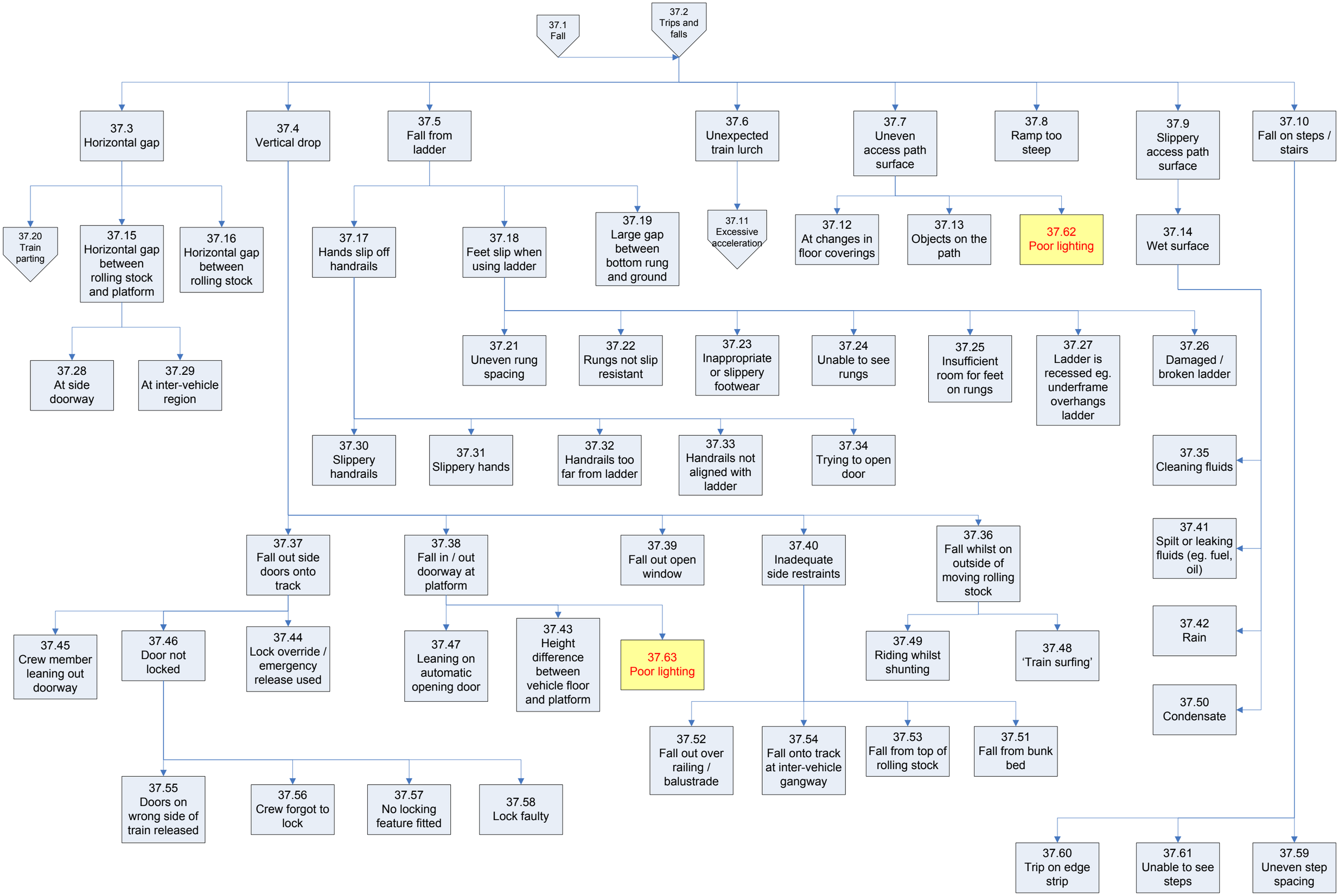

32.3 Out of gauge train
32.2 Out of gauge train
32.1 Out of gauge train
32.8 Excessive sway
32.9 Critical component failure
32.5 Rolling stock modification creates out of gauge
32.4 Rolling stock not tested / verified for gauge compliance
32.13 Poorly restrained equipment
32.7 Rolling stock operating on incorrect / forbidden route
32.6 Poorly restrained load
32.10 Rolling stock too high
32.11 Rolling stock too low
32.12 Rolling stock too wide
32.14 Tilt system failure
32.15 Bogie failure
32.50 Poorly restrained equipment
32.16 Container too high
32.17 Double-stacked containers
32.18 'Hungry boards' fitted
32.19 Bogies too tall
32.20 Wide load on flat wagon
32.22 Overloaded
32.21 Cyclic top irregularities resulting in sway of vehicles
32.24 High cross wind
32.25 Pressure pulse from passing (high speed) train
32.29 Outward hinging doors
32.30 Equipment hatches
32.31 Plant
32.26 Pantograph not dropped at breaks in the catenary eg. loadouts
32.27 Bulk product loaded too high
32.28 High load on flat wagon
32.23 Rear-view mirrors extended too far
32.32 Extendable doorway treadplates / steps / ladders
32.36 Crane jibs
32.35 Conveyors, plows etc on track machines
32.33 Cyclic top irregularities resulting in bogie or body pitching / bouncing
32.34 Infrastructure maintenance vehicle not properly packed up for travel
32.37 Inadequate suspension
32.38 Track condition monitoring system unable to detect resonant inducing irregularities
32.39 Underframe misaligned to bogie centre
32.40 Cowcatcher not adjusted for adequate rail clearance
32.45 Spring failure
32.43 Fully / over worn wheels
32.44 Overloaded
32.42 Bogie not fitted correctly
32.41 Underframe jumps out of bogie centre
32.47 Inadequate body to bogie vertical restraint
32.49 Excessive dynamic train forces
32.46 Cyclic top irregularities resulting in bogie or body pitching / bouncing
32.48 Loaded at one end only

