ច្បាប់សុវត្ថិភាពការដ្ឋានរ៉ែនៃព្រះរាជាណាចក្រកម្ពុជា(សេចក្តីព្រាង)

The primary draft of Mine Safety Law in Kingdom of Cambodia

カンボジア王国の鉱山保安法（原案）

April 10, 2015

ជំពូក១ ទូទៅ

(គោលបំណងនៃច្បាប់)

មាត្រា១ ច្បាប់នេះមានទំនាក់ទំនងជាមួយនឹង「ច្បាប់ស្តីពី ការគ្រប់គ្រងនិងធ្វើអាជីវកម្មធនធានរ៉ែ 」មានគោលបំណង ទប់ស្កាត់គ្រោះថ្នាក់ចំពោះកម្មកររ៉ែ ទប់ស្កាត់ការបំពុលដោយសាររ៉ែនៅក្នុងព្រះរាជាណាចក្រកម្ពុជា និងព្រមទាំងការអភិវឌ្ឍធនធានរ៉ែឲ្យបានត្រឹមត្រូវតាមលក្ខណៈបច្ចេកទេស ។

Chapter Ⅰ General provisions

(Purpose of the law)

Article 1

The law aims to prevent injuries to mineworkers, to prevent mine pollution and to promote rational development of mineral resources in consonance with the Law on Management and Exploitation of Mineral Resources in the Kingdom of Cambodia.

第一章　総　則

（法律の目的）

第１条

この法律は、「鉱物資源の管理及び利用に関する法律」と相俟って、カンボジア王国における鉱山労働者に対する危害の防止とともに鉱害を防止し、鉱物資源の合理的開発を図ることを目的とする。

(និយមន័យនៃពាក្យ)

មាត្រា២

ពាក្យដែលត្រូវបានឲ្យនិយមន័យនិងប្រើក្នុងច្បាប់នេះ មានការពន្យល់ដូចខាងក្រោម៖

1 「អាជ្ញាប័ណ្ណការងាររ៉ែ」គឺជាលិខិតអនុញ្ញាតឲ្យជីកយករ៉ែដែលបានចេញដោយរដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែ ដែលមាន៦ប្រភេទគឺ អាជ្ញាប័ណ្ណសិប្បកម្មធនធានរ៉ែ អាជ្ញាប័ណ្ណអណ្តូងរ៉ែបើកនិងការដ្ឋានវាយថ្ម អាជ្ញាប័ណ្ណអាជីវកម្មរ៉ែត្បូងថ្មមានតម្លៃ អាជ្ញាប័ណ្ណកែច្នៃធនធានរ៉ែ អាជ្ញាប័ណ្ណស្វែងរុករករ៉ែ និងអាជ្ញាប័ណ្ណ ឧស្សាហកម្មអាជីវកម្មធនធានរ៉ែ ។

2 「ម្ចាស់សិទ្ធិការងាររ៉ែ」គឺបុគ្គល ឬក្រុមហ៊ុនដែលមានអាជ្ញាប័ណ្ណសំរាប់អនុវត្តការងាររ៉ែ ដោយមន្ទីររ៉ែនិង

ថាមពលឬដោយរដ្ឋមន្ត្រីទទួលបន្ទុកការងារ។

ក៏ប៉ុន្តែ ស្តីពីអាជ្ញាប័ណ្ណទាក់ទងនឹងការជីករ៉ែក្នុងលក្ខណៈបែបសិប្បកម្ម នឹងត្រូវចេញចំពោះជនជាតិកម្ពុជាតែប៉ុណ្ណោះ។

3 「ការងាររ៉ែ」គឺមានដូចជា សកម្មភាពបុរេសនាស្វែងរុករក ការរុករក ការយករ៉ែ និងដែលអនុលោមនៃការងារមុននេះ គឺការងារជ្រើសរើសរ៉ែ ការងាររំលាយរ៉ែ ការងារចំរាញ់រ៉ែ ក៏ដូចជាការងារគ្រប់គ្រងទំនប់អាចម៍រ៉ែ និងការងារស្តារឡើងវិញនៃទីកន្លែងដែលបានជីកយករ៉ែរួច ។

4 「ការដ្ឋានរ៉ែ」គឺជាទីកន្លែងធ្វើការអនុវត្តការងាររ៉ែ។

5 「កម្មកររ៉ែ」គឺជាអ្នកដែលត្រូវបានឲ្យធ្វើការដោយម្ចាស់សិទ្ធិការងាររ៉ែ និងអនុវត្តការងាររ៉ែ នៅក្នុងការដ្ឋានរ៉ែ។

6 「ការងារទប់ស្កាត់ការបំពុលដោយរ៉ែ」គឺជាការងារដាំស្មៅ ដើមឈើឬលុបដីគ្រប ទៅលើកន្លែងគរថ្មចោល កន្លែងគរផ្ទុកអាចម៍រ៉ែ និងកន្លែងគរផ្ទុកកាកសំណល់រងដែលចេញមកពីអគារចំរាញ់ទឹកនៃការដ្ឋានរ៉ែក្រោមដី ឬកន្លែងជ្រើសរើសរ៉ែ ការងារលុបបិទច្រកផ្លូវចូលទៅក្នុងការដ្ឋានរ៉ែក្រោមដី ព្រមទាំង ស្ថានភាពនៃការបំពុលនៅក្រោយបានបញ្ចប់ប្រតិបត្តិការនៃអគារ ការងារធ្វើការចំរាញ់ជានិរន្តភាពចំពោះទឹកកខ្វក់ ឬទឹកក្នុងការដ្ឋានរ៉ែក្រោមដែលបរិមាណទឹកនោះមិនត្រូវនឹងស្តង់ដាដែលបានកំណត់។

(Definition)

Article 2

Terms used in this law shall be interpreted as follows:

1 “Mineral licenses are classified into six categories: “artisanal mining licenses” are issued by the states or provincial governments that have jurisdiction over the mineral sector in the region in question, while “pits and quarries mining licenses,” “gem mining licenses,” “mineral (gemstone) cutting licenses,” “mineral exploration licenses” and “industrial mining licenses” are issued by the minister in charge of the mines sector.

2 “The concessionaire” is the individual or legal entity (corporation) that possesses a license to carry out mineral-related operations, issued by provincial departments or the minister in charge of mines sector.

However, “artisanal mining licenses” shall be issued only to Cambodian citizens.

3 “Mineral-related operations” means projects related to the prospecting, exploration and exploitation of minerals, accompanying projects such as the processing, refining and smelting of minerals, as well as projects related to management of tailings dam and restoration of former mine sites.

4 “Mine” means any place of work where mineral-related operations are carried out.

5 “Mineworker” means a person employed by the concessionaire to occupy with mineral-related operations at a mine.

6 “Mine pollution prevention projects” means projects concerning the vegetation and soil covering of waste stone dumps, slag dumps, and tailings dams attached to processing plants and mine-water treatment facilities, as well as projects related to blockage of the drifts, and those related to the perpetual treatment of mine- and waste-water from

facilities that are no longer used, which fail to meet water quality standards concerning contamination levels and amounts.

（用語の解釈）

第２条

本法において定義された用語は、以下のとおり解釈する。

１「鉱物事業許可書」は、対象地域が所在する鉱物部門を管轄する州又は地方自治体によって発行される手工業採掘許可書、鉱物部門を所管する大臣によって発行される、石材採掘許可書、宝石採掘許可書、鉱物（宝石原石）切削許可書、鉱物探査許可書及び産業採掘許可書の計６種類に分類される。

２　「鉱物事業権所有者」とは、対象地域が所在する鉱物部門を管轄する州又は地方自治体によって発行される鉱物事業を行うための許可書を所有する個人のほか、鉱物部門を所管する大臣によって発行される鉱物事業を行うための許可書を所有する個人又は法人をいう。

但し、手工業採掘に係る許可書については、カンボジア国民に限り発行される。

３　「鉱物事業」とは、概査、探査及び採鉱の事業、これに附属する選鉱、金属溶解及び製錬の事業並びにダム尾鉱及び採掘跡地の復旧の事業をいう。

４　「鉱山」とは、鉱物事業を行う事業場をいう。

５　「鉱山労働者」とは、鉱物事業権所有者に雇用され、鉱山において鉱物事業に従事する者をいう。

６　「鉱害防止事業」とは、捨石集積場、選鉱場又は坑内水の処理施設に附属する沈殿物の集積場及び鉱滓集積場の覆土、植栽等の事業、坑道の坑口閉塞の事業並びに施設の終了後においても汚染の状態、量が規定された基準に適合しない坑内水又は廃水を永続して処理する事業をいう。

មាត្រា៣

「សុវត្ថិភាព」គឺមានចំនុចផ្សេងៗ ដែលទាក់ទងនឹងការងាររ៉ែដូចមានខាងក្រោម៖

១ ទប់ស្កាត់គ្រោះថ្នាក់ចំពោះមនុស្សនៅការដ្ឋានរ៉ែ។

២ ការការពារធនធានរ៉ែ។

៣ រក្សាសុវត្ថិភាពនៃ ឧករណ៍សម្ភារៈនិង អគារ របស់ការដ្ឋានរ៉ែ។

៤ ទប់ស្កាត់ការបំពុលដោយសាររ៉ែ។

៥ ខ្យល់ឆ្លងកាត់ទាក់ទងនឹងសុខភាព។

៦ ការជួយសង្គ្រោះនៅពេលមានគ្រោះថ្នាក់កើតឡើង។

Article 3

In this law, “safety” indicates the following items concerning mineral-related operations.

1　Prevention of danger and injury to people at mines

2　Preservation of mineral resources

3　Maintenance and management of mine facilities

4　Prevention of mine pollution

5　Sanitation-related ventilation

6 Rescue activities at times of mine disasters

第３条

「保安」とは、鉱物事業に関する次の各号の事項をいう。

一　鉱山における人に対する危害の防止

二　鉱物資源の保護

三　鉱山の施設の保全

四　鉱害の防止

五　衛生に関する通気

六　災害時における救護

(ប្រសិទ្ធភាពចំពោះដំណោះស្រាយ និងវិសាលភាពរបស់ច្បាប់នេះ)

មាត្រា៤

១ ច្បាប់នេះមានប្រសិទ្ធភាពចំពោះ ការងាររ៉ែដែលបានអនុវត្តដោយម្ចាស់សិទ្ធិការងារកំណត់ដោយមាត្រា៤ នៃ「ច្បាប់គ្រប់គ្រងនិងអាជីវកម្មធនធានរ៉」 ឬ ចំពោះឧបករណ៍សម្ភារៈអគារនៃការងាររ៉ែរបស់អតីតម្ចាស់សិទ្ធិការងាររ៉ែ ដែលក្រោយពីអាជ្ញាប័ណ្ណអស់សុពលភាពក្នុងរយៈពេល៥ឆ្នាំ។

២ ស្តីអំពីសកម្មភាពផ្សេងៗនៃបែបបទដែលបានអនុលោមតាមច្បាប់និងការកំណត់នៃច្បាប់នេះ ទោះបីម្ចាស់សិទ្ធការងាររ៉ែបានផ្ទេរទៅឲ្យអ្នកដ៏ទៃក៏ដោយ ក៏បែបបទដែលបានអនុវត្តរួចមកនោះ នៅតែមានប្រសិទ្ធភាពចំពោះអ្នកដែលទទួលការងាររ៉ែបន្ត ដ៏ដែល ។

(Application and validity of the Law)

Article 4

1 This law shall be applicable to the mineral-related operations by the concessionaires as prescribed in Article 4 of the Law on Management and Exploitation on Mineral Resources or the mine facilities which former concessionaires had used for implementing the mineral-related operations within five (5) years after the mineral license has renounced.

2 The penalties prescribed in this law, and procedures and other actions to be carried out by the concessionaire in accordance with the provisions of the law shall also be valid with regard to the concessionaire's successor.

(法律の適用及び処分等の効力)

第４条

１　この法律は、「鉱物資源の管理及び利用に関する法律」第４条に規定される鉱物事業権所有者が行う鉱物事業又は鉱物事業権が消滅してから５年以内の元鉱物事業権所有者が事業を実施した施設に対して適用する。

２　この法律の規定によってした処分及び鉱物事業権所有者がこの法律によってした手続きその他の行為は、鉱物事業権所有者の承継人に対しても、その効力を有する。

ជំពូក២ សុវត្ថិភាព

(កាតព្វកិច្ចនៃម្ចាស់សិទ្ធការងាររ៉ែ)

មាត្រា៥

ម្ចាស់សិទ្ធការងាររ៉ែ ត្រូវតែចាត់វិធានការចាំបាច់សំរាប់ចំនុចនីមួយៗដែលមានដូចខាងក្រោម៖

១ ទប់ស្កាត់នូវ ភាពបាក់ស្រុត ភាពបាក់រលំ ភាពទឹកចេញ ការផ្ទុះនៃ ឧស្ម័នឬធូលីធ្យូងថ្ម ភាពឆេះដោយធម្មជាតិ និងអគ្គិភ័យ នៅក្នុងការដ្ឋានរ៉ែក្រោមដី។

២ ទប់ស្កាត់នូវ បំពុលដោយសាររ៉ែ ឬគ្រោះថ្នាក់ដែលកើតឡើងក្នុងពេលចំរាញ់ផ្សែងរ៉ែ ទឹកកខ្វក់ ទឹកនៅក្នុងការដ្ឋានរ៉ែក្រោមដី អាចម៍រ៉ែ ថ្មចោល ធូលីនិងឧស្ម័ន។

៣ ទប់ស្កាត់នូវ គ្រោះថ្នាក់តាមរយៈការប្រើភ្លើងនិងកំឡាំងម៉ូទ័រ គ្រឿងចក្រ ឧបករណ៍បរិក្ខារសម្ភារៈ ប្រភេទនៃរំសេវ ។

៤ បង្កើតនូវចនាសម្ព័ន្ធនិងវិធានការនៃការសង្គ្រោះ ព្រមទាំងការរក្សា ឲ្យបាននូវផ្លូវខ្យល់ឆ្លងកាត់។

៥ រក្សាការពារធនធានរ៉ែ។

៦ រក្សាសុវត្ថិភាពនៃគ្រឿងចក្រ បរិក្ខារឧបករណ៍ ឧបករណ៍ផលិតកម្ម និងអគារ។

៧ ទប់ស្កាត់នូវបំពុលដោយសាររ៉ែតាមរយៈការខួងដី ។

៨ ទប់ស្កាត់គ្រោះថ្នាក់តាមរយៈការសាងសង់អគារ និងការតំឡើងបរិក្ខារផលិតឬការផ្លាស់ប្តូរនៃការសាងសង់។

Chapter Ⅱ Safety

(Duties and responsibilities of the concessionaire)

Article 5

The concessionaire shall carry out necessary measures to ensure the following:

1 Prevention of rock-falls, collapses, floods, gas outburst, gas or coal dust explosions, spontaneous combustion and fires in mines

2 Prevention of danger and injuries and/or mine pollution due to treatment and disposal of gas, dust, waste stones, slag, mine- and waste-water, and smoke

3 Prevention of damage and injuries related to the handling of machinery and equipment, as well as the handling of explosives, motive power and fires.

4 Establishment of suitable ventilation and rescue mechanisms.

5 Conservation of mineral resources

6 Maintenance and management of machinery, equipment, buildings and structures

7 Prevention of mine pollution due to land excavation

8 Prevention of damage and injuries related to the establishment and/or modification of mine facilities.

第二章 保 安

(鉱物事業権所有者の義務)

第５条

鉱物事業権所有者は、次の各号のため必要な措置を講じなければならない。

一 落ばん、崩壊、出水、ガスの突出、ガス又は炭塵の爆発、自然発火及び坑内火災の防止

二　ガス、粉塵、捨石、鉱滓、坑内水、廃水及び鉱煙の処理に伴う危害又は鉱害の防止
三　機械、器具、火薬類、動力及び火気の取扱いに伴う危害の防止
四　通気の確保及び救護体制
五　鉱物資源の保護
六　機械、器具、建設物及び工作物の保全
七　土地の掘削による鉱害の防止
八　鉱物事業に使用する鉱山施設の設置又は変更の工事に伴う危害の防止

(កាតព្វកិច្ចរបស់កម្មកររ៉ែ)

មាត្រា៦

នៅការដ្ឋានរ៉ែ កម្មកររ៉ែ ដើម្បីសុវត្ថិភាពចាំបាច់ត្រូវតែគោរពតាមចំនុចចាំបាច់ដែលមាន។

(Obligations of mineworkers)

Article 6

Mineworkers must obey items necessary to safety at the mines.

