ACCESS:

An Important After Thought

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1. INTRODUCTION

Access may not be the most dramatic subject on which to address an audience.

But drama does not equate with importance. Using a cost of $500 each day lost, access accidents are costing the industry $4.375 million per year. The pain and suffering cannot be costed. In a number of serious or fatal accidents in the period considered, access was a key feature. What is more, figures indicate on an industry wide basis access accidents have not decreased.

I have compared periods 85/87 and 90/93 and found that between the beginning of the first period and end of the last period, days lost due to all accidents dropped a creditable 24%, but access accidents stayed the same, becoming a more significant part of the overall total. This was a surprising result given that my initial response when asked to prepare an address on this subject was that the industry was already well focussed on this area. I considered it would be interesting to review progress, to find out how many gains had been made and whether perhaps a fresh approach was necessary to squeeze that extra advantage from the developments made to date. The picture revealed is quite different.

My approach to this topic will be as follows:

I will attempt to give the basic outlines of an in depth study carried out by G.L. McDonald under a grant from National Energy Research Development & Demonstration Program delivered in 1989. This very comprehensive study was titled "Access to Mobile Equipment" by G.L. McDonald.

Without going into the minutia of access systems I intend to re-state the objectives of this study and explain some of the basic methods used by Mcdonald. My reason is that I believe there is still much to be learnt from this study and still more importantly, applied.

It is always necessary to know where you have been, where you are going and how far you have come. I therefore intend to look at some statistics which should throw light on the three important travel questions.

Defining and identifying problems may be a sort of progress but may discourage rather than encourage, so I intend to show some solutions developed by industry to overcome some of the access problems.

The parting message, I will leave to the conclusion.

Before moving on I would like to give a thought to why we have access problems. I believe it is because as the need to mechanize earth moving developed and the demand grew, the initial machines were designed to meet industries' functional needs. Matters such as health and safety in those rugged times were of secondary consideration. With smaller machines operator and maintenance access was less important. As needs further developed and technological progress allowed, the basic machinery evolved into more specialized variants getting bigger and bigger. This process is still with us and often designs originally conceived without consideration for access are still the basis of our modern machines where access is very important.

I mention this because in our commitment to solve such problems as we are talking about today we must not forget that we are providing add ons; "access, an important after thought". There will come a point when the law of diminishing returns begins to operate and the designer/manufacturer must shoulder his responsibility to include good access in his basic design. It is an objective we should always work towards.

2. WHEN THE PROBLEM CAME INTO FOCUS

In July 1989 Mr G.L. McDonald presented the results of his study into access related accidents in the Queensland Coal Industry.

The objectives of this study were as follows:

i. *To investigate in detail hazards associated with access to mobile equipment in use in the coal mining industry.*

ii. *To provide, where possible, readily implemented solutions to identify hazardous situations during site investigations.*

iii. *To develop guidelines for retrofitting safe and efficient access systems, suitable for operational and maintenance functions on existing mobile equipment.*

iv. *To develop purchasing specifications to facilitate safe and more efficient access for systems on mobile equipment.*

v. *To influence the development of specific access standards.*

vi. *To encourage the development and installation of safe and efficient access systems.*

This investigation is probably the most comprehensive ever carried out in Australia and is, in the writer's opinion, the definitive study into access accidents and problems. For any person wishing to understand the factors, human, design and environmental, which mesh together to remove the barriers to access accidents, this is required reading.

The study used information from the Department of Mines data base which at the time was maintained by Safety in Mines Testing & Research Station (SIMTARS). 238 separate access accidents occurring between 1 July 83 and 30 June 88 were considered. A further 53 litigation cases involving access incidents from the files of G.D. McDonald & Associates were added to the study. Wherever possible the people involved in the mine accidents were interviewed and surveys made of the systems involved in the accidents at 7 of the mines involved.

Access systems were categorized into types, primitive, rudimentary, rung type ladder, step type ladder, stairs and mechanical (*see definitions following*). How often each type was used was then calculated. The total accident count was then distributed among the access types according to frequency of use. This figure of accidents attributed is the number of accidents which could be anticipated for each access type if all types were equally hazardous.

If the actual number of accidents for each access type was the same as expected from usage alone then each type would be equally hazardous. It follows those with greater than expected accidents would be more hazardous; those with less than expected, less hazardous.

This approach did reveal that some systems were inherently more hazardous than others and allowed a hierarchy to be established.

Some of the names of the system types used by McDonald are self explanatory, others are not. The following definitions apply:

<u>Primitive System:</u>

The major descriptor of a primitive system is that there is relatively little specific provision for the hands and the feet and the access consists of some surface treatment of components to help improve grip and the provision of an odd foot step or hand hold to assist in ingress or egress. Typical representatives of the primitive class would be bulldozers, excavators and some mobile cranes where the person clambers up, utilising the wheels. It should be noted here that the word 'primitive' is used in terms of *'simple, original, primary'*.

Rudimentary:

The term 'rudimentary' is used in the sense of *'imperfect beginning of something that will develop, or might under other conditions, have developed.'* Consequently, on a rudimentary access early stages of development of access systems can be seen. For example, on scrapers, small front end loaders and graders, a number of rungs or steps for the feet can be identified and whilst hand grips are to be found, they are not fully developed and co-ordinated with the foot provisions. Similarly, an access path which had an organised set of hand grips and oddly placed foot grips would be regarded as rudimentary.

Mechanical:

Includes pull down ladders or steps which are part fixed and part hinged and have to be operated manually or are assisted mechanically but have to be operated by the person seeking access.

McDonald tabulates the distribution of accidents among the various access types and used the lowest accident type, mechanical, as the unit of measurement. This is shown in column one of the following Table 1. McDonald then corrects for bottom step effects (bottom step greater than 400mm above the ground) which is considerable, to give the third column.

