Περιβαλλοντικές Επιπτώσεις από την Εκμετάλλευση ΟΠΥ – Αποκατάσταση Περιβάλλοντος

Χειμερινό Εξάμηνο Πάτρα 2015

Διδάσκων

Δρ. Σταύρος Καλαϊτζίδης

Λέκτορας

skalait@upatras.gr

Linkedin: gr.linkedin.com/pub/stavros-kalaitzidis/39/7b8/156/

Κοιτασματολογία - Αντικείμενο

Σύγχρονη Θεώρηση

Οικονομική Γεωλογία (Κοιτασματολογία) ***[Economic Geology – Geology of Mineral Deposits – Resource Geology]:***

Είναι ο κλάδος των γεωεπιστημών που αναφέρεται:

- στον εντοπισμό Ορυκτών Πρώτων Υλών,
- την περιγραφή των γεωλογικών – ορυκτολογικών – γεωχημικών χαρακτηριστικών τους και τη μελέτη των συνθηκών γένεσης (**Κοιτασματογένεση**)
- την εκτίμηση της εμπορικής και βιομηχανικής αξίας των ορυκτών πρώτων υλών
- **την εκτίμηση των επιπτώσεων στο περιβάλλον από την εκμετάλλευσή τους**

• Ασκείται ως επάγγελμα από όσους εργάζονται στα μεταλλεία, λατομεία και ορυχεία

• Περιλαμβάνει άπειρα ενδιαφέροντα αντικείμενα για ακαδημαϊκή και εφαρμοσμένη έρευνα.

Διαχρονικά Κύρια Αναπτυξιακή & Επενδυτική Επιλογή

Εθνική Νομοθεσία

1973 Ν.Δ.210/73 «Περί Μεταλλευτικού Κώδικος»

Τροποποιήσεις (π.χ. 274/1976)

2011 ΚΛΜΕ


2539

ΕΦΗΜΕΡΙΣ ΤΗΣ ΚΥΒΕΡΝΗΣΕΩΣ
ΤΗΣ ΕΛΛΗΝΙΚΗΣ ΔΗΜΟΚΡΑΤΙΑΣ

ΕΝ ΑΘΗΝΑΙΣ ΤΗ 5 ΟΚΤΩΒΡΙΟΥ 1973 | ΤΕΥΧΟΣ ΠΡΩΤΟΝ | ΑΡΙΘΜΟΣ ΦΥΛΛΟΥ 277

ΝΟΜΟΘΕΤΙΚΟΝ ΔΙΑΤΑΓΜΑ ΥΠ' ΑΡΙΘ. 210

Περί Μεταλλευτικού Κώδικος.

Ο ΠΡΟΕΔΡΟΣ
ΤΗΣ ΕΛΛΗΝΙΚΗΣ ΔΗΜΟΚΡΑΤΙΑΣ

Προτάσει τοῦ Ἡμετέρου Ὑπουργικοῦ Συμβουλίου, ἀπεφασίσαμεν καὶ διατάσσομεν :

ΚΕΦΑΛΑΙΟΝ Α'
ΓΕΝΙΚΑΙ ΔΙΑΤΑΞΕΙΣ

Ἄρθρον 1.
Ὀρυκτὰ ὕλαι.

Διὰ τὴν ἐφαρμογὴν τοῦ παρόντος αἱ ὀρυκταὶ ὕλαι ὡς αὗται εὑρίσκονται εἰς τὴν φύσιν, διακρίνονται ἀπὸ νομικῆς ἀπόψεως, εἰς μεταλλευτικὰ ὀρυκτὰ ἢ μεταλλεύματα καὶ εἰς λατομικὰ ὁμοιά.

Ἄρθρον 2.