(鉱山労働者の義務)

第６条

鉱山労働者は、鉱山において保安のため必要な事項を守らなければならない。

(ការអប់រំផ្នែកសុវត្ថិភាព)

មាត្រា៧

1　**ម្ចាស់សិទ្ធការងាររ៉ែ នៅក្នុងពេលឲ្យកម្មកររ៉ែអនុវត្តការងារ ចាំបាច់ត្រូវតែអនុវត្តការបណ្តុះបណ្តាលដែលទាក់ទងនឹងសុវត្ថិភាពចាំបាច់ ដល់កម្មករ។**

2　**ស្តីពីការងារមានគ្រោះថ្នាក់ខ្លាំង ដើម្បីសុវត្ថិភាពសំរាប់កម្មកររ៉ែ ការកំរិតចំពោះអ្នកធ្វើការដែលពុំទាន់បានបញ្ចប់ការសិក្សា និងកំរិតការបណ្តុះបណ្តាលនៅមានកំណត់ ការកំហិតនេះនឹងមានកំណត់ក្នុងសេចក្តីប្រកាសរបស់ក្រសួង។**

(Education on mine safety)

Article 7

1　The concessionaire shall educate and train mineworkers with regard to measures necessary for mine safety.

2　With regard to particularly dangerous tasks, the level of education that the mineworker should receive, and the restrictions on the tasks that can be performed by mineworkers who have not received this education, shall be prescribed in ministerial ordinances.

(保安教育)

第７条

1　鉱物事業権所有者は、鉱山労働者にその作業を行うに必要な保安に関する教育を施さなければならない。

2　特に危険な作業について、保安のため鉱山労働者に施すべき教育の程度及びこれを修了しない者の就業の制限は、省令で定める。

(ការកំហិតទាក់ទងនឹងម៉ាស៊ីន បរិក្ខារសំភារៈ។ល។)

មាត្រា៨

1 ម្ចាស់សិទ្ធការងាររ៉ែ តាមបៀបបទកំណត់ដោយសេចក្តីប្រកាសរបស់ក្រសួង ចំពោះគ្រឿងចក្រ បរិក្ខារសម្ភារៈ ឬ ប្រភេទនៃរំសេវនិងវត្ថុធាតុផ្សេង ដែលមានភាពគ្រោះថ្នាក់ខ្លាំង បើមិនបានជាប់តេស្តនៃការត្រួតពិនិត្យ ដោយក្រសួងទទួលបន្ទុកការងាររ៉ែទេ គឺអាចមិនអនុញ្ញាត ឲ្យប្រើឬតំឡើងនៅក្នុងការដ្ឋានរ៉ែក្រោមដី បានឡើយ។

2 រដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែ នៅក្នុងការដ្ឋានរ៉ែ មានការបង្ហាញនូវហេតុផលនៅពេលទទួលស្គាល់មានភាពចាំបាច់ដោយយោងតាមរយៈស្ថានភាពជាក់ស្តែង អាចមានសិទ្ធបញ្ឈប់ការតំឡើង ឬការប្រើរបស់ដែលមានភាពគ្រោះថ្នាក់ខ្លាំងដូចជា ម៉ាស៊ីនគ្រឿងចក្រ ឧបករណ៍សំភារៈ ឬវត្ថុធាតុផ្សេងៗ។ល។នៃប្រភេទរំសេវ បាន។

3 រដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែ ស្តីពីការងារពិនិត្យ យោងតាមរយៈចំនុច 1 អាច ឲ្យស្ថាប័នខាងក្រៅសមរម្យណាមួយ ធ្វើការងារត្រួតពិនិត្យជំនួសបាន។

(Restrictions regarding machinery, equipment and the like)

Article 8

1 The concessionaire shall not use or install in a mine particularly dangerous machinery, equipment, explosives and other materials according to the procedures prescribed by the ministerial ordinances, unless it has passed the examinations set by the Ministry in charge of mines sector.

2 The minister in charge of mines sector has the power to prohibit the use or installation of especially dangerous machinery, equipment, explosives or other materials in mines if, with given reason, it is deemed necessary to ensure safety.

3 The said minister can outsource the examination prescribed in Paragraph 1 above, to a qualified external institution.

(機械、器具等に関する制限)

第８条

1 鉱物事業権所有者は、省令で定める手続きに従い、機械、器具又は火薬類その他の材料であって危険性の大きいものは、鉱物部門を所管する省が行う検定に合格したものでなければ、鉱山の坑内において使用し、又は設置してはならない。

2 鉱物部門を所管する大臣は、鉱山において、実地の状況により保安上必要があるあると認めるときは事由を示して、特に危険性の大きい機械、器具、又は火薬類その他の材料の坑内における使用又は設置を禁止することができる。

3 鉱物部門を所管する大臣は、第１項の規定による検定の事務について、適格な外部機関に行わせることができる。

(ការអនុញ្ញាតិនៃប្លង់អគារ)

មាត្រា៩

1 ម្ចាស់សិទ្ធិការងាររ៉ែ នៅពេលចង់សាងសង់ឬចង់ផ្លាស់ប្តូរនៃការសាងសង់អគារប្រើសម្រាប់ការងាររ៉ែ របស់ផលិតកម្មនិងអគារផ្សេងៗទៀត តាមបៀបបទកំណត់ដោយសេចក្តីប្រកាសរបស់ក្រសួង「បង្កើតប្លង់នៃអគារ」នោះ នឹងត្រូវធ្វើរាយការណ៍ជូនដល់រដ្ឋមន្ត្រីទទួលបន្ទុក និងចាំបាច់ត្រូវទទួលការអនុញ្ញាតិពីសំណាក់រដ្ឋមន្ត្រី

ទទួលបន្ទុកការងាររ៉ែ ជាមុនសិន ទើបអាចអនុវត្តបាន។

2　អគារប្រើសម្រាប់ការងាររ៉ែ ចំនុចដែលត្រូវតែសរសេរលើ「ប្លង់អគារ」ទាក់ទងនឹងនឹងការប្តូរឬតំឡើងអគារផ្សេងៗ និងសម្ភារៈផលិតកម្ម ត្រូវកំណត់ដោយសេចក្តីប្រកាសរបស់ក្រសួង។

3　ម្ចាស់សិទ្ធិការងាររ៉ែ យោងតាមការកំណត់នៃចំនុចមុន មុននឹងចាប់ផ្តើមសាងសង់ ឬធ្វើការផ្លាស់ប្តូរ ការសាងសង់ ចាំបាច់ត្រូវតែរាយការណ៍ដល់រដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែ ឲ្យបានមុន៣០ថ្ងៃជាមុនសិន ។

4　រដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែ ទាក់ទងនឹងការសាងសង់ដែលបានរាយការណ៍តាមរយៈការកំណត់ពីចំនុចមុន មានការបង្ហាញនូវហេតុផលនៅពេលទទួលស្គាល់ថាមានភាពចាំបាច់សំរាប់សុវត្ថិភាព អាចធ្វើការបញ្ជាឲ្យ ម្ចាស់សិទ្ធការងាររ៉ែ ធ្វើការបញ្ឈប់ការសាងសង់ ឬធ្វើផ្លាស់ប្តូរផែនការនោះបាន។

5　ម្ចាស់សិទ្ធការងាររ៉ែ នៅពេលបានបញ្ចប់ការសាងសង់តាមចំនុចទី1 ឬនៅពេលបានបោះបង់ចោលនូវអគារផលិតកម្មផ្សេងៗ ឬអគារនៃចំនុចដូចគ្នា ចាំបាច់ត្រូវតែធ្វើការរាយការណ៍ដល់ រដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែ ឲ្យបានក្នុងរយៈពេល៣០ថ្ងៃ ស្តីពីការគោលបំណង ទាំងនោះ។

(Permission regarding facility plan)

Article 9

1　When the concessionaire establishes or modifies buildings, structures or other facilities for use in mineral-related operations, “facility plan shall be drafted and submitted to the minister in charge of mines sector for permission according to the procedures prescribed by the ministerial ordinance.

2　Items to be included in the “facility plan” for the establishment or modification of buildings, structures or other facilities to be used in mineral-related operations shall be prescribed by the ministerial ordinance.

3　The concessionaire shall submit the plan to the minister in charge of mines sector no later than 30 days before the work is due to begin.

4　The minister has the power to prohibit work on such facilities or order the plan to be modified by the concessionaire if, with given reason, it is deemed necessary to ensure safety.

5　When the plan prescribed in Paragraph 1 above has been completed, or such buildings, structures or other facilities have been scrapped, the concessionaire shall notify the minister within 30 days.

（施設計画書の許可）

第９条

1　鉱物事業権所有者は、鉱物事業に使用する建設物、工作物及びその他の施設の設置又は変更の工事をしようとするときは、省令で定める手続きに従い、「施設計画書」を作成し、鉱物部門を所管する大臣に届け出て、その許可を受けなければならない。

2　鉱物事業に使用する建設物、工作物及びその他の施設の設置又は変更に関して、「施設計画書」に記載すべき事項は、省令で定める。

3　鉱物事業権所有者は、前項の規定による設置又は変更の工事に着手しようとする３０日前までにその計画を鉱物部門を所管する大臣に届け出なければならない。

4　鉱物部門を所管する大臣は、前項の規定による届出があった工事に関し、保安のため

必要があると認めるときは事由を示して、鉱物事業権所有者に対し、その工事の着手を禁止し、又はその計画の変更を命ずることができる。

5　鉱物事業権所有者は、第一項の工事が完成したとき、又は同項の建設物、工作物その他の施設を廃止したときは、３０日以内にその旨を鉱物部門を所管する大臣に届け出なければならない。

(ផ្លូវនៅក្នុងការដ្ឋានរ៉ែក្រោមដី និងទីកន្លែងប្រមូលគទុក)

មាត្រា១០

1　ម្ចាស់សិទ្ធការងាររ៉ែ ស្តីពីផ្លូវនៅក្នុងការដ្ឋានរ៉ែក្រោមដី និងទីកន្លែងគទុកអាចម៍រ៉ែ ទីកន្លែងទុកកាកសំណល រងនៃក្រោយពីការចំរាញ់ទឹកនៅក្នុងការដ្ឋានរ៉ែក្រោមដី ឬទីកន្លែងជ្រើសរើសរ៉ែ ទីកន្លែងទុកថ្មចោល ផ្លូវនៅក្នុងការដ្ឋានរ៉ែក្រោមដី ចាំបាច់ត្រូវតែបង្កើតនូវវិធានការទប់ស្កាត់ការបំពុលដោយរ៉ែ យោងតាមតាមច្បាប់នេះឬតាមរយៈសេចក្តីប្រកាសរបស់ក្រសួងដោយអនុលោមតាមច្បាប់នេះ ទោះបីក្រោយពីបានបោះ បង់ចោល ឬផ្ទេរឲ្យភាគីណាក៏ដោយ ចំបាច់ត្រូវតែចាត់នូវវិធានការនោះជាចំបាច់។

2　នៅពេលមានការផ្ទេរនៃសិទ្ធការងាររ៉ែ អ្នកដែលទទួលការងារបន្តនៃសិទ្ធការងាររ៉ែនោះ ត្រូវធ្វើការបន្តកាតព្វកិច្ចទាក់ទងនឹងផ្លូវក្នុងការដ្ឋានរ៉ែក្រោមដី និងទីកន្លែងទុកកាកសំណលរបស់អតីតម្ចាស់សិទ្ធការងាររ៉ែមុន។

(Dumps and drifts)

Article 10

1　The concessionaire shall maintain and manage waste stone dumps, slag dumps, and tailings dams attached to processing plants and mine- and waste-water treatment facilities, and drifts, as prescribed in this law and ministerial ordinances based on the law, to prevent mine pollution, even if the mineral license has already been transferred or renounced.

2　When the concessionaire transfers the mineral license to a third party, the successor shall implement existing duties and obligations with regard to the dumps, dams and drifts inherited from the previous concessionaire.

（集積場及び坑道）

第１０条

1　鉱物事業権所有者は、この法律又はこの法律に基づく省令により鉱害防止の措置を講じなければならないとされる捨石集積場、選鉱場又は坑内水の処理施設に付属する沈殿物の集積場、鉱滓集積場及び坑道については、これを譲渡し又は放棄した後であっても、その措置を講じなければならない。

2　鉱物事業権の移転があったときは、鉱物事業権所有者の承継人は、当該鉱物事業権所有者の集積場及び坑道に係る義務を承継する。

(បទបញ្ជាផ្ទៃក្នុងនៃសុវត្ថិភាព)

មាត្រា១១

1　ម្ចាស់សិទ្ធការងាររ៉ែ ដើម្បីរក្សា ឲ្យបាននូវសុវត្ថិភាពនៅក្នុងការដ្ឋានរ៉ែ ត្រូវធ្វើការបង្កើតបទបញ្ជាផ្ទៃក្នុងអំពី

សុវត្ថិភាព ហើយចាំបាច់ត្រូវតែរាយការណ៍ស្តីអំពីបទបញ្ជាផ្ទៃក្នុងនៃសុវត្ថិភាពនោះ ដល់រដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែ។

2 ករណីធ្វើការ កំណត់ឬផ្លាស់ប្តូរ「បទបញ្ជាផ្ទៃក្នុងនៃសុវត្ថិភាព」ដោយម្ចាស់សិទ្ធការងាររ៉ែ អនុលោមតាមការកំណត់នៃមាត្រាទី១៦ ចាំបាច់ត្រូវតែដាក់ធ្វើការពិភាក្សាដោយគណៈកម្មាធិការសុវត្ថិភាព។

3 ស្តីពីចំនុចចាំបាច់ដែលត្រូវចែងនៅក្នុង「បទបញ្ជាផ្ទៃក្នុងនៃសុវត្ថិភាព」គឺត្រូវកំណត់ដោយសេចក្តីប្រកាសរបស់ក្រសួង។

4 រដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែ បង្ហាញនូវហេតុផលនៅពេលទទួលស្គាល់ថាមានភាពចាំបាច់សំរាប់សុវត្ថិភាព អាចធ្វើការបញ្ជាឲ្យផ្លាស់ប្តូរ「បទបញ្ជាផ្ទៃក្នុងនៃសុវត្ថិភាព」បាន។

(Safety rules)

Article 11

1 Concessionaires shall establish their own safety rules to ensure safety at the mine, and submit them to the minister in charge of mines sector.

2 When the concessionaire establishes or modifies the safety rules, these rules need to be approved by the safety committee prescribed in Article 16.

3 Items to be included in the safety rules shall be prescribed by the ministerial ordinance.

4 The said minister has the power to order the concessionaire to modify the rules if, with given reason, it is deemed necessary to ensure safety.

（保安内規）

第１１条

1 鉱山の鉱物事業権所有者は、鉱山における保安を確保するため「保安内規」を定め、鉱物部門を所管する大臣に届け出なければならない。

2 鉱物事業権所有者が「保安内規」を定め、又は変更する場合は、第１６条に規定する保安委員会の議に附さなければならない。

3 「保安内規」に記載すべき事項は、省令で定める。

4 鉱物部門を所管する大臣は、保安のため必要があると認めるときは事由を示して、「保安内規」の変更を命ずることができる。

មាត្រា១២

ម្ចាស់សិទ្ធការងាររ៉ែ និងកម្មកររ៉ែ ចាំបាច់ត្រូវតែគោរពតាម「បទបញ្ជាផ្ទៃក្នុងនៃសុវត្ថិភាព」។

Article 12

The concessionaire and mineworkers must obey the said safety rules.

第１２条　鉱物事業権所有者及び鉱山労働者は、「保安内規」を守らなければならない。

(ការជ្រើសរើសអ្នកគ្រប់គ្រងសុវត្ថិភាពរួម អ្នកគ្រប់គ្រងបច្ចេកទេសសុវត្ថិភាព និងអ្នកគ្រប់គ្រងការងារព្រមទាំងអ្នកជំនួសអ្នកគ្រប់គ្រងសុវត្ថិភាពរួម)

មាត្រា១៣

1 ម្ចាស់សិទ្ធការងាររ៉ែ យោងតាមបែបបទនៃការកំណត់សេចក្តីប្រកាសរបស់ក្រសួង នៅការដ្ឋានរ៉ែ ចាំបាច់ត្រូវតែជ្រើសតាំងអ្នកគ្រប់គ្រងសុវត្ថិភាពរួម។

2 អ្នកគ្រប់គ្រងសុវត្ថិភាពរួមនៃចំនុច1មុន ចាំបាច់ត្រូវតែជាអ្នកគ្រប់គ្រងរួម ក្នុងការអនុវត្តការងារ៉ែ នៅក្នុងការដ្ឋានរ៉ែនោះ។

ក៏ប៉ុន្តែ ករណីម្ចាស់សិទ្ធការងារ៉ែ ធ្វើការគ្រប់គ្រងរួមនៃការអនុវត្តការងារ៉ែដោយខ្លួន ឯង សាមីខ្លួននឹងអាចក្លាយទៅជា អ្នកគ្រប់គ្រងសុវត្ថិភាពរួម បាន។

3 ម្ចាស់សិទ្ធការងារ៉ែ ចាំបាច់ត្រូវតែជ្រើសតាំងអ្នកជំនួសអ្នកគ្រប់គ្រងសុវត្ថិភាពរួមជាមុនសិន សំរាប់ ឲ្យអ្នកជំនួសអនុវត្តការងារ ក្នុងករណីអ្នកគ្រប់គ្រងសុវត្ថិភាពរួម អវត្តមានដោយសារ ការឈប់សំរាក់សំរាប់ដំណើរកំសាន្ត មានជំងឺឬដោយសារគ្រោះថ្នាក់ផ្សេងៗ ។

4 ម្ចាស់សិទ្ធការងារ៉ែ នៅពេលបានជ្រើសរើសអ្នកគ្រប់គ្រងសុវត្ថិភាពរួមនិងអ្នកជំនួស ចាំបាច់ត្រូវតែធ្វើការរាយការណ៍ដល់រដ្ឋមន្ត្រីទទួលបន្ទុកការងារ៉ែ។

5 ម្ចាស់អាជីវកម្មរ៉ែដែលមានកម្មករលើសពីចំនួន៣០នាក់ ដើម្បីគ្រប់គ្រងនូវចំនុចបច្ចេកទេសទាក់ទងនឹងសុវត្ថិភាព នៅការដ្ឋានរ៉ែ អាស្រ័យលើការងារ ចាំបាច់ត្រូវតែជ្រើសរើសអ្នកគ្រប់គ្រងបច្ចេកទេសសុវត្ថិភាពនិងអ្នកគ្រប់គ្រងការងារ ពីមនុស្សដែលមានលក្ខខ័ណ្ឌគ្រប់គ្រាន់តាមការកំណត់ដោយសេចក្តីប្រកាសរបស់ក្រសួង។

6 ករណីអ្នកជំនួសនៃអ្នកគ្រប់គ្រងសុវត្ថិភាពរួម ស្តីពីវិសាលភាពនៃការកំណត់របស់សេចក្តីប្រកាសរបស់ក្រសួងអនុលោមតាមច្បាប់នេះ៖ កាអនុវត្តការងារជំនួសនោះ គឺចាត់ទុកថាជា អ្នកគ្រប់គ្រងសុវត្ថិភាពរួម។

(Appointment of a safety supervisor, technical safety managers, technical safety staffs and a representative of safety supervisor)

Article 13

1 The concessionaire shall appoint a safety supervisor at a mine according to the procedures prescribed by the ministerial ordinance.