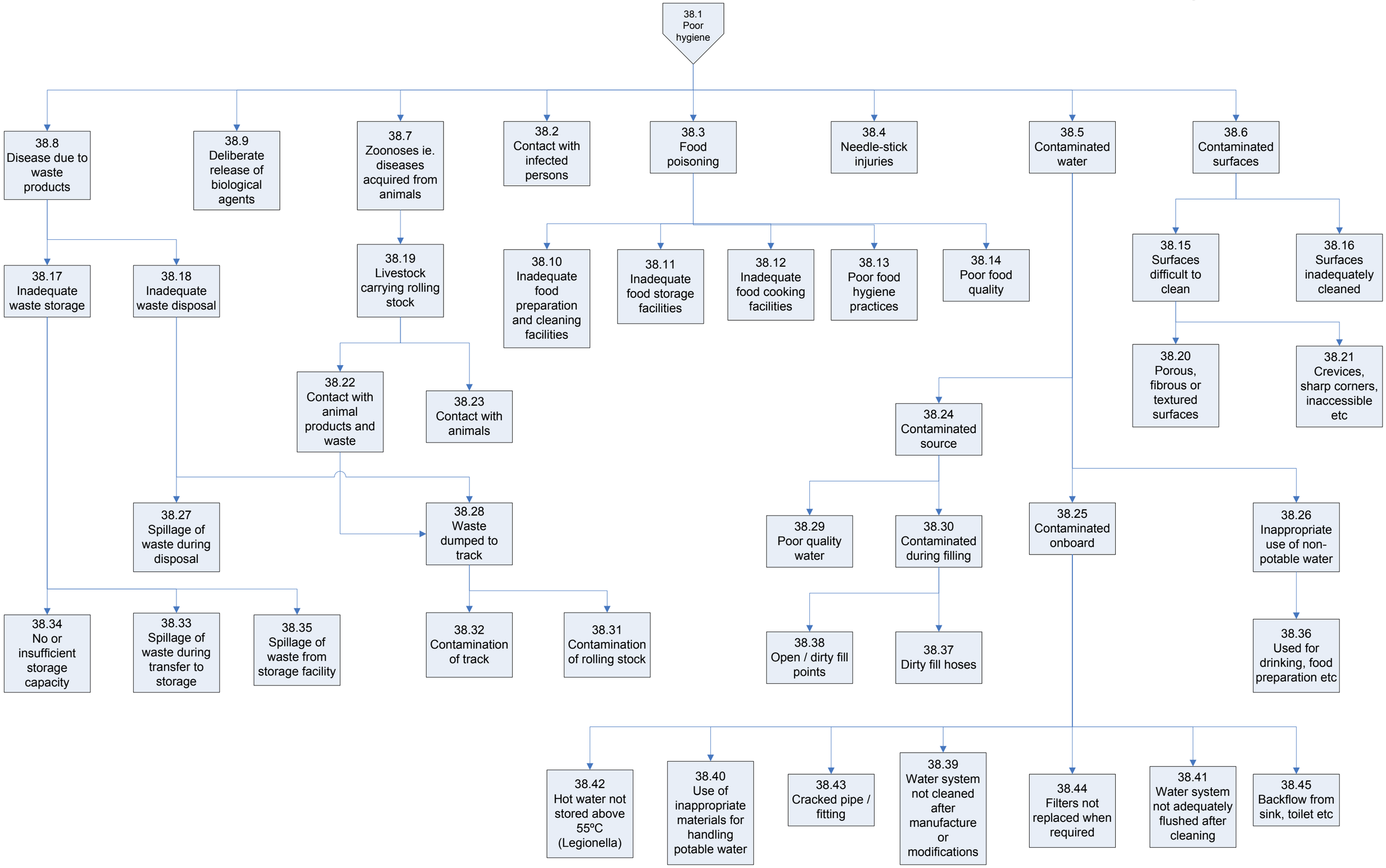

33.2 Fire
33.3 Fire
33.4 Fire
33.1 Fire
33.5 Fire
33.6 Fire
33.8 Fire not prevented
33.9 Fire not controlled
33.7 Persons or property not protected from fire
33.10 Heat source interacts with combustible material
33.11 Smoke and heat not controlled
33.12 Fire not suppressed
33.13 Fire propagation not controlled
33.14 Heat source not eliminated or rate of heat release not sufficiently reduced
33.15 No separation or barrier between source and fuel
33.16 Combustible material not eliminated or combustibility sufficiently reduced
33.18 Properties, quantity or distribution of combustible materials not controlled
33.17 Environment not controlled to reduce smoke and heat production
33.20 Fire not detected
33.21 No or insufficient suppressant
33.19 Fire not vented
33.22 Fire not contained
33.23 Traction systems
33.24 Braking systems
33.25 Electrical systems
33.26 Cooking equipment
33.27 Grinding equipment
33.28 Malicious act
33.29 Bush fire
33.31 Immobile property or persons
33.30 Rolling stock unable to be moved away from fire
33.32 Mobile persons
33.33 Evacuation hazards
33.34 Fuel
33.35 Freight
33.36 Luggage
33.37 Interior surfaces
33.38 Exterior surfaces
33.39 Oil
33.40 Waste / rubbish
33.44 Wayside materials
33.42 Environment not maintained
33.41 Structure not maintained
33.43 Fire products harm persons or property
33.45 Blowback from firebox on steam locomotive

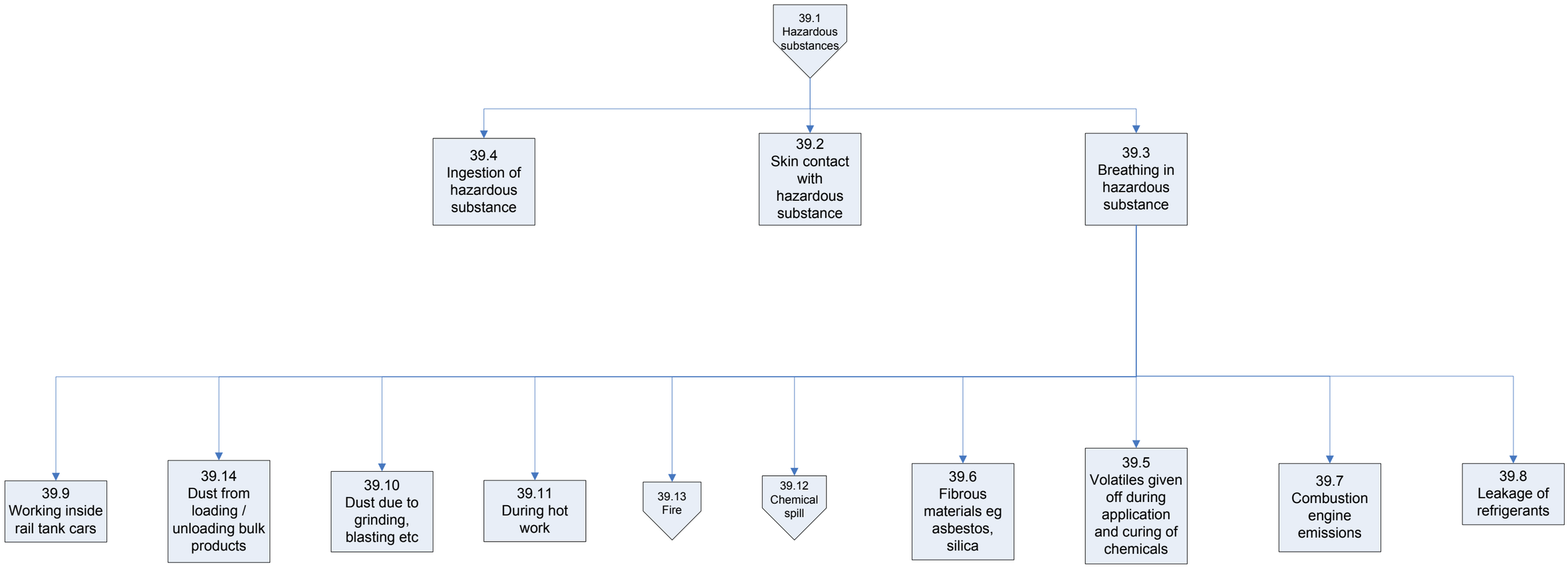

34.31 Poor visibility of train
34.1 Poor visibility of train
34.2 Poor visibility of train
34.26 Poor visibility of train
34.9 Vegetation obscuring vision
34.7 Cuttings, embankments etc obscuring vision
34.10 Poor eyesight
34.3 Train livery not distinguishable from surroundings
34.4 Glare from sun
34.5 No lights or reflectors on train (at night)
34.8 Weather affecting vision eg. rain, fog
34.6 Train lights or reflectors not noticeable
34.11 Train livery colour contrast poor
34.12 Dirty or faded train livery
34.13 Train lights not switched on
34.14 Train lights or reflectors not fitted
34.15 Train lights faulty
34.27 Headlight illumination inadequate
34.29 Reflector illuminance inadequate
34.25 Light or reflector unable to be seen at mounted location
34.17 Many surrounding lights
34.28 Light illumination inadequate
34.30 Reflectors dirty
34.24 Reflector producing insufficient illuminance
34.16 Lights dirty
34.18 Lamp orientation
34.19 Lamp covering restricts output
34.20 Incorrect lamp fitted
34.21 Inadequate power to lamp
34.22 Light design output insufficient
34.23 Headlamps on low beam

