

# SAFE PLAN OF ACTION

## Summary of Responses from SSSAAP XXXI Conference Sunday Night, March 18, 2007

### Summary of Responses

<i>Problems/Accidents:</i>	<i>Responses</i>		<i>Causes of Various Accidents:</i>	<i>Responses</i>
Falls	26		Drowsiness	9
Problems with access elevators/manlifts	7		Improper or faulty plant equipment	42
Vehicle/Driving problems	10		Carelessness/inattentiveness	50
Lifting	9		Improper or faulty stack equipment	6
Plant Hazards	20		Proper personal protective equipment not used	14
Sampling equipment malfunctions	9		Poor training	30
Gases/Leaking or Exposure	21		Ambient conditions (heat/cold)	8
Dropping/falling tools, equipment, etc.	26			
Electrical	17			
Burns, cuts	8			
Ambient (Heat/Cold)	8			
Miscellaneous	5			

## List of Responses

<i>What is the Problem/Accident?</i>	<i>What Caused the Problem/Accident?</i>	<i>What is the Solution/Safe Plan?</i>	<i>What Resources Are Needed?</i>
Grating removed from catwalk for construction. Catwalk was not isolated or tagged. Lighting was off for construction also. Catwalk was a normal access walkway.		Safety culture has improved. Work control group evaluates work and mandates safety barrier. Site communication from managers to supervisor.	No more than communication and safe work practices.
High wind - almost lost balance and blown off stack	Drowsy; stepped out into wind on platform; long work hours (12-hour night)	Work less hours; no work in high winds; tie off in high winds	
Elevator problems; falling items; umbilicals getting caught		Barricade; move vehicles away from base of stack; improve elevator design	
Near miss on test platform	Poor grating; corrosion; spongy areas	Annual inspection program	
Vehicle backing; backed into I-beam at test site; \$1,200 damage to vehicle	No ware of backing hazard	Always back with a buddy; avoid backing where possible	
Lower back injury	Lifting a compressed gas cylinder	(1) Improper lifting technique; (2) Develop a hand lifting strap	(1) Training; (2) Material to make a strap
Plant failure to pay attention to plant operator conditions that create hazards	Foundry upset; fine in plant; drop adjacent copater	Communication of emergency conditions	Accountability
Exposure to gate above IDCH	Positive pressure inlet; positive pressure baghouse	Know IDCH; take necessary precautions	Actual ability to stop job when <u>real</u> hazard exists
Long hours	Equipment; job planning; process; expectation	Limit work hours; purchasing awarding by low bid	Plant/consulting/communications
Driving after test are finished	Hurry to get home	Consultants limit hours worked/driving	Common sense
Sampling train fell from stack monorail	Double quick connect connection monorail chain tangled together which caused them to release	Don't connect multiple quick connections in series. They are the weakest link.	Rigging training; adequate equipment.
Cooling tower fan blade let go (fan blade was at knee/waist level)	Poor maintenance by plant	Make sure that sampling location is "safe" from high inertia accident releases	
Nitrogen gas slowly leaked into trailer, displacing air, resulting in insufficient oxygen in trailer			
Explosion on coal mine in process (grinding) plant	Spark in baghouse	Infra red at plant. Fire protective clothing	Coveralls; goggles; gloves; communications
Rolling up Teflon line – eye injury	Rolling up line; end of line popped into eyeball, detaching retina	More care and use safety glasses	Safety glasses and know safety requirements

