Fatal and lost time injuries

in Western Australian mines

1997/98

DEPARTMENT OF
MINERALS AND ENERGY
WESTERN AUSTRALIA

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SUMMARY

Overall, 1997/98 has been a year of mixed performances. The unusually high number of fatalities was balanced by a lost time injury frequency rate showing a 20 percent improvement to 8 (10 in 1996/97). Even with a slight overall increase in the duration rate, the injury index has improved by 16 percent to 133 (158 in 1996/97). Some mining sectors' lost time injury frequency rates, such as underground gold and nickel, and coal have shown improvements in excess of 20 percent.

In 1997/98 the Department continued on a program of management changes aimed at addressing the delivery of improvements in safety and health issues in the mining industry. One of these was the introduction of a stronger profiled and independent legislative and policy secretariat to drive regulatory enhancements in conjunction with the tripartite Mines Occupational Safety and Health Advisory Board (MOSHAB). The operational group continued its program of change in emphasis of activities towards industry self-management, underpinned by a move towards audits and risk management, by conducting 20 management safety system audits, 118 high impact function audits, 30 occupational safety and health audits and 2208 inspections. The audits identified issues to be followed up in the future to provide the Mining Operations Division of the Department with an effective means of identifying problems and setting priorities for remedial measures.

The Department also continued to play an important role in providing education, training and information to the mining industry with 82 joint initiatives involving workshops, seminars and conferences on safety and health during the year.

In September 1997, Western Australia's Minister for Mines, Norman Moore instructed the Chairman of the MOSHAB to call a special meeting of the Board to establish an inquiry into mining fatalities.

MOSHAB set up the tripartite Prevention of Mining Fatalities Taskforce to carry out the inquiry (with particular attention directed to rock falls in underground mines) and to report its findings within three months to the Minister for Mines on the current situation and to recommend strategies for the prevention of fatalities.

In summary, data reported to the AXTAT system indicates an encouraging trend of improved safety performance in the Western Australian mining industry as born out by the statistics for the year of 1997/98. The Department has acted on all recommendations from the Mining Fatalities Taskforce and has continued with its program of regulatory reform and proactive regulation and the facilitation of improvement of the industry's occupational safety and health management performance

SUMMARY

STATISTICAL SUMMARY

- There were thirteen fatalities during 1997/98; two in the surface metalliferous sector, nine in the underground metalliferous mining sector and two on exploration sites.
- For the five-year period 1993/94 to 1997/98 the largest proportion of underground fatalities was due to underground rock falls (55 percent).
- For the five year period 1993/94 to 1997/98, in the case of surface operations the largest proportion of fatalities was due to being caught by operating machines (24 percent).
- During the five-year period 1993/94 to 1997/98, the underground mining sector had a fatal incidence rate over eleven times that of the surface mining sector.
- For the five-year period 1993/94 to 1997/98 the underground mining sector had a serious injury incidence rate more than twice that of the surface mining sector.
- There were 726 lost time injuries during 1997/98, 16 percent less than for the previous year (861 injuries in 1996/97) for a total workforce of 43,466.
- The overall injury frequency rate for 1997/98 was 8. This shows a 20 percent improvement on the 1996/97 figure (10).
- The overall duration rate of average work days lost per injury has increased slightly from 16.3 to 16.5 during 1997/98.
- Injury index improved by 16 percent during 1997/98 (down from 158 to 133).
- Serious injuries in the mining industry during 1997/98 totalled 289, which is 70 less than for 1996/97.
- During 1997/98 the overall serious injury frequency rate decreased from 4 to 3.
- Back injuries accounted for 38 percent of surface coal mining injuries compared with 26 percent of surface metalliferous mining injuries.
- The diamond sector had the lowest frequency rate at 3 during 1997/98.
- The underground gold and nickel frequency rate improved by 27 percent during 1997/98, decreasing from 11 to 8.
- The iron ore and bauxite and alumina frequency rates remained steady during 1997/98, at 8 and 5 respectively.
- The coal frequency rate improved significantly during 1997/98, falling from 41 to 32, representing a 22 percent fall.

EXPLANATORY NOTES

Introduction

The statistics published in this report are based on data at hand at the time of the report preparation, and relate to accidents that occurred in 1997/98 and involved time lost from work of one day or more (lost time injuries) on mines in Western Australia. The day on which the accident occurred is not counted as a day lost. The total number of working days lost through injury in 1997/98 has three components :

i) Initial Injuries - days lost in 1997/98 from injuries that occurred in 1997/98.

ii) Recurrent Injuries - days lost through recurrences of injuries that occurred in 1997/98 and previous years.

iii) Carry Over Injuries - days lost in 1997/98 by persons continuously off work from injuries which occurred before 1 July 1997.

Scope

Injuries to all company and contractor employees who worked inside mine boundaries are included in these statistics. The definition of 'mining operation' is stated in Section 4 of the Mines Safety and Inspection Act 1994 and includes mining company treatment plants, port facilities, and railways. Exploration activities, although now included in the definition of mining operations, have not been included. In addition, the oil and petroleum industry injuries are not included in the statistics in this report.

Metalliferous Mines

All mines which are not coal mines are classed as metalliferous mines.

Fatal Accidents

Work days lost have not been allocated to this type of accident, nor have fatalities been included in injury incidence, frequency or duration calculations.

Collection of Information

Information is collected monthly, or by period (4 weeks). Accident/Injury details are reported to the Department of Minerals and Energy by mine managers, as are the number of persons employed (including contractor employees) and the hours worked during the month or period.

During the twelve months, on average, 182 mines or groups of mines reported to the AXTAT system. One hundred per cent of returns were received in 1997/98.

Journey Accidents

Injuries which occurred in journey accidents (to or from work) have not been included in calculations of incidence, frequency or duration rates.

Definitions

Lost Time Injury - a work injury which results in inability to work for at least one full day or shift any time after the day or shift on which the injury occurred.

Serious Injury - an injury which results in the injured person being disabled for a period of two weeks or more.

Incidence Rate - the number of lost time injuries per1000 employees for a 12 month period.

Frequency Rate - the number of lost time injuries per million hours worked.

Duration or Severity - the average number of work-days lost per injury.

Injury Index - the number of workdays lost per million hours worked (Frequency x Duration).

Fatal Incidence Rate - the number of fatal accidents per 1000 employees for a 12 month period.

Fatal Frequency Rate - the number of fatals per million hours worked.

Serious Incidence Rate - the number of serious injuries per1000 employees for a 12 month period.

Serious Frequency Rate - the number of serious injuries per million hours worked.

Abbreviations

BAUX ALUM – bauxite and alumina mines
BRUISE/CONT – bruise/contusion
C/BY MACH – caught by or between operating machine
CHANGE RMS – change rooms
CONST MAT – construction materials
C/BY–BETWN – caught by or between moving and stationary object
C/W ELECTRIC – contact with electric current
C/W FRGN BODY – contact with foreign body
C/W OBJ/TOOL – contact with object or tool
EFF/CHEM – effects of chemicals
EXPL/DETONATION – explosives detonation
FRACT/BREAKS – fractures and breaks
FRGN BODY – foreign body
METAL AV – metalliferous average
METWORKERS – metal workers
MIN SANDS – mineral sands
MINE ROAD – mine access road not haul road
MOTOR COLLSN – motor vehicle collision
MOTOR VEH ROLL – motor vehicle roll over
M VEH/EQUIP – motor vehicle/equipment
O/C PROD – open cut production
OBJT – object
OVER/STREN MOV – overexertion or strenuous movements
OFF/ADMIN – office and administration
O/CUT – open pit
R/WAY – railway
R/FALL U/G – rock fall underground
S/AGAINST OBJT – struck against object
S/BY OBJT – struck by object
S/BY VEH/MOBILE – struck by vehicle/mobile
STREN MOV – strenuous movements
T/PLANT – treatment plant, includes: stockpiles, train load/unload, wharf
U/G ACCESS – underground access, includes: travelling and haulage ways
U/G DUMPG – underground dumping
U/G PROD/DEV – underground production/development
U/G PROD – underground production
U/GROUND – underground
VEH/EQP JOLT – vehicle/equipment jolting
W/SHOP – workshop

FATAL ACCIDENTS

Review of Fatal Accidents During 1997/98

There were thirteen fatalities during 1997/98; two in the surface metalliferous sector, nine in the underground metalliferous mining sector and two on exploration sites.

- An underground diesel operator was found lying on the ground covered by broken rock. It is understood that the deceased was operating a remotely controlled loader when a seismic tremor occurred. The mine has a history of seismic activity. The deceased was killed by rocks falling from between W straps high up in the hangingwall.

- A contract drill jumbo operator and his assistant died after being buried by a rockfall in a stope. It appears the two men were working near the drill jumbo when a tremor occurred. A large section of the backs and footwall of the stope (some 20 metres long) fell.

- A geologist exploring in remote country was struck by a helicopter rotor blade. The helicopter had landed and the deceased and another passenger had disembarked when the aircraft experienced some instability on the ground and rolled.

- A tree feller was killed when struck by a tree which fell in the wrong direction whilst being felled by a work colleague. When the work colleague attempted to warn the deceased he became confused and subsequently ran across the path of the falling tree.

- A contract LHD operator was found in the cab of his vehicle which had been crushed when it was buried inside a stope following a fall of some 1000 tonnes of material from the backs and the hangingwall. The operator had been loading ore from a pillar blast using the remote controlled LHD.

- An exploration field assistant died during a sampling operation. He had been vomiting during the previous night and morning. After working for about four hours he felt too sick to continue and attempted to return to the vehicle 350 metres away. His absence was noticed after about 30 minutes and a search discovered his body about 200 meters from where the vehicle had been when he set off. The post mortem report indicates he could have died from exposure to extreme heat.

- A contract LHD operator who had been operating a remotely controlled LHD in an ore drive was found pinned between the rear left side of the loader and sidewall of the ore drive, some 10 to 15 metres back from the drawpoint from which the loader had been excavating ore.

- An underground truck driver was found pinned under 15 sheets of 3.0m x 2.4m mesh weighing an estimated 435kg The mesh had been stood up against the sidewall of a drive. It appears that the deceased was caught when the sheets fell over after he commenced relocating the mesh alone.

- A contractor working as a shot firer's assistant received fatal injuries after a long hole rise was fired when an air blast pushed open ventilation doors and he was struck in the head by either the ventilation doors or by a regulator which was dislodged from one of the doors. The two holes in the long-hole rise had been charged with approximately 350kg of ANFO, four times the design quantity.

- An contract LHD operator was operating a remotely controlled loader underground moving ore from a stope to an orepass when he was crushed against the sidewall by the loader bucket. It appears that he may have inadvertently operated the wrong control.

- A maintenance foreman/caretaker died when he fell down a mine shaft. He had been checking the area around the top of the shaft when the badly corroded grid mesh on which he was standing gave way.

- A visitor at a small limestone dimension stone quarry was found pinned between the bucket assembly and the body of a skid-steer loader. It appears he was using the bucket of the machine to raise a drum to re-fuel a rock-cutting saw and was entering or leaving the cabin of the loader when the bucket and its load dropped.

Fatal Incidence by Mineral Mined 1993/94–1997/98

Figure 1 is a chart of fatal incidence by mineral mined (excluding exploration) for the last five years. The grouped information for all surface and underground mines, is given at the top of the chart.