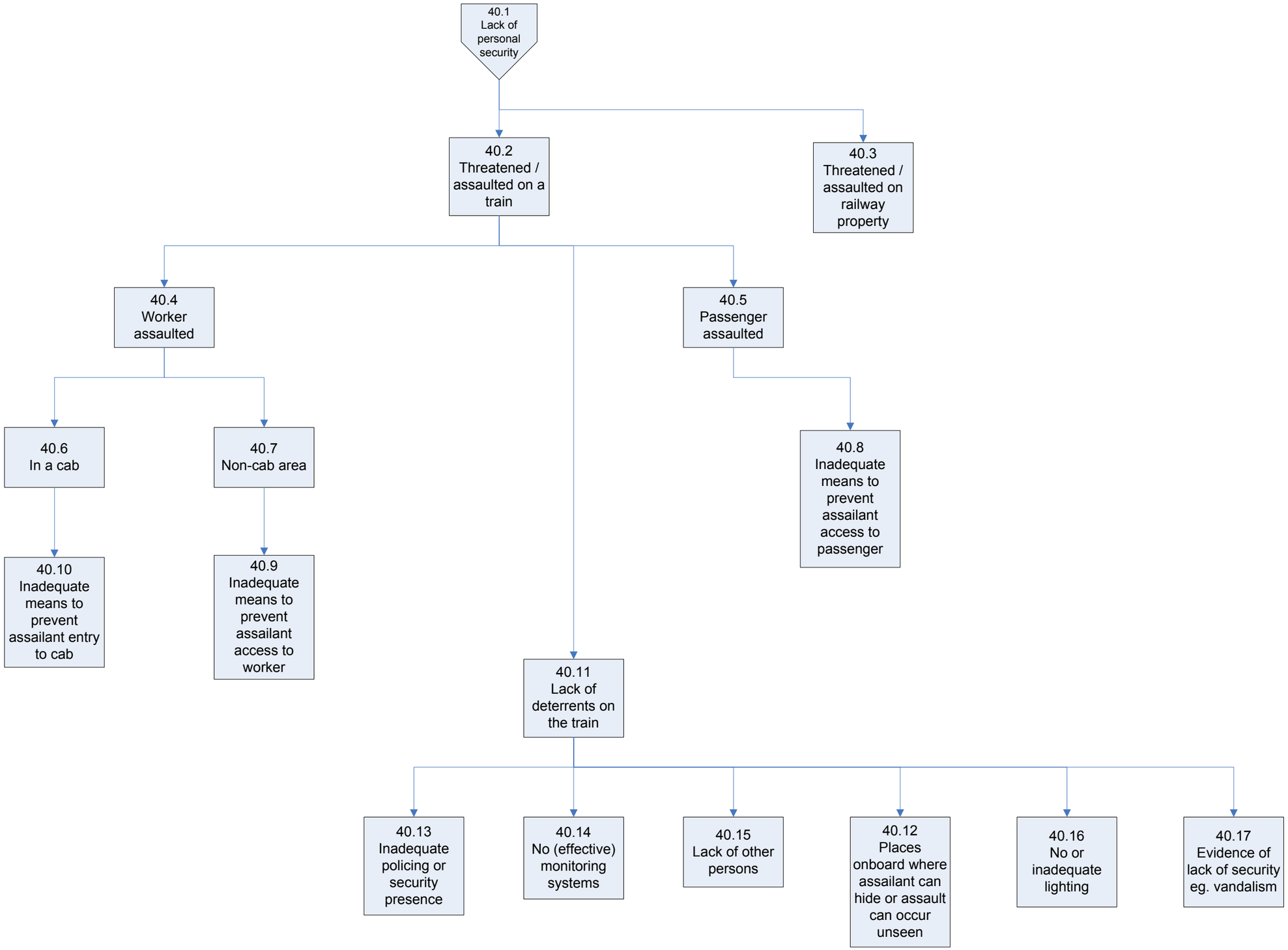

35.16 Poor audibility of train
35.1 Poor audibility of train
35.2 Poor audibility of train
35.3 Train horn not sounded
35.4 Train horn or reversing beeper faulty
35.5 Train horn or reversing beeper tone(s) not noticeable
35.6 Train horn or reversing beeper not loud enough
35.7 Train horn or reversing beeper not fitted
35.8 Device oriented away from listener
35.9 Device sound power output
35.10 High wind speed in opposite direction
35.11 Device obscured by rolling stock fixtures
35.15 Wayside feature blocking horn sound path
35.12 Insufficient power to device
35.13 Device design output insufficient
35.14 Town horn used instead of country horn

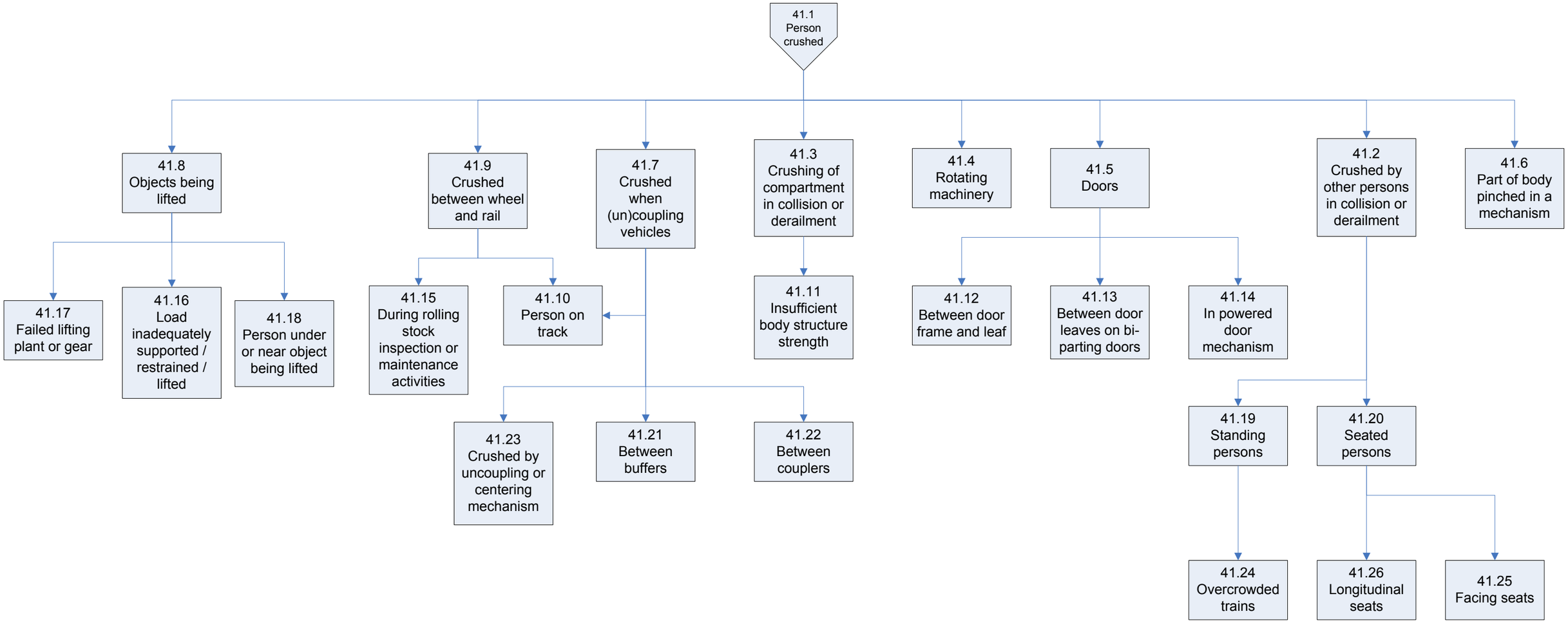

36.2 Train parting
36.1 Train parting
36.3 Train parting
36.4 Uncoupling mechanism operated
36.5 Inadequate body structure strength
36.6 Marshalling structurally weak rolling stock towards the front of the train
36.7 Excessive difference in coupler heights
36.8 Excessive track vertical drop or rise
36.9 Excessive dynamic train forces
36.10 Coupler or drawgear mechanical failure
36.11 Incorrectly coupled
36.12 Accidentally operated
36.13 Malicious act
36.14 Hit by object
36.15 Inadequate training or competence
36.16 No indication of coupled status
36.17 Inadequate lighting around coupler area