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Inhalation of unanticipated gases	Nearby sources; calibration gas	SCUBA	Test kit? Be aware.
Dropping equipment, bolts, etc.	Carelessness, faulty rope	Be aware always; inspect lifting equipment	Employee awareness; replace lift and ropes and straps regularly
Shocking transformer; improperly wired transformer shocked worker	Improperly wired by electrician	Fuse protection; indicator to show proper wiring	Instruction card on transformer for electrician.
Walking on the roof. Misjudged strength of roof and fell through.	Lack of warnings. Lack of guards to prevent access	Check with plant as to safe areas. Set up temporary guard rails.	Access to plant safety and engineering. Temporary guard rails.
High voltage electrocution	Extension cord over high voltage line. Kept losing power; had to run new line.		
Fell through MWL Duct lassing. Burned heads and legs.	Trip hazards; poor test location	Built test platform instead of walking on grating.	Plant Support. Better site analyses.
Hit by debris from steam vent blow.	Emergency steam vent had been closed off and insulated over.	Plant improved process; better testing.	Plant research.
Kellum grip hit railing and came off; heated line feel approx. 75'	Not taping on Kellum Grip	Tape on Kellum Grip	Training; when buying them, should tell you to tape them
Dropping anything off platform	Not being trained; not being careful; housekeeping	Be careful.	Training.
Pushing on regulator to move cylinder, broke off regulator. Main valve on.	Pushing on regulator.	Don't ever push on regulator. Loosen straps to move/rotate cylinders.	Training
Working a man lift without proper training.	Training was not provided.	Workers need to be training to use the equipment.	
Person trapped between railcars.	Improper position of person.	Give proper safety distance.	
Exposure to high concentration of SO2 at smelter.	Release from smelter. No O2 in tanks at plant.	Check safety equipment.	Field bottles of O2.
Stepped on transit plastic and fell. Stepped on open bus bar	Weak floor	Safety handrail to protect. Cover bus bar.	Physical barriers
Probe – electric shock	Power wire on probe pinched in clamp. Wore through during this testing. Stack tech was shocked.	Care in problem connection. Protect open wires from getting loose into connection.	Heat shrink to protect wires from getting loose. Grounding – better on stack
Loading – trailer flipped over			
Fell asleep driving			
Dropped objects	Bad clamp	Locking clamps	

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"The Arrow" monorail unistrut came loose from stack hoist at approx. 50 ft. Punched through roof of test trailer and stopped when it hit the work table. The operator had been working at that desk 30 sec. before.	Use client's hoist cable and non-locking snap ring.	Always use locking carabineer with securely attached rope & pulley.  Train personnel.	Proper equipment.
Control box placed on railing side of platform fell through railing to the ground. Near miss.	Box placed in a location where it could fit through the railings. Technician bumped it when moving other gear.	Train personnel on proper handling on the platform.	Training
At the top of the stack ladder, as you access the platform through a flow door, you upset a bee nest near the edge of the door. Bees swarm.	No surveying the access area sufficiently.	Thoroughly survey the entire site not only for physical deficiencies but for presence of unexpected dangers.	Have bee spray on hand.
Run over by remote control railcar	Complacency; safety procedure slipup	Strict safety guidelines and training	Increased training; motion detectors to detect when operator is in danger zone.
Flue gas exposure from positive pressure stack.	Spiking of flue gas contained a contaminant that was not controlled by scrubber.	Was unaware of problem until test was over.	Forethought; better knowledge of facility operations.
Release of vapors from nearby unit.	Employee error.	Be made aware of risks from nearby units before starting.	Monitoring by plant coordinators and unit supervisor. Alarms if necessary.
SO2 exposure.	Positive pressure stack and not enough P.P.E.	Supplied air P.P.E.	Minimal - \$50-\$100 per test
Operator asleep at the platform	Late to sleep the night before	Control sleeping hours of staff	Reporting system to ensure 8-hour sleep before workday. Enough cushion time between stack testing programs. Spare staff to makeup for sudden staff sickness, insufficient sleep hours.
Having the plant electricians hook up portable transformer – Shock	Transformer hook-up as three phase instead of single phase. Energized the outside of transformer.	Fuse the transformer. Hard wire test light into 110 outlets.	Train our employees to check plant electrical work. Transformers clearly labeled.
CEM vent line vented back into CEM trailer. Haz gases present	Vent line not exit sampling trailer	Bundle vents together / Color check / Check before test (final check)	
Rope burn	Carelessness	Secure rope – use gloves	Education
Scaffold falling	Not secured	Secure scaffolding	Education
Burns	Carelessness; haste	Use gloves	Education

