

SAFETY, HEALTH & ENVIRONMENT PROCEDURE

FLUID INJECTION PROTOCOL

Document No.:

Issue: 001

Number of Pages:

Date Printed:

File Name:

Approved by:

WARNING: Failure to act appropriately may result in death of patient, or the need to amputate the affected limb.

REVISION	DOCUMENT NAME	PAGE NO.	DATE	AUTHOR
2	D:\MECHANICAL WEB SITE\5 REPORTS AVAILABLE\FIPROTOCOL.DOC	PAGE 1 OF 1	21/11/2002.	M.S.O.-M

TABLE OF CONTENTS

1.0	PURPOSE	3
2.0	SCOPE	3
3.0	REFERENCES	3
4.0	DEFINITIONS	3
5.0	RESPONSIBILITIES	3
6.0	PROCEDURE	3
7.0	DOCUMENTATION	3
8.0	ATTACHMENTS	3
	Appendix 1: Letter to the Doctor.....	3
	Appendix 2- ADDITIONAL INFORMATION.....	3
	Appendix 3 Sydney Hospital Information.	3
	Appendix 4 Injuries.....	3

REVISION	DOCUMENT NAME	PAGE NO.	DATE	AUTHOR
2	D:\MECHANICAL WEB SITE\5 REPORTS AVAILABLE\FIPROTOCOL.DOC	PAGE 2 OF 1	21/11/2002.	M.S.O.-M

1.0 PURPOSE

This procedure defines the protocol to follow for a person who receives fluid injected through the skin. This protocol establishes a minimum level of treatment for any person who has received fluid injected through the skin. This procedure to go with the Patient and to the Doctor / Hospital.

2.0 SCOPE

This procedure applies to any person reporting to the Medical centre after receiving fluid injected under the skin, regardless of how minor the contact may appear upon reporting.

This procedure applies to all employees, contractors and visitors on the site.

3.0 REFERENCES

Safety Alerts. SA 00-02, SA 98-08 and SA 02-14.
MDG 1016 First Aid Guideline.

The intention of this document is to make all persons aware that delayed effects can still occur, in some cases several hours or days after a fluid injection under the skin.

4.0 DEFINITIONS

1. **Baseline Observations** - Measuring of pulse, blood pressure and temperature.
Feel near the cut or puncture wound: Severe pain, throbbing, or numbness?
2. **When any fluid has punctured the skin and likely to have injected the fluid under the skin of a person.**
3. **Look for entry wound / site.**

5.0 RESPONSIBILITIES

Site Manager

Authorise persons to carry out this procedure.

Department Managers

Ensure that all employees (including contractors and visitors) working under their control are aware of the need to follow this procedure.

Managers of Contractors

Ensure that all employees (including sub-contractors and visitors) workings under their control are aware of the need to follow this procedure.

Contractor Companies

Ensure that all employees (including sub-contractors and visitors) workings under their control are aware of the need to follow this procedure. Contractor companies are responsible for their own employee's costs associated with any incident.

REVISION	DOCUMENT NAME	PAGE NO.	DATE	AUTHOR
2	D:\MECHANICAL WEB SITE\5 REPORTS AVAILABLE\FIPROTOCOL.DOC	PAGE 3 OF 1	21/11/2002.	M.S.O.-M

6.0 PROCEDURE

Any person (whether employee or contractor or visitor) receiving fluid injected under the skin, no matter how small, during the course of their work is required to follow the procedure listed below.

- Step 1:** The employee should, if possible, make the area safe to prevent other employees from also receiving a fluid injected injury.
Call for an ambulance to transport the employee to hospital.
First Aid treatment given at the mine would consist of gentle cleaning of the injured part, immobilise and elevate the affected limb to a comfortable position.
Rest the patient to avoid anxiety.
The patient should NOT be given food or fluids as they must remain fasted in anticipation of anaesthesia and surgery being required.
- Step 2:** Transport the causality to the surface first aid room.
Attach the following documents to the patient and a copy to the ambulance.
- Dear Doctor Letter.
 - Additional Information from Sydney Hospital, “High Pressure Injection Injury of a Hand”.
 - Injuries involving High Pressure Injection.
 - Material Safety Data Sheet of the fluid involved eg hydraulic oil safety data sheet.
- Step 3:** The employees must not be left alone or allowed to drive themselves to the medical facility. Repeat baseline observation every 20-30 minutes especially if suspicious of systemic infection (into blood stream).
- Step 4:** Upon arriving at the hospital, the employee should report that **“I’m an employee of (..company..) at (...location ...) where I received a fluid injection injury about XX minutes ago. I’m here for a medical assessment”**.
- Step 5:** When the doctor arrives, the employee should hand over the INFORMATION KIT for HIGH PRESSURE INJECTION INJURIES and “Dear Doctor” form for the doctor’s information and assessment. A medical check of the injury will be performed. If considered necessary, the doctor may require the person to be admitted for observation or surgery if required. The medical facility should then advise the injured employee’s family of the situation.
- Step 6:** If following the medical examination and investigations the patient is not admitted they will be driven back to work.
- Step 7:** Upon arrival back at work, the person should report to the Medical Centre and advise the Supervisor of the results of the investigation.