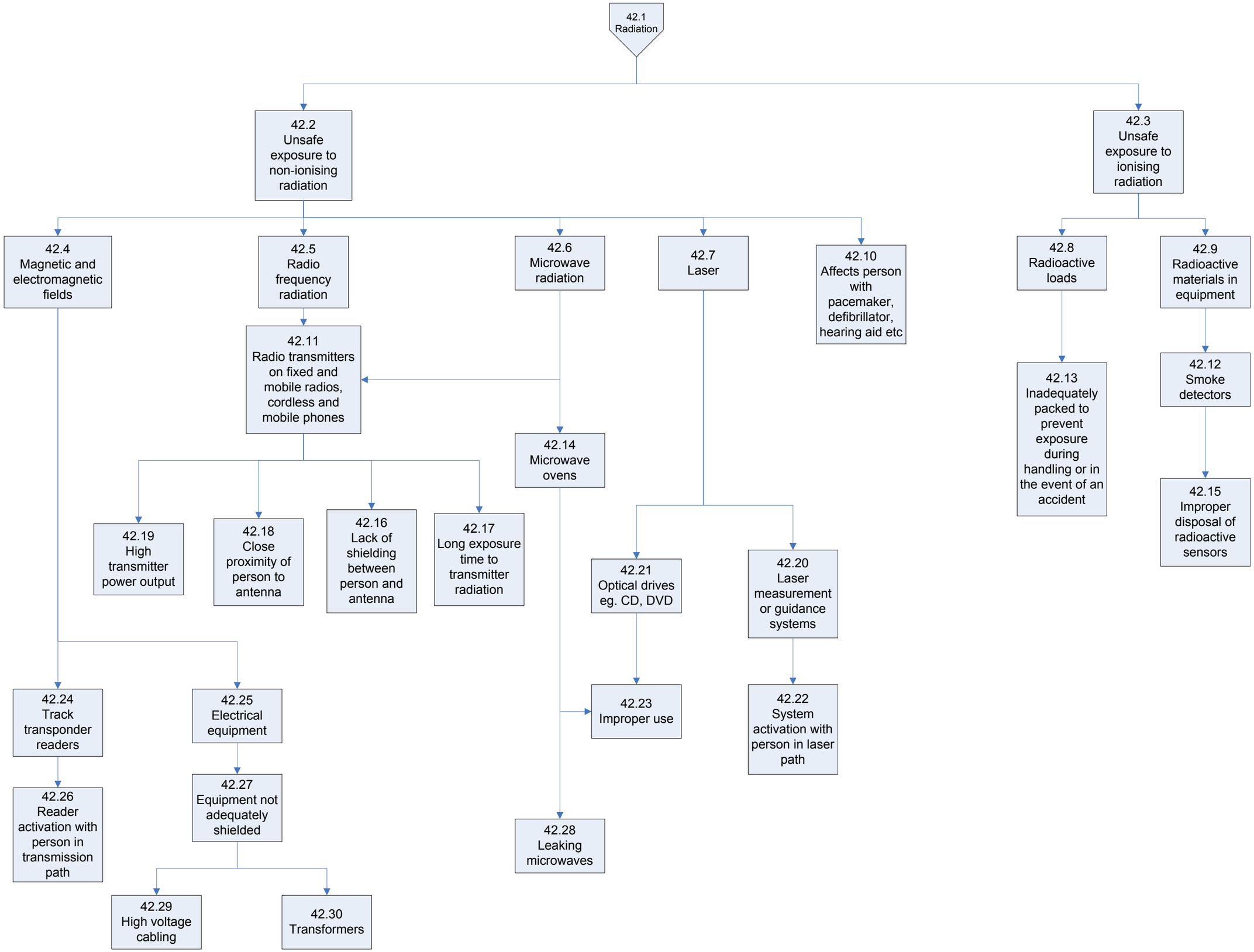

37.1 Fall
37.2 Trips and falls
37.3 Horizontal gap
37.4 Vertical drop
37.5 Fall from ladder
37.6 Unexpected train lurch
37.7 Uneven access path surface
37.8 Ramp too steep
37.9 Slippery access path surface
37.10 Fall on steps / stairs
37.20 Train parting
37.15 Horizontal gap between rolling stock and platform
37.16 Horizontal gap between rolling stock
37.17 Hands slip off handrails
37.18 Feet slip when using ladder
37.19 Large gap between bottom rung and ground
37.11 Excessive acceleration
37.12 At changes in floor coverings
37.13 Objects on the path
37.62 Poor lighting
37.14 Wet surface
37.28 At side doorway
37.29 At inter-vehicle region
37.21 Uneven rung spacing
37.22 Rungs not slip resistant
37.23 Inappropriate or slippery footwear
37.24 Unable to see rungs
37.25 Insufficient room for feet on rungs
37.27 Ladder is recessed eg. underframe overhangs ladder
37.26 Damaged / broken ladder
37.30 Slippery handrails
37.31 Slippery hands
37.32 Handrails too far from ladder
37.33 Handrails not aligned with ladder
37.34 Trying to open door
37.35 Cleaning fluids
37.41 Spilt or leaking fluids (eg. fuel, oil)
37.42 Rain
37.50 Condensate
37.37 Fall out side doors onto track
37.38 Fall in / out doorway at platform
37.39 Fall out open window
37.40 Inadequate side restraints
37.36 Fall whilst on outside of moving rolling stock
37.45 Crew member leaning out doorway
37.46 Door not locked
37.44 Lock override / emergency release used
37.47 Leaning on automatic opening door
37.43 Height difference between vehicle floor and platform
37.63 Poor lighting
37.49 Riding whilst shunting
37.48 'Train surfing'
37.52 Fall out over railing / balustrade
37.54 Fall onto track at inter-vehicle gangway
37.53 Fall from top of rolling stock
37.51 Fall from bunk bed
37.55 Doors on wrong side of train released
37.56 Crew forgot to lock
37.57 No locking feature fitted
37.58 Lock faulty
37.60 Trip on edge strip
37.61 Unable to see steps
37.59 Uneven step spacing