6) Οἱ ὀβριγανόμπρακκες παντὸς εἴδους ἐν στερεᾷ, ὑγρᾷ ἢ ἀερώδει καταστάσει, ὡς καὶ τὰ προϊόντα ἐξευδαίσεως αὐτῶν (ἀζοκηρίτης, ἀσφαλτος, τισσάσφαλτος, πισσασφάλταρμοι ἀσβεστόλιθοι κτλ. κτλ.).
ι) Αἱ ραντινώδεις ὁμοιαὶ ὕλαι.
ια) Τὸ ἐφέριον ἅλυον καὶ τὰ γηγενῆ ἀέρια.
ιβ) Οἱ ουσιακοὶ ἀτμοὶ (πηγαὶ γεωθερμικῆς ἐνεργείας).

2. Ὁρυκτὸς ὡς μεταλλευτικὰ ὀρυκτὰ ἢ μεταλλεύματα θεωροῦνται αἱ ἐν ἄρθρῳ 5 τοῦ κειμένου ὁρυκταὶ ὕλαι ἐφ' ὅσον ἐξ αὐτῶν δύνανται νὰ ἀπαλληρθοῦν καὶ νὰ ἀποτεσσουν ἀντικειμένου οἰκονομικῆς ἐκμεταλλεύσεως τὰ ἐν τῇ παραγομένῃ παραγράφῳ μεταλλευτικὰ ὀρυκτά, δι' ἐφαρμογῆς μηχανῶν ἢ χημικῶν ἢ θερμικῶν ἢ μεταλλουργικῶν μεθόδων.

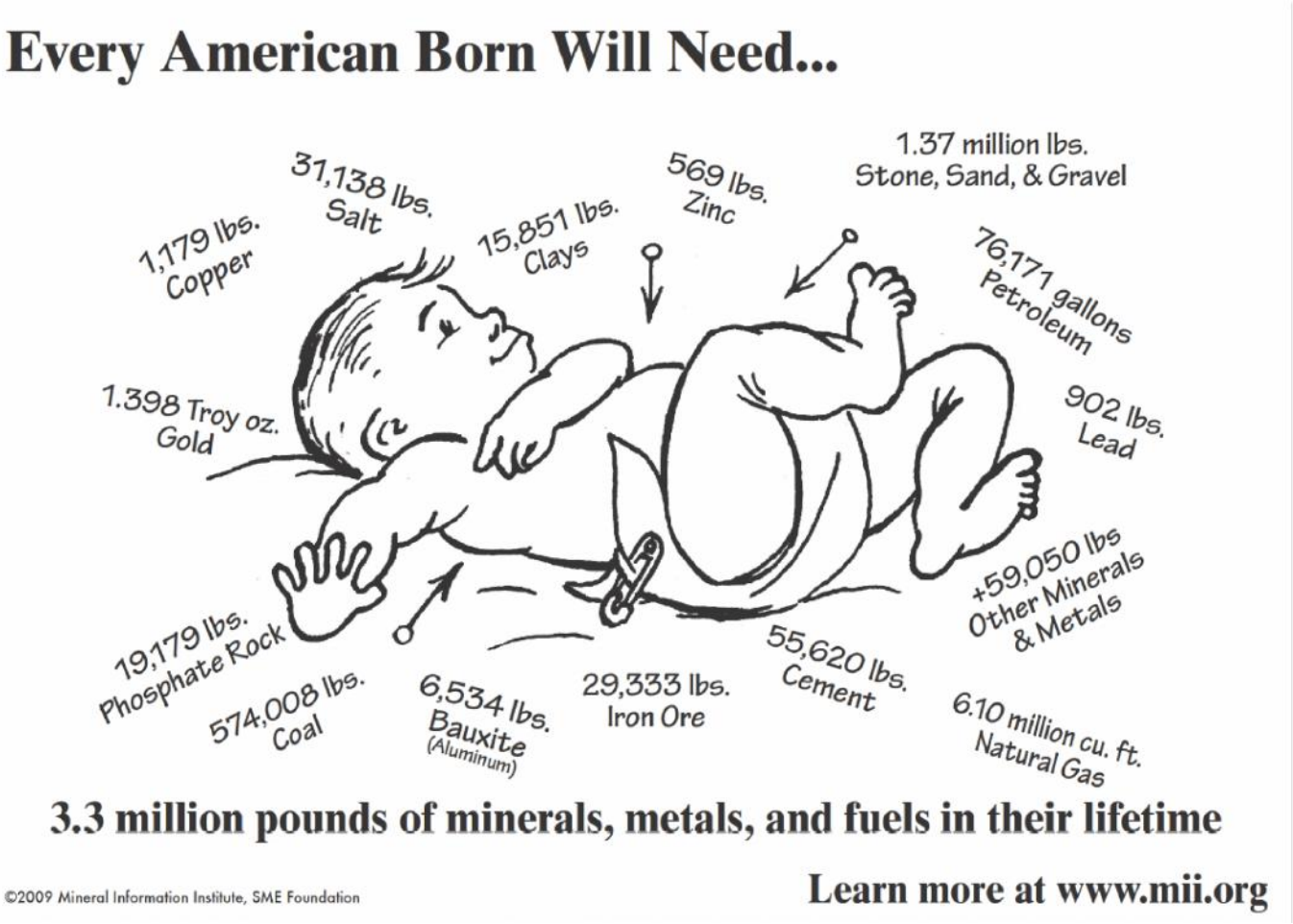
3. Αἱ διατάξεις τῆς προηγουμένης παραγράφου δὲν ἐφαρμόζονται ἐπὶ χώρων ἐντὸς τῶν ὁποίων ἐκτελοῦνται ἐργασίαι ἐκμεταλλεύσεως τῶν ἐν ἄρθρῳ 5 τοῦ παρόντος Ν. Ὕλαι ὁρικτῶν ὑλῶν, συμφώνως πρὸς τὰς περὶ ἐκμεταλλεύσεως τῶν λατομείων κειμένας διατάξεις.