Fatal Incidence by Mineral Mined 1993/94-1997/98

Figure 1

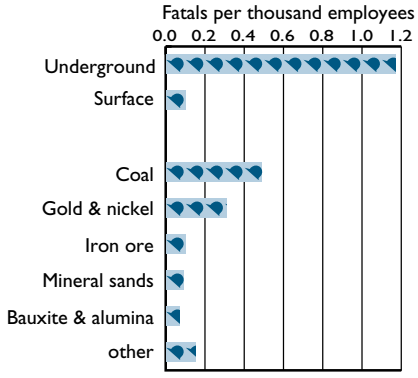


Figure 1 shows that underground mining has a much higher rate of fatal incidence than for surface. This is reflected in the gold and nickel sector where the majority of the State's underground mining occurs. The exceptionally high incidence for coal mines was the result of two fatal accidents in a relatively small work force.

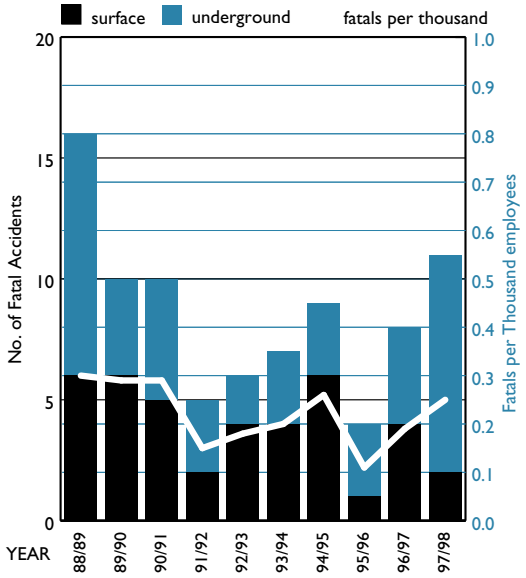
Fatal Incidence Rate 1988/89 - 1997/98

The fatal incidence rate, as indicated in Figure 2 was 0.25 (0.19 in 1996/97) for 1997/98 and is still of serious concern to the Department. While the overall trend continues to decline, there is a year-by-year scatter of incidence rates which is typical for fatalities.

The Department will continue to support the view that no fatal accident is acceptable and a fatal incidence rate of zero is achievable and sustainable.

Fatal Incidence Rate 1988/89-1997/98

Figure 2



Fatal Accidents by Type 1993/94 - 1997/98

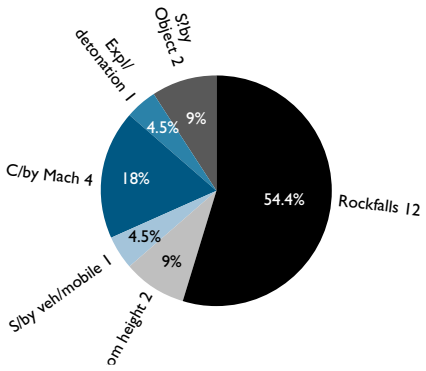
Figures 3 and 4 show the type of accidents (excluding exploration) for the 39 fatalities that occurred in the mining industry over the last five years. Of these fatalities, 22 occurred underground and 17 were in surface operations.

The most common type of underground fatal accident was rock-falls which resulted in 12 fatalities (55%). Greater emphasis should continue to be placed on all aspects of ground control in underground mines, including training, excavation design and support, lighting, mechanisation of scaling operations and overhead protection for operators.

The most common type of surface fatal accident was being caught by operating machinery which resulted in four fatalities.

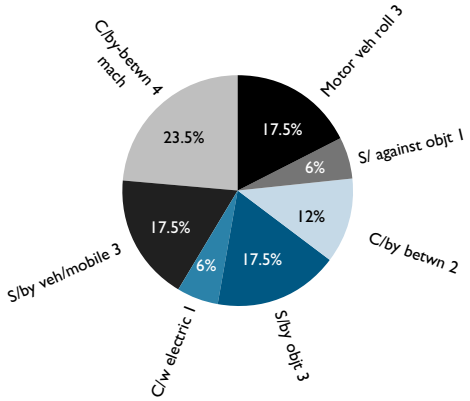
Underground Fatalities 1993/94-1997/98

Figure 3



Surface Fatalities 1993/94-1997/98

Figure 4



SERIOUS INJURIES

Review of Serious Injuries during 1997/98

There was a total of 289 serious injuries in the mining industry during the 1997/98 fiscal year (359 in 1996/97). Of these injuries, 282 occurred in metalliferous mines and 7 were in coal mines. Descriptions of some selected serious incidents that occurred during the year follow:

- A driller's offsider dislocated his finger when his gloved hand was caught on a rotating rod while placing a drill rod onto the shank of a drill rig.
- A rigger received a fractured leg when he was struck by a steel section being moved by a crane. During the move the steel section caught on a bin support structure and then swung towards him.
- A boilermaker had his thumb amputated when his gloved hand was caught in the rotating element of a lathe. He had been polishing a metal shaft on the lathe with emery paper.
- A truck driver unloading tyres from a truck jumped approximately 1 metre to the ground breaking his ankle when he landed on a rock.
- A serviceman received scalds to his arms, legs and groin when hot water under pressure escaped from the radiator of a front end loader while he was loosening the radiator cap with his foot.
- A driller sustained serious injuries to his head, neck and arm after being propelled through the air and colliding with the drill mast. He had been holding down a PVC pipe, which was diverting water from an adjacent hole, when compressed air combined with the water in the hole and caused the pipe to be blown off.
- A shift supervisor who entered a rod mill after tagging out and completing a vessel entry permit received multiple fractures when he was struck by two rods weighing 200kg each.
- A crusher operator attempting to clear a blockage in the jaw crusher by using a wedge was struck in the eye by a fragment of rock when he looked into the blocked area.
- A loader driver who was leaving a loader without turning the power off caught his clothing on the joystick causing the loader to articulate and crush his foot.
- An electrician received burns to his face, chest, arms and hands when an explosion occurred while he was attempting to remove an object which was next to a live bus-bar in an electrical cabinet.
- A scraper driver received broken ribs and lacerations after a tyre blew-out on the scraper he was driving. A large section of the tyre tread came loose, broke the mudguard, and went through the rear window of the cab.

Serious Injury Incidence Rate by Mineral Mined 1993/94 – 1997/98

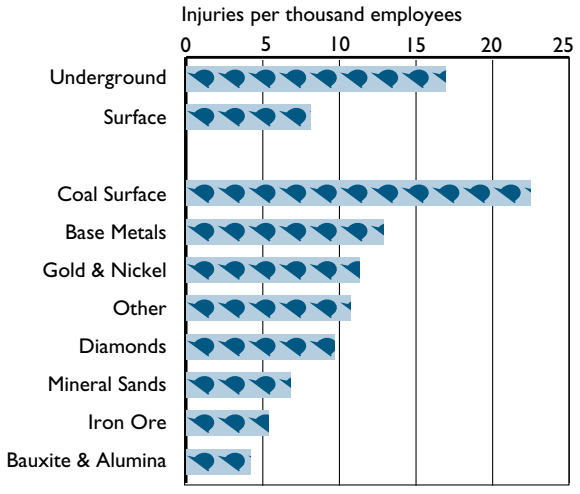
Figure 5 is a chart of incidence rates for serious injuries by mineral mined for the past five years. At the top of the chart the same information, grouped for all surface and underground mines, is provided.

The chart shows that underground mining has over twice the number of serious injuries per 1000 employees compared to surface mining.

The coal sector had the worst serious incidence rate.

Serious Injury Incidence Rate 1993/94-1997/98

Figure 5

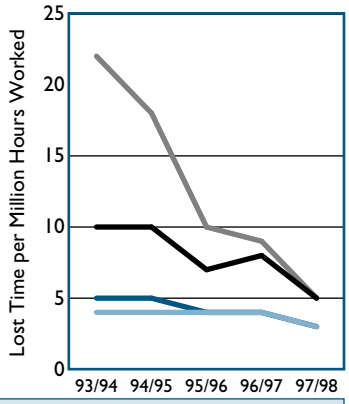


Serious Injury Frequency Rate 1993/94 - 1997/98

Figure 6 shows that, in underground metalliferous operations, the serious injury frequency rate, which increased during 1996/97, improved during 1997/98. The metalliferous underground serious injury frequency rate improved by 38 percent, from 8 down to 5.

Serious Injury Frequency Rate 1993/94-1997/98

Figure 6



	93/94	94/95	95/96	96/97	97/98
Metal. U/g	10	10	7	8	5
Metal. Surface	4	4	4	4	3
Coal Surf.	22	18	10	9	5
Total	5	5	4	4	3

Serious Injuries Percentage Breakdown for 1997/98

Appendix B and C provide a percentage breakdown of the number of serious injuries by part of body, nature of injury, location of accident, and type of accident for underground and surface operations, respectively.

Underground

- Injuries to arms, legs, and backs accounted for 25, 23 and 20 percent of serious injuries, respectively.
- Consistent with the high percentage of falls and rockfalls, fractures and bruises/contusions represented 18 and 14 percent of serious injuries, respectively. Strains accounted for 18 percent, possibly reflecting the poor manual handling environment which is typical of underground mining.
- Underground general areas experienced the majority of serious injuries (30 percent).
- The most common types of serious injuries underground were falls (18 percent), overexertion and strenuous movements (18 percent), rock falls (14 percent) and struck by objects (11 percent).

Surface

- Injuries to legs, backs, and arms accounted for 29, 24, and 14 percent of serious injuries, respectively.
- Consistent with the high proportion of back injuries, strains represented the highest proportion by nature (29 percent). Fractures and sprains accounted for 24 and 9 percent, respectively.
- The majority of surface serious injuries occurred in treatment plants (36 percent) and open pits (26 percent) followed by the general surface areas (19 percent).
- The most common types of serious injuries in surface operations were overexertion and strenuous movements (26 percent), falls (19 percent), struck by objects (11 percent), and vehicle and equipment jolting (7 percent).

LOST TIME INJURIES

Review of Lost Time Injuries During 1997/98

In 1997/98, 20,024 days were lost through occupational injuries on mines in the State. This figure is made up of the number of days lost from injuries in 1997/98 (11,999), the number of days lost from recurrences of injuries which occurred before 1997/98 and in 1997/98 (112) and from lost time injuries which carried over into 1997/98 from accidents which occurred prior to July 1997 (7913). A breakdown of work days lost in coal and metalliferous mining is given in Table 1.

During the 1997/98 fiscal year there were 726 lost time injuries in the State's mining industry, 684 in metalliferous mines and 42 in coal mines. A breakdown together with performance indicators is given in tables 2 and 3.

Thirty seven persons who were injured before July 1997 lost time in 1997/98 amounting to 7,913 work days. A breakdown of these injuries is given in table 4.

In addition to the initial injuries there were 6 recurrences of previous injuries resulting in 112 work days lost during 1997/98. A breakdown of recurrent injuries by year of initial injury is given in table 5.