2 The said safety supervisor must be appointed from among those responsible for supervising the implementation of the mineral-related operations at the mine.

However, if the concessionaire is responsible for supervising the implementation of the mineral-related operations, the concessionaire can be the safety supervisor.

3 The concessionaire shall appoint a representative safety supervisor in case of absence due to travel, illnesses or another accidents, in advance.

4 When the concessionaire has appointed a safety supervisor and his/her representative at a mine, notification must be submitted to the minister in charge of mines sector.

5 The concessionaires of mines that employ more than 30 mineworkers at all times shall appoint technical safety managers and technical safety staffs to manage technical matters related to the safety according to the amount of affairs, and to fulfill the requirements prescribed by the ministerial ordinance.

6 When the said representative undertakes the duties on behalf of the safety supervisor at a mine, the application of this law and the ministerial ordinances based on the law shall consider the representative to be the safety supervisor.

（保安統括者、保安技術管理者及び作業監督者）

第１３条

1 鉱物事業権所有者は、省令で定める手続きに従い、鉱山において、保安統括者を選任しなければならない。

2 前項の保安統括者は、当該鉱山において鉱物事業の実施を統括管理する者をもって充

てなければならない。

但し、鉱物事業権所有者が鉱物事業の実施を統括管理している場合は、自ら保安統括者となることができる。

3　鉱物事業権所有者は、保安統括者が旅行、疾病その他の事故によってその職務を行うことができない場合、その職務を行わせるため、あらかじめ代理者を選任し、鉱物部門を所管する大臣に届け出なければならない。

4　鉱物事業権所有者は、保安統括者及びその代理者を選任したときは、これを鉱物部門を所管する大臣に届け出なければならない。

5　鉱山労働者数が常時３０名を超える鉱山の鉱物事業権所有者は、鉱山における保安に関する技術的事項を管理するため、省令で定める要件を備える者のうちから、業務上必要とされる保安技術管理者及び作業監督者を選任しなければならない。

6　保安統括者の代理者がその職務を行う場合は、この法律及びこの法律に基づく省令の規定の適用については、これを保安統括者とみなす。

មាត្រា១៤

1　**អ្នកគ្រប់គ្រងសុវត្ថិភាពរួម ធ្វើការគ្រប់គ្រងនូវចំនុចទាក់ទងនឹងសុវត្ថិភាព។**

2　**អ្នកគ្រប់គ្រងបច្ចេកទេសសុវត្ថិភាព គឺធ្វើការងារជាអ្នកជំនួយការដល់អ្នកគ្រប់គ្រងសុវត្ថិភាពរួម និងធ្វើការគ្រប់គ្រងនូវចំនុចបច្ចេកទេសដែលទាក់ទងនឹងសុវត្ថិភាព។**

3　**អ្នកគ្រប់គ្រងការងារ ទទួលបញ្ជាពីសំណាក់អ្នកគ្រប់គ្រងបច្ចេកទេសសុវត្ថិភាព និង អ្នកគ្រប់គ្រងសុវត្ថិភាពរួម ធ្វើការក្តាប់បែងចែកនូវលក្ខណៈបច្ចេកទេសដែលទាក់ទងនឹងសុវត្ថិភាព។**

4　**ចំនុចចាំបាច់ទាក់ទងនឹងការងាររបស់ អ្នកគ្រប់គ្រងសុវត្ថិភាពរួម អ្នកគ្រប់គ្រងបច្ចេកទេសសុវត្ថិភាព អ្នកគ្រប់គ្រងការងារ នឹងត្រូវកំណត់ដោយសេចក្តីប្រកាសរបស់ក្រសួង។**

(Duties of the safety supervisor, technical safety managers and technical safety staffs)

Article 14

1　The safety supervisor shall manage and control matters related to mine safety.

2　The technical safety manager shall assist the safety supervisor by managing technical matters related to the safety.

3　The technical safety staffs shall allocate technical duties related to the safety under the direction of the safety supervisor and technical safety managers.

4　The necessary items concerning the duties of the safety supervisor, technical safety managers and technical safety staffs shall be prescribed by the ministerial ordinance.

第１４条

1　保安統括者は、保安に関する事項を管理する。

2　保安技術管理者は、保安統括者を補佐して、保安に関する技術的事項を管理する。

3　作業監督者は、保安統括者及び保安技術管理者の指揮を受け、保安に関する技術的事項を分掌する。

4　保安統括者、保安技術管理者及び作業監督者の職務に関し必要な事項は、省令で定める。

មាត្រា១៥

កម្មកររ៉ែ ដើម្បីរក្សាបាននូវការអនុវត្តនៃ យោងតាមតាមច្បាប់នេះឬតាមរយៈសេចក្តីប្រកាសរបស់ក្រសួង ដោយអនុលោមតាមច្បាប់នេះ ចាំបាច់ត្រូវតែគោរពនិងអនុវត្តតាមបញ្ជារបស់ អ្នកគ្រប់គ្រងសុវត្ថិភាពរួម និងបច្ចេកទេសផ្សេងៗទៀត។

Article 15

The mineworkers must obey the instructions issued by the safety supervisor and other technicians to ensure mine safety, as prescribed in this law and ministerial ordinance based on the law.

第１５条

鉱山労働者は、保安統括者及びその他の技術者がこの法律又はこの法律に基づく省令の規定の実施を確保するためにする指示に従わなければならない。

(គណៈកម្មការសុវត្ថិភាព)

មាត្រា១៦

1 ម្ចាស់សិទ្ធការងាររ៉ែនៃការដ្ឋានដែលជាធម្មតាមានកម្មកររលើសពីចំនួន៣០នាក់ ដើម្បីធ្វើការពិភាក្សានូវចំនុចសំខាន់ទាក់ទងសុវត្ថិភាព យោងតាមបែបបទនៃការកំណត់សេចក្តីរបស់ក្រសួង ចាំបាច់ត្រូវបង្កើត គណៈកម្មការសុវត្ថិភាពនៅក្នុងការដ្ឋានរ៉ែ។

2 ម្ចាស់សិទ្ធការងាររ៉ែ នៅពេលមានការពិន័យដោយអគ្គនាយកនៃអគ្គនាយកដ្ឋានធនធានរ៉ែ ឬដោយរដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែ តាមការកំណត់នៃសេចក្តីប្រកាសក្រសួងដោយអនុលោមតាមច្បាប់ ឬដោយច្បាប់នេះ ចាំបាច់ត្រូវតែផ្តល់ខ្លឹមសារពត៌មាននៃការពិន័យនោះដល់គណៈកម្មការសុវត្ថិភាព ដោយពុំឲ្យមានការយឺតយ៉ាវឡើយ។

3 គណៈកម្មការសុវត្ថិភាពកម្មកររ៉ែ នៅទីកន្លែងនៃការដ្ឋានរ៉ែ ត្រូវធ្វើការរាយការណ៍ដល់គណៈកម្មការសុវត្ថិភាពនៅពេលទទួលស្គាល់ថាមានគ្រោះថ្នាក់ច្រើនកើតឡើង ឬដែលនឹងអាចកើតឡើង ដោយមានសិទ្ធស្នើសុំឲ្យមានការសិក្សាស្រាវជ្រាវនិងពិភាក្សាអំពីបញ្ហានោះ បាន។

(The safety committee)

Article 16

1 Concessionaires of mines that employ more than 30 mineworkers at all times shall establish the safety committee to research and deliberate important matters related to safety according to the procedures prescribed by the ministerial ordinance.

2 When the concessionaire is punished by the minister or the director general in charge of mines sector, as prescribed in this law or ministerial ordinance based on the law, the concessionaire shall inform the safety committee the details of the punishment, without delay.

3 When a mineworker recognizes that damage occurs or there is a risk of such damage occurring at the working places of a mine, the worker must report and request the safety committee to research and deliberate such facts for clearance of the damage or risk.

(保安委員会)

第１６条

1　鉱山労働者数が常時３０名を超える鉱山の鉱物事業権所有者は、保安に関する重要事項を調査審議するため、省令で定める手続きに従い、鉱山に保安委員会を設けなければならない。

2　鉱物事業権所有者は、この法律又はこの法律に基づく省令の規定による鉱物部門を所管する大臣又は鉱物資源総局長の処分があったときは、遅滞なく、その処分の内容を保安委員会に通知しなければならない。

3　鉱山労働者は、鉱山の作業場において、危害を生じ、又はそのおそれが多いと認めたときは保安委員会に報告し、調査審議を要求することができる。

មាត្រា១៧

1　ស្តីពីសមាសភាពនៃសមាជិកគណៈកម្មការសុវត្ថិភាពចំនួនពាក់កណ្តាលនៃសមាជិកគឺត្រូវបានជ្រើសរើសចេញពីក្នុងចំណោមកម្មកររ៉ែ ដោយម្ចាស់សិទ្ធិការងារ និងចំនួនពាក់កណ្តាលទៀតនៃសមាជិកគឺត្រូវបានជ្រើសរើសចេញពីក្នុងចំណោមកម្មកររ៉ែ ដោយកម្មកររ៉ែ។

2　ប្រធានគណៈកម្មការសុវត្ថិភាពគឺអ្នកគ្រប់គ្រងសុវត្ថិភាពរួម។
ក៏ប៉ុន្តែ អ្នកគ្រប់គ្រងសុវត្ថិភាពរួម អាចឲ្យអ្នកគ្រប់គ្រងបច្ចេកទេសធ្វើជាប្រធានគណៈកម្មការសុវត្ថិភាពបាន។

3　គណៈកម្មការសុវត្ថិភាពគឺត្រូវកោះហៅដោយប្រធាននៃគណៈកម្មការសុវត្ថិភាពការសំរេចនៃកិច្ចការដែលបានពិភាក្សាគ្នានៅពេលនោះ គឺសំរេចយកតាមចំនួនលើសពីពាក់កណ្តាលនៃសមាជិកដែលមានវត្តមានក្នុងករណីពុំមានការសំរេចដោយសារចំនួនស្មើគ្នា ប្រធានគណៈកម្មការសុវត្ថិភាពមានសិទ្ធិធ្វើការសំរេចបាន។

Article 17

1　Half of the members of the safety committee shall be appointed by the concessionaire from among mineworkers, and remained half of the members shall be selected aforesaid mineworkers on the recommendation of mineworkers at the mine.

2　The safety supervisor shall be the chairperson of the safety committee.
The safety supervisor may appoint a technical safety manager to undertake the duties of the chairperson of the safety committee.

3　The chairperson shall call the safety committee, and items on the agenda shall be determined by the majority of attendees.　When the vote is tied, the chairperson shall cast the deciding vote.

第１７条

1　保安委員会の委員の構成については、鉱物事業権所有者がその鉱山の鉱山労働者の中から半数を選任し、残る半数についてはその鉱山の鉱山労働者から推せんされた者を選任する。

2　保安委員会は、保安統括者が議長となる。
但し、保安統括者は、保安技術管理者に保安委員会会の議長の職務を行わせることができる。

3　保安委員会は、議長が招集し、その議事は、出席した委員の過半数で決する。可否同数の場合は、議長が決する。

(ការស្រាវជ្រាវអំពីស្ថានភាពសុវត្ថិភាព)

មាត្រា១៨

1 ម្ចាស់សិទ្ធការងាររ៉ែនៃការដ្ឋានដែលជាធម្មតាមានកម្មករលើសពីចំនួន៣០នាក់ យោងតាមសេចក្តីប្រកាសរបស់ក្រសួង នៅពេលចង់បើកដំណើការការងារ ឬនៅពេលចង់ផ្អាក់ការងារដែលមានចំនួនថ្ងៃលើសពី១ខែ ឬនៅពេលចង់ដំណើរការជាថ្មីម្តងទៀត ឬនៅពេលមុនបញ្ចប់ការងារ ឬក៏ដូចជានៅពេលចង់ផ្លាស់ប្តូរក្នុងទ្រង់ទ្រាយធំនៃវិធីអនុវត្តការងាររ៉ែ ចាំបាច់ត្រូវធ្វើការស្រាវជ្រាវស្តីពីស្ថានភាពសុវត្ថិភាពនៃការដ្ឋានរ៉ែ តាមរយៈលទ្ធផលនៃការស្រាវជ្រាវសុវត្ថិភាពនោះ ស្តីពីចំនុចដែលបានទទួលស្គាល់ថាចាំបាច់ត្រូវតែកែលំអ ចាំបាច់ត្រូវតែចាត់វិធានការធ្វើការកែលំអ។

2 ម្ចាស់សិទ្ធការងាររ៉ែ យោងតាមបែបបទនៃសេចក្តីប្រកាសរបស់ក្រសួង ធ្វើការកត់ត្រានិងរក្សាទុកនូវលទ្ធផលនៃការស្រាវជ្រាវសុវត្ថិភាពរបស់ការដ្ឋានរ៉ែ។

(A survey of mine safety conditions)

Article 18

1 When concessionaires of mines that employ more than 30 mineworkers at all times shall start, temporarily stop (more than one month) , restart and expire the mineral-related operations at mines, and when methods of the operations change considerably, as prescribed in the ministerial ordinance, a survey of mine safety conditions shall be carried out before those actions, and appropriate measures taken to deal with items recognized as matters for improvement.

2 The concessionaires shall record and conserve the results of the survey according to the procedures prescribed by the ministerial ordinance.

(安全・保安状況調査)

第１８条

1 鉱山労働者数が常時３０名を超える鉱山の鉱物事業権所有者は、省令の定めるところにより、鉱物事業を開始するとき、１ヵ月以上の期間休止しようとするとき、再開するとき及び同事業を終了しようとするとき並びに鉱物事業の実施の方法を大きく変更しようとするときは、鉱山の安全・保安状況について調査し、その結果改善が必要と認められる事項について、適切な措置を講じなければならない。

２ 鉱物事業権所有者は、省令で定める手続きに従い、鉱山の安全・保安状況調査の結果を記録し、それを保存しておかねばならない。

(សុវត្ថិភាពទាក់ទងនឹងការងារទទួលអនុវត្តបន្ត)

មាត្រា១៩

1 ម្ចាស់សិទ្ធការងាររ៉ែ យោងតាមបែបបទនៃសេចក្តីប្រកាសរបស់ក្រសួង នៅពេល ឲ្យអ្នកក្រៅមកធ្វើការការងារនៅក្នុងការដ្ឋានរ៉ែដែលមានរយៈពេលសើសពី១ខែ ត្រូវបង្កើត「ផែនការការងារសម្រាប់អ្នកទទួលបន្ត」និងចាំបាច់ត្រូវតែកំណត់ចាត់វិធានការសំរាប់សុវត្ថិភាព សំរាប់ឲ្យអ្នកក្រៅមកធ្វើការងារនោះ ព្រមទាំងចាំបាច់ត្រូវតែរាយការណ៍ជូនដល់រដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែ ហើយនៅពេលចង់ធ្វើការផ្លាស់ប្តូរក៏ត្រូវអនុវត្តដូចគ្នាដែរ។

2 រដ្ឋមន្ត្រីទទួលបន្ទុកការងារអ៊ែ ក្នុងករណីមានការរាយការណ៍តាមរយៈការកំណត់នៃចំនុចមុន នៅមានបង្ហាញនូវហេតុផលពេលទទួលស្គាល់ថាមានភាពចាំបាច់សំរាប់សុវត្ថិភាព អាចធ្វើការបញ្ជាឲ្យ ម្ចាស់សិទ្ធការងារអ៊ែ ធ្វើការផ្លាស់ប្តូរ「ផែនការការងារសម្រាប់អ្នកទទួលបន្ត」 បាន។

Article 19

1 When the concessionaire shall make a deal with a contractor other than a mineworker to be engaged more than one month at work places of a mine according to the procedures prescribed by the ministerial ordinance, a “contractual work plan” which includes measures to ensure the safety shall be drafted by the concessionaire, and shall be submitted to the minister in charge of mines sector. This shall also apply when the plan is modified.