Άρθρο 101: Περιεχόμενο μελέτης

- ✓ **ε. γ)** Υπολογισμός αποθεμάτων ορυκτών υλών, ανάλογα με το είδος τους και κατάταξή τους σε συγκεκριμένη κατηγορία με βάση τα ορυκτολογικά, πετρολογικά, μηχανικά κτλ χαρακτηριστικά τους, τις φυσικοχημικές ιδιότητες, την περαιτέρω επεξεργασία και χρήση τους.
- ✓ **ε. δ)** Επιλογή μεθόδου για την εκμετάλλευση του κοιτάσματος και υπολογισμός των απολήψιμων αποθεμάτων.

Γιατί Κοιτασματολογία;

Οι ορυκτές ύλες είναι απαραίτητες στον άνθρωπο



(Από Σκαρπέλη, 2012)

Χρήσιμες Ιστοσελίδες

Canadian Institute of Mining, Metallurgy and Petroleum
http://www.cim.org/

AUSIMM The Minerals Institute
http://www.ausimm.com.au/

http://www.saimm.co.za/

http://www.mining.com/

http://www.geotee.gr/

http://www.geosociety.gr/

http://web.tee.gr/

http://www.geologist.gr/

http://www.sme.gr

http://www.segweb.org/

Σύνδεσμος Μεταλλευτικών Επιχειρήσεων

http://www.sme.gr

Μεταλλοφορία (mineralization)