Table 1. Time Lost Through Injury During 1997/98

	Days Lost			
	Initial Injuries	Recurrent Injuries	Carry Over Injuries	TOTAL
Metalliferous Mining	11,461	112	7,538	19,111
Coal Mining	538	0	375	913
TOTAL	**11,999**	**112**	**7,913**	**20,024**

Table 2. Initial Lost Time Injuries During 1997/98

	No of Employees	No of LTIs	Incidence	Frequency	Duration	Injury Index	Days Lost
Metalliferous Surface	38,657	596	15	8	16.3	122	9,698
Metalliferous U/Ground	4,095	88	21	9	20.0	189	1,763
Metalliferous Total	42,752	684	16	8	16.8	129	11,461
Coal Total	714	42	59	32	12.8	408	538
TOTAL MINING	**43,466**	**726**	**17**	**8**	**16.5**	**133**	**11,999**

Table 3. Injuries by Mineral Mined During 1997/98

Mineral Mined	No of Employees	No of LTIs	Incidence	Frequency	Duration	Injury Index	Days Lost
Gold	14,201	312	22	9	21.9	205	6,836
Iron Ore	9,136	120	13	8	8.1	61	966
Bauxite and Alumina	6,039	58	10	5	10.0	48	581
Nickel	5,995	73	12	6	18.7	105	1,363
Mineral Sands	2,466	49	20	10	14.1	136	692
Base Metals	1,327	17	13	7	15.8	111	268
Diamonds	1,267	7	6	3	7.9	24	55
Coal	714	42	59	32	12.8	408	538
Salt	655	10	15	7	4.3	32	43
Construction Materials	426	7	16	11	17.0	180	119
Other	1,240	31	25	12	17.4	212	538
TOTAL	**43,466**	**726**	**17**	**8**	**16.5**	**133**	**11,999**

NOTE: Duration in tables 2 and 3 does not take into consideration time lost after 30 June 1998 by persons still off work at the end of the fiscal year, or time lost by persons with carry over injuries from before July 1997, or for time lost from recurrent injuries.

Table 4. Carry Over Injuries During 1997/98

	Metalliferous Mining		Coal Mining	
Year	Number of Injuries	Number of Days Lost	Number of Injuries	Number of Days Lost
1997	17	3,714	–	–
1996	10	2,380	1	180
1995	2	439	–	–
1994	3	629	–	–
1992	1	231	–	–
1991	1	21	–	–
1990	1	124	1	195
TOTAL	**35**	**7,538**	**2**	**375**

NOTE: Apart from the information shown in tables 1, 4 and 5 analysis of carry over and recurrent injuries has not been presented in this publication.

Table 5. Recurrent Injuries During 1997/98

	Metalliferous Mining		Coal Mining	
Year	Number of Injuries	Number of Days Lost	Number of Injuries	Number of Days Lost
1998	2	63	–	–
1997	3	44	–	–
1993	1	5	–	–
TOTAL	**6**	**112**	**–**	**–**

Review of Lost Time Injuries During 1997/98 in Accordance with Australian Standard AS 1885.1 - 1990

In June 1990 Standards Australia and Worksafe Australia released a joint Standard for recording workplace injuries and diseases. This standard, AS 1885.1 - 1990 "Workplace Injury and Disease Recording Standard", is designed to be used by individual workplaces. There are two major differences between AXTAT and this Standard. The Standard treats fatalities as lost time injuries with a penalty of 220 workdays lost for each, whereas AXTAT keeps them separate with no penalty. Also, AXTAT calculates incidence per thousand, in contrast to the Standard's definition of injuries per hundred employees.

Tables 6 and 7 provide statistical information in accordance with this standard.

Table 6. Initial Lost Time Injuries During 1997/98 (AS1885.1-1990)

Mines	No of Employees	No of LTIs	Injuries per Hundred	Frequency	Duration	Days Lost
Metalliferous Surface	38,657	598	1.5	8	17.0	10,138
Metalliferous U/ground	4,095	97	2.4	10	38.6	3,743
Metalliferous Total	42,752	695	1.6	8	20.0	13,881
Coal Total	714	42	5.9	32	12.8	538
TOTAL	**43,466**	**737**	**1.7**	**8**	**19.6**	**14,419**

NOTE : Duration in this table does not take into consideration time lost after 30 June 1998 by persons still off work at the end of the fiscal year, or time lost by persons with carry over injuries from before July 1997, or for time lost from recurrent injuries.

Table 7. Injuries by Mineral Mined During 1997/98 (AS1885.1-1990)

Mines	No of Employees	No of LTIs	Injuries per Hundred	Frequency	Duration	Days Lost
Gold	14,201	320	2.3	10	26.9	8,596
Iron Ore	9,136	120	1.3	8	8.1	966
Bauxite and Alumina	6,039	58	1.0	5	10.0	581
Nickel	5,995	75	1.3	6	24.0	1,803
Mineral Sands	2,466	49	2.0	10	14.1	692
Base Metals	1,327	17	1.3	7	15.8	268
Diamonds	1,267	7	0.6	3	7.9	55
Coal	714	42	5.9	32	12.8	538
Salt	655	10	1.5	7	4.3	43
Construction Material	426	7	1.6	11	17.0	119
Other	1,240	32	2.6	13	23.7	758
TOTAL	**43,466**	**737**	**1.7**	**8**	**19.6**	**14,419**

INJURIES BY COMMODITY

METALLIFEROUS PERFORMANCE INDICATORS

The performance indicators for the metalliferous mining sector show mixed results during 1997/98. Figures 7 to 10 are charts depicting the performance indicators, incidence, frequency, duration and injury index (see explanatory notes for definitions) for the last five years.

Some interesting features of these performance indicators during 1997/98 include the following:

- Both the surface and underground incidence rates improved significantly during 1997/98 resulting in an overall 20 percent improvement on 1996/97 (falling from 20 to 16).
- Similarly, the overall frequency rate showed a significant improvement falling from 9 to 8 representing an 11 percent improvement.
- A rise in the duration rate for surface operations, rising by 7 percent was evident. The duration rate is currently 16.8 representing a slight (1 percent) increase on 1996/97.
- Despite the slight deterioration in duration rate, the fall in frequency rate has resulted in a decrease in the overall injury index, improving by 15 percent (down from 152 to 129).

Metalliferous Injury Percentage Breakdown for 1997/98

Appendices D and E provide a percentage breakdown of the number of injuries for part of body, nature of injury, location of accident, and type of accident for underground and surface sectors, respectively.

Injuries by Part of Body

- Back injuries accounted for the largest proportion of injuries underground at 23 percent and for surface operations at 26 percent.
- Leg injuries accounted for the second largest proportion of injuries underground at 20 percent. This was followed by arms at 17 percent.
- Leg injuries also accounted for the second largest proportion for surface operations at 22 percent followed by hand injuries at 12 percent.

Injuries by Nature

- Strains accounted for the majority of injuries for both underground and surface sectors at 24 and 53 percent respectively.
- For surface operations the second highest ranking nature of injury was fractures at 13 percent and sprains at 11 percent.
- For underground operations the second highest ranking nature of injury was also fractures at 12 percent followed by sprains at 10 percent.

Injuries by Location

- For the underground sector most injuries occurred in general underground areas at 29 percent.
- The majority of injuries occurred in treatment plants for the surface sector at 41 percent, open cut pits 24 percent and workshops at 13 percent.

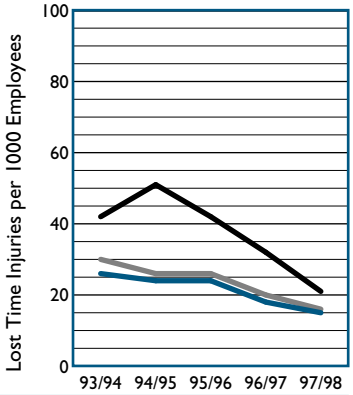
Injuries by Type

- Falls were the major cause of underground injuries at 14 percent followed by overexertion and strenuous movements at 13 percent. Injuries caused by rockfalls fell to 11 percent.
- For surface operations 26 percent of injuries were classified as overexertion and strenuous movements followed by falls at 16 percent and struck by objects at 11 percent.

Metalliferous Performance Indicators

Incidence Rate

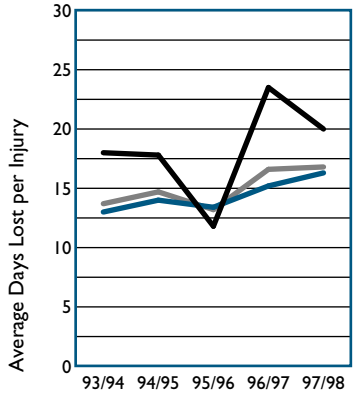
Figure 7



	93/94	94/95	95/96	96/97	97/98
Underground	42	51	42	32	21
Surface	26	24	24	18	15
Total	30	26	26	20	16

Duration Rate

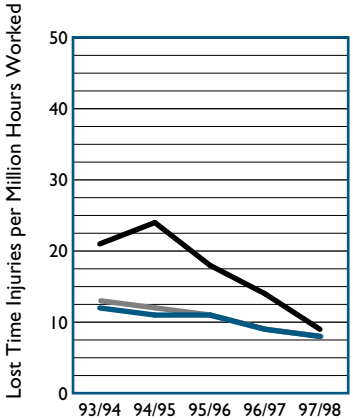
Figure 9



	93/94	94/95	95/96	96/97	97/98
Underground	18.0	17.8	11.8	23.5	20.0
Surface	13.0	14.0	13.4	15.2	16.3
Total	13.7	14.7	13.2	16.6	16.8

Frequency Rate

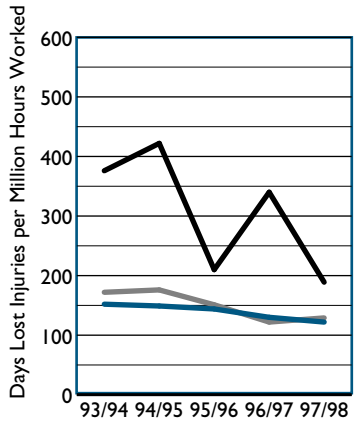
Figure 8



	93/94	94/95	95/96	96/97	97/98
Underground	21	24	18	14	9
Surface	12	11	11	9	8
Total	13	12	11	9	8

Injury Index

Figure 10



	93/94	94/95	95/96	96/97	97/98
Underground	376	422	210	340	189
Surface	152	149	144	130	122
Total	172	176	151	152	129

INJURIES BY COMMODITY

GOLD AND NICKEL PERFORMANCE INDICATORS

The performance indicators for the gold and nickel mining sectors show mixed results during 1997/98. Figures 11 to 14 are charts depicting the performance indicators, incidence, frequency, duration and injury index.

Some interesting features of the performance indicators during 1997/98 for the gold and nickel mining sectors include the following:

- The overall incidence rate improved by 24 percent, dropping from 25 to 19. The underground sector showed the greatest improvement dropping 34 percent (from 32 to 21).
- A similar trend was noted for the frequency rate for both underground and surface sectors. The overall frequency rate improved by 27 percent, currently at 8.
- A rise in the duration rate for surface operations, by 24 percent was evident. The duration rate is currently 21.3 representing a 13 percent increase on 1996/97.
- Despite the deterioration in the duration rate, the sharp fall in frequency rate has resulted in a decrease in the injury index, falling by 12 percent (from 200 to 177).

Gold and Nickel Injury Percentage Breakdown for 1997/98

Appendices F and G provide a percentage breakdown of the number of injuries for part of body, nature of injury, location of accident, and type of accident for the underground and surface sectors, respectively.

Injuries by Part of Body

- Back injuries accounted for the largest proportion of injuries for underground and surface sectors at 25 and 28 percent, respectively.
- Leg injuries accounted for the next largest group of injuries for underground at 15 percent followed by arms at 14 percent.
- For the surface sector, leg injuries also accounted for the next largest group at 21 percent followed by arm injuries at 11 percent.

Injuries by Nature

- Strains accounted for the majority of injuries for both underground and surface at 26 and 31 percent respectively.
- For the underground sector the second highest ranking nature of injury was sprains at 11 percent.
- For the surface sector the second highest ranking nature of injury was fractures at 15 percent.