2 The minister has the power to order the concessionaire to modify the plan if, with given reason, it is deemed necessary to ensure safety.

（請負作業に対する保安）

第１９条

1 鉱物事業権所有者は、省令で定める手続きに従い、鉱山の作業現場に使用人以外の者を１ヵ月以上の期間に亘り従事させるときは、保安のため講ずべき措置について「請負作業計画書」を作成し、鉱物部門を所管する大臣に届け出なければならない。 これを変更しようとするときも、同様とする。

2 鉱物部門を所管する大臣は、前項の規定による届出があった場合において、保安のため必要があると認めるときは事由を示して、鉱物事業権所有者に対し、「請負作業計画書」に係る措置の変更を命ずることができる。

(ការអនុញ្ញាតសម្រាប់ផែនការនៃការជីកយកពិសេស)

មាត្រា២០

1 ម្ចាស់សិទ្ធការងារអ៊ែ នៅពេលចង់ជីកយកអ៊ែនៅក្នុងដីដែលមានគ្រោះថ្នាក់ខ្លាំងនឹងអាចកើតឡើងនូវការបំពុលដោយសារអ៊ែ យោងតាមរយៈការជីកដីនៅក្រោម បាតបឹង ទន្លេ សមុទ្រ ត្រូវបង្កើត「ផែនការជីកពិសេស」និងចាំបាច់ត្រូវតែរាយការណ៍និងទទួលការអនុញ្ញាតិពីសំណាក់រដ្ឋមន្ត្រីទទួលបន្ទុកការងារអ៊ែជាមុនសិន ហើយនៅពេលធ្វើការផ្លាស់ប្តូរក៏អនុវត្តតាមនិតិវិធីដូចគ្នាដែរ។

2 ចំនុចដែលត្រូវតែកំណត់លើ「ផែនការជីកពិសេស」នឹងកំណត់ដោយសេចក្តីប្រកាសរបស់ក្រសួង។

3 រដ្ឋមន្ត្រីទទួលបន្ទុកការងារអ៊ែ បង្ហាញពីហេតុផលនូវពេលទទួលស្គាល់ថាមានភាពចាំបាច់សំរាប់សុវត្ថិភាព អាចបញ្ជាឲ្យធ្វើការផ្លាស់ប្តូរ「ផែនការជីកពិសេស」បាន។

4 ម្ចាស់សិទ្ធការងារអ៊ែ នៅក្នុងដីកំណត់ដោយចំនុចទី 1 ពុំមានសិទ្ធិជីកយកអ៊ែដែលពុំមានបានកំណត់នៅក្នុង「ផែនការជីកពិសេស」ដែលទទួលពុំបានទទួលការអនុញ្ញាតពីរដ្ឋមន្ត្រីទទួលបន្ទុកការងារអ៊ែ ឡើយ។

(Permission for special mineral operation plan)

Article 20

1 In case a concessionaire plans to dig for minerals under the sea, rivers, lakes or any place where there is a risk of mine pollution occurring, a “special mineral operation plan” shall be drafted and submitted to the minister in charge of mines sector for approval. This shall also apply when the plan is modified.

2 The items to be included in the “special mineral operation plan” shall be prescribed by the ministerial ordinance.

3 The minister has the power to order the concessionaire to modify the plan if, with given reason, it is deemed necessary to ensure safety.

4 The concessionaire must never dig for minerals underground prescribed in Paragraph 1above, without the permission of the minister.

（特別採掘計画書の許可）

第２０条

1 鉱物事業権所有者は、海底、河底若しくは湖沼底の地下又は土地の掘削により鉱害を生ずる恐れの特に多い地下において鉱物を採掘しようとするときは、「特別採掘計画書」を作成し、鉱物部門を所管する大臣に届け出て、その許可を受けなければならない。これを変更するときも同様とする。

2 「特別採掘計画書」に記載すべき事項は、省令で定める。

3 鉱物部門を所管する大臣は、保安のため必要があると認めるときは事由を示して、「特別採掘計画書」の変更を命ずることができる。

4 鉱物事業権所有者は、第一項に規定する地下においては、鉱物部門を所管する大臣の許可を受けた「特別採掘計画書」によらなければ、鉱物を採掘してはならない。

(ផែនការការងារទប់ស្កាត់ការបំពុលដោយរ៉ែ)

មាត្រា២១

1 ម្ចាស់សិទ្ធការងាររ៉ែ ស្តីអំពីការទប់ស្កាត់ការបំពុលដោយសាររ៉ែទាក់ទងនឹងទឹកន្លែងចោលថ្មចោល ទឹកន្លែងចោលសារធាតុរងនៃអគារចំរាញ់ទឹកនៅក្នុងរូង ឬ ទឹកន្លែងជ្រើសរើសរ៉ែ ឬទឹកន្លែងទុកអាចម៍រ៉ែ និងផ្លូវនៅក្នុងការដ្ឋានរ៉ែក្រោមដី នៅពេលបិទការដ្ឋានរ៉ែទៅថ្ងៃអនាគត ត្រូវធ្វើការបង្កើត「ផែនការការងារទប់ស្កាត់ការបំពុលដោយសាររ៉ែ」និងចាំបាច់ត្រូវធ្វើការរាយការណ៍ជូនដល់រដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែ អំពីផែនការនោះ។

2 ម្ចាស់សិទ្ធការងាររ៉ែ នៅក្រោយពេលបិទការដ្ឋានក៏ដោយ ស្តីពីការទប់ស្កាត់ការបំពុលដោយសាររ៉ែដែលយល់ឃើញថាចាំបាច់ត្រូវតែធ្វើការចំរាញ់ជានិរន្តចំពោះ ទឹកកខ្វក់ឬទឹកនៅក្នុងការដ្ឋានរ៉ែក្រោមដី ដែលបរិមាណមិនសមស្របនឹងស្តង់ដាដែលបានត្រូវបានកំណត់ ធ្វើការបង្កើត「ផែនការការងារទប់ស្កាត់ការបំពុលដោយសាររ៉ែ」និងចាំបាច់ត្រូវធ្វើការរាយការណ៍ជូនដល់រដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែ អំពីផែនការនោះ។

3 ចំនុច២ដែលត្រូវតែកំណត់សរសេរលើ「វិធានការទប់ស្កាត់ការបំពុលដោយសាររ៉ែ」នឹងត្រូវកំណត់ដោយសេចក្តីប្រកាសរបស់ក្រសួង។

4 រដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែ បង្ហាញនូវហេតុផលនៅពេលទទួលស្គាល់ថាមានភាពចាំបាច់សម្រាប់សុវត្ថិ

ភាព អាចបញ្ជាឲ្យធ្វើការផ្លាស់ប្តូរនូវ「វិធានការទប់ស្កាត់ការបំពុលដោយសាររ៉ែ」បាន។

(Mine pollution prevention measures)

Article 21

1 The concessionaire shall draft a “mine pollution prevention measures” with regard to the prevention of mine pollution from facilities such as waste stone dumps, slag dumps, and tailings dams attached to processing plants or mine-water treatment facilities and drifts for when mines are closed in the future, and submit this measures to the minister in charge of mines sector.

2 The concessionaire shall draft a “mine pollution prevention measures” with regard to the perpetual treatment of contaminated mine- and waste-water that is not expected to meet water quality standards after the mine has closed, and submit this measures to the minister in charge of mines sector.

3 Items to be included in the “mine pollution prevention measures” as stipulated in Paragraphs 1 and 2 above shall be prescribed by the ministerial ordinance.

4 The minister has the power to order the concessionaire to modify the measures if, with given reason, it is deemed necessary to ensure safety.

（鉱害防止対策）

第２１条

1　鉱物事業権所有者は、将来の閉山時における捨石集積場、選鉱場若しくは坑内水の処理施設に附属する沈殿物の集積場又は鉱滓集積場及び坑道などの施設に係る鉱害の防止について「鉱害防止対策書」を作成し、鉱物部門を所管する大臣に届け出なければならない。

2　鉱物事業権所有者は、閉山後においても汚染の状態、量が規定された基準に適合しない坑内水又は廃水について永続的な処理が見込まれる鉱害の防止について「鉱害防止対策書」を作成し、これを鉱物部門を所管する大臣に届け出なければならない。

3　前二項の「鉱害防止対策書」に記載すべき事項は、省令で定める。

4　鉱物部門を所管する大臣は、保安のため必要があると認めるときはその事由を示して、「鉱害防止対策書」の変更を命ずることができる。

(ប្រព័ន្ធប្រាក់សន្សំសំរាប់ទប់ស្កាត់ការបំពុលដោយរ៉ែ)

មាត្រា២២

1　ម្ចាស់សិទ្ធការងាររ៉ែ ជារៀងរាល់ឆ្នាំ ចាំបាច់ត្រូវបង់ប្រាក់សន្សំនៅក្នុងប្រព័ន្ធប្រាក់សន្សំសំរាប់ទប់ស្កាត់ការបំពុលដោយរ៉ែ ទៅស្ថាប័នហិរញ្ញវត្ថុដែលបានកំណត់ទឹកប្រាក់ដោយរដ្ឋមន្ត្រីទទួលបន្ទុកការ ងាររ៉ែ ។

2　ចំនួនទឹកប្រាក់នៃ「ប្រាក់សន្សំទប់ស្កាត់ការបំពុលដោយសាររ៉ែ」គឺជាប្រាក់គ្រឹះប្រើក្នុងវេលាសំរាប់អគារនិងចំនួនទឹកប្រាក់ប្រើចាំបាច់នៃការងារទប់ស្កាត់ការបំពុលដោយរ៉ែ គោរពតាមការគណនាស្តង់ដាដែលកំណត់ដោយសេចក្តីប្រកាសរបស់ក្រសួង ចំនួនទឹកប្រាក់ដែលបានប្រកាសនិងបានគណនាដោយរដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែ គឺជាចំនួនទឹកប្រាក់កំណត់ជាផ្លូវការ។

3　ម្ចាស់សិទ្ធការងាររ៉ែ ស្តីពីអគារ បរិក្ខារដែលបានកំណត់នៅលើ「វិធានការទប់ស្កាត់ការបំពុលដោយសាររ៉ែ」

ដែលបានកំណត់នៅចំនុច១និង២នៃមាត្រា២១ នៅពេលអនុវត្តការងារទប់ស្កាត់ការបំពុលដោយសាររ៉ែ យោងតាមបែបបទនៃការកំណត់សេចក្តីប្រកាសរបស់ក្រសួង ដោយមានការអនុញ្ញាតពីរដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែ អាចនឹងដកយកប្រាក់សន្សំនោះ យកមកអនុវត្តការងារដែលទាក់នឹងអគារបរិក្ខារទាំងនោះបាន ។

(Reserve fund system)

Article 22

1 Every year, the concessionaire must save the amount of money notified by the minister in charge of the mines sector to the “reserve fund system for mine pollution prevention” in a financial institution designated by the said minister.

2 The reserve fund amount shall be calculated according to the calculation standards prescribed by the ministerial ordinance, based on the costs necessary to carry out the mine pollution prevention measures and the period of use of the respective facilities, and to be indicated by the said minister.

3 When the concessionaire implements the project mentioned in the “mine pollution prevention measures” prescribed in Article 21, Paragraph 1 to 2 inclusive of this law, after using of the facility has closed, the reserved funds relating to the respective facilities can be returned to the concessionaire with the permission of the said minister according to the procedures prescribed by ministerial ordinance.

（鉱害防止積立金制度）

第２２条

1 鉱物事業権所有者は、毎年度、鉱物部門を所管する大臣が通知する額の金銭を指定された金融機関の「鉱害防止積立金制度」に積み立てなければならない。

2 積立金の額は、鉱害防止事業に必要な費用の額及び当該施設の使用する期間を基礎として、省令で定める算定基準に従い、鉱物部門を所管する大臣が算定して通知する額とする。

3 鉱物事業権所有者は、前条第１項及び第２項に規定された「鉱害防止対策書」に記載された施設について、その使用を終了し、鉱害防止事業を実施するときは、省令で定める手続きに従い、鉱物部門を所管する大臣の許可を得て当該施設に係る積立金を取り戻すことができる。

(វិធានការផ្នែករដ្ឋបាលនៃការធ្វើអធិការកិច្ច)

មាត្រា២៣

រដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែ យោងតាមការអនុវត្តការងាររ៉ែ នៅករណីមានការទទួលស្គាល់ថា មានគ្រោះថ្នាក់ឬការបំពុលរ៉ែកើតឡើង មានការបំផ្លាញធនធានរ៉ែនិងអគារដ៏ធ្ងន់ធ្ងរ ឬនឹងអាចមានសភាពនោះកើតឡើង បង្ហាញហេតុផលនៅពេលចាំបាច់ អាចធ្វើការបញ្ជាឲ្យម្ចាស់សិទ្ធការងាររ៉ែធ្វើការបញ្ឈប់ឬលុបចោលអាជ្ញាប័ណ្ណការងាររ៉ែនោះបាន។

(Administrative measures to be supervised)

Article 23

In case a serious disaster or mine pollution occurs, or mineral resources or mine facilities are seriously damaged, or there is a risk of such damage, the minister in charge of mines

sector has the power to suspend the mineral-related operations or cancel the license of the concessionaire with given reason.

（(監督上の行政措置)

第２３条

鉱物部門を所管する大臣は、鉱物事業の実施により、危害若しくは鉱害を生じ、鉱物資源若しくは施設を大きく損じ、又はその恐れが多いと認める場合には事由を示して、鉱物事業の停止命令又は同事業許可書を取り消すことができる。

មាត្រា២៤

១ អគ្គនាយកនៃអគ្គនាយកដ្ឋានធនធានរ៉ែ នៅពេលមានបទល្មើសនៃសេចក្តីប្រកាសក្រសួងដោយអនុលោមតាមច្បាប់ឬច្បាប់នេះ អាចបញ្ជាណែនាំឬព្រមានដល់ម្ចាស់សិទ្ធការងាររ៉ែ ជាបន្ទាន់បាន។

២ រដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែ ចំពោះម្ចាស់អាជីវកម្មរ៉ែ បង្ហាញពីហេតុផលក្នុងពេលពុំមានការអនុវត្តតាមការណែនាំឬ ព្រមានតាមចំនុចមុន អាចមានសិទ្ធិបញ្ឈប់ការងាររ៉ែនោះបាន ដោយកំណត់រយៈពេលនៃការបញ្ឈប់នោះគឺមានក្នុងរយៈពេល១ឆ្នាំ។

Article 24

1 In case the concessionaire is found to have violated this law or ministerial ordinance based on the law, the director general in charge of mines sector has the power to issue the warning or directing to the concessionaire for clearance of violated items speedily with given reason.

2 When the concessionaire is found to fail to the warning or directing as prescribed in Paragraph 1 above, the minister in charge of mines sector has the power to order the concessionaire to suspend mineral-related operations for a set period of up to one year.

第２４条

1　鉱物資源総局長は、鉱物事業権所有者がこの法律又はこの法律に基づく省令に違反したときは、鉱物事業権所有者に対し速やかに是正するよう警告又は指導を行う。

2　鉱物部門を所管する大臣は、鉱物事業権所有者が前項に規定する警告又は指導に従わないときは事由を示して、鉱物事業権所有者に対して一年以内の期間を定めて、その鉱物事業の停止を命ずることができる。

មាត្រា២៥

រដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែ នៅពេលទទួលស្គាល់ថាមានគ្រោះថ្នាក់ ឬមានបំផ្លាញសុវត្ថិភាព ដោយយោងតាមរយៈការបានខួងចូលទៅក្រៅតំបន់រ៉ែដោយម្ចាស់សិទ្ធការងាររ៉ែ អាចបញ្ជាឲ្យម្ចាស់សិទ្ធការងាររ៉ែ ចាត់ចែងនូវចំនុចចាំបាច់សំរាប់សុវត្ថិភាព និងការបិទទីកន្លែងដែលបានខួងជ្រួល នោះបាន។

Article 25

In case encroaching outside the mining area causes harm to safety or there are risks of the safety being influenced, the minister in charge of mines sector has the power to order the concessionaire to execute closure of that area and take necessary measures to ensure safety, with given reason.