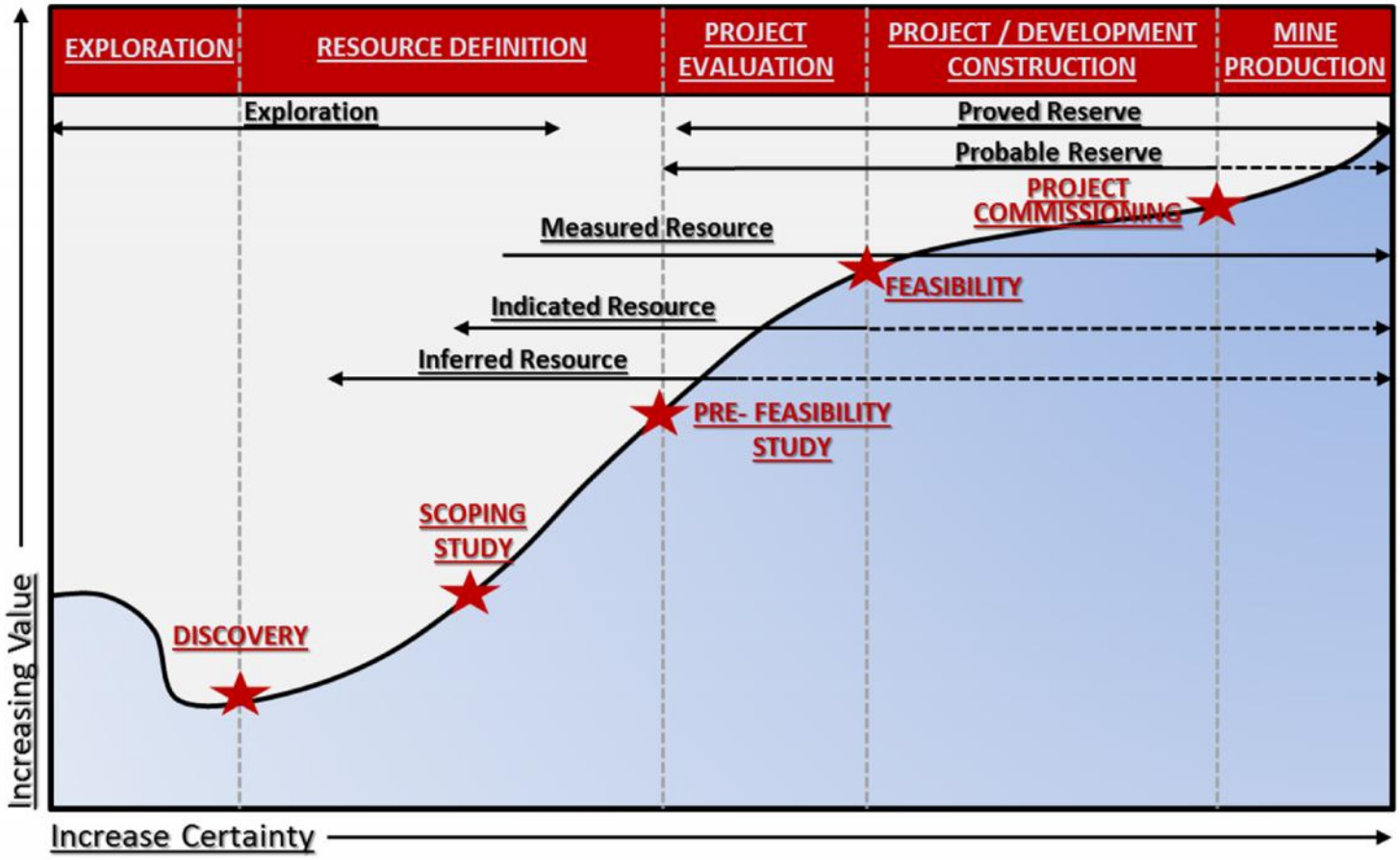
- **Κοιτασματολογία [Οικονομική Γεωλογία]**