Injuries by Location

- For underground operations most injuries occurred in general underground areas at 31 percent followed by access and haulage ways at 27 percent.
- The majority of injuries occurred in treatment plants for the surface sector at 34 percent, followed by open pit areas at 32 percent.

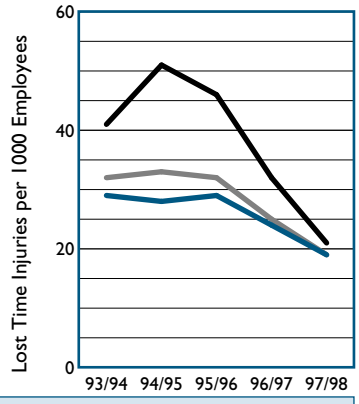
Injuries by Type

- Overexertion and strenuous movements was the major cause of underground injuries at 15 percent followed by falls at 14 percent and rockfalls at 12 percent.
- For surface operations 25 percent of injuries were classified as overexertion and strenuous movements followed by falls and struck by objects at 17 and 14 percent respectively.

Gold and Nickel Performance Indicators

Incidence Rate

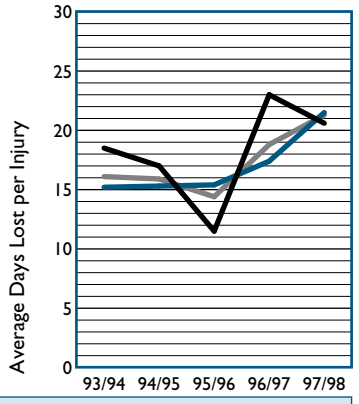
Figure 11



	93/94	94/95	95/96	96/97	97/98
Underground	41	51	43	32	21
Surface	29	28	29	24	19
Total	32	33	32	25	19

Duration Rate

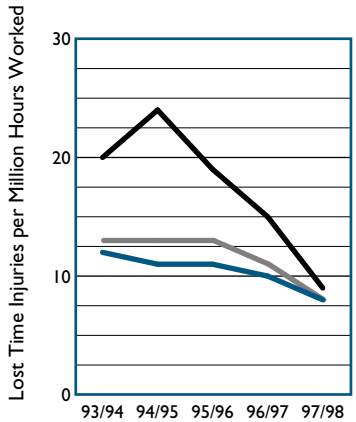
Figure 13



	93/94	94/95	95/96	96/97	97/98
Underground	18.5	17.0	11.5	23.0	20.6
Surface	15.2	15.3	15.4	17.4	21.5
Total	16.1	15.9	14.4	18.8	21.3

Frequency Rate

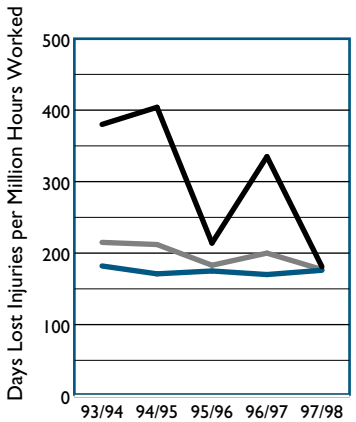
Figure 12



	93/94	94/95	95/96	96/97	97/98
Underground	20	24	19	15	9
Surface	12	11	11	10	8
Total	13	13	13	11	8

Injury Index

Figure 14



	93/94	94/95	95/96	96/97	97/98
Underground	380	404	214	335	181
Surface	182	171	175	170	176
Total	215	212	183	200	177

INJURIES BY COMMODITY

IRON ORE PERFORMANCE INDICATORS

With the exception of the frequency rate, all other performance indicators for iron ore mining showed improvement during 1997/98. Figures 15 to 18 are charts depicting the performance indicators, incidence, frequency, duration and injury index.

Some interesting features of the iron ore performance indicators during 1997/98 include the following:

- The incidence rate at 13 represents a 13 percent decrease on 1996/97.
- The frequency rate however, showed no improvement remaining at 8.
- There was a significant fall in the duration rate now recorded as 8.1. This is the lowest duration rate of all the major commodity groups.
- The significant fall in the duration rate has resulted in producing an overall fall in injury index (down from 82 to 61, 23 percent).

Iron Ore Injury Percentage Breakdown for 1997/98

Appendix H provides a percentage breakdown of the number of injuries for part of body, nature of injury, location of accident, and type of accident.

Injuries by Part of Body

- Back injuries accounted for the largest proportion of injuries representing 30 percent, 4 percent higher than 1996/97, and higher than the surface metalliferous average.
- Leg injuries accounted for the next largest proportion of injuries accounting for 25 percent, followed by hands and arms at 14 and 13 percent, respectively.

Injuries by Nature

- Strains accounted for the majority of injuries at 44 percent.
- Sprains and bruise/contusions accounted for the next highest proportions at 10 and 9 percent, respectively.

Injuries by Location

- The majority of injuries occurred in Treatment plants which accounted for 36 percent.
- Open cut pits and workshops accounted for 23 and 18 percent of injuries respectively.

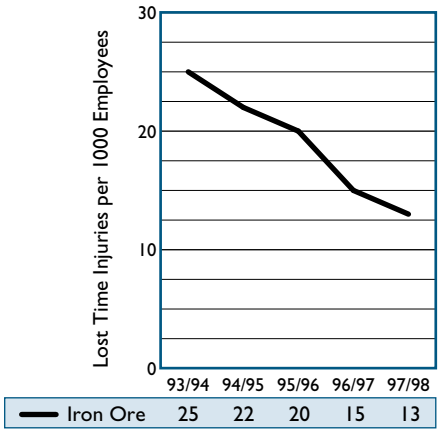
Injuries by Type

- Overexertion and strenuous movements continued to dominate as the major type of injury representing 31 percent.
- Falls were the next highest proportion at 16 percent followed by caught by or between moving objects and stepping related injuries both at 8 percent each.

Iron Ore Performance Indicators

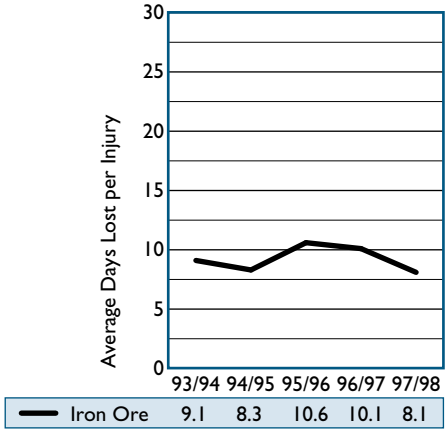
Incidence Rate

Figure 15



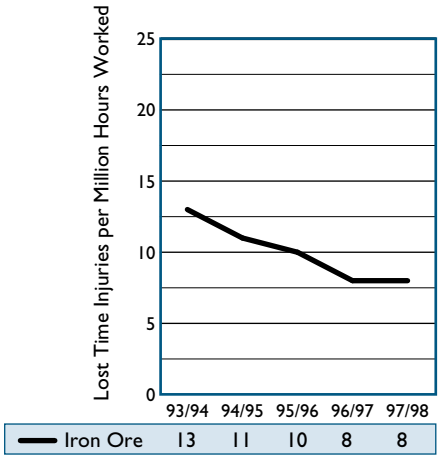
Duration Rate

Figure 17



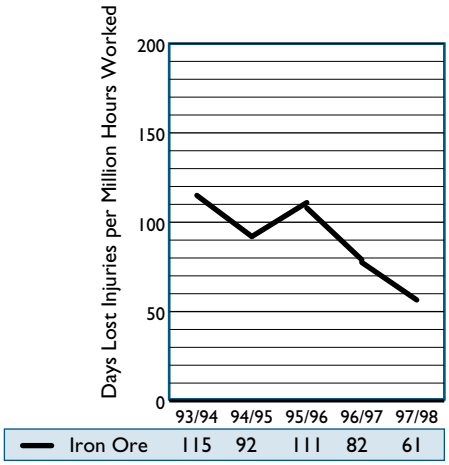
Frequency Rate

Figure 16



Injury Index

Figure 18



INJURIES BY COMMODITY

BAUXITE AND ALUMINA PERFORMANCE INDICATORS

There were mixed results in the performance indicators for bauxite and alumina during 1997/98. Figures 19 to 22 are charts depicting the performance indicators, incidence, frequency, duration and injury index.

Some interesting features of the bauxite and alumina performance indicators during 1997/98 include the following:

- The incidence rate increased from 9 to 10, however, it remains the lowest incidence rate of all the major commodity groups.
- The frequency rate showed no improvement remaining at 5. Once again this is the lowest rate of all the major commodity groups.
- There was a significant fall in the duration rate now recorded as 10.0, representing a 29 percent decrease. Although it is difficult to establish from the data the reasons for this drop, it is apparent that rehabilitation programs may be having more impact on the more serious injuries resulting in a decrease in the average number of days lost per injury.
- The fall in the duration rate has resulted in producing a sharp fall in injury index down from 67 to 48 representing a 28 percent decrease.
- On all accounts the bauxite and alumina sector continues to be the better performing major commodity group and is clearly established as the industry benchmark.

Bauxite and Alumina Injury Percentage Breakdown for 1997/98

Appendix 1 provides a percentage breakdown of the number of injuries for part of body, nature of injury, location of accident, and type of accident.

Injuries by Part of Body

- Leg injuries accounted for the largest proportion of injuries representing 33 percent.
- Back and arm injuries accounted for the next largest proportion of injuries representing 16 and 10 percent respectively. The result with back injuries was interesting, given that in all other commodity groups back injuries always represented the largest proportion. Clearly, this sector is leading the way in back injury prevention.

Injuries by Nature

- Strains accounted for the majority of injuries at 24 percent, however this was now lower than the surface metalliferous average (33 percent).
- Sprains and fractures accounted for the next highest proportion at 16.
- Burns and effects of chemical were the next highest both at 10 percent each.

Injuries by Location

- The majority of injuries, 78 percent, occurred in treatment plants followed by workshops at 10 percent.
- Only two injuries were reported to have occurred in the open cut pits.

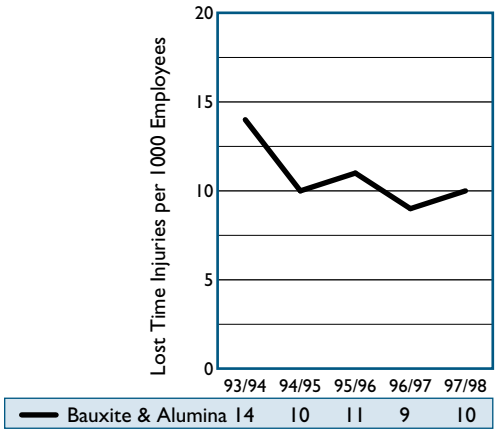
Injuries by Type

- Overexertion and strenuous movements, and falls continued to dominate as the major type of injuries both representing 17 percent.
- Caught by or between moving and stationary object and stepping related injuries were the next highest proportion both at 10 percent each.