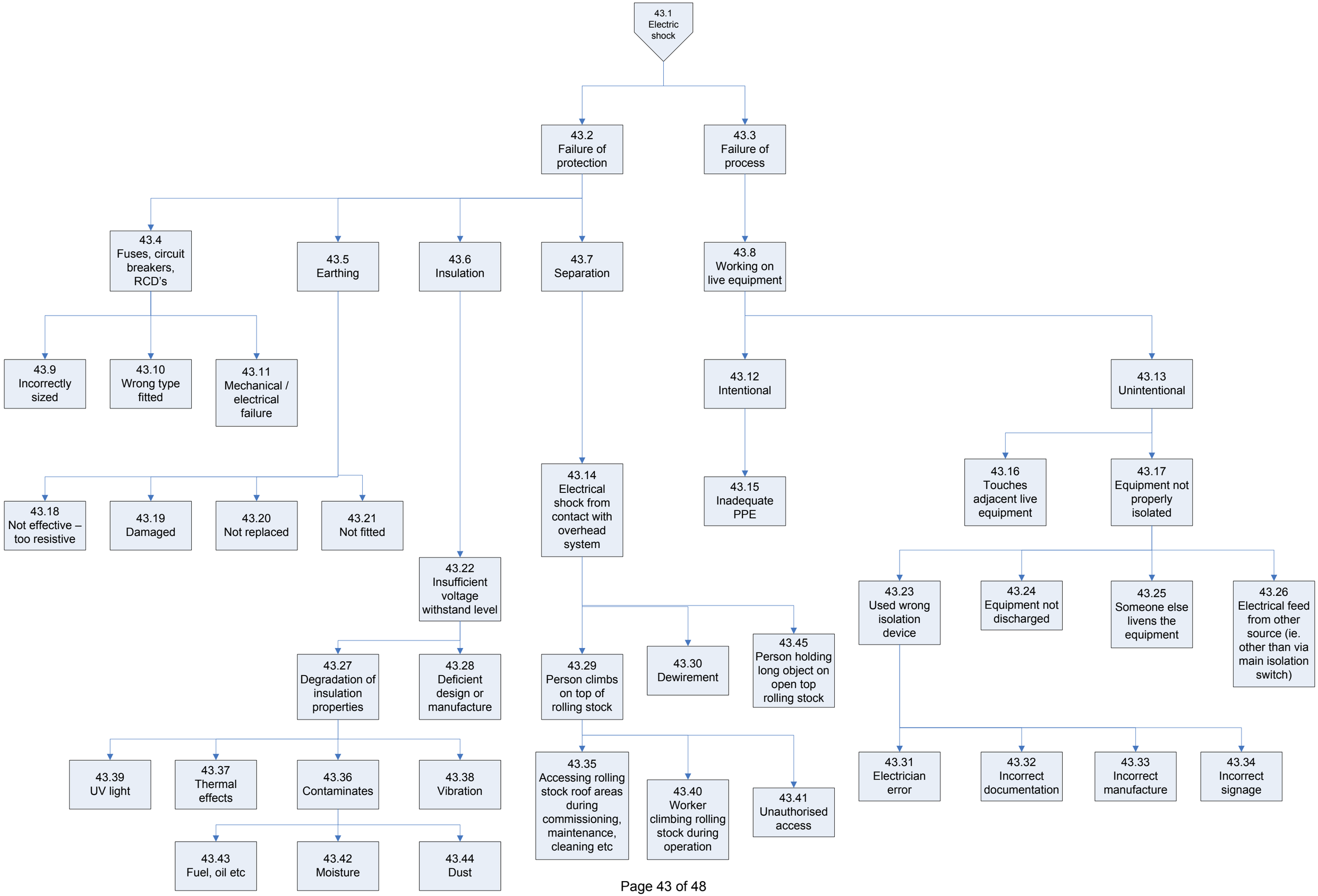

38.1 Poor hygiene
38.8 Disease due to waste products
38.9 Deliberate release of biological agents
38.7 Zoonoses ie. diseases acquired from animals
38.2 Contact with infected persons
38.3 Food poisoning
38.4 Needle-stick injuries
38.5 Contaminated water
38.6 Contaminated surfaces
38.17 Inadequate waste storage
38.18 Inadequate waste disposal
38.19 Livestock carrying rolling stock
38.10 Inadequate food preparation and cleaning facilities
38.11 Inadequate food storage facilities
38.12 Inadequate food cooking facilities
38.13 Poor food hygiene practices
38.14 Poor food quality
38.15 Surfaces difficult to clean
38.16 Surfaces inadequately cleaned
38.20 Porous, fibrous or textured surfaces
38.21 Crevices, sharp corners, inaccessible etc
38.22 Contact with animal products and waste
38.23 Contact with animals
38.24 Contaminated source
38.27 Spillage of waste during disposal
38.28 Waste dumped to track
38.29 Poor quality water
38.30 Contaminated during filling
38.25 Contaminated onboard
38.26 Inappropriate use of non-potable water
38.34 No or insufficient storage capacity
38.33 Spillage of waste during transfer to storage
38.35 Spillage of waste from storage facility
38.32 Contamination of track
38.31 Contamination of rolling stock
38.38 Open / dirty fill points
38.37 Dirty fill hoses
38.36 Used for drinking, food preparation etc
38.42 Hot water not stored above 55ºC (Legionella)
38.40 Use of inappropriate materials for handling potable water
38.43 Cracked pipe / fitting
38.39 Water system not cleaned after manufacture or modifications
38.44 Filters not replaced when required
38.41 Water system not adequately flushed after cleaning
38.45 Backflow from sink, toilet etc

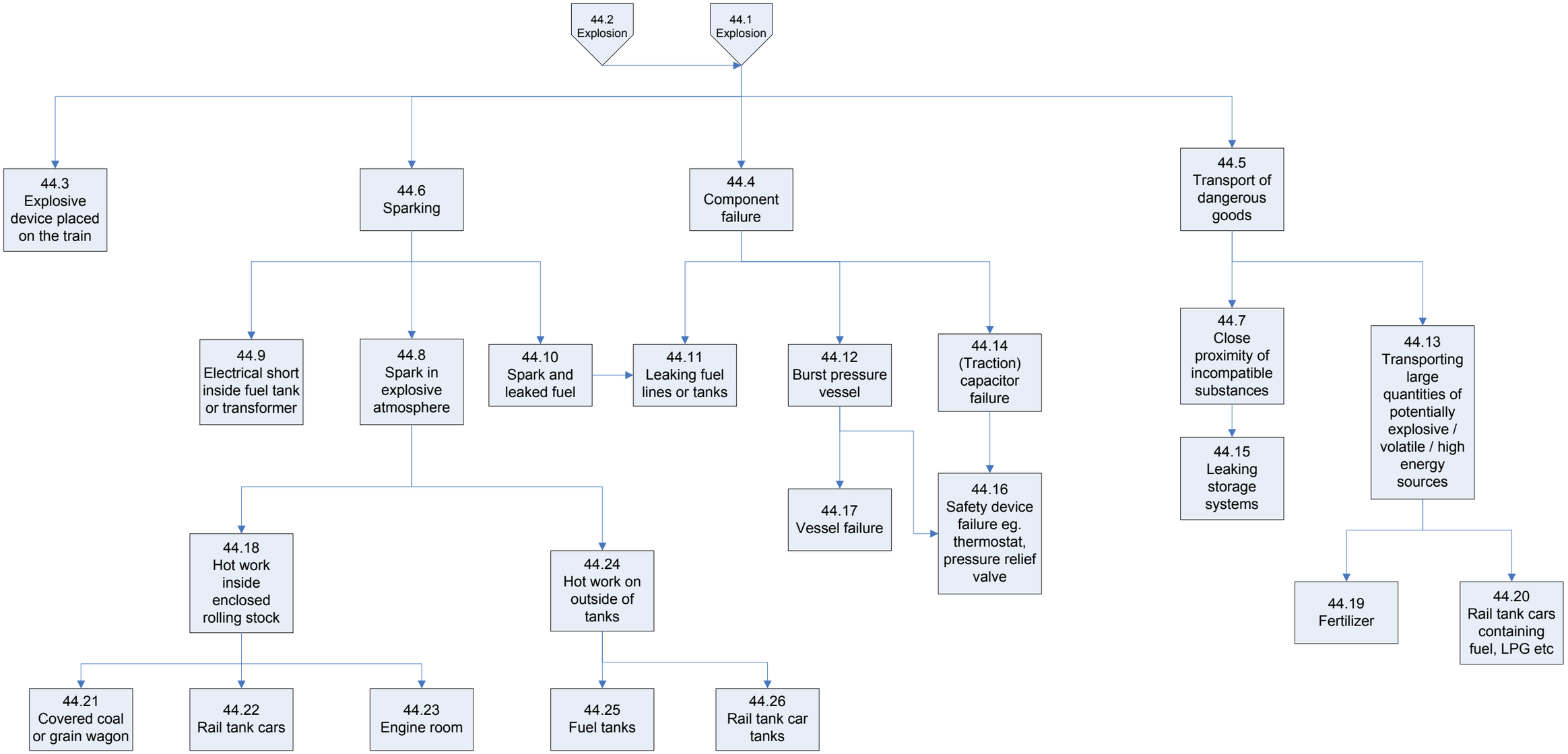

39.1 Hazardous substances
39.4 Ingestion of hazardous substance
39.2 Skin contact with hazardous substance
39.3 Breathing in hazardous substance
39.9 Working inside rail tank cars
39.14 Dust from loading / unloading bulk products
39.10 Dust due to grinding, blasting etc
39.11 During hot work
39.13 Fire
39.12 Chemical spill
39.6 Fibrous materials eg asbestos, silica
39.5 Volatiles given off during application and curing of chemicals
39.7 Combustion engine emissions
39.8 Leakage of refrigerants