TABLE 1: ACCIDENT RATE FOR ALL ACCIDENTS and for the BOTTOM STEP and OTHER PARTS

Access Type	All Accidents	Bottom step Accidents	Other parts Accidents
PRIMITIVE	10.2	0.78	9.4
RUDIMENTARY	10	4.8	5.2
RUNG TYPE LADDER	3.4	2.1	1.3
STEP TYPE LADDER	4	2.1	2.1
STAIRS	3.8	2.2	1.6
MECHANICAL	1	1	0
OVERALL	4.85	2.3	2.5

What this table says is that some access types are very much more hazardous than others.

If we include bottom step effects then for every access accident on a mechanical system we could expect 10 accidents on primitive and rudimentary systems and 4 on step and rung type ladders.

3. HOW FAR HAVE WE PROGRESSED? A LOOK AT SOME STATISTICS

When we compare total accident and access accident statistics for the periods 1984 to 1987 (4 years) and 1990 to 1993 (4 years) we obtain the following.

TABLE 2: COMPARISON TOTAL ACCIDENTS and ACCESS ACCIDENTS PERIOD 4 YRS 1984 TO 1987 and 1990 TO 1993

	Period 84/87	Period 90/93	Change
Accidents: Total Accidents	3 242	2 613	-19.4%
Accidents; Total Days Lost	59 474 days	45 127 days	-24%
Access Accidents % of Total Accidents	9.3% 5 531 days	13.1% 5 912 days	+41%
Access Accidents % of Total Days Lost	12.1%	14.2%	+12%

These figures indicate that over the past few years the industry has achieved a creditable 24% decrease in accident days lost - a decrease of 14 347 days. However access accidents have stayed essentially the same showing a slight increase from 5 531 days to 5 912 days. On these figures the proportion of access accidents has increased significantly from 9.3% to 13.1% (against a diminishing base).

While these surprising figures have to be viewed in perspective against increasing machine population and usage they do point to an area requiring closer attention. The figures also poise such questions as where and why and how this has occurred.

In Table 3 is listed the type of equipment in use each period and to what extent the equipment was involved in access accidents in each period.

TABLE 3: LISTING THE NUMBER OF TIMES EACH MACHINE TYPE WAS INVOLVED IN ACCESS ACCIDENTS

Surface Mobile Equipment	Period 83/87	Period 90/93[1]
BELLY DUMP TRUCK	21	23*
BUCKET WHEEL EXCAVATOR	4	1
CABLE REELER TRUCK	4	-
CRANE - MOBILE & GANTRY	8	6
DOZER - RUBBER TYRED	10)	
DOZER - TRACKED	59) 69	55
DRAGLINE	66	43
DRILL - OVERBURDEN, COAL ETC.	24	11
ELEVATED WORK PLATFORM	2	2
EXPLOSIVES TRUCK	1	2
FORKLIFT	4	1
FRONT END LOADER - NS	2)	)
FRONT END LOADER - RT	12)	)
FRONT END LOADER - TR	18) 32	) 21
GRADER	30	13
LIGHT VEHICLE	12	7
LIGHTING PLANT - MOBILE	1	3
LOW LOADER	1	3
REAR DUMP TRUCK	16	31
SCRAPER	23	2
SERVICE TRUCK	11	20
SHOVEL	10	11
SMALL LOADER	8	-
TYRE HANDLER	1	1
WATER TRUCK	15	8
PUMP TRUCK	NR	2
HIGHWALL MINER	-	1
TOTAL	363	266[2]

Notes: (1) First period is 5 yrs and second 4 yrs.

(2) Accidents have to be allocated from brief one line description in data base. Judgement had to be exercised, eg. on accidents relating to trucks - hauler or belly dump. A small number were impossible to allocate and were excluded.

Table 3 shows that trouble spots are dozers and draglines (primitive or rudimentary access systems); followed by trucks (overburden and coal) and front end loaders where bottom step problems are a distinct possibility. Drills, service trucks and water trucks make a surprising contribution but each could also have rudimentary access systems.

4. SOME SOLUTIONS

Considerable work has been carried out across industry to address access problems. Work has been done on:

SLIDE 1:	ACCESS TO DRAGLINE FROM GROUND LEVEL
SLIDE 2:	ACCESS TO DRAGLINE REVOLVING FRAMES
SLIDE 3 & SLIDE 4:	MAINTENANCE & INSPECTION ACCESS ON DRAGLINES
SLIDE 5 & SLIDE 6:	HYDRAULIC POWERED PLATFORMS ON DOZERS & GRADERS
SLIDE 7:	SEMI RIGID STEPS ON GRADERS
SLIDE 8:	POWERED STEPS INTER CONNECTED WITH HAND BRAKES ON HAUL TRUCKS & BOTTOM DUMPERS AND SHOVELS
SLIDE 9:	SOME COMPANIES HAVE SOLVED SOME OF THE ACCESS PROBLEMS ON DRILLS BY INSTALLING ALTERNATIVES
SLIDE 10:	LAST BUT NOT LEAST MANY COMPANIES HAVE DEVELOPED A NUMBER OF MOBILE ACCESS PLATFORMS TO ASSIST MAINTENANCE ACCESS IN WORK SHOPS.

5. SOME TIMES FIGURES LIE - OR PERHAPS THEY DON'T IT MAY BE TIME FOR A REVISIT

Quite frankly, I am surprised at the results of the data base analysis. This exercise was undertaken with the preconception that improvement in access systems across the industry was a driver behind the significant improvement from 1989 onwards in open cut accident statistics.

However the figures from the data indicate otherwise.

Casting around for explanations as is usual in such circumstances a number come to mind.