5th Atlantic Alliance Conference Washington DC USA.

Safer By Design – Mobile Plant
The USERs viewpoint

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September 25th 2008

Safer Design for Mobile Plant

- Originated early 2003 QNJAC meeting to reduce mobile plant injuries. Discuss issues on Cleaning; Maintenance; Inspection and Operating.
- Discovered most were caused by Slips and Falls from getting on and off the machines.
- Subject featured in all AA conferences since Orlando Florida 2005

Setting the Scene

- StGB 2001/2003 1st reliable factual study
- 79% related to Access systems.
- 75%of these were slips and falls off machines
- 57% were design related (13% operational)
- Florida conference resulted in A.A letter to all manufacturers highlighting facts and Users concern, plus wish list for safer access.
- User representation on Standards Committee, to put forward our views.

ISO 2867 Earth – Moving Machinery – Access systems. Voted on in Jan. 2009

- Q : Will the Standard result in Safer Design?
- A: YES.

- Q : Will the number of injuries due to slips and falls from plant reduce as a result?
- A: Possibly by a few, in about five years!

Notable Improvements

- Excellent section on moveable access systems.
  - Caters for future development (probably on large machines only)
- Good section on ENCLOSURE openings.
- Clear definitions, tables, dimensions for platforms, walkways, guardrails, steps, handrails, handholds.

Step Design Improvements

- Steps to be designed with natural foot placement, or be clearly visible. Plus three point support. With small platforms every 1.7 m to place handheld items on when climbing up.
- All surfaces for access will be slip resistant, and designed to minimize the risk of the foot slipping laterally off the step
- Steps wide enough for two feet, and not to allow the foot to protrude through into moving parts.
- Step tread surface not to be designed as a handhold, and to minimize accumulation of debris
- Bottom step now max height off ground 600mm target 400mm down from 700mm
- Parts for Access systems to be designed for easy replacement

Have we got what we asked for on Step Design?

1) 1st step (or last coming down) is ***the most important*** one.

2) Make the **step rigid** (can still be flexible steps 80mm inward when horizontal force of 250N)

3) 1st step Sensible height off ground say max 300mm, (still max 600mm)

4) Make it ***retractable*** out of harms way

5) Steps to be ***Inclined*** with a ***Continuous handrail***

6) Round rungs banned (still accepted if over 50mm circumference and have slip resistance)

Examples of unacceptable height and stability of first step

Better design: Much improved step width, height, tread depth, on an inclined angle with reasonable handrails.

- Photos by QPA

It can be done even on midsized machines.

- We asked for: the Primary access to cab via inclined stairway or at least inclined between 75º to 80º from the vertical (standard does say ‘use inclined ladders when possible’. But vertical ladders are still acceptable as primary access systems after risk assessment!)
- Asked for: A continuous handrail (encourage 3 point support i.e handholds permitted)

Access with everything a USER could wish for

- Photos by QPA

Not a good example of safe first step (or even 6 steps!)

- Photos by QPA

Good example of safe access design.

Photos by QPA

Cab Access

- We asked that access to the cab needs to be from a position of safety either from the ground or a guard railed platform. i.e.safe.
- We have: The door of the enclosure shall permit opening and closing without ‘infringement’ on the operator while standing with 3 points of contact

- Also ‘The primary opening shall be accessible directly from the access steps. Or from a ramp, platform, walkway, or the ground’

Falling from Height

- We now have heights above 2m: Guardrails
- Between 2m - 3m: Handrails adequate if antislip materail is more than 500mm from the edge (Nothing on the open side!).
- Footbarriers: Should be provided where ever a foot could slip or tools fall onto a person

Safe Design: Guardrail for Maintenance

- Photos by QPA

Safe Working Position?

- Photos by QPA

Falls from Height

- Platforms for Maintenance less than 2m high must be 300mm wide min with handholds provided on the inside.
- This will still be acceptable:

Steps may be used as a standing surface for routine maintenance if less than 2m high and wide enough for both feet

Example of improved safer design from falling from Height

- Photos by QPA

Tracked Machine Access Still has a Raw Deal

- We asked for: NO USE of the TRACKS as a means of access.
- We have: ‘Tracked surfaces are accepted as a part of the access system if 3 points of support is provided’

We asked for: NO Steps Inside Trackframes.

- WHY?

1) You can't see them when descending.
2) They get covered in mud and rock,
3) Easily damaged , bent or broken away.

(1st step can be set back by 15º i.e. approx 60mm recessed if wide enough for 2 feet).

Tracked Machine Access

- We Have: ‘parts of access systems likely to be damaged by contact with objects or the ground shall be designed for easy replacement’.
- ‘If track systems are used as steps, the riser height may be increased to 500mm from the track to the platform’.

No Use of Tracks: It can be done

- Photos by QPA

It doesn't have to be like this!

- Photos by QPA

Lighting Access Ways

- We had hoped for the ability to switch on lighting on access ladders from ground level for machines with cab heights 2m and above.

- We have: 3 m and above

We asked for safer design for access when cleaning.

- At least a top window rail to hold or clip onto, with an antislip foot platform.

Example: Slippery surface, with risk of falling when cleaning front windscreen.

- Photos by QPA

We asked for the Design all fluids top ups to carried out from ground level. There is ***no statement*** in the standards to achieve this aim.