Επιστημονικά Περιοδικά

Title	SJR	H index	Country
Economic Geology	2.271	62	United States
Petroleum Exploration and Development	1.881	19	Netherlands
Ore Geology Reviews	1.451	44	Netherlands
Marine and Petroleum Geology	1.189	61	Netherlands
International Journal of Coal Geology	1.18	60	Netherlands
Petroleum Geoscience	0.962	33	United Kingdom
Journal of Geochemical Exploration	0.871	47	Netherlands
Mineral Processing and Extractive Metallurgy Review	0.503	15	United Kingdom
Physicochemical Problems of Mineral Processing	0.378	8	Poland
Petroleum Science	0.362	9	China
Annales Societatis Geologorum Poloniae	0.334	10	Poland
Gospodarka Surowcami Mineralnymi / Mineral Resources Management	0.303	6	Poland
Xitong Gongcheng Lilun yu Shijian/System Engineering Theory and Practice	0.297	20	China
Lithology and Mineral Resources	0.264	9	Russian Federation
Anuario do Instituto de Geociencias	0.249	3	Brazil
Revista Escola de Minas	0.232	6	Brazil
Rocks and Minerals	0.206	4	United Kingdom
Bulletin of Mineralogy Petrology and Geochemistry	0.19	12	China
International Coal Preparation Congress 2010, Conference Proceedings	0.163	3	United States
AAPG Memoir	0.16	22	United States
Special Paper - Geological Survey of Finland	0.156	12	Finland
Handbook of Petroleum Exploration and Production	0.121	1	Netherlands
Solutions to Coastal Disasters 2011 - Proceedings of the 2011 Solutions to Coastal Disasters Conference	0.12	1	United States
Exploration and Research for Atomic Minerals	0.118	7	India
Japanese Magazine of Mineralogical and Petrological Sciences	0.11	3	Japan
Mining History	0.102	5	United Kingdom
Bulletin Mineralogicko-Petrologickeho Oddeleni Narodniho Muzea v Praze	0.101	0	Czech Republic
Geotermia - Revista Mexicana de Geoenergia	0.1	4	Mexico
Mining Magazine	0.1	4	United Kingdom

http://www.scimagojr.com/journalrank.php?category=1905

increasing levels of geological confidence and techno-economic studies from concept to execution



Source: *Noppe, M. & De Klerk, I., 2013. Resource classification and confidence assessment – practical first steps using geostatisctics. AIG Technical Talk, July 2013, Brisbane Australia.*

Job Safety Analysis

- A job safety analysis (JSA) is a procedure which helps integrate accepted safety and health principles and practices into a particular task or job operation.
- In a JSA, each basic step of the job is to identify potential hazards and to recommend the safest way to do the job. Other terms used to describe this procedure are job hazard analysis (JHA) and job hazard breakdown.
- Some individuals prefer to expand the analysis into all aspects of the job, not just safety. This approach is known as total job analysis.
- Methodology is based on the idea that safety is an integral part of every job and not a separate entity.
- The terms "job" and "task" are commonly used interchangeably to mean a specific work assignment, such as "operating a grinder," "using a pressurized water extinguisher," or "changing a flat tire."
- JSAs are not suitable for jobs defined too broadly, for example, "overhauling an engine"; or too narrowly, for example, "positioning car jack."

http://www.ccohs.ca

Job Safety Analysis

What are the benefits of doing a Job Safety Analysis?

One of the methods used in this example is to observe a worker actually perform the job.

The major advantages of this method include that it does not rely on individual memory and that the process prompts recognition of hazards. For infrequently performed or new jobs, observation may not be practical.

One approach is to have a group of experienced workers and supervisors complete the analysis through discussion.

A JSA, or better still, a **written work procedure** based on it, can form the basis for regular contact between supervisors and workers.
It can serve as a teaching aid for initial job training and as a briefing guide for infrequent jobs.
It may be used as a standard for health and safety inspections or observations.
In particular, a JSA will assist in **completing comprehensive accident investigations**.

http://www.ccohs.ca

Job Safety Analysis

What are the four basic steps?

Four basic stages in conducting a JSA are:

1. selecting the job to be analyzed
2. breaking the job down into a sequence of steps
3. identifying potential hazards
4. determining preventive measures to overcome these hazards

http://www.ccohs.ca

Job Safety Analysis

What is important to know when "selecting the job"?

Ideally, all jobs should be subjected to a JSA.

In some cases there are practical constraints posed by the amount of time and effort required to do a JSA.

Another consideration is that each JSA will require revision whenever equipment, raw materials, processes, or the environment change.

For these reasons, it is usually necessary to identify which jobs are to be analyzed.

Even if analysis of all jobs is planned, this step ensures that the most critical jobs are examined first.

http://www.ccohs.ca

Job Safety Analysis

What is important to know when "selecting the job"?