第２５条

鉱物部門を所管する大臣は、鉱物事業権所有者が鉱区外に侵掘したことにより保安を害し、又そのおそれがあると認めるときは事由を示して、鉱物事業権所有者に対し、侵掘した場所の閉鎖及びその他保安のため必要な措置を命ずることができる。

មាត្រា២៦

រដ្ឋមន្ត្រីទទួកបន្ទុកការងាររ៉ែ នៅការដ្ឋានរ៉ែ (រួមទាំងទីកន្លែងបានខួងជ្រួលទៅក្រៅតំបន់រ៉ែ) បង្ហាញនូវហេតុផលនៅពេលទទួលស្គាល់ថាមានភាពចាំបាច់សំរាប់ជួយសង្គ្រោះជនរងគ្រោះនៅការដ្ឋានរ៉ែ អាចបញ្ជាឲ្យម្ចាស់សិទ្ធការងាររ៉ែ ចាត់នូវវិធានការចាំបាច់សំរាប់ធ្វើការជួយសង្គ្រោះដល់ជនរងគ្រោះទាំងនោះបាន។

Article 26

In case encroaching outside the mining area causes harm to safety or there are risks of the safety being influenced, the minister in charge of mines sector has the power to order the concessionaire to execute closure of that area and take necessary measures to ensure safety, with given reason.

第２６条

鉱物部門を所管する大臣は、鉱山（鉱区外に侵掘した場所を含む。）における被災者を救出するため必要があると認めるときは事由を示して、鉱物事業権所有者に対し、必要な措置を講ずることを命ずることができる。

មាត្រា២៧

1 **រយៈពេល៥ឆ្នាំក្រោយពីបានបាត់បង់សិទ្ធិការងាររ៉ែ រដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែ អាចមានសិទ្ធិបញ្ជា ឲ្យម្ចាស់សិទ្ធការងាររ៉ែដែលបានអនុវត្តការងាររ៉ែនោះ ធ្វើការងាររៀបចំនូវវិធានការចាំបាច់សំរាប់ធ្វើការទប់ស្កាត់ការបំពុលដោយសាររ៉ែ ឬ ភាពគ្រោះថ្នាក់កើតឡើងដោយសារបានអនុវត្តការងាររ៉ែនោះ បាន។**

2 **អ្នកដែលបានទទួលនូវបញ្ជាតាមរយៈការកំណត់នៃចំនុចមុន នៅក្នុងទំហំនៃភាពចាំបាច់អនុវត្តនូវចំនុចទាក់ទងនឹងបទបញ្ជានោះ គឺចាត់ទុកថាជាជាអ្នកមានសិទ្ធធ្វើការងាររ៉ែ។**

Article 27

1 The minister in charge of mines sector has the power to order former concessionaires to set up necessary facilities for preventing injuries and mine pollution due to mineral-related operations, up to five years after the mineral license has been renounced.

2 The recipient of the above ministerial order shall be considered to be the concessionaire within the scope necessary to execute the items ordered.

第２７条

1 鉱物事業権が消滅した後でも５年間は、鉱物部門を所管する大臣は、鉱物事業権所有者であった者に対し、その者が鉱物事業を実施したことにより生ずる危害又は鉱害を防止するため事由を示して必要な設備をすることを命ずることができる。

2 前項の規定による命令を受けた者は、その命令に係る事項を実施するため必要な範囲内において、鉱物事業権所有者とみなす。

មាត្រា២៨

1 រដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែ នៅពេលបញ្ចាបញ្ឈប់ការងាររ៉ែ ឬលុបអាជ្ញាប័ណ្ណការងាររ៉ែ ចំពោះម្ចាស់សិទ្ធការងាររ៉ែឬអ្នកដែលជាអ្នកម្ចាស់សិទ្ធការងាររ៉ែ យោងតាមរយៈការកំណត់នៃមាត្រា២៣, មាត្រា២៤-២, មាត្រា២៥ ឬ មាត្រា២៧-១ ត្រូវធ្វើការជូនដំណឹងជាមុន ពីកាលបរិច្ឆេទនិងទីកន្លែង និងអនុវត្តការសាកសួរ ក្នុងលក្ខណៈបើកចំហរ។

2 អ្នកដែលទទួលនូវការជូនដំណឹងនៃចំនុចមុន នៅពេលសាកសួរ អាចផ្តល់នូវភស្តុតាង និងមតិយោបល់ដល់រដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែ បាន។

Article 28

1 In case the minister in charge of mines sector intends to issue the orders or cancel the license as prescribed in Article 23; Article 24, Paragraph 2; Article 25 or Article 27, Paragraph 1, the concessionaire or former concessionaire shall be notified of a date and location of a public hearing, in advance.

2 The recipients of such notifications can express their opinions to the said minister at the hearing.

第２８条

1 鉱物部門を所管する大臣は、第２３条、第２４条第２項、第２５条又は第２７条第１項の規定による鉱物事業の停止命令又は鉱物事業許可書を取り消すときは、鉱物事業権所有者又は鉱物事業権所有者であった者に対し、あらかじめ期日及び場所を通知して、公開による聴聞を行うものとする。

2 前項の通知を受けた者は、聴聞に際し、鉱物部門を所管する大臣に対し、意見を陳述し、証拠の申出をすることができる。

(របាយការណ៍)

មាត្រា២៩

1 រដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែ ឬអគ្គនាយកនៃអគ្គនាយកដ្ឋានធនធានរ៉ែ យោងតាមបែបបទនៃការកំណត់សេចក្តីប្រកាសរបស់ក្រសួង អាច ឲ្យម្ចាស់សិទ្ធការងាររ៉ែធ្វើការរាយការណ៍នូវរបាយការណ៍ដែលមានភាពចាំបាច់ទាក់ទងនឹងសុវត្ថិភាព បាន។

2 ម្ចាស់សិទ្ធការងាររ៉ែ នៅពេលមានកើតឡើងនូវអ្វីដែលបានកំណត់ដោយសេចក្តីប្រកាសរបស់ក្រសួងដូចជាគ្រោះអគ្គិភ័យដ៏ធ្ងន់ធ្ងរ ចាំបាច់ត្រូវតែធ្វើការរាយការណ៍នូវស្ថានភាពអគ្គិភ័យនោះ ដល់អគ្គនាយកនៃអគ្គនាយកដ្ឋានធនធានរ៉ែ ដោយតាមរយៈទូរស័ព្ទនិងតាមវិធីសមស្របផ្សេងៗទៀត ជាបន្ទាន់។

(Mine safety reports)

Article 29

1 The concessionaire must submit mine safety reports to the minister or director general in charge of mines sector according to the procedures prescribed by the ministerial ordinance.

2 In the case of a major disaster prescribed by the ministerial ordinance occurs, the concessionaire shall report immediately the contents of the disaster to the director general in charge of mines sector by phone or other suitable methods.

（報　告）

第 29 条

1　鉱物事業権所有者は、省令で定める手続きに従い、保安に関する必要な報告を鉱物部門を所管する大臣又は鉱物資源総局長にしなければならない。

2　鉱物事業権所有者は、重大な災害として省令で定めるものが発生したときは、直ちに、鉱物資源総局長に電話その他適当な方法により、災害の状況を報告しなければならない。

(Mine safety reports)

(ផែនទីសុវត្ថិភាពការដ្ឋានរ៉ែ)

មាត្រា៣០

1 ម្ចាស់សិទ្ធការងាររ៉ែ ត្រូវបង្កើតនូវ 「ផែនទីសុវត្ថិភាពការដ្ឋានរ៉ែ」 (ជារៀងរាល់ឆ្នាំ។)និងរក្សាច្បាប់ដើមនៅការិយាល័យការដ្ឋានរ៉ែ និង ត្រូវតែផ្តល់ជូនដល់អគ្គនាយកដ្ឋានធនធានរ៉ែជារៀងរាល់ឆ្នាំ នូវច្បាប់ថតចំលងមួយច្បាប់ ។

2 ក្នុងការបង្កើតនូវ「ផែនទីសុវត្ថិភាពការដ្ឋានរ៉ែ」ចំនុចដែលចាំបាច់ត្រូវតែសរសេរលើផែនទីនោះ នឹងកំណត់ដោយសេចក្តីប្រកាសរបស់ក្រសួង។

(Mine safety maps)

Article 30

1 The concessionaire shall draw-up mine safety maps to be kept in the mine offices, and regularly submit copies to the director general in charge of mines sector , once a year.

2 Items to be included in the mine safety maps shall be prescribed by the ministerial ordinance.

（鉱山保安図）

第３0 条

1　鉱物事業権所有者は、「鉱山保安図」を作成し、これを鉱物事業事務所に備え、且つ、その複本を毎年一回定期的に鉱物資源総局長に届け出なければならない。

2　「鉱山保安図」の作成にあたり、その記載すべき事項は、省令で定める。

(ពាក់ព័ន្ធនឹងសេចក្តីប្រកាស)

មាត្រា៣១

១ ម្ចាស់សិទ្ធិការងាររ៉ែ យោងតាមការកំណត់នៃមាត្រាទី៥ ត្រូវតែចាត់វិធានចាំបាច់ ដែលវិធាននោះត្រូវបានកំណត់ដោយសេចក្តីប្រកាសរបស់ក្រសួង។

២ កម្មកររ៉ែ យោងតាមការកំណត់នៃមាត្រា៦ ត្រូវតែគោរពនូវចំនុចចាំបាច់ទាំងនោះ ដែលចំនុចទាំងនោះនឹងត្រូវកំណត់ដោយសេចក្តីប្រកាសរបស់ក្រសួង។

ចំនុចទាំងនោះរួមមាន៖រចនាសម្ព័ន្ធនៃការសង្គ្រោះ និងការសង្គ្រោះនៅពេលមានគ្រោះថ្នាក់, បាក់ស្រុតនិងរលំ, ប្រភេទនៃរំសេវនិងការបំផ្ទុះ, ប្រភេទយានប្រើសម្រាប់ការដ្ឋានរ៉ែ, កាដឹកជញ្ជូនតាមរយៈរថយន្តនិងខ្សែពាន, បរិក្ខាសុវត្ថិភាពនៃប្រភេទម៉ាស៊ីន, អគ្គិភ័យនិងការឆេះដោយធម្មជាតិ, វិធានការសំរាប់ការដ្ឋានរ៉ែក្រោមដីដែលបានបោះបង់ចោលរួចមកហើយ, ទប់ស្កាត់ការបំពុលបរិដ្ឋានដោយសារ៉ែ (ថ្មចោល, កាកសំណល់រ៉ែ, អាចម៍រ៉ែ (Tailings), ទឹកនៅក្នុងការដ្ឋានរ៉ែក្រោមដី, ទឹកកខ្វក់, ធូលី, សំឡេងថ្លង់, ភាពរញ៉ៃ, ផ្សែងរ៉ែ, ការជីកដីនិងផ្សេងៗទៀត), ឧបករណ៍ផលិតប្រើដោយចរន្តអគ្គិសនី, ទីកន្លែងធ្វើការនៅក្នុងការដ្ឋានរ៉ែក្រោមដីនិងផ្លូវនៅក្នុងការដ្ឋានរ៉ែក្រោមដី, ខ្យល់ឆ្លងកាត់, ឧស្ម័ននៅក្នុងរ៉ែ, ការផ្ទុះដោយធូលីធ្យូងថ្ម, ទីកន្លែងធ្វើការនៅលើដី, សារធាតុពុល។

(Commission to ministerial ordinance)

Article 31

1 The necessary measures with regard to following subjects to be taken by the concessionaire, as stipulated in Article 5 of this law, shall be prescribed by the ministerial ordinance.

2 The necessary items with regard to following subjects to be observed by mineworkers, as stipulated in Article 6 of this law, shall be prescribed by the ministerial ordinance.

Subjects: Rescue mechanism and activities during times of disaster; Rock-falls and collapses; Explosives and blasting; Haulage by vehicle typed mining machines, automobiles and belt conveyors; Safety device for machineries; Mine fires and spontaneous combustion; Measures of disused pits; Mine pollution prevention (waste stones, slag, tailings, mine-water, waste-water, dust, noise, vibration, smoke; the excavation of land and so on); Electric equipment; Underground passage and work places; Ventilation; Mine gas; Coal dust explosions; Work places on the ground; Toxic substances.

（省令への委任）

第３１条

1 鉱物事業権所有者が、第５条の規定により、講じなければならない必要な以下の項目に関する措置については、省令で定める。

2 鉱山労働者が、第６条の規定により、守らなければならない必要な以下の項目に関する事項については、省令で定める。

項目：救護体制及び災害時の救護；落盤及び崩壊；火薬類及び発破；車両系鉱山機械、自動車及びベルトコンベアによる運搬；機械類の安全装置；火災及び自然発火；旧坑の対策；鉱害防止（捨石、鉱さい、尾鉱、坑内水、廃水、粉じん、騒音、振動、鉱煙、土地の掘削及びその他）；電気工作物；坑内通路及び坑内作業場；通気；鉱内ガス；炭塵爆発；坑外作業場；毒劇物

(ការប្រើដីនៅពេលមានអសន្ន)

មាត្រា៣២

1 ម្ចាស់សិទ្ធការងាររ៉ែ នៅពេលមានភាពចាំបាច់សំរាប់ទប់ស្កាត់នូវភាពគ្រោះថ្នាក់ដែលនឹងឈានមកដល់ក្នុងពេលដ៏ខ្លីខាងមុខដែលទាក់ទងនឹងសុវត្ថិភាព ក្រោយពីទទួលបានការអនុញ្ញាតពីសំណាក់រដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែ អាចចូលប្រើប្រាស់ដីអ្នកដ៏ទៃបានភ្លាម ឬក្នុងរយៈពេលខ្លីណាមួយ បាន។

2 ក្នុងករណីនៃចំនុចខាងមុន ម្ចាស់សិទ្ធការងាររ៉ែ ចាំបាច់ត្រូវតែផ្តល់ដំណឹងដល់ម្ចាស់នោះពីគោលបំណងនៃការប្រើប្រាស់ដីនោះ។

3 យោងតាមការកំណត់នៃចំនុច1 អ្នកដែលចង់ប្រើប្រាស់ដីនោះ ឬចូលទៅក្នុងដីអ្នកដ៏ទៃ ចាំបាច់ត្រូវតែកាន់ភ្ជាប់ជាមួយនឹងលិខិតអនុញ្ញាតពីសំណាក់រដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែ ហើយនៅពេលមានការស្នើសុំ ឲ្យបង្ហាញដោយម្ចាស់ដី ចាំបាច់ត្រូវតែបង្ហាញនូវលិខិតអនុញ្ញាតនោះ។

4 យោងតាមការកំណត់នៃចំនុច1 អ្នកបានប្រើប្រាស់ដីនោះក្នុងរយៈពេលខ្លី ឬបានចូលក្នុងដីនោះ ចាំបាច់ត្រូវតែបង់សំណងចំពោះការខូចដែលបានកើតមានតាមរយៈការប្រើប្រាស់ ដោយតាមតំលៃទីផ្សារ។

(Use of land in emergencies)

Article 32 **(Suspended Article)**

1 When it is necessary to prevent imminent danger, the concessionaire can – with the permission of the minister in charge of mines sector – enter onto a third party's land, or use that land temporarily.

2 In the case prescribed in Paragraph 1 above, the concessionaire shall immediately inform the owner of the land, accordingly.

3 In case a person enters or uses a third party's land as prescribed in Paragraph 1above, that person shall carry documents to prove that the minister's permission has been granted, and have to produce the document if requested by the landowner.

4 In case, as prescribed in Paragraph 1above, land belonging to a third party is entered onto or used temporarily, any loss or damages incurred shall be compensated for at current value.

（緊急土地使用）

第３２条 （保留条項）

1 鉱物事業権所有者は、保安に関する急迫の危険を防ぐため必要があるときは、鉱物部門を所管する大臣の許可を受けて、直ちに他人の土地に立ち入り、又は一時これを使用することができる。

2 前項の場合には、鉱物事業権所有者は、すみやかにその旨をその土地の占有者に通知しなければならない。

3 第一項の規定により、他人の土地に立ち入り、又はこれを使用しようとする者は、鉱物部門を所管する大臣の許可を受けたことを証する書面を携帯し、土地の占有者の請求があったときは、これを呈示しなければならない。

4 第一項の規定により、他人の土地に立ち入り、又は一時これを使用した者は、時価により、これによって生じた損失を補償しなければならない。

ជំពូក៣ ស្ថាប័នអធិការកិច្ច

(រចនាសម្ព័ន្ធអធិការកិច្ច)

មាត្រា៣៣

ក្រសួង អគ្គនាយកដ្ឋាន និងមន្ទីរនៅតាមបណ្តាខេត្តៗដែលទទួលបន្ទុកការងារ៉ែ ដើរតួនាទីសំខាន់ក្នុងការអនុវត្តនូវច្បាប់នេះ ។

Chapter Ⅲ Supervision authorities

(Supervision)

Article 33

The Ministry, General Department and provincial Departments in charge of the mines sector shall enforce this law.