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Team working at height unable to hear site fire alarm	10 fans causing too much loud noise; no local alarm at testing site	Issue team with portable alarm or install alarms (visual if noise interference) at sampling platform.	
Team in vent plume from another area of process plant	Lack of coordination across large plant as to presence of stack team.	Better communications of risks across plant	
On 2 occasions, an exterior elevator on a stack got derailed by a test team rope that got blown by the wind over the elevator track. Testers had to be rescued.	Failure to pay attention and secure a rope.	Look at elevator track before going up to verify it is unobstructed.	None – just care and attention.
Testing on top of an incinerator; very hot location. Testers noted shoes were melting. Facility provided wooden pallets for insulation. Overnight the pallets caught fire along with the sampling equipment.	Location was too hot to test. Pallets were not a good idea.	Pre-test inspection should have identified problem.	
Electrician resulting in serious injury. Photo degradation of power line ran on roof.	Temporary electrical line servicing a recently installed A.P.C. device.	Inspect job work area upon arrival. Ask questions during walk thru.	None extra. Make sure the plant escort is familiar with the work area. If not, ask for production or more familiar
Possible metals exposure (high Cd in blood – medical monitoring)	Not conclusive. Individual did test at a site with high metal emissions.	Be aware of possible site emissions; better hygiene.	Use available respirators/hygiene when exposure is possible.
Chemical inhalation hazard	Tester untrained and in area he was not supposed to be in	Hazard awareness for site. Don't wander around.	MSDS on-site. Review. Delineation of responsibility.
Scaffolding fall hazard	Unsafe assembly of scaffold	Instruction on scaffold safety. Review by Qual. Individual	Training for scaffold safety and insisting plant inspect properly
Removable handrail came loose while still installed and looked secure	Rusty bolt	Inspect bolt and handrail prior to job	Pre-job safety inspection and safety plan must be discussed with all workers, especially each safety item on how to perform the job.
Section of roof that we were walking on gave way and eventually collapsed.	AD facility. Hot day softened roofing.	Carefully examine walkways. Always walk over support beams.	Eyes. Awareness. Coordination with on-site contact. Concentrate on safety issue.
Electrical extension cord thrown over high power line	Cord over line	Site inspection with plant personnel. ID all hazards.	Plant involvement
CO inhalation in trailer.	Excessive CO infiltrated into trailer during the day.	Gas monitors in trailer for CO.	
Driving back from a job, crew ran van and trailer into ditch and rolled them.	Excessive speed. Fatigue. Not using good judgment.	Obey speed limit. Take the extra time to get the rest that is needed.	

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Cal gas leaked into the CEMS shelter.	Cal gas was hooked up outside the shed and turned on, but wasn't hooked up inside.	Check that all the lines are hooked up before the gas is turned on.	Check list to go thru before turning any gases on.
Driving trailer and driver falling asleep.	Driver didn't get enough rest before driving back.	Be sure driver gets time before driving. DOT regs	Time; log book
Lifting and loading equipment. "A Chilli bin fell from a height"	Attaching gear to a rope; non-standard equipment.	1-Always use rated lifting gear 2-Provide more lifting gear 3-Review point of attachments 4-Train staff on attaching gear 5-Keep clear of gear being lifted	1-Train 2-Lifting gear 3-time
Vehicle issue in breaking up at plant resulting in wreck	Unaware of surrounding prior to backing up	Inspect surroundings prior to moving vehicles	Coworker to provide direction (spotter)
Trailer power cord run over steam line with relief valve downstream	Unaware of system piping and possibility of system being charged or vented.	Discuss with plant personnel to determine potential for piping system to become hot	Consult knowledgeable plant personnel. Personnel to verify system status.
Entangled in rope while lower equipment from stack.	Personnel not aware of others; actions during multiple activities simultaneously	Ensure coworkers are clear of area and aware of each other's actions.	Good communication mechanism.
Working in high winds at elevated test plane and potential fall	Long shifts led to fatigue which led to actions that resulted in exposure to wind unexpectedly.	More personnel to minimize fatigue.	
Falling objects	Employee didn't correctly hook the equipment to the lowering rope.	Double check visually and physically the hook up connection to the rope.	Time to make proper connection.
Fall	Loose material on a sloping surface.	Always provide safe walk areas.	Proven walkway materials.
Stack ladder not welded to the stack	Metal breakdown	Inform plant; do not attempt to climb	Staff from plant needs to fix problem.
Sample line snagged in stack elevator track. Elevator function snapped line and scared those in elevator.	(1) Line too close to elevator; (2) Not secured at enough locations to minimize slack; (3) high winds	(1) Try to spot sample line opposite side of stack from elevator; (2) Secure at multiple points; (3) Visually check line location prior to elevator use.	Time; common sense.
Contact with high power line	Extension cord thrown over power line high voltage	Be aware of potential hazard	Cooperation with client/safety briefings
Rope lowering equipment almost dragged employee off a platform	Carelessness	Training. Use a site hoist instead of rope.	Training