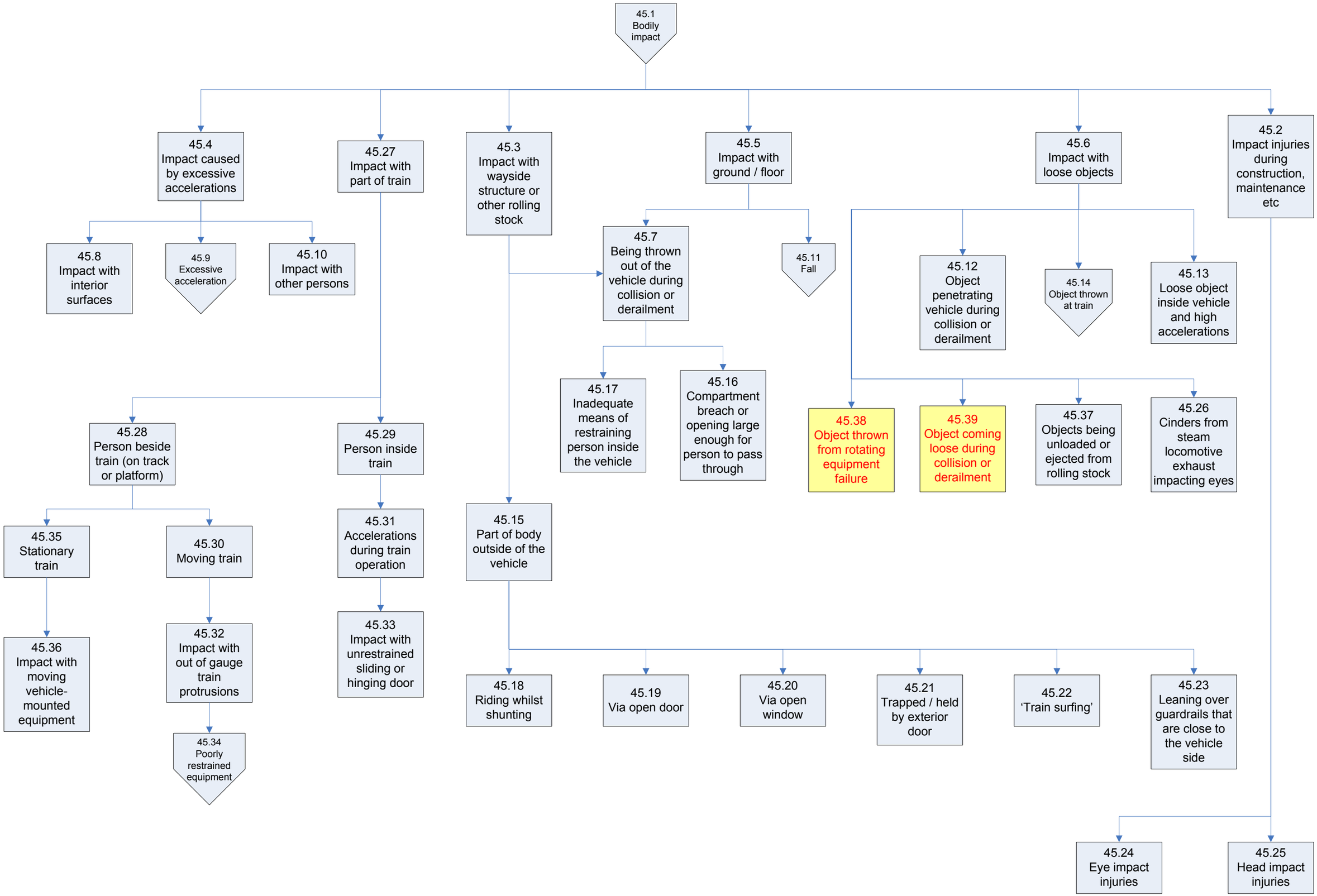

40.1 Lack of personal security
40.2 Threatened / assaulted on a train
40.3 Threatened / assaulted on railway property
40.4 Worker assaulted
40.5 Passenger assaulted
40.6 In a cab
40.7 Non-cab area
40.8 Inadequate means to prevent assailant access to passenger
40.10 Inadequate means to prevent assailant entry to cab
40.9 Inadequate means to prevent assailant access to worker
40.11 Lack of deterrents on the train
40.13 Inadequate policing or security presence
40.14 No (effective) monitoring systems
40.15 Lack of other persons
40.12 Places onboard where assailant can hide or assault can occur unseen
40.16 No or inadequate lighting
40.17 Evidence of lack of security eg. vandalism

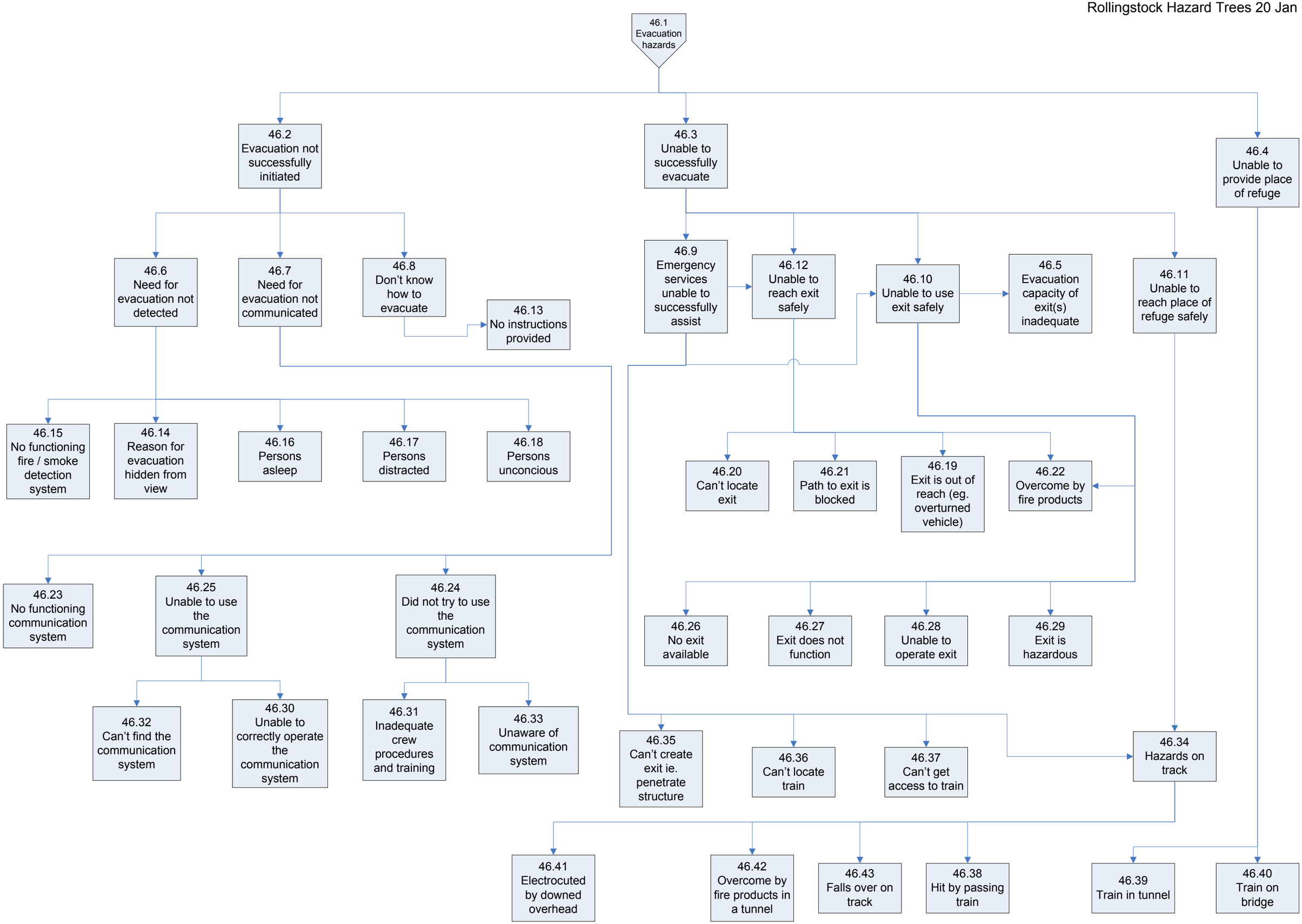

41.1 Person crushed
41.8 Objects being lifted
41.9 Crushed between wheel and rail
41.7 Crushed when (un)coupling vehicles
41.3 Crushing of compartment in collision or derailment
41.4 Rotating machinery
41.5 Doors
41.2 Crushed by other persons in collision or derailment
41.6 Part of body pinched in a mechanism
41.17 Failed lifting plant or gear
41.16 Load inadequately supported / restrained / lifted
41.18 Person under or near object being lifted
41.15 During rolling stock inspection or maintenance activities
41.10 Person on track
41.11 Insufficient body structure strength
41.12 Between door frame and leaf
41.13 Between door leaves on bi-parting doors
41.14 In powered door mechanism
41.23 Crushed by uncoupling or centering mechanism
41.21 Between buffers
41.22 Between couplers
41.19 Standing persons
41.20 Seated persons
41.24 Overcrowded trains
41.26 Longitudinal seats
41.25 Facing seats