第三章　監督機関

（監督組織）

第３３条

鉱業部門を所管する省、総局及び地方局は、本法律を施行する。

(មន្ត្រីអធិការកិច្ចសុវត្ថិភាពការដ្ឋានរ៉ែ)

មាត្រា៣៤

1 បង្កើតឲ្យមានមន្ត្រីអធិការកិច្ចសុវត្ថិភាពការដ្ឋានរ៉ែ នៅក្នុងមន្ទីរនៃបណ្តាខេត្តនានា នៅអគ្គនាយកដ្ឋានធនធានរ៉ែ នៃក្រសួងរ៉ែនិង ថាមពល ។

2 មន្ត្រីអធិការកិច្ចសុវត្ថិភាពការដ្ឋានរ៉ែ គឺជាមន្ត្រីជាអ្នកធ្លាប់បានអនុវត្តការងារជាក់ស្តែងទាក់ទងនឹងរដ្ឋបាលការងាររ៉ែលើសពី៣ឆ្នាំ និងជាអ្នកបានបញ្ចប់កម្មសិក្សាផ្នែកមន្ត្រីអធិការកិច្ចសុវត្ថិភាពការដ្ឋានរ៉ែ និងដោយមានការចាត់តាំងពីសំណាក់រដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែ។

(Mine safety inspectors)

Article 34

1 Mine safety inspectors shall be staffed in the Ministry, General Department and provincial Departments in charge of mines sector.

2 The mine safety inspector shall have at least 3 years' practical experience in mine administration, shall have completed a training course in mine safety, and shall be appointed by the minister in charge of mines sector.

（(鉱山保安監督官)

第３４条

1 鉱物部門を所管する省、総局及び地方局に鉱山保安監督官を配置する。

2 鉱山保安監督官は、３年以上鉱山行政に関する実務に従事した者であって、且つ鉱山保安に関する研修を修了した者について、鉱物部門を所管する大臣が任命する。

(សិទ្ធិអំណាចនៃមន្ត្រីអធិការកិច្ចសុវត្ថិភាពការដ្ឋានរ៉ែ)

មាត្រា៣៥

1 មន្ត្រីអធិការកិច្ចសុវត្ថិភាពការដ្ឋានរ៉ែ នៅពេលមានភាពចាំបាច់លើការងារអធិការកិច្ចសុវត្ថិភាពការដ្ឋានរ៉ែ

អាចមានសិទ្ធិចូលទៅក្នុងការដ្ឋានរ៉ែ អាចមានសិទ្ធិពិនិត្យនូវការងារទាក់ទងនឹងសុវត្ថិភាព ឬសៀវភៅកំណត់ហេតុស្តីអំពីស្ថានភាពនៃអគារ ឬអាចមានសិទ្ធិសួរសំណួរដល់អ្នកដែលពាក់ព័ន្ធបាន។

2 គ្រប់រាល់ពេលធ្វើការត្រួតពិនិត្យ មន្ត្រីអធិការកិច្ចសុវត្ថិភាពការដ្ឋានរ៉ែ ចំបាច់ត្រូវតែបង្ហាញនូវលិខិតសំគាល់ខ្លួន និងលិខិតបេសកម្មរបស់ខ្លួន។

3 មន្ត្រីអធិការកិច្ចសុវត្ថិភាពការដ្ឋានរ៉ែ ស្តីពីបទល្មើសនឹងច្បាប់នេះ យោងតាមរយៈការកំណត់នៃក្រមនីតិវិធីព្រហ្មទណ្ឌ នឹងអនុវត្តការងារនោះក្នុងនាមជានគរបាលយុត្តិធម៌។

(Jurisdiction of the mine safety inspector)

Article 35

1 The mine safety inspector has the power to enter a mine to inspect safety-related duties, facilities, records, documentation and other safety-related matters, as well as question the people concerned.

2 Every inspection, the inspector has to present its identification and show the inspection mission letter to the people concerned.

3 The mine safety inspectors perform the duties as judicial police officers pursuant to the provisions of the Criminal Law for crimes that violate this Law.

（鉱山保安監督官の権限）

第 35 条

1 鉱山保安監督官は、保安の監督上必要があるときは、鉱山に立ち入り、保安に関する業務若しくは施設の状況若しくは帳簿、書類その他の物件を検査し、又は関係人に対して質問することができる。

2 鉱山保安監督官が前項の規定により査察を行い、又は質問する場合は、その身分を示す証票を携帯し、且つ、関係人の請求があるときは、これを呈示しなければならない。

3 鉱山保安監督官は、この法律に違反する罪について刑事法の規定による司法警察員としての職務を行う。

មាត្រា៣៦

1 វិធីអនុវត្តនៃការប្រើប្រាស់ភ្លើងឬកំឡាំងម៉ូទ័រ វត្ថុធាតុនៃប្រភេទរំសេវ ឬការប្រើអគារផលិតកម្មផ្សេងៗ អគារឧបករណ៍សំភារៈ ម៉ាស៊ីនដែលប្រើពាក់ព័ន្ធនឹងការងាររ៉ែ នៅពេលមានភាពគ្រោះថ្នាក់នឹងកើតឡើងក្នុងពេលដ៏ខ្លីទាក់ទងនឹងសុវត្ថិភាព និងមានបទល្មើសនឹងសេចក្តីប្រកាសដោយអនុលោមតាមច្បាប់នេះ មន្ត្រីអធិការកិច្ចសុវត្ថិភាពការដ្ឋានរ៉ែ អាចមានសិទ្ធិប្រើនូវសិទ្ធិអំណាចរបស់រដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែបាន ដោយតាមការកំណត់នៃមាត្រា២៥នៃច្បាប់នេះ។

2 នៅពេលមានគ្រោះថ្នាក់នឹងកើតឡើងក្នុងពេលដ៏ខ្លីទាក់ទងនឹងសុវត្ថិភាព យោងតាមរយៈការបានជីកជ្រួលទៅខាងក្រៅនៃតំបន់រ៉ែដោយម្ចាស់សិទ្ធិការងាររ៉ែ មន្ត្រីអធិការកិច្ចសុវត្ថិភាពការដ្ឋានរ៉ែ អាចមានសិទ្ធិប្រើនូវសិទ្ធិអំណាចរបស់របស់រដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែបាន ដោយអនុលោមតាមការកំណត់នៃមាត្រា២៥នៃច្បាប់នេះ។

3 នៅពេលមានភាពចាំបាច់ជាបន្ទាន់សំរាប់ធ្វើការជួយសង្គ្រោះដល់ជនរងគ្រោះ មន្ត្រីអធិការកិច្ចសុវត្ថិភាពការដ្ឋានរ៉ែ អាចមានសិទ្ធិប្រើនូវសិទ្ធិអំណាចរបស់របស់រដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែបាន ដោយតាមការ កំណត់នៃមាត្រា២៦នៃច្បាប់នេះ។

4 នៅពេលធ្វើការបញ្ជាតាមការកំណត់នៃចំនុច1 ចំនុច 2 ចំនុច 3 នៃមាត្រាមុន មន្ត្រីអធិការកិច្ចសុវត្ថិភាពការដ្ឋានរ៉ែ ត្រូវតែធ្វើការរាយការណ៍លំអិត ដល់អគ្គនាយកនៃអគ្គនាយកដ្ឋានធនធានរ៉ែ ឬ ជូនដល់រដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែជាមុនសិន។

5 ស្តីពីបញ្ជាតាមរយៈមន្ត្រីអធិការកិច្ចសុវត្ថិភាពការដ្ឋានរ៉ែ អនុលោមតាមការកំណត់នៃចំនុច1, 2, 3 នៃមាត្រាមុន រដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែ យោងតាមការកំណត់នៃមាត្រា២៥ ឬមាត្រា២៦ គឺចាត់ទុកថាអ្នកនោះជាអ្នកអនុវត្តជំនួសអគ្គនាយកនៃអគ្គនាយកដ្ឋានធនធានរ៉ែ ឬរដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែ។

Article 36

1 In case a mine safety inspector recognizes that the use or handling of machinery, equipment, buildings, structures or other facilities, or the management of explosives, motive power or fires in mineral-related operations violates this law or ministerial ordinance based on the law, or that there is an imminent safety risk, the inspector has the authority to carry out the duties of the director general in charge of mines sector, as prescribed in Article 24, Paragraph 1 of this law.

2 In case a mine safety inspector recognizes that there is an imminent safety risk due to excavation outside the concessionaire's mining area, the inspector has the authority to carry out the duties of the minister in charge of mines sector, as prescribed in Article 25 of this law.

3 In case there is a need for urgent rescue of a disaster victim, a mine safety inspector has the authority to carry out the duties of the said minister, as prescribed in Article 26 of this law.

4 When a mine safety inspector issues orders to the concessionaire as a result of safety risks being recognized, as prescribed in Paragraphs 1 to 3 inclusive above, the inspector shall promptly report the details of the orders to the said director general concerning the provision of Article 24, paragraph 1, or the said minister concerning the provision of Articles 26 to 27 inclusive of this law in advance.

5 The orders issued by the mine safety inspector as prescribed in paragraphs 1 to 3 inclusive above, shall be regarded as orders issued by the said director general in accordance with Article 24, paragraph 1, and by the said minister in accordance with Articles 26 to 27 inclusive of this law.

第３６条

1 鉱物事業に使用する機械、器具、建設物、工作物その他の施設の使用又は火薬類その他の材料、動力若しくは火気の取扱その他の実施の方法が、この法律又はこの法律に基づく省令に違反し、且つ、保安に関し急迫の危険があるときは、鉱山保安監督官は、第２４条第１項に規定する鉱物資源総局長の権限を行うことができる。

2 鉱物事業権所有者が鉱区外に侵掘したことにより保安に関し急迫の危険があるときは、

鉱山保安監督官は、第２５条に規定する鉱物部門を所管する大臣の権限を行うことができる。

3　被災者を救出するため緊急の必要があるときは、鉱山保安監督官は、第２６条に規定する鉱物部門を所管する大臣の権限を行うことができる。

4　鉱山保安監督官は、前第１項、第２項又は第３項に規定される命令を行う際には、鉱物部門を所管する総局長又は大臣に対して事前に命令に関する詳細な報告を行わなければならない。

5　前第１項、第２項又は第３項の規定に基づく鉱山保安監督官による命令については、鉱物資源総局長が第２４条第１項、鉱物部門を所管する大臣が第２５条及び第２６条の規定によりしたものとみなす。

(ការរាយការណ៍ចំពោះស្ថាប័នអធិការកិច្ចតាមរយៈកម្មកររ៉ែ)

មាត្រា៣៧

1　**នៅពេលមានគ្រោះថ្នាក់ច្រើន ឬនឹងអាចកើតឡើងនូវគ្រោះថ្នាក់ តាមរយៈមានភាពជាក់ស្តែងនៃបទល្មើសនឹងសេចក្តីប្រកាសរបស់ក្រសួងដោយអនុលោមតាមច្បាប់នេះឬច្បាប់ នៅក្នុងការដ្ឋានរ៉ែ កម្មកររ៉ែអាចមានសិទ្ធិធ្វើការរាយការណ៍ដល់មន្ត្រីអធិការកិច្ចសុវត្ថិភាពការដ្ឋានរ៉ែ ឬប្រធានមន្ទីរ៉ែនិងថាមពល នៅតាមបណ្តាខេត្តនានា បាន។**

2　**ម្ចាស់សិទ្ធិការងាររ៉ែ មិនអាចធ្វើការបញ្ឈប់ការងារ ឬធ្វើ ឲ្យកម្មកររ៉ែ មិនមានផលប្រយោជន៍ ដោយសារតែគាត់បានយករឿងទាំងនោះយកមករាយការណ៍ បានឡើយ។**

(Reports by a mineworker to supervision authorities)

Article 37

1　In case there is a violation of this Law or ministerial ordinance based on the law, or damage occurs or there is a risk of such damage occurring, a mineworker may report such facts to the provincial director in charge of mines sector or a mine safety inspector.

2　The concessionaire shall not dismiss a mineworker or treat the worker unfairly as a result of reports prescribed in Paragraph 1 above being made.

（鉱山労働者による監督機関への報告）

第３７条

1　鉱山においてこの法律又はこの法律に基づく省令に違反する事実があり、且つ、危害を生じ、又はそのおそれが多いときは、鉱山労働者は鉱物部門を所管する地方の部長又は鉱山保安監督官に報告することができる。

2　鉱物事業権所有者は前項の報告をしたことを理由として、鉱山労働者に対して解雇その他不利益な取扱をしてはならない。

(គណៈកម្មាការសុវត្ថិភាពការដ្ឋានរ៉ែ)

មាត្រា៣៨

គណៈកម្មាការសុវត្ថិភាពការដ្ឋានរ៉ែ នឹងត្រូវបង្កើតឡើងដោយអនុក្រឹត្យ។

(Mine Safety Advisory Committee)

Article 38

The Mine Safety Advisory Committee shall be formed under the Ministry in charge of mines sector in accordance with a sub-decree.

（鉱山保安顧問委員会）

第３８条

鉱物部門を所管する省に、政令に基づき、鉱山保安諮問委員会を設置する。

មាត្រា៣៩

១ គណៈកម្មាការសុវត្ថិភាពការដ្ឋានរ៉ែ យោងតាមការកំណត់របស់អនុក្រឹត្យ ទទួលសំណើរពីសំណាក់រដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែ និងម្ចាស់សិទ្ធិការងារ ធ្វើការពិភាក្សាស្រាវជ្រាវស្តីអំពីចំនុចសំខាន់ៗដែលទាក់ទងនឹងសុវត្ថិភាព។

២ គណៈកម្មាការសុវត្ថិភាពការដ្ឋានរ៉ែ នឹងត្រូវបង្កើតឡើងដោយមានការចូលរួមពីសំណាក់រដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែ ឬដោយអ្នកតំណាង បញ្ញាវ័ន្តក្នុងចំនួនច្រើននាក់ អ្នកតំណាងឲ្យកម្មករនិងម្ចាស់ការងាររ៉ែក្នុងចំនួនដូចគ្នា។

៣ ស្តីពីចំនុចលំអិតនៃរចនាសម្ព័ន្ធនិងមុខងាររបស់គណៈកម្មាការសុវត្ថិភាពការដ្ឋានរ៉ែ នឹងចែងដោយអនុក្រឹត្យ។

Article 39

1 The Mine Safety Advisory Committee shall investigate and deliberate important matters of mine safety on consultation with the minister in charge of mines sector.

2 The Mine Safety Advisory Committee shall be composed of the said minister or his/her representatives, some of academic background, and equal number of representatives from mineworkers and concessionaires in mines.

3 The detailed function and composition of the Mine Safety Advisory Committee shall be prescribed by a sub-decree.

第３９条

1 鉱山保安諮問委員会は、政令に基づき、鉱物部門を所管する大臣の諮問に応じて保安に関する重要事項について調査審議を行う。

2 鉱山保安諮問委員会は、鉱物部門を所管する大臣又はその代理人、複数の学識経験者、同数の鉱山労働者及び鉱物事業権所有者を代表する者により構成される。

3 鉱山保安諮問委員会の機能及び構成の詳細事項については、政令で定める。

(អង្គភាពបណ្តុះបណ្តាលសុវត្ថិភាពការដ្ឋានរ៉ែ)

មាត្រា៤០

១ រដ្ឋមន្ត្រីទទួលបន្ទុកការងាររ៉ែ ដើម្បីធ្វើកម្មសិក្សាទាក់ទងនឹងសុវត្ថិភាពការដ្ឋានរ៉ែ ត្រូវបង្កើតទីកន្លែងធ្វើកម្មសិក្សាសុវត្ថិភាពការដ្ឋានរ៉ែ។

២ ទីកន្លែងធ្វើកម្មសិក្សាសុវត្ថិភាពការដ្ឋានរ៉ែ ដើម្បីបណ្តុះបណ្តាលអ្នកដែលនឹងក្លាយទៅជាមន្ត្រីអធិការកិច្ចសុវត្ថិភាពការដ្ឋានរ៉ែ និងបច្ចេកទេសសុវត្ថិភាពការដ្ឋាន។

(Mine safety training units)

Article 40

1 The Ministry in charge of mines sector shall establish the mine safety training units for training in mine safety.

2 The mine safety training units shall nurture technical mine safety personnel working in mines and potential mine safety inspectors by means of training in mine safety.

（鉱山保安研修所）

第４０条

１　鉱物部門を所管する省は、鉱山保安に関する研修を行うため、鉱山保安研修所を設置する。

２　鉱山保安研修所では、鉱山保安技術者及び鉱山保安監督官の候補者を養成するため、鉱山保安に関する実務研修を行う。

(ឯកសារជំនួយ: ជំពូក៤ ការផាកពិន័យ)

មាត្រា៤១

ចំពោះបុគ្គលណាដែលអនុវត្តចំនឹងចំនុចនីមួយៗខាងក្រោម នឹងមានការពិន័យចំនួនទឹកប្រាក់ក្រោម ៣,០០០ដុល្លា ឬជាប់ពន្ធធនាគារចំនួនក្រោម៣ឆ្នាំ៖

១ បុគ្គលណាដែលបានល្មើសនឹងការកំណត់នៃមាត្រា២០ ឬ មាត្រា២០-១ ឬមាត្រា២០-៤។

២ បុគ្គលណាដែលបានល្មើសនឹងការព្រមាន ឬបទបញ្ជា យោងតាមរយៈតាមការកំណត់នៃមាត្រា ៨-២ មាត្រា២០-៣ មាត្រា២៣ មាត្រា២៤-២ មាត្រា២៥ មាត្រា២៦ ឬ មាត្រា២៧-១។

Chapter IV Penal Provisions (Reference)

Article 41

Parties to which any of the following subsections apply shall be punishable by imprisonment of no more than three years, or a fine of no more than 300,000 yen.