Factors to be considered in setting a priority for analysis of jobs include:

Accident frequency and severity: jobs where accidents occur frequently or where they occur infrequently but result in disabling injuries.

Potential for severe injuries or illnesses: the consequences of an accident, hazardous condition, or exposure to harmful substance are potentially severe.

Newly established jobs: due to lack of experience in these jobs, hazards may not be evident or anticipated.

Modified jobs: new hazards may be associated with changes in job procedures.

Infrequently performed jobs: workers may be at greater risk when undertaking non-routine jobs, and a JSA provides a means of reviewing hazards.

http://www.ccohs.ca

Job Safety Analysis

How do I break the job into "basic steps"?

After a job has been chosen for analysis, the next stage is to break the job into steps. A job step is defined as a segment of the operation necessary to advance the work.

Sequence of Events	Potential Accidents or Hazards	Preventive Measures
Park vehicle		
Remove spare and tool kit		
Pry off hub cap and loosen lug bolts (nuts)		
And so on.....		

Care must be taken not to make the steps too general. Missing specific steps and their associated hazards will not help. On the other hand, if they are too detailed, there will be too many steps. A rule of thumb is that most jobs can be described in less than ten steps.
If more steps are required, you might want to divide the job into two segments, each with its separate JSA, or combine steps where appropriate. As an example, the job of changing a flat tire will be used in this document.
An important point to remember is to keep the steps in their correct sequence. Any step which is out of order may miss serious potential hazards or introduce hazards which do not actually exist.
Each step is recorded in sequence. Make notes about what is done rather than how it is done. Each item is started with an action verb.

http://www.ccohs.ca

Job Safety Analysis

How do I "identify potential hazards"?

Based on observations of the job, knowledge of accident and injury causes, and personal experience, list the things that could go wrong at each step.

At this stage, no attempt is made to solve any problems which may have been detected.

To help identify potential hazards, the job analyst may use questions such as these (this is not a complete list):

Can any body part get caught in or between objects?

Do tools, machines, or equipment present any hazards?

Can the worker make harmful contact with moving objects?

Can the worker slip, trip, or fall?

Can the worker suffer strain from lifting, pushing, or pulling?

Is the worker exposed to extreme heat or cold?

Is excessive noise or vibration a problem?

Is there a danger from falling objects?

Is lighting a problem?

Can weather conditions affect safety?

Is harmful radiation a possibility?

Can contact be made with hot, toxic, or caustic substances?

Are there dusts, fumes or vapours in the air?

Job Safety Analysis

Potential hazards are listed in the middle column of the worksheet, numbered to match the corresponding job step. For example:

Sequence of Events	Potential Accidents or Hazards	Preventive Measures
Park vehicle	a) Vehicle too close to passing traffic b) Vehicle on uneven, soft ground c) Vehicle may roll.	
Remove spare and tool kit	a) Strain from lifting spare.	
Pry off hub cap and loosen lug bolts (nuts).	a) Hub cap may pop off and hit you b) Lug wrench may slip	
And so on.....	a) ...	

http://www.ccohs.ca

Job Safety Analysis

How do I "determine preventive measures?"
The final stage in a JSA is to determine ways to eliminate or control the hazards identified. The generally accepted measures, in order of preference, are:

1. Eliminate the hazard
This is the most effective measure. These techniques should be used to eliminate the hazards:
Choose a different process
Modify an existing process
Substitute with less hazardous substance
Improve environment (ventilation)
Modify or change equipment or tools

2. Contain the hazard
If the hazard cannot be eliminated, contact might be prevented by using enclosures, machine guards, worker booths or similar devices.

http://www.ccohs.ca

Job Safety Analysis

How do I "determine preventive measures?"

3. Revise work procedures

Consideration might be given to modifying steps which are hazardous, changing the sequence of steps, or adding additional steps (such as locking out energy sources).

4. Reduce the exposure

These measures are the least effective and should only be used if no other solutions are possible.

One way of minimizing exposure is to reduce the number of times the hazard is encountered. An example would be modifying machinery so that less maintenance is necessary.