7.0 DOCUMENTATION

All proposals to modify this procedure should be sent to the Mines Corporate SH&E Manager.

8.0 ATTACHMENTS

Attachment 1: “Dear Doctor ...” form (***** Works)

REVISION	DOCUMENT NAME	PAGE NO.	DATE	AUTHOR
2	D:\MECHANICAL WEB SITE\5 REPORTS AVAILABLE\FIPROTOCOL.DOC	PAGE 4 OF 1	21/11/2002.	M.S.O.-M

Appendix 1: Letter to the Doctor.

“Dear Doctor ...” form (Works Site)

WORKS NAME

Road
Suburb
Town, NSW
P.O. Box **,
Suburb, NSW 2***
Phone
Fax:

Date: _____

Dear Doctor,

The patient _____ you are assessing has a fluid injection injury.
(PLEASE PRINT NAME)

He/she received a fluid (oil) injection injury atam/pm .../...../..... The mines First Aid Management System require our employees to have a medical assessment to check for any medical complications regarding this incident.

Their baseline observations at _____ am/pm were:

Pulse: _____ Blood pressure: _____ Temperature: _____

He/she is complaining of:

1. Sydney Hand Unit Phone No: 02 9382 7201. (24 hour advice).
Note: If the employee is required to be admitted to the hospital for observation overnight, please contact the company and advise of the situation.
2. Royal North Shore Hospital Phone No. 02 9926 7111.
3.Mine Phone No:.....

REVISION	DOCUMENT NAME	PAGE NO.	DATE	AUTHOR
2	D:\MECHANICAL WEB SITE\5 REPORTS AVAILABLE\FIPROTOCOL.DOC	PAGE 5 OF 1	21/11/2002.	M.S.O.-M

Appendix 2- ADDITIONAL INFORMATION



**INJECTION OF HIGH PRESSURE HYDRAULIC OIL:
ADDITIONAL INFORMATION RELATED TO
SAFETY ALERT No. SA98-08 (November 1998)**

Background information

The high pressure injection of a fluid such as hydraulic oil, grease and paint constitutes a medical and surgical emergency, requiring access to appropriate specialist surgical expertise as soon as possible. This comment is consistent with the document "INJURIES INVOLVING HIGH PRESSURE INJECTION" which was attached to SA98-08 (distributed November 1998).

The injury sustained in a high pressure injection incident is usually worse than it will first appear. The injury is relatively rare and it may be that some medical practitioners or hospital services will not be alert to the severity of an injury of this type.

Dr Ian Isaacs, Director of the Sydney Hospital Hand Unit, has provided advice on the response to 'High Pressure Injuries of the Hand', and this is included as Attachment 1.

The injured person will generally require specialist surgery or hand surgery services. Such services will usually be available through the Accident and Emergency Department at a major public health system teaching hospital or, as appropriate, through a specialist Hand Clinic. Urgent transport to the appropriate service is required. The locations of such services in NSW are indicated in Attachment 2.

Where Emergency Transport is required for a person working in a remote area, a local medical officer or service can usually arrange this more effectively than a work site representative or the injured individual. However, if establishing contact with a local medical officer or service entails any delay, contact can be made direct with the specialist services.

Issues for mine site consideration and management

Prevention

As indicated in SA98-08 personnel should be made aware of the potential dangers of fluids at high pressure.

Reporting a high pressure fluid injection injury

Mine site personnel should report any incident where they may have received a high pressure fluid injection.

REVISION	DOCUMENT NAME	PAGE NO.	DATE	AUTHOR
2	D:\MECHANICAL WEB SITE\5 REPORTS AVAILABLE\FIPROTOCOL.DOC	PAGE 6 OF 1	21/11/2002.	M.S.O.-M

ADDITIONAL INFORMATION



Response to an 'Injection of High Pressure fluid' incident

First aid response

As suggested in the attached advice of the Director of the Sydney Hospital Hand Unit.