1 Parties that violate the provisions of Article 20, Paragraphs 1 or 4.

2 Parties that violate an order or penalty according to the provisions of Article 8, Paragraph 2; Article 20, Paragraph 3; Article 23; Article 24, Paragraph 2; Article 25, 26; or Article 27, Paragraph 1.

（参考：第四章　罰　則）

第４１条

次の各号の一に該当する者は、三年以下の懲役又は三十万円以下の罰金に処する。

一　第２０条第１項又は同第４項の規定に違反した者

二　第８条第２項、第２０条第３項、第２３条、第２４条第２項、第２５条、第２６条又は第２７条第１項の規定による命令又は処分に違反した者

មាត្រា៤២

ចំពោះបុគ្គលណាដែលអនុវត្តចំចំនុចនីមួយៗខាងក្រោម នឹងមានការពិន័យចំនួនទឹកប្រាក់ក្រោម១,០០០ ដុល្លា ឬជាប់ពន្ធធនាគារចំនួនក្រោម១ឆ្នាំ៖

១ បុគ្គលណាដែលបាន ឲ្យកម្មករវ៉ៃធ្វើការ ដែលល្មើសនឹងការកំហិតនៃមាត្រា៧-២។

២ បុគ្គលណាដែលបានល្មើសនឹងការកំណត់នៃមាត្រា៨-១ មាត្រា៩-១ មាត្រា១១-១ មាត្រា១៣-១ ឬ

មាត្រា១៣-៣, មាត្រា១៣-៥, មាត្រា២២-១ ឬមាត្រា៣៧-២។

៣ បុគ្គលណាដែលបានរាយការណ៍ភូតកុហក ឬ មិនបានរាយការណ៍នូវអ្វីដែលល្មើសនឹងការកំណត់នៃមាត្រា៩-៣ មាត្រា១៩-១ មាត្រា២១-១ ឬ មាត្រា២១-២។

៤ បុគ្គលណាដែលបានល្មើសនឹងការព្រមាន ឬបទបញ្ជា យោងតាមរយៈការនឹងការកំណត់នៃមាត្រា៩-៤ មាត្រា១១-៤ មាត្រា១៤-១ មាត្រា១៩-២ ឬមាត្រា២១-៤។

៥ បុគ្គលណាដែល ល្មើសនឹងសេចក្តីប្រកាសរបស់ក្រសួងយោងតាមរយៈការកំណត់នៃមាត្រា៣១-១ដោយអនុលោមតាមមាត្រាទី៥នៃច្បាប់នេះ ឬ បុគ្គលណាមិនគោរពតាមការកំណត់នៃមាត្រា៦ដោយល្មើសនឹងសេចក្តីប្រកាសរបស់ក្រសួងតាមការកំណត់នៃមាត្រា៣១-២។

Article 42

Parties to which any of the following subsections apply shall be punishable by imprisonment of no more than one year, or a fine of no more than 150,000 yen.

1 Parties that employ a mineworker to do tasks that violate restrictions according to the provisions of Article 7, Paragraph 2.

2 Parties that violate the provisions of Article 8, Paragraph 1; Article 9, Paragraph 1; Article 11, Paragraph 1; Article 13, Paragraphs 1,3 or 5; Article 22, Paragraph 1 or Article 37, Paragraph 2.

3 Parties that violate, fail to submit notifications for, or make false notifications regarding the provisions of Article 9, Paragraph 3; Article 19, Paragraph 1; Article 21, Paragraph 1 or 2.

4 Parties that violate orders or penalties according to the provisions of Article 9, Paragraph 4; Article 11, Paragraph 4; Article 14, Paragraph 1; or Article 19, Paragraph 2; or Article 21, Paragraph 4.

5 Parties that violate the ministerial ordinances according to the provisions of Article 31, Paragraph 1; who fail to carry out measures prescribed in Article 5 and of Article 31, Paragraph 2; who violate the provisions of Article 6.

第４２条

次の各号に一に該当する者は、一年以下の懲役又は十万円以下の罰金に処する。

一　第７条第２項の制限に違反して鉱山労働者を就業させた者

二　第８条第１項、第９条第１項、第１１条第１項、第１３条第１項、同条第３項、同条第５項、第２２条第１項又は第３７条第２項の規定に違反した者

三　第９条第３項、第１９条第１項、第２１条第１項若しくは第２１条第２項の規定に違反して届出をせず、又は虚偽の届出をした者

四　第９条第４項、第１１条第４項、第１９条第２項又は第２１条第４項の規定による命令又は処分に違反した者

五　第３１条第１項の規定による省令に違反して第５条に定める措置を講ぜず又は第３１条第２項の規定による省令に違反して第６条に定める事項を守らない者

មាត្រា៤៣

ចំពោះបុគ្គលណាដែលអនុវត្តចំនឹងចំនុចនីមួយៗខាងក្រោម នឹងមានការពិន័យជាចំនួនទឹកប្រាក់ក្រោម ៥០០ដុល្លារ៖

១ បុគ្គលណាដែលបានល្មើសនឹងការកំណត់នៃមាត្រា៧-១ មាត្រា១៨-១ មាត្រា១៨-២ ឬមាត្រា៣១-១។

២ បុគ្គលណាដែលបានរាយការណ៍ភូតកុហក ឬមិនបានរាយការណ៍នូវអ្វីដែលល្មើសនឹងការកំណត់នៃមាត្រា៩-៥ ឬមាត្រា៣២-២។

៣ បុគ្គលណាដែលបានរាយការណ៍ភូតកុហក ឬមិនបានរាយការណ៍នូវអ្វីដែលល្មើសនឹងការកំណត់នៃមាត្រា៣២-១។

៤ បុគ្គលណាមិនមានលិខិតសំគាល់ខ្លួនកាន់មកជាមួយ ដែលល្មើសនឹងការកំណត់នៃមាត្រា៤៥-៣ ឬមិនបានបង្ហាញនូវលិខិតនោះតាមការស្នើសុំឲ្យបង្ហាញ។

៥ បុគ្គលណាមិនព្រមទទួលការត្រួតពិនិត្យ បង្ក ឲ្យមានឧបសគ្គ គេចវេស ឬមិនចង់ឆ្លើយនឹងសំណួររបស់មន្ត្រីអធិការកិច្ចសុវត្ថិភាពការដ្ឋានរ៉ែ ដែលល្មើសនឹងការកំណត់នៃមាត្រា៣៥-១ ។

Article 43

Parties to which any of the following subsections apply shall be punishable by a fine of no more than 50,000 yen.

1 Parties that violate the provisions of Article 7, Paragraph 1; Article 18, Paragraphs 1 or 2; Article 30, Paragraph 1.

2 Parties that violate, fail to submit notifications for, or make false notifications regarding the provision of Article 9, Paragraph 5 or Article 29, Paragraph 2.

3 Parties that violate, fail to submit notifications for, or make false notifications regarding the provisions of Article 29, Paragraph 1.

4 Parties that fail to carry or produce documented proof of permission, in violation of the provisions of Article 32, Paragraph 3.

5 Parties that refuse to allow, interfere with or evade on-site inspections, prescribed in Article 35, Paragraph 1, or those who fail to respond to questioning by a mine safety inspector.

第４３条

次の各号の一に該当する者は、五万円以下の罰金に処する。

一　第７条第１項、第１８条第１項、同第２項又は第３０条第１項の規定に違反した者

二　第９条第５項又は第２９条第２項の規定に違反して届出をせず、又は虚偽の届出をした者

三　第２９条第１項の規定による報告をせず、又は虚偽の報告をした者

四　第３２条第３項の規定に違反して書面を携帯せず、又はこれを呈示しなかった者

五　第３５条第１項の規定による鉱山保安監督官による査察を拒み、妨げ、若しくは忌避し、又は質問に対して陳述をしなかった者

មាត្រា៤៤

អ្នកដែលត្រូវបានប្រើដោយម្ចាស់ការងាររ៉ែ ឬ អ្នកដែលអនុវត្តការងាររ៉ែតាមការកំណត់នៃមាត្រា១៩-១នៃ

ច្បាប់នេះ ទាក់ទងទៅនឹងការងាររបស់ម្ចាស់សិទ្ធិការងារ៉ែ នៅពេលមានបទល្មើសនៃមាត្រា៣មុន(មាត្រា៤១, ៤២, ៤៣) ក្រៅពីការពិន័យដល់សាមីខ្លួនដែលប្រព្រឹត្ត នឹងមានការពិន័យជាទឹកប្រាក់ទៅតាមមាត្រានីមួយៗ ចំពោះម្ចាស់សិទ្ធការងារ៉ែ ផងដែរ។

Article 44

In case an employee of the concessionaire or a contractor, as prescribed in Article 19, Paragraph 1 of this law, violates the provisions while carrying out the concessionaire's duties, as prescribed in Articles 41 to 43 inclusive above, the respective punishment shall apply to not only the violator, but also the concessionaire.

第４４条

鉱物事業権所有者の使用人又は本法第１９条第１項に規定する従業者が、鉱物事業権所有者の業務に関し、前三条の違反行為をしたときは、行為者を罰する外、鉱物事業権所有者に対して各本条の罰金刑を科する。

The draft of Mine Safety Regulation (phase 1) in the Kingdom of Cambodia

The Regulation (phase 1) will be enforced as same time as the enforcement of Mine Safety Law in the Kingdom of Cambodia.

December 2015 (revised on June 2016)

The draft of Mine Safety Law	The draft of Mine Safety Regulation (phase 1)
Chapter I General Provisions **(Purpose of the law)** Article 1 The law aims to prevent injuries to mineworkers, to prevent mine pollution and to promote rational development of mineral resources in consonance with the Law on Management and Exploitation of Mineral Resources in the Kingdom of Cambodia. **(Definition)** Article 2 Terms used in this law shall be interpreted as follows: 1 “Mineral licenses are classified into six categories: “artisanal mining licenses” are issued by the states or provincial governments that have jurisdiction over the mineral sector in the region in question, while “pits and quarries mining licenses,” “gem mining licenses,” “mineral (gemstone) cutting licenses,” “mineral exploration licenses” and “industrial mining licenses” are issued by the minister in charge of the	**Chapter I General Provisions** (Scope of provisions) Article 1 This regulation (hereinafter referred as "the Regulation") prescribes safety in mineral-related operations in accordance with the Mine Safety Law in Kingdom of Cambodia (hereinafter referred as "the Law"). (Definition) Article 2 1 In the Regulation, "pit" means the underground excavated open space as follows. 1) a part of it consists of mineral working field; 2) a part of it consists of tunneling field which connects preparing mineral working field to surface; 3) a part of it consists of tunneling field for surveying the condition of ore deposits; 4) tunneling field connecting to each preceding Item above; 5) tunnels (galleries) composed by levels, inclined shafts and vertical shafts that connect ore deposits or its nearby to the surface to ensure safety for mineral

mineral sector. 2 “The concessionaire” is the individual or legal entity (corporation) that possesses a license to carry out mineral-related operations, issued by the respective provincial ministerial department or minister responsible for the area in question. However, “artisanal mining licenses” shall be issued only to Cambodian citizens. 3 “Mineral-related operations” means projects related to the prospecting, exploration and exploitation of minerals, accompanying projects such as the processing, refining and smelting of minerals, as well as projects related to management of tailings dams, and restoration of former mine sites. 4 “Mine” means any place of work where mineral-related operations are carried out. 5 “Mineworker” means a person employed by the concessionaire to carry out mineral-related operations at a mine. 6 “Mine pollution prevention projects” means projects concerning the vegetation and soil cover of waste stone dumps, slag dumps, and sediment dams attached to processing plants and mine-water treatment facilities, as well as projects related to blockage of the drifts, and those related to the perpetual treatment of mine- and waste-water from facilities that are no longer used, which fail to meet standards concerning	working field or/and tunneling field. 2 In the Regulation, "explosive coal dust" means the coal dust which is extracted from coal seams that volatile matter content exceeds eleven (11) percent (%) based on the designated analysis method. 3 In the Regulation, "mine buildings" mean a mineral processing plant, a coal preparation plant, a size reduction plant, a mechanical slaked lime production facility, a refinery & smelting, an embankment and other structure on the surface, and a tunnel (gallery) and timbering, a blockage and other structures in underground. 4 In the Regulation, "mine structures" mean machineries and instruments like a winding apparatus, a drilling machine, a belt conveyer, a fan, an incinerator for mining wastes, a compressor, an electrical transformer or other materials for the purpose of mineral-related operations. 5 In the Regulation, "vehicle type mine machines" mean machineries which can be moved by an engine prescribed in the “Regulation on procedures and items of mentioned provided in Mine Safety Law”. 6 In the Regulation, "mine roads" mean surface roads used for vehicle type mine machines or automobiles at a mine. 7 In the Regulation, "a boiler" means a closed container which generates higher pressure steam compared with the atmospheric pressure (so called a steam boiler) and a closed container which generates and supplies hot water with increased temperature. 8 In the Regulation, "a special type boiler" means a steam boiler of a closed container which generates steam or heats up materials by receiving steam, a closed

contamination levels and amounts. Article 3 1 In this law, “safety” indicates the following items concerning mineral-related operations. 1 Prevention of danger and injury to people at mines 2 Preservation of mineral resources 3 Maintenance and management of mine facilities 4 Prevention of mine pollution 5 Sanitation-related ventilation 6 Rescue activities at times of mine disaster **(Validity)** Article 4 1 This law shall be applicable to the mineral-related operations by the concessionaires as prescribed in Article 4 of the Law on Management and Exploitation on Mineral Resources or the mine facilities which former concessionaires had used for implementing the mineral-related operations within five (5) years after the mineral license has renounced. 2 The penalties prescribed in this law, and procedures and other actions to be carried out by the concessionaire in accordance with the provisions of the law shall also be valid with regard to the concessionaire’s successor.	container which generates higher pressure steam compare with the atmospheric pressure and a closed container heat accumulator in which steam is accumulated. 9 In the Regulation, "a crane" means a unit which uses a motor for lifting with a lifting capacity greater than three (3) ton or with an attached bucket type unit with a grasp capacity greater than 0.5 ton or with a boom longer than ten (10) m. 10 In the Regulation, "mining wastes" mean unnecessary materials or goods accompanying mineral-related operations as following items. 1) waste stones accompanying mineral workings of ore deposits or coal seam; 2) slag; 3) sediment (tailings); 4) cinders, waste oil, waste acid, waste alkaline and waste plastics; 5) waste paper coated with PCB, waste rubber, waste metal, waste glass, waste ceramic and broken concrete accompanying demolition of mine structures, and related materials; 6) dusts generated and collected by a dust collector in a smoke generating facility, and in an incinerator for waste oil, waste plastic, waste paper and waste metal which are coated or sealed with Poly Chlorinated Biphenyls (PCB); 7) dusts generated and collected by a dust collector in a waste incinerator which causes dioxin kinds after burning, and; 8) treated materials for disposal of above mentioned mining wastes. 11 In the Regulation, "harmful mining wastes" mean as following items. 1) cinders, and dusts generated and collected by a dust collector in an incinerator for waste oil, waste plastic, waste paper and waste metal, which

	exceed the standard for treatment and disposal of mining wastes, and treated materials for disposal of those mining wastes. 2) cinders, and dusts generated and collected by a dust collector in a waste incinerator that causes dioxin kinds after burning or sediment discharged from a waste incinerator having emission gas cleaning facility, which exceed the standard for treatment and disposal of mining wastes, and treated materials for disposal of those mining wastes. 12 In the Regulation, “mine smoke” contents the hazardous air pollutant substances such as sulfur oxide, nitrogen oxides, soot and dusts, cadmium and its compounds, and lead and its compounds, which may impair human health in case continually ingestion of the pollutants, and may cause air pollution. 13 In the Regulation, “dioxin kinds” mean the hazardous substances as following items. 1) Poly chlorinated dibenzofurans (PCDFs) 2) Poly chlorinated dibenzofurans – para – dioxins (PCDDs) 3) Co – poly chlorinated biphenyls (Co-PCB) 14 In the Regulation, “specific harmful substances” mean the hazardous substances which may ruin human health proceeding from soil or water containing as following items. 1) Cadmium and its compounds 2) Six valence chromium compounds 3) Cyanides 4) Mercury and its compounds

	5) Selenium and its compounds 6) Lead and its compounds 7) Arsenic and its compounds 8) Parathion, methyl parathion, methyl dimetion 9) PCB 10) Carbon tetrachloride 11) Trichloroethylene 12) Tetra-chloroethylene (Designation of category) Article 3 1 In the Regulation, mines shall be categorized into Coal mine, Metal mine and Non-metal mine in accordance with the mineral classification. 2 In case of underground Coal mine shall be categorized into Class-A coal pit and Class-B coal pit. 3 Class-A coal pit shall come under one of the following items and shall be designated by the Minister in charge of mines sector. 1) the concentration of flammable gas in the total exhaust of the return air in a tunnel (gallery) exceeds 0.25% or more; 2) the concentration of flammable gas at a mineral working field of a pit exceeds 0.5% or more; 3) flammable gas content of 3% or more is detected at some points in a pit when the ventilation facilities are stopped for one hour. 4 Class-B coal pits are all other coal pits except for Class-A coal pit.