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Platform incident; stack tester almost fell off (>300')	12-hour shifts; inattention; high wind	Safety harness; shorter shifts; stop work in high wind	Better procedures. Avoid pressures on employees.
Near miss with proximity work X-ray, crane lifting. Analyze trailer with people was roped into X-ray area and lifting area.	Proximity work affecting others.	Better communication. Better work groups, operators.	Take more time with permitting, stack tester and operators.
Gassed with bromine	Operator forgot we were measuring scrubber diameter. Turned feed gas on while ports were opened.	Lock-out.	Better operator training. Suspect plant operator violated his own rules re: lock-out. Stack tests should be trained to insist on lock-out even if plant doesn't require it.
Electrocuted employee	Stepped on 480V power line which had been laid across the roof.	Line should have been barricaded to prevent being stepped on.	Stack testers should have ID'ed potential hazard and asked about voltage. Plant was negligent.
Employees burned with steam.	Water cooled probe had kink in water supply and water in probe boiled, splitting hoses and spraying employees	Flow meter with alarm on water flow plus alarm on water temp monitor. (Water temp was measured but not alarmed.)	Extra electronics.
<b>Site employee fell through roof into NaOH tank. Died.</b>	Walked on roof	Stay off roofs that are not designed for foot traffic.	
Nearly flung from basket of crane	Operated hooked basket on guy wire.	All passengers should be in 5-point harness at all times in basket.	Harnesses which are already owned by testers.
Port cap kicked off scaffolding. No kick plate. Port cap fell and bounced off a person's hard hat.	No kick plate. Personnel not clear of the base of the scaffold.	Scaffolding inspector. Caution tape at base of stack.	Training; caution tape
Glass bottle fell off stack and almost hit person at the bottom.	In testing, pocket bottle of juice fell out when person leaned over the rail to full rope.	Empty shirt pockets on the stack. Top of rope - caution tape rope area.	Training/ caution tape
Test roped client's winch and unable to raise monorail. Hook on end to cable bailees as cable spun. Impaled top of trailer 1 feet from person in the trailer.	Improper carabineers; no bottom rope; trailer too close to lifting area.		Training; locking carabineers; control robe
Dropped items from stack/rope.	Not properly tied on (physical problem)	Tie off	Training; safety handbook
Pitot tube dropped off stack	Rookie/lack of tie off	Don't set things on handrails without tie off/tape off	Training
Electrocution	Faulty wire on probe	GFI	Proper grounding
Fall off roof	Darkness	Barricades	Plant Safety Department cooperation

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Heat exhaustion	No respect for heat	Ice vest; electrolyze starter; express safety training; designation of responsibility to person on site; institutional toolbox safety meeting; 15 min. before end of job to list all safety problems.	Ice Vest  Electrolyze starter
Deteriorating rail, supports, train/EQ falling	Age, corrosion	Inspect prior to use	
Ice falling on walkways	Scrubber stack condensing forms ice, hot gases keep coming.	Beware of the hazard.	
480V electric wired to ground the electronics in trailer; results in employee on stack receiving severe shock	Lack of communication between test team and electrician. Late in day on Friday; rush to complete.	Complete root course analysis performed. All trailers inspected and signage created to eliminate risk.	Corporate and plant H&S Review; Electrical inspectors; Signs on transformers and cables; Checklist developed to use with every high voltage wattage; Educate all employees to follow correct procedures; Provide clients with schematics of electrical requirements.
<b>Falling from platform. Fatality.</b>	Removing ice from grating; grating gave way.	Inspect walkways before using.	None. Time to look at walkways.
Electrical. No GFI's. Mis-wired connections (480 to 110V)	Electricians and others not following correct code procedures.	Don't take wiring for granted. Double check it.	Time and equipment to test wiring before connecting.
Back pedaling off an elevated platform with test cases.	Lack of attention to surroundings.	Plan layout of test boxes to give access.	Team review of site.
Stack platform rail broke and fell, hitting employee in hand.	Loose/missing bolting.	Visual inspection of hand rail each day.	Team review of site conditions.
Lab chemicals - Lost control. Explosion/fire.	Mishandling of chemicals.	Strict protocols for chemical handling.	Supervision; proper equipment; consequences
440 single phase - wired incorrectly by plant as 440 three-phase - sample equipment	Incorrect wiring - electrical	(!) Separate voltage verification; (2) Better training to testing staff (to check the plant); (3) Better written wiring directions to plant	Training; written guidelines
Gantry and pulley fell off the stack	Not sufficiently tied off; kicked out and came loose	Better securing of the gentry	Training; better tie off policy
Falling thru the skylight covered in dust	Old building roof; skylight either painted or covered with dust	Walk only on the beams of the roof/follow the plant guy	Knowledge of the roof; awareness of where you walk
Step through roof of baghouse; had to lay a plank to get from ladder to port	Poor maintenance of equipment	Install OSHA-approved platform	Money