Bauxite and Alumina Performance Indicators

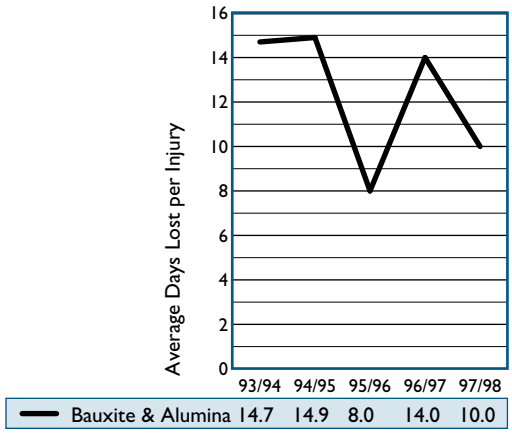
Incidence Rate

Figure 19



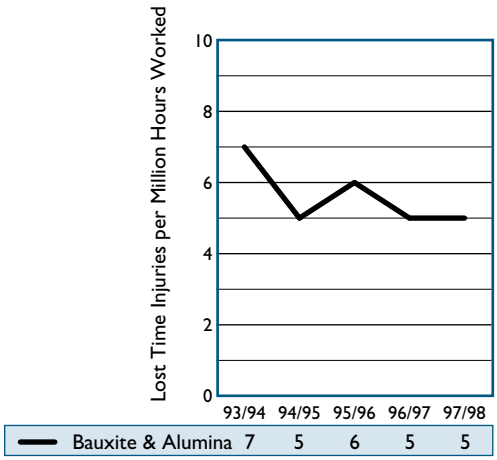
Duration Rate

Figure 21



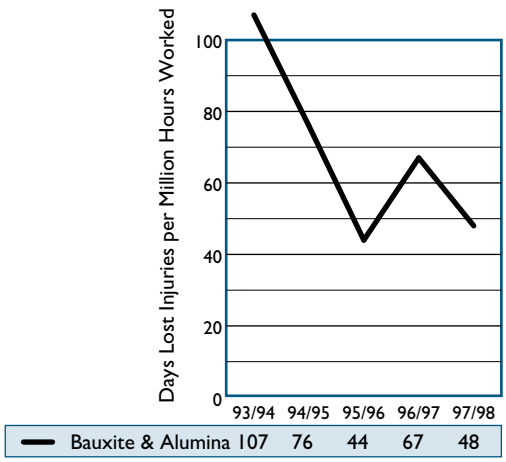
Frequency Rate

Figure 20



Injury Index

Figure 22



INJURIES BY COMMODITY

COAL PERFORMANCE INDICATORS

The coal industry experienced a significant improvement in performance during 1997/98, however, it continues to be the worst performing commodity group. Figures 23 to 26 are charts depicting the performance indicators incidence, frequency, duration and injury index.

Some interesting features of the coal mining sector performance indicators during 1997/98 include the following:

- The incidence rate recorded at 59, represents a 15 percent improvement on 1996/97, however this rate is still nearly four times that of surface metalliferous mining.
- A similar trend was noted for the frequency rate which is currently at 32, 22 percent lower than 1996/97, however this rate is still over four times that of surface metalliferous mining.
- The only performance indicator that increased during 1997/98 was the duration rate now recorded as 12.8, which represents a 4 percent increase. This is approximately 24 percent less than the rate for metalliferous mining. Therefore, although the coal industry has a higher incidence of injuries, they tend to be less severe.
- The significant improvement in the frequency rate has outweighed the rise in duration rate resulting in a decline in injury index (from 503 to 408) which is equivalent to a 19 percent improvement since 1996/97. Despite this improvement, the coal sector has an injury index approximately three times as high as the surface metalliferous average.

Coal Injury Percentage Breakdown for 1997/98

Appendix J provides a percentage breakdown of the number of injuries for part of body, nature of injury, location of accident, and type of accident.

Injuries by Part of Body

- Back injuries accounted for the largest proportion of coal mining injuries representing 38 percent, significantly higher than the surface metalliferous average at 26 percent.
- Arm injuries accounted for the next largest proportion of injuries representing 21 percent, followed by legs at 12 percent.

Injuries by Nature

- Strains accounted for the majority of injuries at 57 percent, significantly higher than surface metalliferous average at 33 percent.
- Sprains accounted for the next highest proportion at 10 percent followed by bruise/contusions at 7 percent.

Injuries by Location

- The majority of injuries occurred in open pits accounting for 52 percent.
- Workshops accounted for 36 percent of injuries.

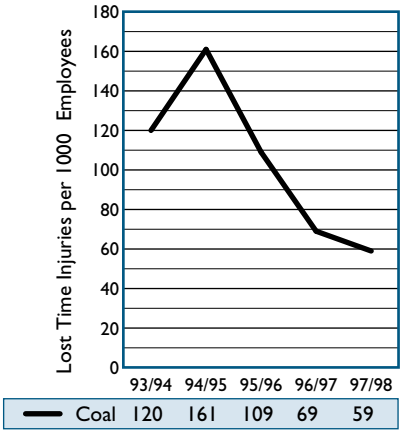
Injuries by Type

- Overexertion and strenuous movements continued to dominate as the major type of injury representing 36 percent.
- Struck against object featured as the second most frequent type of injury (12 percent), significantly higher than for surface metalliferous mining where it represented 5 percent of all injuries.
- Falls and stepping related injuries were the next highest proportion both at 10 percent each.

Coal Performance Indicators

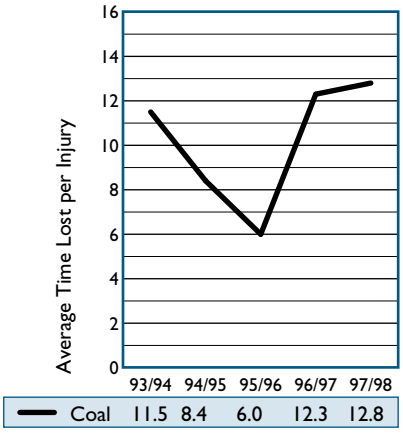
Incidence Rate

Figure 23



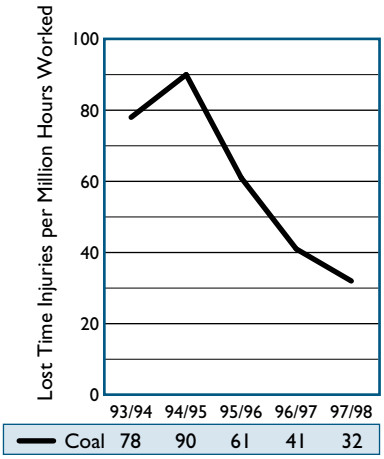
Duration Rate

Figure 25



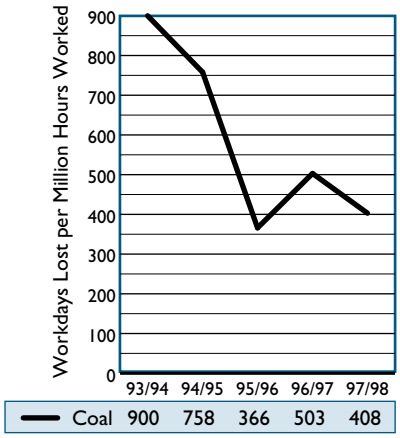
Frequency Rate

Figure 24



Injury Index

Figure 26



WORKERS COMPENSATION PREMIUM RATES FOR THE WESTERN AUSTRALIAN MINING INDUSTRY

The Workers' Compensation premium rates recommended by the Premium Rates Committee, are published in the Western Australian Government Gazette and are effective from 30 June.

Figure 27 indicates workers' compensation cost trends for some major mineral groups since 1986/87.

Most mineral groups have shown significant reductions in compensation costs since 1986/87. In particular, underground gold operations for the 1986/87 fiscal year incurred a cost equivalent to approximately 18 percent of payroll which has been reduced to just 3.65 percent for 1998/99. This represents a 76 percent improvement in costs. The overall average premium rate for the Western Australian mining industry for 1998/99 is currently 3.2 percent, a 20 percent increase on 1997/98 at 2.67 percent.

Figure 28 shows the current recommended premium rates for the 1998/99 fiscal year for a variety of mineral groups and other industries.

The poor safety performance in the coal industry highlighted in previous sections of this report is also reflected in the premium rates. The coal mining industry currently has a rate equivalent to 6.55 percent of payroll. This is a significant increase on the previous year at 5.77 percent.

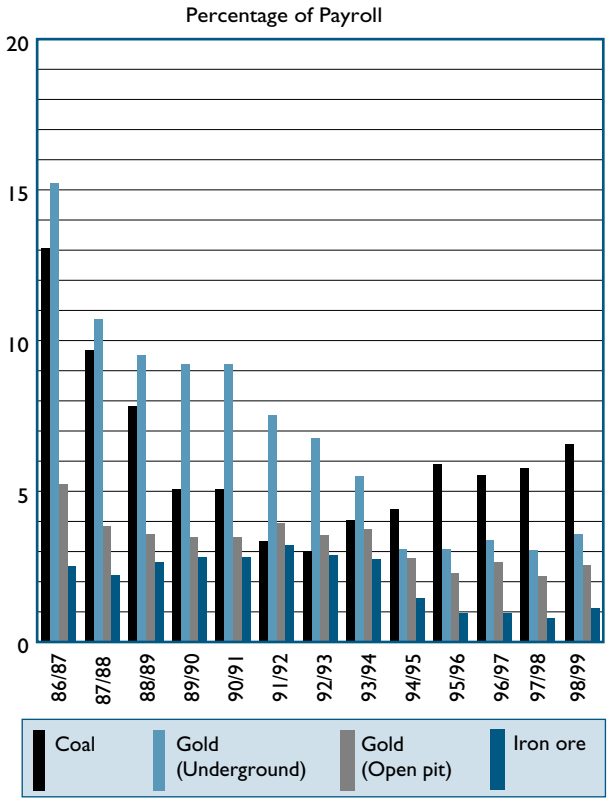
The rates, however, for the mining industry groups compare favourably with other industry groups such as clay brick manufacturing and structural steel fabrication both of which have current premium rates of 7.67 and 9.23 percent of payroll, respectively.

In fact, the industry has reached a stage where even the traditionally higher risk mining sectors have lower premium rates than many manufacturing sectors.

Although premium rates in isolation are not necessarily reliable indicators of risk, they do represent a cost to industry and, in part, reflect past accident rates.