In addition, there should be clear identification of the injected material, and its chemical constituents if possible, for the information of specialist medical services.

Access to specialist medical services

A person who has sustained a high pressure fluid injection injury requires emergency assessment and/or treatment at specialist medical units (Attachment 2).

Transport to the emergency medical service

The use of emergency medical transport to the specialist service is warranted with a high pressure hydraulic oil or other fluid injection injury. For people in areas remote from the specialist services, local medical officers or medical services may facilitate and speed up access to emergency medical transport.

Where mine sites have their own medical advisers this document and SA98-08 could be discussed with them as part of establishing the work sites' response to the high pressure injection of hydraulic oil or other fluids.

For NSW coal mines the Joint Coal Board doctors are available for discussion of the topic and the work site response if required.

Attachments

Page 8. Advice from the Director of the Sydney Hospital Hand Unit regarding "High Pressure Injection Injuries of the Hand".

Page 9. Specialist Hand Units and major Accident and Emergency units in NSW.

REVISION	DOCUMENT NAME	PAGE NO.	DATE	AUTHOR
2	D:\MECHANICAL WEB SITE\5 REPORTS AVAILABLE\FIPROTOCOL.DOC	PAGE 7 OF 1	21/11/2002.	M.S.O.-M

Appendix 3 Sydney Hospital Information.

**ADDITIONAL INFORMATION
SYDNEY HOSPITAL & SYDNEY EYE HOSPITAL**

Macquarie Street, Sydney, 2000
G.P.O. Box 1614, Sydney, NSW 2001

Our reference: IJ:ejh/II030299
Your reference: 3rd February 1999

Telephone: (02) 9382 7111
Direct: (02) 9382 _____
Facsimile: (02) 9382 7320

Enquiries to:

The Mine Managers
New South Wales Department of Mineral Resources

re: High Pressure Injection Injuries of the Hand

The advice of Sydney Hospital Hand Unit has been sought in updating the protocols for the management of high pressure injection injuries occurring in the hand.

The information that has been distributed is by no means an over-statement of the problems that can arise as a result of such injuries. It needs to be emphasised that high pressure injection injuries to the hands are one of the very few injuries that require prompt and highly specialised treatment to minimise tissue damage and maximise restoration of function. The only effective treatment for high pressure injection injuries is surgical. This invariably will require extensive decompression of the area that has been affected by the injection injuries and this can involve a very extensive area beyond the apparent initial point of entry. The faster the injured worker is able to be transported to a centre that is able to perform this surgical treatment, the better the outcome will be.

The most important consideration at the work-site is the employer and employees to all be aware of these injuries and their potential problems. Prevention remains the best treatment and the safety procedures that you use within the mines, avoiding exposure to hydraulic lines and teaching employees the proper techniques in handling high pressure hoses and components, are paramount.

A high index of suspicion of this injury must be entertained when a worker reports an accident whilst handling such equipment. Make note that the point of entry may look very small and may not bleed. It will usually be on the working surface of the hand, that is, on the pulps of the fingers or towards the palm. The worker may not complain initially of pain but may have a feeling of numbness and tenseness within the affected part. Within a short period following this injury, however, the part usually becomes quite irritated with the worker complaining of throbbing pain which can seem out of proportion to what is visible to the naked eye. Once the diagnosis has been entertained, there is little to be done apart from expediting that worker's transfer to a surgical facility where he can get treatment with the minimum of delay.

The First Aid procedures would consist of gentle cleaning of the part, resting the patient to avoid anxiety, and elevating the affected limb in a comfortable position so that activity of the extremity is minimal. A resting splint applied gently to the wrist would be an advantage. The patient should not be given fluids or food as they must remain fasted in anticipation of anaesthesia and surgery being required.

The urgency of transfer is of the same degree as would be required for an amputation injury where replantation is being considered. In this regard there are some situations where, due to the isolation of the mine, the Occupational Health & Safety Officer at the site may wish to liaise directly with the Specialist Unit for advice re the transfer. The staff at Sydney Hospital Hand Unit would be available 24 hours a day for advice and assistance in expediting treatment of any of your workers suspected of having these injuries.

Ian J. Isaacs FRACS
Director
SYDNEY HOSPITAL HAND UNIT

FACILITIES OF THE SOUTH EASTERN SYDNEY AREA HEALTH SERVICE DTP/283

REVISION	DOCUMENT NAME	PAGE NO.	DATE	AUTHOR
2	D:\MECHANICAL WEB SITE\5 REPORTS AVAILABLE\FIPROTOCOL.DOC	PAGE 8 OF 1	21/11/2002.	M.S.O.-M

ADDITIONAL INFORMATION



SPECIALIST HAND UNITS AND MAJOR ACCIDENT AND EMERGENCY UNITS IN NSW

For a hand injury there are "Hand Clinics" at Sydney Hospital (02 93827201) and Royal North Shore Hospital (02 99267111). These services can be contacted by phone and advice sought when a high pressure fluid injection injury has occurred to a hand.