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Manlift sank into muddy ground and the guy in the basket nearly fell out	Small concrete platform; ground was soggy and manlift sank	Make the client provide a proper area for manlift tie off while in manlifts.	Cement pad or build a platform rather than work from manlifts; harness to tie off.
Guy walking through the job site with client stepped in a puddle and sank to armpits in really yucky hot water (caustic)	Followed the client; don't step in puddles at plants; know what is in water.	Make the client mark hazardous areas. Do a pre-test inspection.	Yellow caution tape / cones
Working on flat roof, our guy stepped from one level to another and roof broke through. He caught himself by armpits.	Poor roof design; old roof	Pre-test inspection with client; tie off any time you are on a roof.	Install temporary roof top area to work on harness to tie off.
Heat. Many work areas are too hot. Grommets on clothes burn your skin. Feet get burned from shoes being too hot.	No insulation in work area.	Insulate work area with kaowool or some product.	Insulation material.
Plant monorail support cable broke while re-installing probe.	Cable in service for 13 years.	Inspect/replace support cables.	Plant
Burn on left cheek from M4 probe at 300°F	Poor placement of setup	Verify clearances so personnel is a safe distance.	Staff - be aware of surroundings.
Electrical problem causing fire in probe from heater.	Heavy rain	Either quit testing or cover the electrical connection	Rain cover or plastic tape
Equipment being dropped while being hoisted to stack	Improper connection of equipment	Foolproof hooks and proper training	Foolproof (double latch) hooks
Working too many hours in a day	Pressure from client to complete the testing	Be brave enough to tell the client NO!	Guts
Mill roof collapse	Age	Good communication with plant contact resulted in evac	Radios/cell/pre-test safety survey
Ammonia leak	Faulty valve	Mill to check fittings	Communication
Sample box dropped from rope	Loose bolt attached to sample box	Check rope and connections; rope/tape off area below stacks	Caution tape "Work Above" signs
Proper lifting techniques; back injury from lifting and twisting at same time while moving meter box	Improper lifting and twisting at same time	Stretching and proper technique	None. Just time to stretch and use proper lifting techniques.
Electrical hazards	Hooked up wrong by plant personnel	Communication with plant personnel	Good, trained electrician
Lightning during stack test	Mother nature	Check weather, conditions and react quickly.	None

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Setting on skylight	<b>Inspector decided to rest; sat on skylight; skylight gave way and he fell to his death.</b>	Always think ahead. Safest way is to only go where plant person goes.	Alertness - constantly.
9" port cover was attached (hand-tightened) with one bolt. Vibrated loose and fell 250' into CEM shed.	Single bolt attaching a cover when there should have been a full complement.	Attach all the bolts to a cover when re-attaching.	Bolts, wrenches
Cutting duct tape without gloves on; cut hand	Not careful when handling a knife.	More care with sharp objects	Self-awareness
Cut head at one point in time when had hard hat off to adjust dust mask	Removed a hard hat in an industrial setting	Make sure face mask/respirator is well-fitting to the face prior to putting on hard hat	More care by the individual
Unknown exposures to chemicals on test sites.	Plant deactivated a carbon canister control and vented gas to atmosphere	Prepare safety plans before each test program. Check plant conditions. Prints entry & testing.	~ < \$1K
Hundreds of pounds of snow impacted on outside of shack.	Wet driving snow storm	Look above stack platform after ice or snow storm for buildup.	Eyes
Thunderstorms - fast approaching during test program. Barely got down off stack and samples back into lab.	Act of God	Have a plan known to all test team for this occasion, especially if you are in LA.	
Many driving accidents; drivers tired after a day of testing	Too many work hours	Follow Federal DOT regulations for rest hours	Knowledge of DOT rules
Confusion on roofs: walked "off" the boards when was supposed to be "on"	Improper communication	Take your time	Good command of English language
Climbing up caged ladder; meter box top was knocked into cage but luckily got lodged	Human error	Pay attention to details	One step at a time
Aging electrical systems in plants; hooked up a trailer 3-phase to 2-phase and fried the trailer	Communication; human error	Ask testers about powering up	Communication
Misjudgment on length of rope needed to lower heavy sampling equipment	Bad planning	Think/check before you initiate a task.	Same resources and minutes.
Loss of flame in vapor combustor on barge; no safety shut-off of vapors; plant relit and fried equipment on stack. Luckily, no testers were on stack at that time.	No safety cutoff for vapor control from barge. No communication from operator on relight.	Auto cutoff to vapors on flame out. Control room operator communications.	Process change. Speedy emergency exit plan?
Junk on catwalk	Plant infrequent checks	Hire maintenance crew	Money