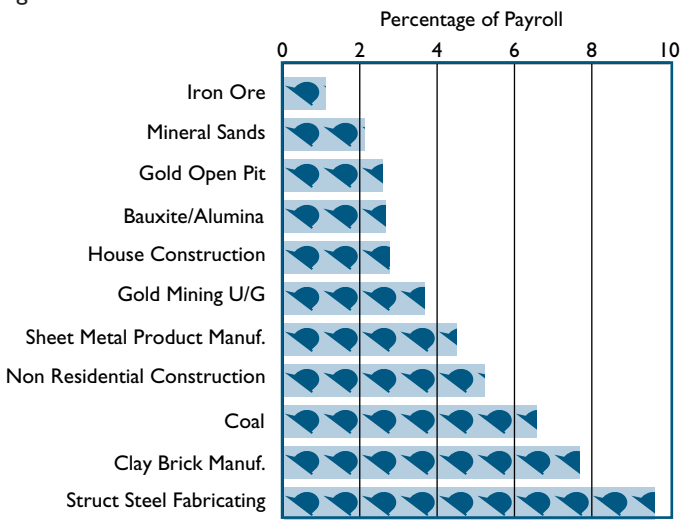
Western Australian Mines Workers Compensation Cost Trends

Figure 27



Western Australian Recommended Premium Rates 1998/99

Figure 28



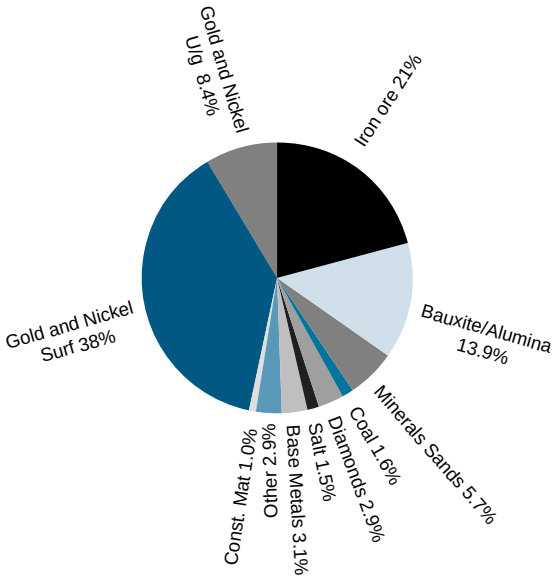
Source: Government Gazette 31 March 1998