The use of appropriate personal protective equipment may be required.

To reduce the severity of an accident, emergency facilities, such as eyewash stations, may need to be provided.

In listing the preventive measures, do not use general statements such as "be careful" or "use caution".

Specific statements which describe both what action is to be taken and how it is to be performed are preferable. The recommended measures are listed in the right hand column of the worksheet, numbered to match the hazard in question.

http://www.ccohs.ca

Job Safety Analysis

Sequence of Events	Potential Accidents or Hazards	Preventive Measures
Park vehicle	a) Vehicle too close to passing traffic b) Vehicle on uneven, soft ground c) Vehicle may roll.	a) Drive to area well clear of traffic. Turn on emergency flashers b)Choose a firm, level parking area c) Apply the parking brake; leave transmission in PARK; place blocks in front and back of the wheel diagonally opposite to the flat
Remove spare and tool kit	a) Strain from lifting spare.	a) Turn spare into upright position in the wheel well. Using your legs and standing as close as possible, lift spare out of truck and roll to flat tire.
Pry off hub cap and loosen lug bolts (nuts).	a) Hub cap may pop off and hit you b) Lug wrench may slip	a) Pry off hub cap using steady pressure b) Use proper lug wrench; apply steady pressure slowly.
And so on.....	a) ...	a) ...

http://www.ccohs.ca

Job Safety Analysis

Job Safety Analysis

PROBABILITY FACTOR		CONSEQUENCE SEVERITY				
		Level 1 Low	Level 2 Minor	Level 3 Moderate	Level 4 Major	Level 5 Critical
A	Happens often	High	High	Extreme	Extreme	Extreme
B	Could easily happen	Moderate	High	High	Extreme	Extreme
C	Could happen and has occurred here or elsewhere	Low	Moderate	High	Extreme	Extreme
D	Hasn't happened yet but could.	Low	Low	Moderate	High	Extreme
E	Conceivable, but only in extreme circumstances	Low	Low	Moderate	High	High
		TOLERABLE	ALARP	ALARP	INTOLERABLE	

Job Safety Analysis

ESTABLISH THE CONSEQUENCE OR SEVERITY AND ASSIGN A RATING OF LEVEL 1 TO 5

Consequence	Injury	Property Damage or Process Loss	Environmental Impact (eg hydrocarbon spills)
Level 1 Low	Very low short term injury. Minor injury or report only	Low financial loss (<$20,000)	Limited damage to minimal area of low significance.
Level 2 Minor	Reversible disability or impairment. (eg Disabling and short term lost time injuries)	Medium financial loss ($20,000 - $200,000)	Minor effects on biological or physical environment.
Level 3 Moderate	Moderate irreversible disability or impairment (<30%).	High financial loss ($200,000 - $2M)	Moderate short term effects but not affecting eco-system.
Level 4 Major	Single fatality and/or severe irreversible disability (>30%).	Major financial loss ($2M - $20M)	Serious medium term environmental effects
Level 5 Critical	Multiple fatality and/or significant irreversible effects to >50 people	Financial loss (>$20M)	Very serious long term environmental - impairment of eco-system

Job Safety Analysis

ESTABLISH THE PROBABILITY FACTOR OF THE EVENT			
		Description	Frequency examples
A	Almost Certain	Happens often	More than 1 event per month
B	Likely	Could easily happen	More than 1 event per year
C	Possible	Could happen and has occurred here or elsewhere	1 event per 1 to 10 years
D	Unlikely	Hasn't happened yet but could.	1 event per 10 to 100 years (eg within a single mine life)
E	Rare	Conceivable, but only in extreme circumstances	Less than 1 event per 100 years (eg within life of BMA)

Job Safety Analysis

BMA uses the diagram below to evaluate risks.

Job Safety Analysis

Implementing Hazard Controls

On the scale below, elimination is the most effective control and PPE is the least effective control. Administration and PPE rely on a change of behaviour, which leaves the possibility that workers may not follow the administrative procedure or wear the prescribed PPE. Therefore they may still be injured.