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Almost fell down elevator shaft due to failed safety inter-lock on exterior elevator doors.	Reliance on safety equipment without checking functionality of safety equipment.	Test safety equipment for proper operation. Don't blindly rely on safety equipment to do it's job.	Awareness training.
Monorail failed and sampling train fell.	The chain supporting the monorail failed. The umbilical line was entangled in the probe pusher.	All the chain on the monorails were checked and replaced.	Time and manpower to check equipment before it leaves the shop.
Loss of balance; almost fell from platform due to high wind.	12-hour shifts; inactivity between sample collection	Shorter shifts/safety belt	Minimal cost and time.
<b>Technician put face in blowdown N2 of vessel at elevated height. Fell to death after becoming incapacitated. Not a stack tester.</b>	Poor judgment and action	Awareness/ training and control by tie off	Awareness - \$150.00
Stepping thru transparent panel on roof	Backing up and not watching your step	Awareness of environment	Communication
Improperly loading trailer to properly balance load	Haste and improper loading techniques	Employee Training	None
Extreme fatigue in conjunction with heat stress	Misunderstanding about work load. Team's decision to push through it.	(1) Better communication with clients. (2) Emphasis on employee has right to say they cannot complete job as staffed.	
Lowering equipment with rope	Cooler opened. Equipment fell out; was near miss.	Walk down equipment; use safety containment	Common sense. Not in a hurry to finish job.
Passed out from CO or CO2 from short stack when on tall stack		Only go up when wind blows other direction	Wet finger
Electrical system setup by facility electrician; lightning hit 50' high; monorail circuit breaker did not trip even though shut off circuit	Wiring/faulty GPI circuit breaker. On power transformer did not shut off power; also using manual switch to off; lightning hitting monorail	Plant electrician to verify that circuit breakers and GPI's are operations.	Facility to be responsible for manpower safety.
Chemical exposure	Incomplete PPE during fuel mixing	Read the MSDS - require the proper PPE	Full face respirator; MSDS
Testing a glass furnace. Very hot source, hot day in July...tester literally froze in place by furnace; could not move.	Dehydration; did not take enough breaks	Make sure you drink LOTS!! of fluids in hot conditions.	Water, ice, gatorade, cook spot to rest.
Employee cut heel of hand (6 stitches) while disassembling/cleaning M5 glassware.	Attempting to use force to separate fragile parts.	Use of protective gloves (Kevlar) when disassembling/cleaning glass.	Forethought, Kevlar gloves