APPENDIX A

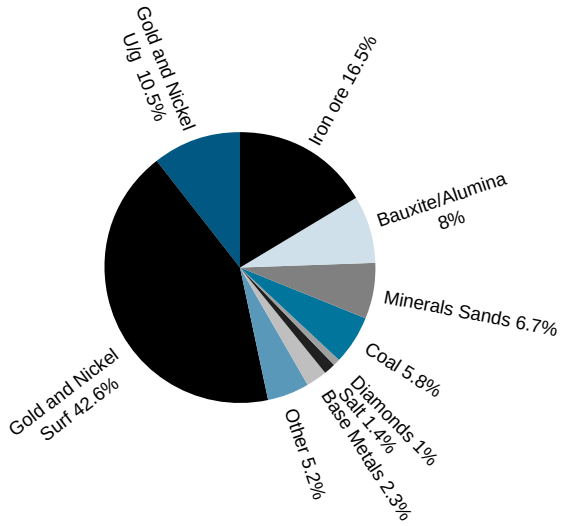
WESTERN AUSTRALIAN MINES 1997/98 FINANCIAL YEAR

726 INJURIES

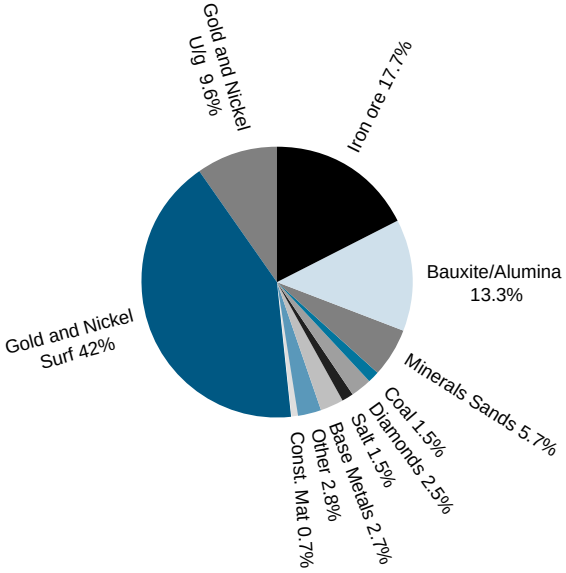
NUMBER OF EMPLOYEES



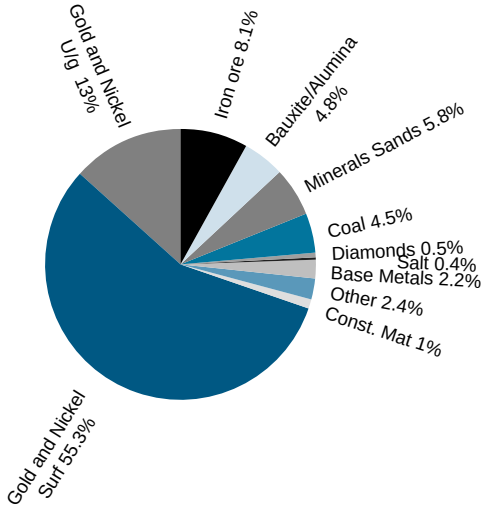
NUMBER OF INJURIES



MILLION HOURS WORKED



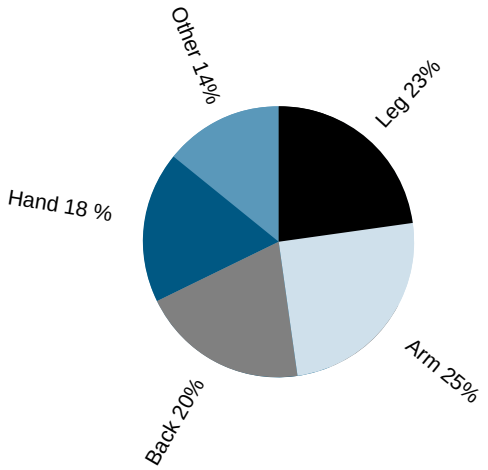
WORK DAYS LOST



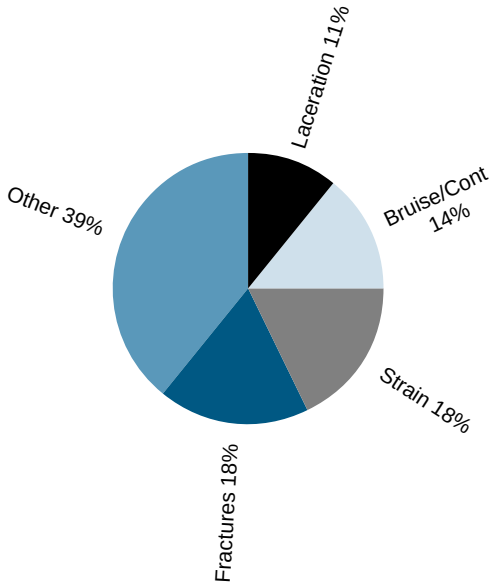
APPENDIX B

SERIOUS INJURIES UNDERGROUND 1997/98

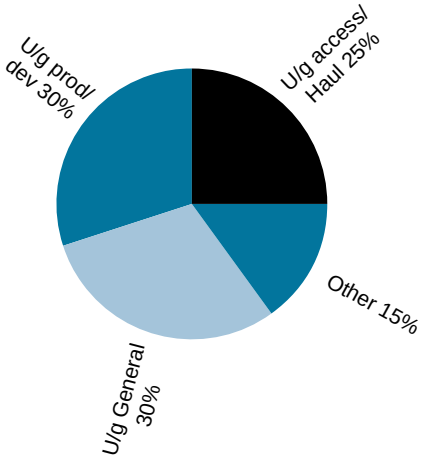
PART OF BODY



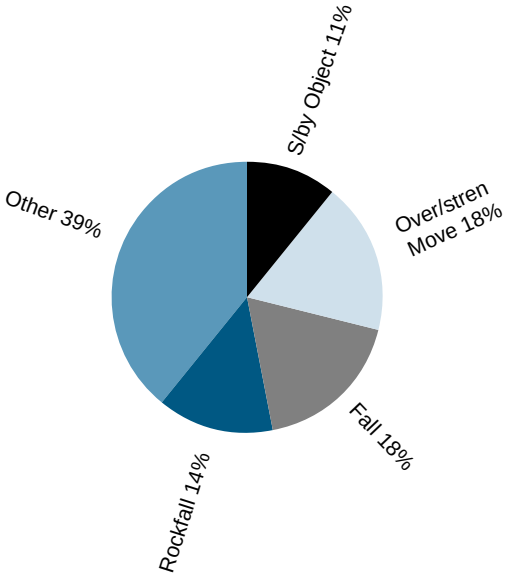
NATURE OF INJURY



LOCATION OF ACCIDENT



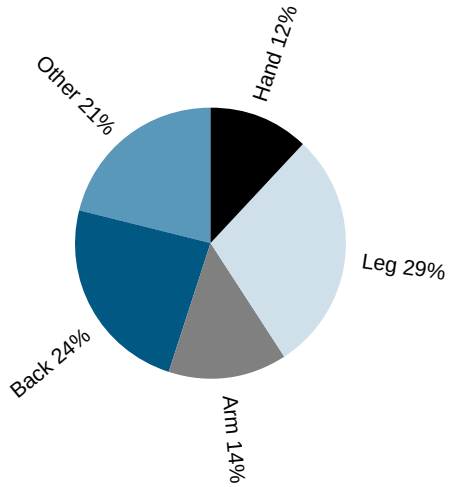
TYPE OF ACCIDENT



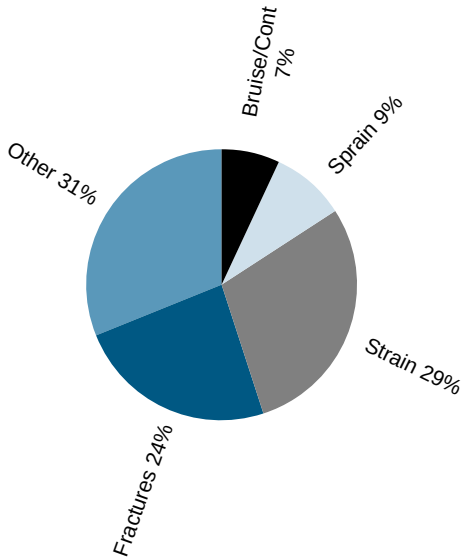
APPENDIX C

SERIOUS INJURIES SURFACE 1997/98

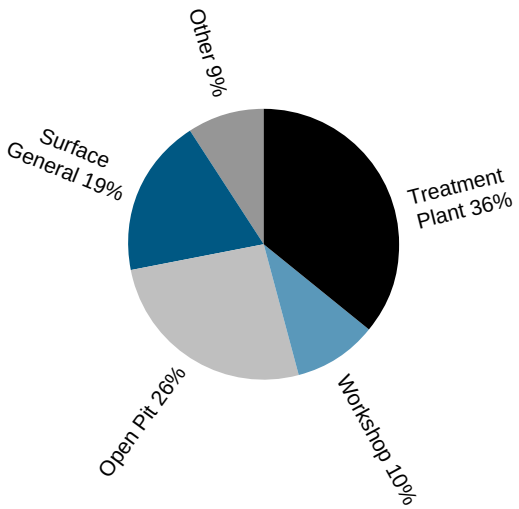
PART OF BODY



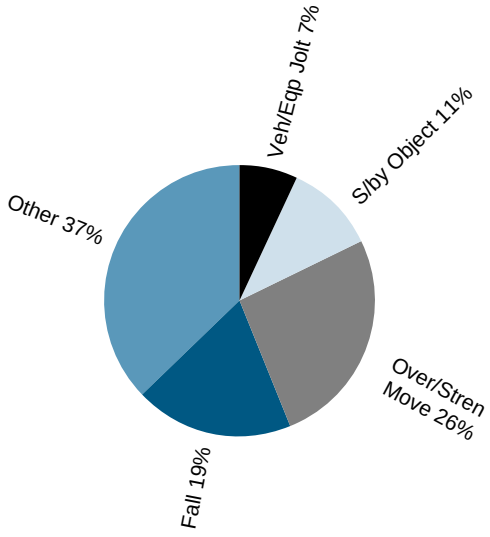
NATURE OF INJURY



LOCATION OF ACCIDENT



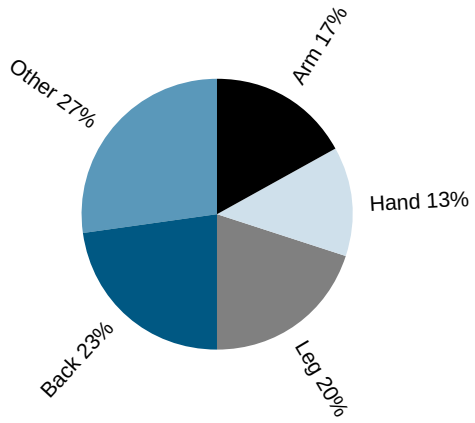
TYPE OF ACCIDENT



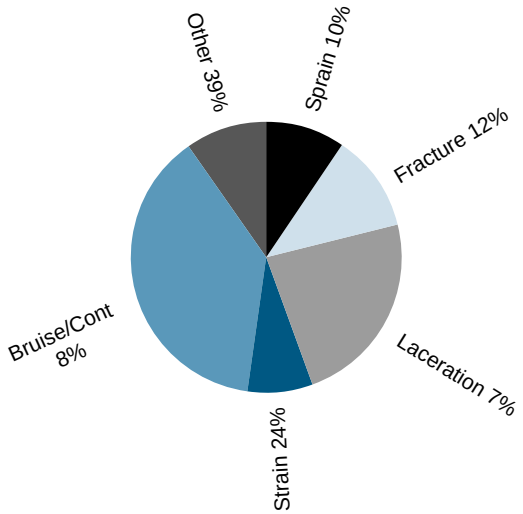
APPENDIX D

METALLIFEROUS UNDERGROUND INJURIES 1997/98

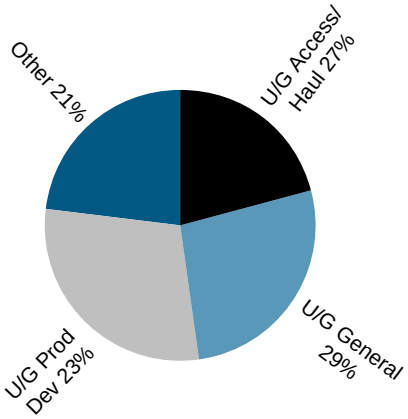
PART OF BODY



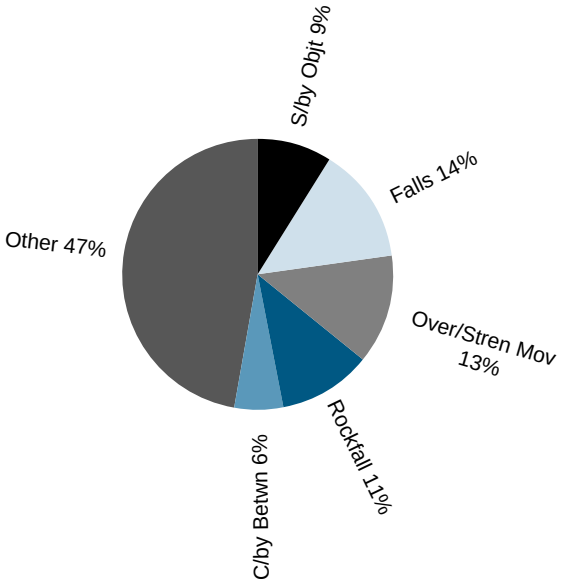
NATURE OF INJURY



LOCATION OF ACCIDENT



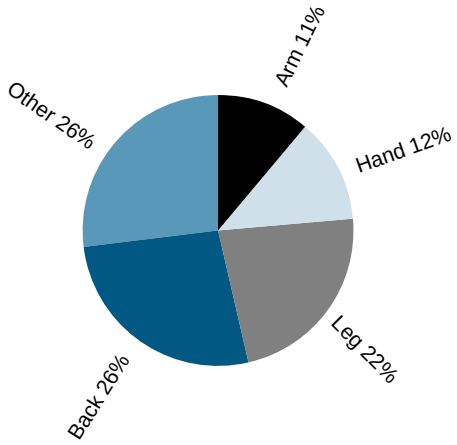
TYPE OF ACCIDENT



APPENDIX E

METALLIFEROUS SURFACE INJURIES 1997/98

PART OF BODY



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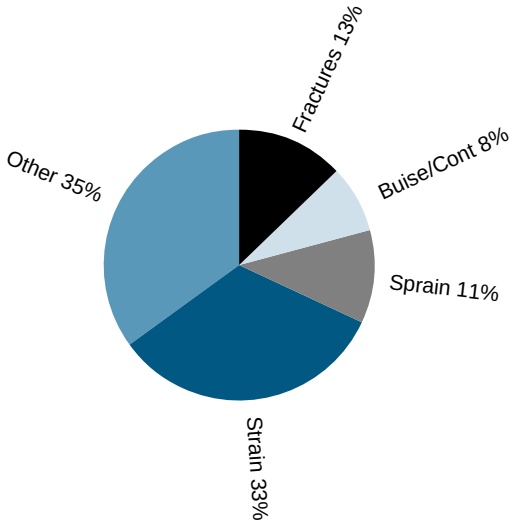

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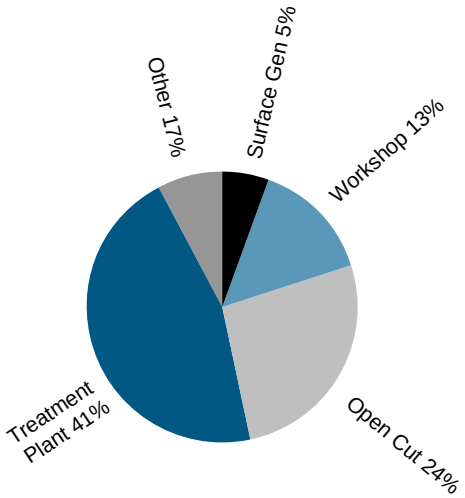
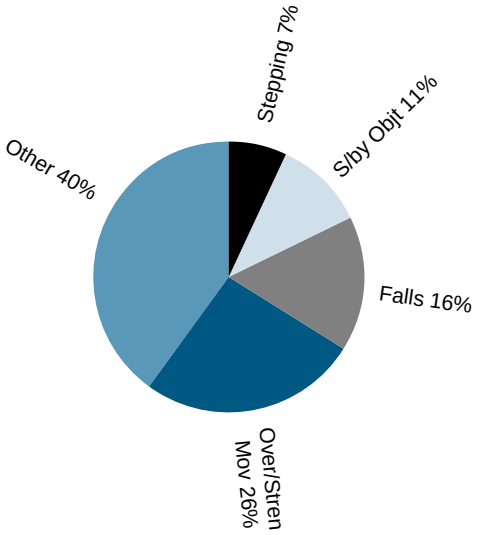


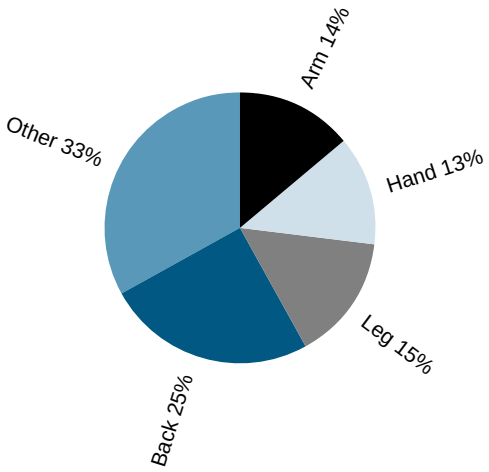
TYPE OF ACCIDENT



APPENDIX F

GOLD AND NICKEL UNDERGROUND INJURIES 1997/98

PART OF BODY



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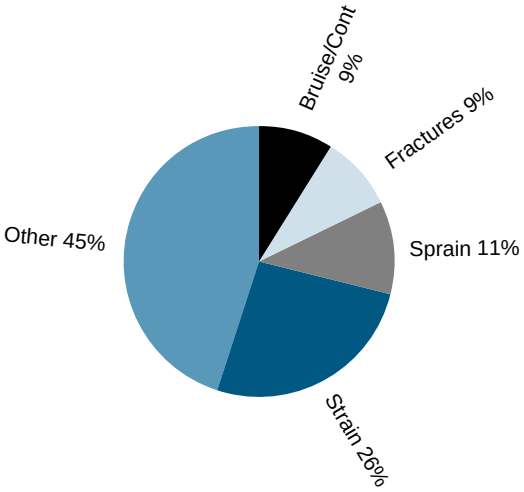

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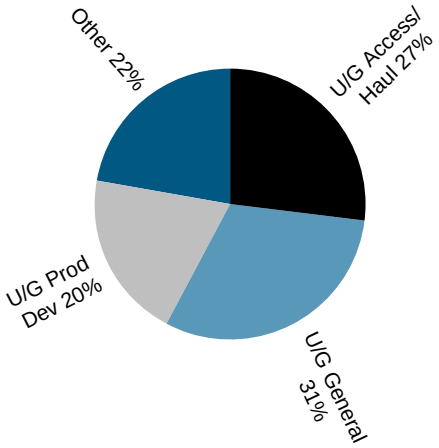
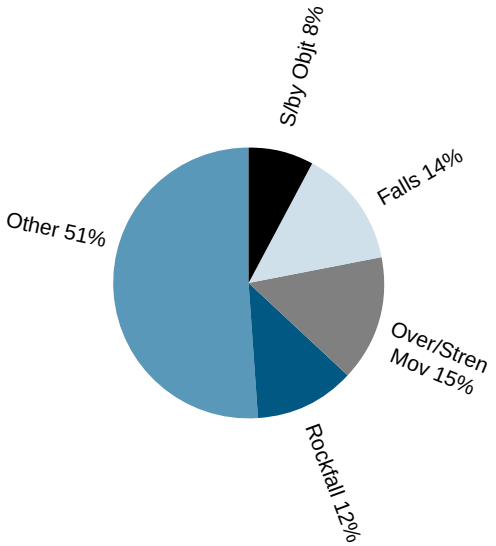


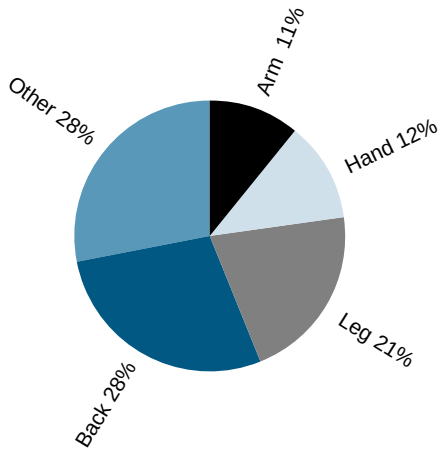
TYPE OF ACCIDENT



APPENDIX G

GOLD AND NICKEL SURFACE INJURIES 1997/98

PART OF BODY



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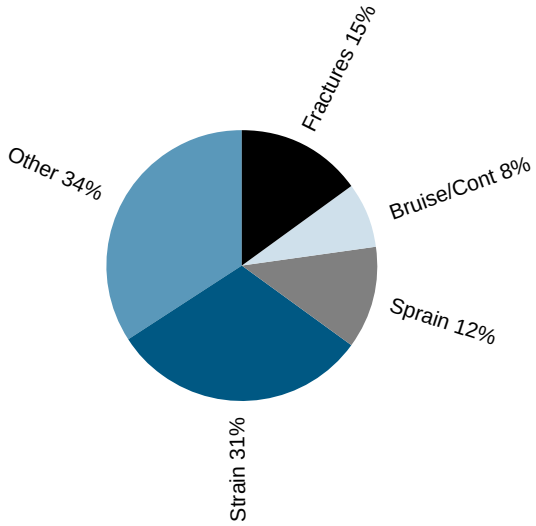