The Accident and Emergency Services at the major public hospitals are likely to be equipped to deal with high pressure fluid injection injuries. In NSW these hospitals are:

- Royal North Shore Hospital
- The Prince of Wales group of hospitals
- Royal Prince Alfred Hospital
- Westmead Hospital
- Liverpool Hospital
- Nepean Hospital
- Concord Hospital
- John Hunter Hospital

REVISION	DOCUMENT NAME	PAGE NO.	DATE	AUTHOR
2	D:\MECHANICAL WEB SITE\5 REPORTS AVAILABLE\FIPROTOCOL.DOC	PAGE 9 OF 1	21/11/2002.	M.S.O.-M

Appendix 4 Injuries

INJURIES INVOLVING HIGH PRESSURE INJECTION

High pressure injection injuries resulting from inadvertent contact with grease gun tips or leaking hydraulic pipes are a rare occurrence (150 reported cases in the 50 years to 1984 in the UK).

When they do occur the speed of treatment is probably the most important factor in limiting the ultimate severity of the injury.

Injury typically involves pressures well in excess of 1500 psi (10.342 bar) punching a hole in the skin and soft tissue. Pressures below 1000 psi (6.895 bar) are unlikely to be energetic enough to cause an injection unless skin has previously been broken or is healing from a recent injury. After the initial injection, the fluid travels in a narrow stream until a structure of sufficient density (i.e., muscle or bone) is encountered. The fluid then rapidly disperses in all directions. Dependent upon the entry pressure, injected fluid can travel a great distance from the initial site of entry.

Damage at this stage is normally related to physical phenomena such as compression, rupture and impact together with the chemical nature of the injected material.

With lesser injections only a small puncture hole may be apparent often with no bleeding and little or no pain. If the material is a low hydrocarbon such as white spirit or kerosene then local anaesthesia can result as fat and myelin nerve sheaths dissolve. With such injections injecting local anaesthetics will potentiate the effects and so must not be administered. With higher distillates such as those typically used as hydraulic mineral oils, the higher viscosity usually results in less lateral penetration but can be more difficult to remove.

After a short period of time, the body's natural defence mechanism is activated and local swelling, pain and heat is noticed. If the material consists of tissue irritants, as would be the case with soluble hydraulic fluids and to lesser extent with their emulsions, this reaction would be faster than if it were just mineral oil.

Urgent surgical treatment is required to reduce the long term implications of this type of injury. First aid treatment is very limited, being mainly restricted to comforting the casualty until qualified medical assistance can be obtained. The general treatment **would include** decompressive surgery and deep cleansing of the wound and affected tissues, removing as much of the foreign material as possible. Relief of pressure on tissues caused by swelling of damaged tissue is continued after the operation by the application of steroids. The wound is closed after cleaning out all necrotic tissue and debris, with loose sutures to help reduce internal pressure.

Obviously, the treatment of this type of injury is highly individualised, depending to a great extent upon the nature of the fluid (its viscosity, chemical nature, etc.) and the impact pressure. One would expect a greater risk of amputation with low viscosity substances but treatment can be over very extended periods (may be years) with greases. Information concerning systemic toxicity of any injected substance is very sparse and not generally of immediate concern in these instances. However, it is worth noting that certain fluids, namely soluble hydraulics, often contain biocides, alkaline anti corrosion inhibitors and other components, which can have a toxic effect.

Consideration of the quantity which is likely to be injected, however, and relating this to the proportion of toxic substance it can be seen that very little enters the body so, whilst the possibility of toxic effects cannot be discounted, the treatment of the more acute damage caused by the actual injection should be paramount.

It can't be emphasised too much that the eventual severity of the disability is strongly dependent upon the immediacy of treatment. With rapid, effective and educated treatment there is a reduced risk of amputation or loss of function of the limb. Therefore, personnel must be trained to inform supervisors of any injection injury as soon as it happens and to seek urgent immediate medical attention.

REVISION	DOCUMENT NAME	PAGE NO.	DATE	AUTHOR
2	D:\MECHANICAL WEB SITE\5 REPORTS AVAILABLE\FIPROTOCOL.DOC	PAGE 10 OF 1	21/11/2002.	M.S.O.-M