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Employee tore arm ligaments when pulley lifting 200' umbilical broke off I-beam. Employee stopped umbilical fall to prevent a ground guy injury.	Facility-installed pulley system was corroded or over-stressed.	Test lift system before every use or install own lift system.	Procedure (written); patience; test rig; own lifting rig
Near-miss - railing corroded under paint and crumbled under employee's hand.	Mindless re-painting of corroded rail. Trusting facility op. for test area safety.	Test crew examines platform, rails, all attachments before testing.	Written procedure, cooperation of source/facility.
Near miss - monorail attach point broke, nearly allowing full M5 train to fall.	Corrosion/over-stress of attach point over time.	Check strength before every test OR periodically replace.	Testing or new hardware/labor.
Accident; auto collisions	Too many hours and pushed by facility to finish	Plan properly and allow adequate time.	Budget for safety
Dropped hydrofluoric acid, attempted to clean up <u>immediately</u> without proper safety gear. Hurt lungs.	Not paying attention.	Clean chemical spills with proper safety gear. Think safety FIRST.	Follow proper clean-up procedures.
Steam burn on hand; slip/trip with a harness	Short stack slip/trip Inadequate engineering	Extend stack Safety survey Better gloves	Engineering PPE Training
Fall off ladder from one roof to another	Wet ladder Slippery gloves Inexperienced tech	Training Guard around ladder	Training Engineering
Fall from platform - fatality	Hatch left open Crowded platform 2 crews on stack at same time	Camera always on hatch New procedures	Improved procedure
Lots of issues with falling or dropped material (probe and pitot tube came unclipped)	Improper clip or tie off when lowering equipment	Proper locking clip Good equipment cases	Attention to the problem.
Removed grating open hold 3 story drop. No barricade/tape/warning/lights	Thoughtless, unsafe working procedures. Didn't give a damn.	Inadequate training. Concern for others. Safe work practices. Fall hazard training.	Training. Consequences for unsafe acts.
Testing 35 years (did not disclose). Lady with asthma - smelters, SO2 cloud. Required O2 mask. 3 shelters. O2 tanks empty.	Safety Manager Negligence.	Don't trust Safety Managers. Have own O2 in trailer.	

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<b>Boiler inspector required boiler to be shut down but plant did not. Blew up and killed 2.</b>			
Checking marks on probe.	Sticking face too close. Got burned.	Use common sense.	Common sense.
The ladder trap door was open and there was a near fall.	The last person to use the door didn't close it and there was no toe guards.	Training/toe guards.	Training is key.
Unsafe scaffold: collapsed and fell while test team was sampling.	Non-OSHA approved scaffold - poorly constructed by on-trained staff.	Only OSHA-approved inspected scaffold built by the properly trained technicians	Rental scaffold - daily inspections - erections by competent personnel
Knocked down by hydrous ammonia; sinuses burned by gaseous ammonia	Uninformed about pressure change in process vent.	When dealing with an <u>unknown</u> , DO NOT SNIFF or put nose near.	More information. Ask one or better questions and try to anticipate the unknown.
Inhalation	Failure to communicate with workers.	Bilingual	Training or resources.
Ammonia vented from small building where stack was located. Ammonia fumes displaced breathable air and testers panicked and became disoriented.	Process malfunction causing gases to be vented. This happens often so don't know how much a malfunction this was.	Inform testers of these frequent bypasses and have safety equipment on site.	Appropriate safety equipment.
Electrical	440 3-phase connected as 440 single phase.	Check connections	Better knowledge
Stepping off roof	Back up with the electric cord	Pay attention to where you are. The work was on the roof. No need to get so close to the edge.	Pay attention.
Fall of equipment cage and cable.	Worn cable and failed hoist	Inspect cable before use. Rope off area under cage/lift area.	Watch person at bottom with only one duty during lifting operation.
<b>Cylinder neck broke off in an elevator and a pressurized cylinder killed the man in the elevator.</b>	No cap on the cylinder. Transported a cylinder in elevator Should never travel in an elevator with a cylinder.	Always keep caps on gas cylinders. Never travel in an elevator with a gas cylinder.	Attention to detail. Knowledge about the dangers of cylinder gases. Transport cylinders safely.
Boiler explosion	The manager did not shut it down when told boiler was not safe.	(1) Make it know that boiler inspector shut down not optional  (2) Police power	Publicity of penalties for not following orders.
Wearing polyester clothing into a chemical facility.	Not realizing a hazard existed.	Plan to wear appropriate attire for the job.	The proper clothes should be provided. Training on potential hazards.

<b><i>What is the Problem/Accident?</i></b>	<b><i>What Caused the Problem/Accident?</i></b>	<b><i>What is the Solution/Safe Plan?</i></b>	<b><i>What Resources Are Needed?</i></b>
High levels of sulfur gases in stack samples from pulp & paper mill.	Changes in process by plant without notifying stack testing	Better communication between stack testers and plant.	Safety meetings with plant
Team in vent plume from another area of process plant.	Lack of coordination across large plant as to presence of stack team.	Better communicate of risks across plant.	