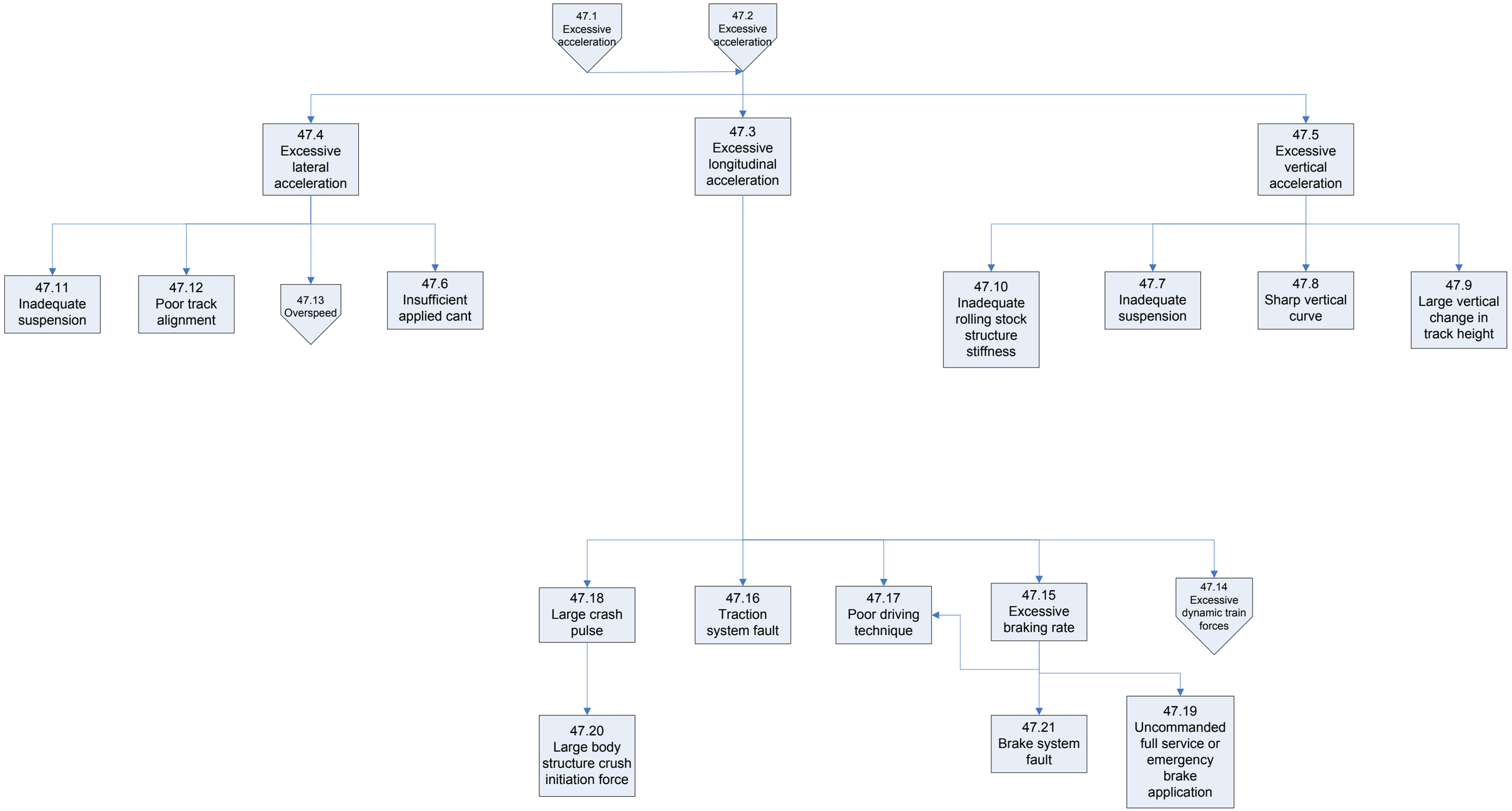

42.1 Radiation
42.2 Unsafe exposure to non-ionising radiation
42.3 Unsafe exposure to ionising radiation
42.4 Magnetic and electromagnetic fields
42.5 Radio frequency radiation
42.6 Microwave radiation
42.7 Laser
42.10 Affects person with pacemaker, defibrillator, hearing aid etc
42.8 Radioactive loads
42.9 Radioactive materials in equipment
42.11 Radio transmitters on fixed and mobile radios, cordless and mobile phones
42.13 Inadequately packed to prevent exposure during handling or in the event of an accident
42.12 Smoke detectors
42.14 Microwave ovens
42.15 Improper disposal of radioactive sensors
42.19 High transmitter power output
42.18 Close proximity of person to antenna
42.16 Lack of shielding between person and antenna
42.17 Long exposure time to transmitter radiation
42.21 Optical drives eg. CD, DVD
42.20 Laser measurement or guidance systems
42.24 Track transponder readers
42.25 Electrical equipment
42.23 Improper use
42.22 System activation with person in laser path
42.26 Reader activation with person in transmission path
42.27 Equipment not adequately shielded
42.28 Leaking microwaves
42.29 High voltage cabling
42.30 Transformers