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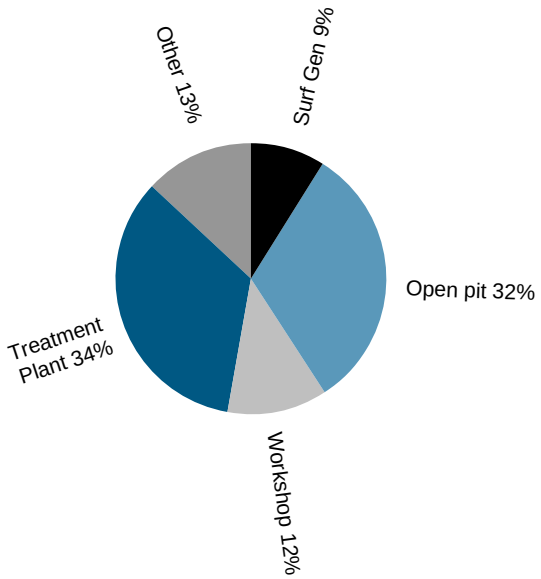
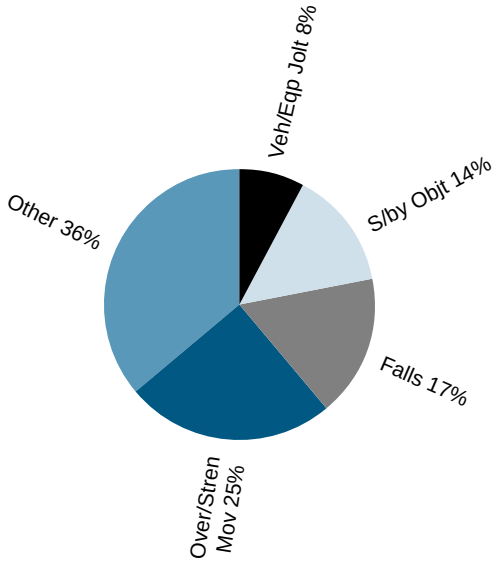


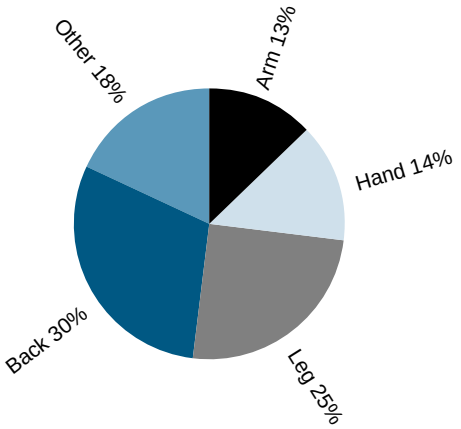
TYPE OF ACCIDENT



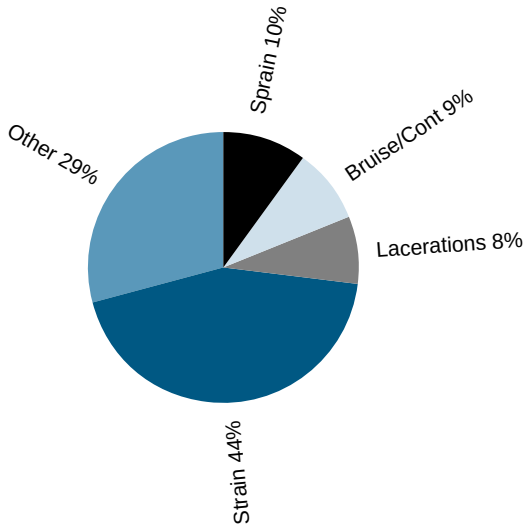
APPENDIX H

IRON ORE INJURIES 1997/98

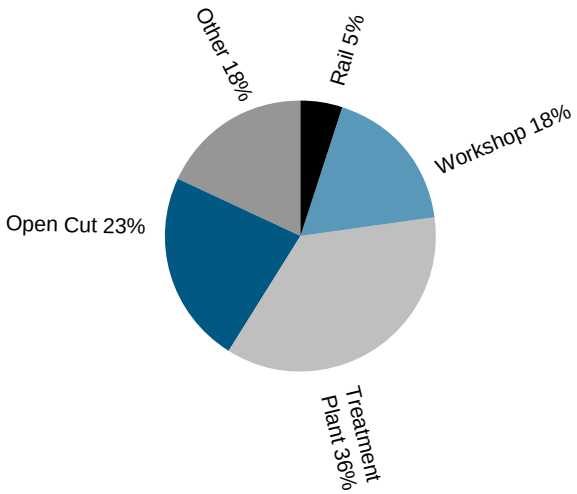
PART OF BODY



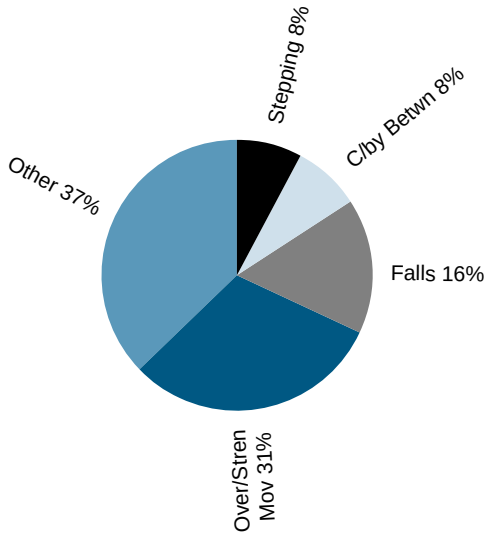
NATURE OF INJURY



LOCATION OF ACCIDENT



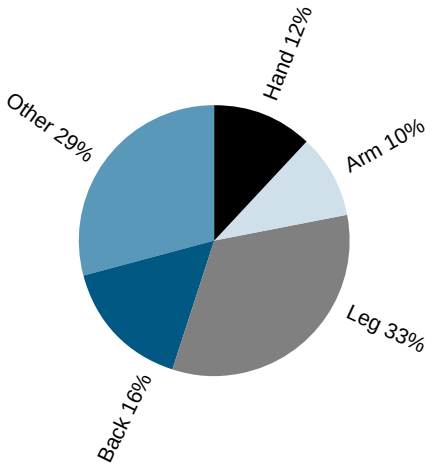
TYPE OF ACCIDENT



APPENDIX 1

BAUXITE AND ALUMINA INJURIES 1997/98

PART OF BODY



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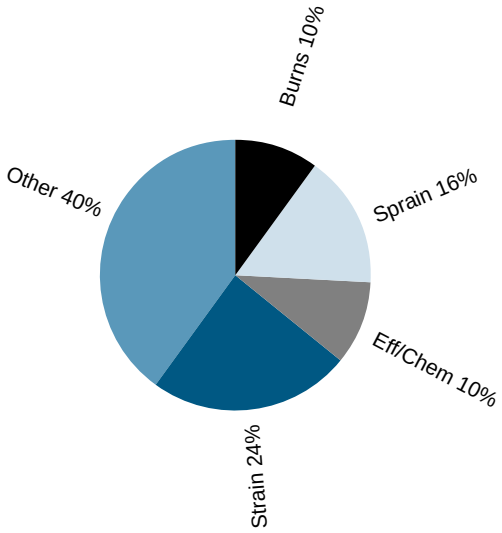

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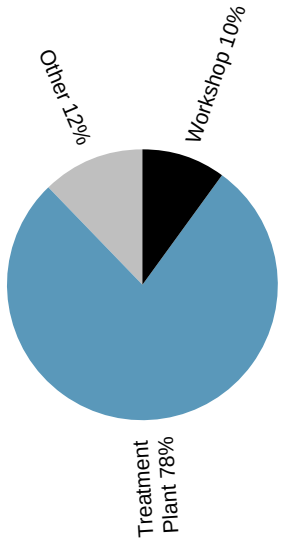
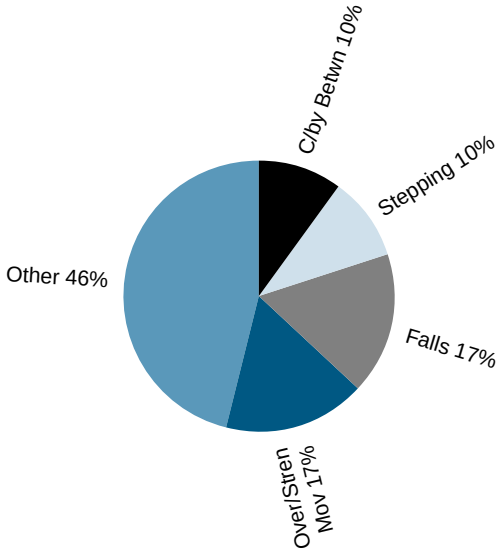


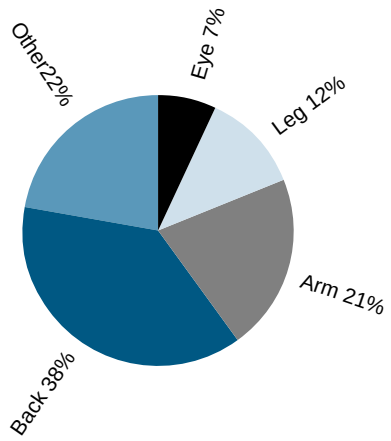
TYPE OF ACCIDENT



APPENDIX 1

COAL INJURIES 1997/98

PART OF BODY



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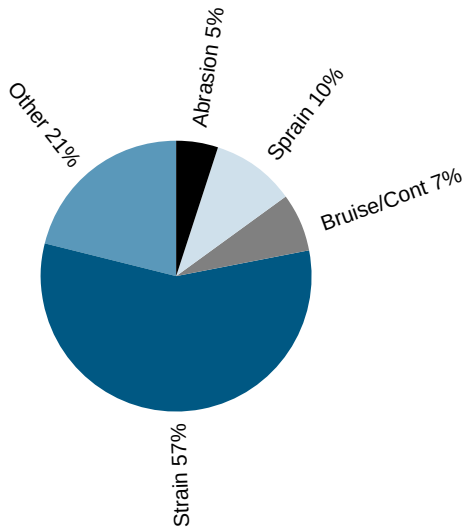

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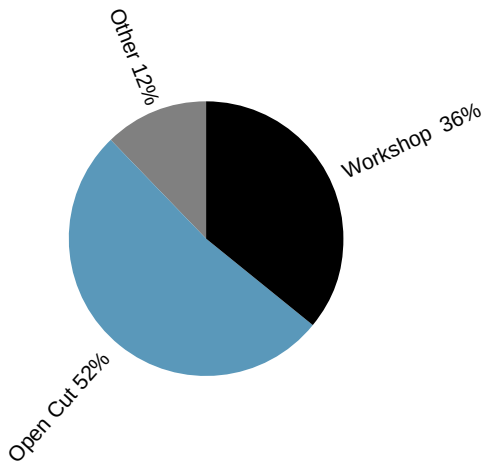

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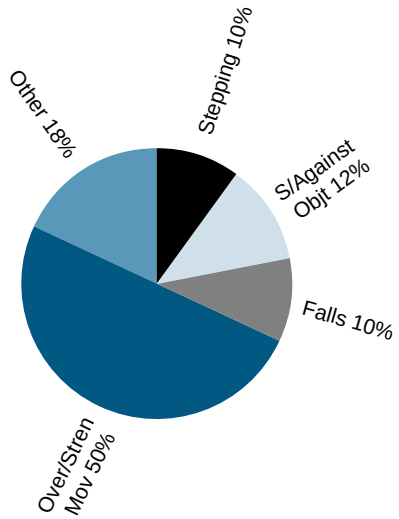


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