- Photos by QPA

Unsafe position from which to refuel from

Users Safety Standards can't wait for ISO Standards

- ISO Standards have and will continue to lag behind legislation, best practice, and requirements of risk and financially aware companies.
- From ISO Standard Publication to Point of Sales takes approximately 5 years.
- ISO Standards reflect lowest common denominator Why?
  - Emerging Countries on Standards committees +
  - Standards written by manufacturers engineers +
  - Need for consensus

UK APPROACH IN 2005

QPA core members agreed standard equipment

Mobile Plant Specification Working Group								
Rigid Dump Trucks	**PF**	**RG**	**SW**	**Geraint Morris Lafarge**	**CH**	**PR**	**JP**	**Total**
TEMPLATE								
COLOUR REVERSING CAMERA	2	2	2	2	2	2	2	14
SENSOR VISION REAR SAFETY SYSTEM	1	2	1	0	1	1	2	8
VMS RADAR BRAKING SYSTEM	0	0	2	0	0	1	1	4
All round heated mirror visibility package					2			2
HEATED CONVEX MIRRORS	0	2	0	1	0	0	2	5
ADDITIONAL CONVEX MIRRORS	2	2	2	2	0	2	2	12
FRONT VIEW MIRROR	2	2	2	2	0	2	2	12
AMBER FLASHING ROTATING BEACON	2	2	2	2	2	2	2	14
BRIGADE WHITE NOISE ALARM (BBS102)	0	2	2	2	2	2	2	12
BRIGADE SMART ALARM (SA917)	0	2	0	0	1	0	1	4
STANDARD REVERSE ALARM	2	0	0	0	0	2	0	4
AUTOMATIC FIRE SUPPRESSION SYSTEM	2	2	0	1	1	1	1	8
MANUAL FIRE EXTINGUISHER IN CAB	1	0	2	2	2	2	2	11
FRONT RADIATOR HANDRAIL	2	2	2	2	2	2	2	14
Cab Access handrails & Walkway					2			2
SEAT BELT WARNING DEVICE (Visual/Audible)	2	0	2	2	2	2	1	11
SKIP UP WARNING DEVICE (Audible)	2	2	2	2	2	2	2	14
STROBE REVERSE LIGHTS	0	0	2	2	2	2	2	10
Heppa Cab air filters					2			2
KEEP YOUR DISTANCE SIGNS	1	1	2	2	0	2	1	9
IN-BUILT SIMERET METER	0	2	1	1	0	2	1	7
SEAT ACTIVATED ENGINE SHUT-DOWN	0	1	1	1	1	1	1	6
RED & WHITE SAFETY CHEVRONS	1	1	2	2	2	2	2	12
AUTOLUBE SYSTEM	0	2	2	2	2	2	2	12
QUICK EVAC OIL CHANGE SYSTEM	0	1	1	0	1	2	1	6

2007 QPA endorsed "25 Commandments"

Listing 25 of the Users fundamental requirements for ***standard*** fitment to new and re-engineered items of mobile plant supplied for use in the UK:-

- Colour rear-view camera
- Additional convex mirrors
- Front view mirror
- Amber flashing rotating beacon
- Broadband "white noise" reversing alarm
- Radar reversing aid
- Front radiator handrail
- Cab access handrails and walkway
- Seat belt warning device (Visual/Audible)
- Skip up warning device (Audible) (Dump-trucks)
- Strobe reverse lights
- Autolube system
- Smart retractable inclined stairway access
- Ground level lockable isolation switch
- Ground operated work/access lights
- Ground level grouped service access
- Ground level refuelling station
- Practical second egress from cab
- Air conditioning
- Front screen cleaning access
- Non-slip access surfaces
- Red & white safety chevrons on counterweight (Excavators; loaders; graders)
- Handrails around upper body (Excavators)
- Extended walkways and handrails (Excavators)
- Manual fire extinguisher in cab

Is it time for an Atlantic Alliance Standard?

Aim:

- To produce a benchmark safety standard detailing the minimum safety requirements for different machine types, for manufacturers to incorporate in their machine design as a standard sales specification, and for Users to sign up to purchase. For this to be developed implemented, and thereafter reviewed and updated on an ongoing basis and reissued regularly.

Is it time for an Atlantic Alliance Standard?

Participants might be Representatives from:

- Quarrying and Mining Trade Associations.(Int Social Security Mining Section).
- National Enforcing Authorities.
- Manufacturers and Suppliers Companies and Trade Associations.
- Other industry Sectors (Construction, Cement etc.)
- Interested Insurance Companies
- Academic Institutions

May be it is time to have an Atlantic Alliance Standard?

Advantages.

- Those Companies that want to be able to specify machinery with a recognised (by international enforcing authorities, and national standards and Insurance companies etc.) could do so with confidence. It would not stop Company's adding additional safety enhancements should they wish.
- Manufacturers and suppliers would **know** what the majority of Users in a particular industry sector required and could present their machines, and price structure 'on a more level playing field'.
- They could design, test, order in bulk, and store spare parts etc for these safety device items.
- The user would have them factory fitted, at an economical price, be included within the warranty, and know they would be maintained or renewed as a standard spare part.
- Smaller Company's may also be encouraged to purchase the 'Standard Safe machine' (although nothing to stop them physically deleting safety devices). This would help raise and improve the overall standard of safety across the industry, thereby reducing the number of injuries.

Thank you

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