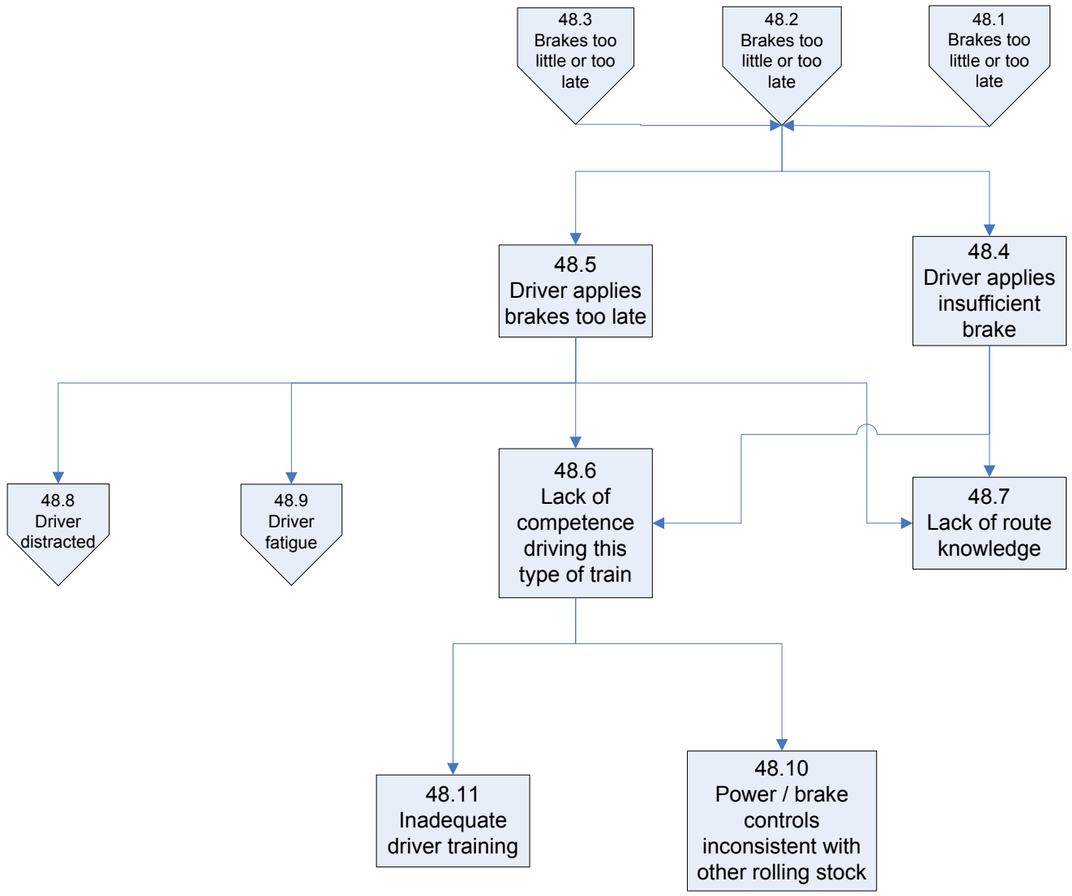

43.1 Electric shock
43.2 Failure of protection
43.3 Failure of process
43.4 Fuses, circuit breakers, RCD's
43.5 Earthing
43.6 Insulation
43.7 Separation
43.8 Working on live equipment
43.9 Incorrectly sized
43.10 Wrong type fitted
43.11 Mechanical / electrical failure
43.12 Intentional
43.13 Unintentional
43.14 Electrical shock from contact with overhead system
43.15 Inadequate PPE
43.16 Touches adjacent live equipment
43.17 Equipment not properly isolated
43.18 Not effective – too resistive
43.19 Damaged
43.20 Not replaced
43.21 Not fitted
43.22 Insufficient voltage withstand level
43.23 Used wrong isolation device
43.24 Equipment not discharged
43.25 Someone else livens the equipment
43.26 Electrical feed from other source (ie. other than via main isolation switch)
43.27 Degradation of insulation properties
43.28 Deficient design or manufacture
43.29 Person climbs on top of rolling stock
43.30 Dewirement
43.45 Person holding long object on open top rolling stock
43.39 UV light
43.37 Thermal effects
43.36 Contaminates
43.38 Vibration
43.35 Accessing rolling stock roof areas during commissioning, maintenance, cleaning etc
43.40 Worker climbing rolling stock during operation
43.41 Unauthorised access
43.31 Electrician error
43.32 Incorrect documentation
43.33 Incorrect manufacture
43.34 Incorrect signage
43.43 Fuel, oil etc
43.42 Moisture
43.44 Dust


44.2 Explosion
44.1 Explosion
44.3 Explosive device placed on the train
44.6 Sparking
44.4 Component failure
44.5 Transport of dangerous goods
44.9 Electrical short inside fuel tank or transformer
44.8 Spark in explosive atmosphere
44.10 Spark and leaked fuel
44.11 Leaking fuel lines or tanks
44.12 Burst pressure vessel
44.14 (Traction) capacitor failure
44.7 Close proximity of incompatible substances
44.13 Transporting large quantities of potentially explosive / volatile / high energy sources
44.15 Leaking storage systems
44.17 Vessel failure
44.16 Safety device failure eg. thermostat, pressure relief valve
44.18 Hot work inside enclosed rolling stock
44.24 Hot work on outside of tanks
44.19 Fertilizer
44.20 Rail tank cars containing fuel, LPG etc
44.21 Covered coal or grain wagon
44.22 Rail tank cars
44.23 Engine room
44.25 Fuel tanks
44.26 Rail tank car tanks


45.1 Bodily impact
45.4 Impact caused by excessive accelerations
45.27 Impact with part of train
45.3 Impact with wayside structure or other rolling stock
45.5 Impact with ground / floor
45.6 Impact with loose objects
45.2 Impact injuries during construction, maintenance etc
45.8 Impact with interior surfaces
45.9 Excessive acceleration
45.10 Impact with other persons
45.7 Being thrown out of the vehicle during collision or derailment
45.11 Fall
45.12 Object penetrating vehicle during collision or derailment
45.14 Object thrown at train
45.13 Loose object inside vehicle and high accelerations
45.17 Inadequate means of restraining person inside the vehicle
45.16 Compartment breach or opening large enough for person to pass through
45.38 Object thrown from rotating equipment failure
45.39 Object coming loose during collision or derailment
45.37 Objects being unloaded or ejected from rolling stock
45.26 Cinders from steam locomotive exhaust impacting eyes
45.28 Person beside train (on track or platform)
45.29 Person inside train
45.35 Stationary train
45.30 Moving train
45.31 Accelerations during train operation
45.15 Part of body outside of the vehicle
45.36 Impact with moving vehicle-mounted equipment
45.32 Impact with out of gauge train protrusions
45.33 Impact with unrestrained sliding or hinging door
45.34 Poorly restrained equipment
45.18 Riding whilst shunting
45.19 Via open door
45.20 Via open window
45.21 Trapped / held by exterior door
45.22 'Train surfing'
45.23 Leaning over guardrails that are close to the vehicle side
45.24 Eye impact injuries
45.25 Head impact injuries


46.1 Evacuation hazards
46.2 Evacuation not successfully initiated
46.3 Unable to successfully evacuate
46.4 Unable to provide place of refuge
46.6 Need for evacuation not detected
46.7 Need for evacuation not communicated
46.8 Don't know how to evacuate
46.13 No instructions provided
46.9 Emergency services unable to successfully assist
46.12 Unable to reach exit safely
46.10 Unable to use exit safely
46.5 Evacuation capacity of exit(s) inadequate
46.11 Unable to reach place of refuge safely
46.15 No functioning fire / smoke detection system
46.14 Reason for evacuation hidden from view
46.16 Persons asleep
46.17 Persons distracted
46.18 Persons unconcious
46.20 Can't locate exit
46.21 Path to exit is blocked
46.19 Exit is out of reach (eg. overturned vehicle)
46.22 Overcome by fire products
46.23 No functioning communication system
46.25 Unable to use the communication system
46.24 Did not try to use the communication system
46.26 No exit available
46.27 Exit does not function
46.28 Unable to operate exit
46.29 Exit is hazardous
46.32 Can't find the communication system
46.30 Unable to correctly operate the communication system
46.31 Inadequate crew procedures and training
46.33 Unaware of communication system
46.35 Can't create exit ie. penetrate structure
46.36 Can't locate train
46.37 Can't get access to train
46.34 Hazards on track
46.41 Electrocuted by downed overhead
46.42 Overcome by fire products in a tunnel
46.43 Falls over on track
46.38 Hit by passing train
46.39 Train in tunnel
46.40 Train on bridge


47.1 Excessive acceleration
47.2 Excessive acceleration
47.4 Excessive lateral acceleration
47.3 Excessive longitudinal acceleration
47.5 Excessive vertical acceleration
47.11 Inadequate suspension
47.12 Poor track alignment
47.13 Overspeed
47.6 Insufficient applied cant
47.10 Inadequate rolling stock structure stiffness
47.7 Inadequate suspension
47.8 Sharp vertical curve
47.9 Large vertical change in track height
47.18 Large crash pulse
47.16 Traction system fault
47.17 Poor driving technique
47.15 Excessive braking rate
47.14 Excessive dynamic train forces
47.20 Large body structure crush initiation force
47.21 Brake system fault
47.19 Uncommanded full service or emergency brake application


48.3
Brakes too little or too late
48.2
Brakes too little or too late
48.1
Brakes too little or too late
48.5
Driver applies brakes too late
48.4
Driver applies insufficient brake
48.8
Driver distracted
48.9
Driver fatigue
48.6
Lack of competence driving this type of train
48.7
Lack of route knowledge
48.11
Inadequate driver training
48.10
Power / brake controls inconsistent with other rolling stock