	5 The flammable gas concentration value prescribed in Paragraph 3 above shall be determined systematically using a precise flammable gas detector or gas analysis through several times of measurements in a pit by mine safety inspectors.

The draft of Mine Safety Law	The draft of Mine Safety Regulation (phase 1)
Chapter II Safety **(Duties and obligations of the concessionaire)** Article 5 The concessionaire shall carry out necessary measures to ensure the following: 1 Prevention of rock-falls, collapses, floods, gas outburst, gas or coal dust explosions, spontaneous combustion and fires in mines 2 Prevention of danger and injuries and/or mine pollution due to treatment and disposal of gas, dust, waste stones, slag, mine water and wastewater, and mine smoke 3 Prevention of damage and injuries related to the handling of machinery and equipment, as well as the handling of explosives, motive power and fires 4 Establishment of suitable ventilation and rescue mechanism 5 Conservation of mineral resources 6 Maintenance and management of machinery, equipment, buildings and structures 7 Prevention of mine pollution due to land excavation 8 Prevention of damage and injuries related to the	**Chapter II Safety** **Section 1 General Rules** (Duties and obligations of the concessionaire) Article 4 1 The specific necessary measures for safety by the concessionaire prescribed in Article 5, Paragraph 1 to 8 inclusive of the Law shall be provided in this Regulation in accordance with Article 31, Paragraph 1 of the Law. 2 The concessionaire shall only conduct mineral-related operations based on the permitted “techniques and financial plans” incorporated in an exploration work program or in a mining feasibility study prescribed in Article 21, Paragraph 1 of Law on Management and Exploitation of Mineral Resources.

establishment and/or modification of mine facilities in mine-related operations	
(Obligations of mineworkers) Article 6 Mineworkers must obey items necessary to the safety at the mines.	(Obligations of mineworkers) Article 5 Mineworkers must obey the specific items necessary for safety prescribed in Article 6 of the Law, shall be provided in this Regulation in accordance with Article 31, Paragraph 2 of the Law.
(Training on mine safety) Article 7 1 The concessionaire shall educate and train mineworkers with regard to measures necessary for mine safety. 2 With regard to particularly dangerous tasks, the level of education that the mineworker should receive, and the restrictions on the tasks that can be performed by mineworkers who have not received this education, shall be prescribed in ministerial ordinances.	**Section 2 Training on Mine Safety** (Instruction regarding safety training for dangerous work) Article 6 1 The concessionaire shall give training to mineworkers who engage in the hazardous works mentioned in each following items, the period and contents of training shall be prescribed in “Regulation on procedures and items of mentioned provided in Mine Safety Law and its regulations” 1) the combustion work of a boiler with a maximum available pressure of 0.4 Mega-Pascal (MPa) or more; 2) the operation of a special boiler with a maximum available pressure of 0.4 MPa or more; 3) the work of installation, maintenance and repair of electrical equipment; 4) the maintenance work of portable cap lamps; 5) the operation of a hoist for transporting workers, or a hoist with a motor of 50

	kW or more; 6) the operation of a locomotive; 7) the maintenance work of an internal-combustion engine or a diesel locomotive in underground mines; 8) the maintenance work of a vehicle type mine machine; (excluding the machine that an internal-combustion engine is out of use) 9) the maintenance work of an automobile; 10) the operation of a crane with a lifting capacity of five (5) tons or more; 11) the operation of a vehicle type mine machine; 12) the operation of an automobile; 13) the blasting work; 14) the rescue work or joint rescue work wearing oxygen breathing apparatus; 15) the maintenance work of oxygen breathing apparatuses and simple life-saving equipment; 16) the operation of a coal mining machine which have a motor of 50 kW or more in underground Coal mine (Class-A coal pit and Class-B coal pit); 17) the operation of a tunnel heading machine or an enlarging machine which has a motor of 35 kW or more in underground Coal mine (Class-A coal pit and Class-B coal pit); 18) the operation of a shuttle car in underground Coal mine (Class-A coal pit and Class-B coal pit); 19) the handling and management work of liquid-like substances containing poisonous or deleterious substance, or inorganic cyanides; 20) the work of electric welding;

	21) the work of gas welding; 22) the work of an advanced drilling or a drilling of gas drainage in underground Coal mines (Class-A coal pit and Class-B coal pit); 23) the handling of sultry and melting substances; 24) the works or operations designated by the Minister in charge of mines sector after consulting to the Mine Safety Advisory Committee prescribed in Article 38 of the Law. 2 The concessionaire shall up-date training for the mineworkers who already finished the training prescribed in Paragraph 1 above for ensuring safety, when there is a significant changes in types, structure and capacity of the machinery, equipment and other facilities at a mine. 3 The concessionaire shall save records of mineworker's lists that have been trained, training contents, date of training and up-date training for three(3) years prescribed in Paragraph 1 and 2 above. Article 7 1 The concessionaire shall give necessary safety instructions to new non-skill mineworkers who engage at a underground mine as follow provisions. 1) instruction items of shelter methods when there is a risk of danger, and prevention of mine fire, spontaneous combustion, flood, and prevention of mine pollution; 2) instruction items of necessary matters for dust prevention measures in working fields where dust scatters remarkable; 3) instruction items of prevention of gas explosion at Coal mines (Class-A coal pit and Class-B coal pit).

(Caution items regarding machinery, equipment and so on) Article 8 1 The concessionaire shall not use or install in a mine particularly dangerous machinery, equipment, explosives, and various gas detectors, life-saving equipment and other materials according to the procedures prescribed by the ministerial ordinances, unless it has passed the examinations set by the Ministry in charge of mines sector. 2 The Minister in charge of mines sector has the power to prohibit the use or installation of especially dangerous machinery, equipment, explosives, and various gas detectors, life-saving equipment and other materials at mines if, with given reason, it is deemed necessary to ensure safety. 3 The said Minister can outsource the examination prescribed in Paragraph 1 above, to a qualified external institution.	(Publicity of the Law and the Regulation) Article 8 The concessionaire shall make some sentences of the Law, this Regulation and safety rules that mineworkers have to obey, simply to the point, and summaries in easy terms shall be posted or provided in the proper places at a mine in accordance with Article 7, Paragraph 1 of the Law. **Section 3 Caution Items regarding Machinery, Equipment and so on** (Caution items) Article 9 1 In accordance with Article 8, Paragraph 1 of the Law, the concessionaires of underground Coal mines(Class-B coal pit), Metal mines and Non-metal mines, shall install or utilize the following materials, machineries, equipment, and other notified parts (hereinafter referred as "mine requisites"), all which shall pass categorized approval tests or inspection tests for type approval. 1) various gas detectors; a) a precision flammable gas detector; b) a carbon dioxide gas detector; c) a carbon monoxide detector; 2) an automatic flammable gas alarm; 3) life-saving equipment; a) an oxygen breathing apparatus;

	b) simple life-saving equipment; c) self life-saving equipment for carbon monoxide(CO); d) a gas mask; 4) the mine requisites designated by Minister in charge of mines sector after consulting to the Mine Safety Advisory Committee prescribed in Article 38 of the Law. 2 In accordance with Article 8, Paragraph 1 of the Law, the concessionaire shall install or utilize the precision flammable gas detectors, oxygen breathing apparatus, simple life-saving equipment and automatic flammable gas alarms, and other notified mine requisites, all of which shall pass individual inspection tests or sampling inspections in addition to the inspection tests prescribed in the preceding paragraph 1 above. Article 10 1 The standards of the inspection and official tests for mine requisites prescribed in the preceding Article 9, shall be stipulated in the “Regulation on procedures and items of mentioned provided in Mine Safety Law”. 2 The mine requisites manufactured overseas accommodate to the certification standards of the inspection and official tests shall be designated by the Minister in charge of mines sector, and shall be treated as permissible mine requisites. 3 The said Minister can entrust the affairs of probation to the qualified external institution regarding designation of permissible mine requisites manufactured overseas, prescribed in preceding Paragraph 2.

(Permission regarding facility plans) Article 9 1 When the concessionaire establishes or modifies buildings, structures or other facilities for use in mineral-related operations, “facility plan” shall be drafted and submitted to the minister in charge of mines sector for permission according to the procedures prescribed by the ministerial ordinance. 2 Items to be included in the “facility plan” for the establishment or modification of buildings, structures or other facilities to be used in mineral-related operations shall be prescribed by the ministerial ordinance.	Article 11 In accordance with the Article 5 of the Law, the concessionaire shall not install or utilize broken or damaged mine requisites prescribed in the preceding Article 9 of the Regulation, all which shall have conformed the standards of inspection and official tests (hereinafter referred as “permissible mine requisites”. (Observance of requirements) Article 12 1 In accordance with Article 5 of the Law, the concessionaire of underground mining shall obey the requirements that are mentioned in the certificate of permissible mine requisites providing and utilizing at a mine. 2 In accordance with Article 6 of the Law, the safety supervisor, the technical safety manager, the safety technical staffs and other mine workers shall obey the requirements that are mentioned in the certificate of permissible mine requisites utilizing at a mine. **Section 4 Permission regarding Facility Plans** (Permission regarding facility plans) Article 13 1 When the concessionaire intends to establish or modifies following mine buildings, structures or other facilities in accordance with Article 9, Paragraph 1 of the Law, “facility plan” shall be drafted and submitted the Minister in charge of mines sector for permission no later than 30 days before the work is due to

3 The concessionaire shall submit the plan to the minister in charge of mines sector no later than thirty (30) days before the work is due to begin. 4 The minister has the power to prohibit work on such facilities or order the plan to be modified by the concessionaire if, with given reason, it is deemed necessary to ensure safety. 5 When the plan prescribed in Paragraph 1 above has been completed, or such buildings, structures or other facilities have been scrapped, the concessionaire shall notify the minister within thirty (30) days. **(Dumps and tunnels (galleries))** Article 10 1 The concessionaire shall maintain and manage waste stone dumps, slag dumps, and tailings dams attached to processing plants and mine- and waste-water treatment facilities, and tunnels (galleries), as prescribed in this Law and ministerial ordinances based on the Law, to prevent mine pollution, even if the mineral license has already been transferred or renounced. 2 When the concessionaire transfers the mineral license to a third party, the successor shall implement existing duties and obligations with regard to the dumps, dams and tunnels (galleries) inherited from the previous concessionaire.	beginning based on “Regulation on procedures and items of mentioned provided in Mine Safety Law and its regulations”. 1) a boiler or a specially designed boiler with a maximum pressure in normal use which exceeds 0.4 MPa; 2) an aerial ropeway; 3) railroad tracks for a battery locomotive; (except electric locomotive) 4) internal-combustion engines in underground mining; 5) mine water treatment facilities; 6) a hauling facilities; 7) an automobile for transporting mineworkers in underground mining; 8) a fuel oil storage facility or a gas filling station in underground mining; 9) a coal preparation plant using motor; 10) a processing plant or a crushing plant using motor; 11) a kiln plant or a drying plant; 12) a smelting and refinery; 13) a waste stone dump, a slag dump, and a tailings dam attached to mine water treatment facilities, a coal preparation plant, a mineral processing plant or a smelting & refinery; 14) electric facilities operated more than ten (10) volts in Coal mines(Class-A coal pit and Class-B coal pit) ; 15) special high voltage electric facilities (over 7,000 V), or high voltage electric facilities all output a hundred (100) kW or more in Metal mines and Non-metal mines; 16) an explosives service station;

	17) a high pressure gas production facility handling a hundred (100) cubic meter per a day (m^3/day) or more; 18) a high pressure gas storage facility with a volume of three-hundreds (300) m^3 or more; 19) a mining wastes landfill; 20) the mine buildings, structures or other facilities designated by the Minister in charge of mines sector after consulting to the Mine Safety Advisory Committee prescribed in Article 38 of the Law. 2 When the concessionaire submits “facility plan” to the said Minister for permission, the documents of “construction program” and “detailed design of facility” shall be attached the aforesaid plan. 3 The documents of “construction program” and “detailed design of facility” shall be drafted in accordance with the “Regulation on procedures and items of mentioned provided in Mine Safety Law and its regulations” (Completion of construction, and abolition of facilities) Article 14 1 When the plan for establishment or modification of mine buildings, structures or other facilities prescribed in Article 9, Paragraph 5 of the Law has been completed, the concessionaire shall notify the Minister in charge of mines sector within thirty (30) days based on the “Regulation on procedures and items of mentioned provided in Mine Safety Law and its regulations”. 2 When mine buildings, structures or other facilities prescribed in Article 9, Paragraph 5 of the Law have been scrapped, the concessionaire shall notify the

(Safety rules) Article 11 1 The concessionaires shall establish their own safety rules to ensure safety at the mine, and submit them to the Minister in charge of mines sector. 2 When the concessionaire establishes or modifies the safety rules, these rules need to be approved by the safety committee prescribed in Article 16. 3 Items to be included in the safety rules shall be prescribed by the ministerial ordinance. 4 The said Minister has the power to order the concessionaire to modify the rules if, with given reason, it is deemed necessary to ensure safety. Article 12 The concessionaire and mineworkers must obey the safety rules prescribed in the preceding Article above.	Minister as same procedures prescribed in Paragraph 1. 3 When a waste stone dump, a slag dump or a tailings dam prescribed in Article 13, Paragraph 1, Item 13 and a mining waste landfill prescribed in Article 13, Paragraph1, Item 19 of the Regulation, have not used for more than one year, or when put to use again, the concessionaire shall notify the said Minister in advance as same procedures prescribed in Paragraph 1. **Section 5 Safety Rules** (Safety rules) Article 15 1 The concessionaire shall establish own safety rules in accordance with Article 11, Paragraph 1 of the Law. 2 The concessionaire shall notify safety rules approved by the safety committee, to the Minister in charge of mines sector. (The items of safety rules) Article 16 1 When the concessionaire establishes own safety rules in accordance with Article 11, Paragraph 3 of the Law, the items of the rules shall be depended on the actual state of mineral-related operations at a mine. 2 The items of the rules shall be drafted based on the “Regulation on procedures and items of mentioned provided in Mine Safety Law and its regulations” 3 The concessionaire shall supplement necessary items of the rules according to the

	actual state of mineral-related operations at a mine without regard to the preceding Paragraph 2.

The draft of Mine Safety Law	The draft of Mine Safety Regulation (phase 1)
(Appointment of a safety supervisor, technical safety managers, technical safety staffs and a representative of safety supervisor) Article 13 1 The concessionaire shall appoint a safety supervisor at a mine according to the procedures prescribed by the ministerial ordinance. 2 The said safety supervisor must be appointed from among those responsible for supervising the implementation of the mineral-related operations at the mine. However, if the concessionaire is responsible for supervising the implementation of the mineral-related operations, the concessionaire can be the safety supervisor. 3 The concessionaire shall appoint a representative safety supervisor in case of absence due to travel, illnesses or another accidents, in advance. 4 When the concessionaire has appointed a safety supervisor and his/her representative at a mine, notification must be submitted to the Minister in charge of mines sector. 5 The concessionaires of mines that employ more than thirty (30) mineworkers at all times shall appoint technical safety managers and technical safety staffs to manage technical matters related to the safety according to the amount of affairs,	**Section 6 Appointment of a safety supervisor, technical safety managers, technical safety staffs and a representative of safety supervisor** (Appointment of a safety supervisor, technical safety managers, technical safety staffs and a representative of safety supervisor) Article 17 The concessionaire shall appoint a safety supervisor at a mine in accordance with Article 13, Paragraph 1 of the Law. However, if the concessionaire supervises and manages mineral-related operations personally at a mine, this provision shall not be applied. Article 18 1 The concessionaire who employs more than thirty (30) mineworkers at all times shall appoint a technical safety manager in accordance with Article 13, Paragraph 5 of the Law. 2 The concessionaire can appoint the plural number of a technical safety manager coping with scale of a mine and working formation without regard to the preceding Paragraph 1, if necessary to ensure the safety. 3 The technical safety manager prescribed in preceding Paragraph 1 and 2 shall be assigned competent personnel who have graduated from technical college or vocational school in charge of mining-related subject, or have superior scholarship ability, and have five (5) years or more mining business practice and experience.

and to fulfill the requirements prescribed by the ministerial ordinance. 6 When the said representative undertakes the duties on behalf of the safety supervisor at a mine, the application of this Law and the ministerial ordinances based on the Law shall consider the representative to be the safety supervisor. **(Duties of the safety supervisor, technical safety managers and technical safety staffs)** Article 14 1 The safety supervisor shall manage and control matters related to mine safety. 2 The technical safety manager shall assist the safety supervisor by managing technical matters related to the safety. 3 The technical safety staffs shall allocate technical duties related to the safety under the direction of the safety supervisor and technical safety managers. 4 The necessary items concerning the duties of the safety supervisor, technical safety managers and technical safety staffs shall be prescribed by the ministerial ordinance. Article 15 The mineworkers must obey the instructions issued by the safety supervisor and other technicians to ensure mine safety,	Article 19 1 The concessionaire shall appoint a representative of the safety supervisor at a mine in accordance with Article 13, Paragraph 3 of the Law. 2 The representative of the safety supervisor prescribed in the preceding Paragraph 1, shall be appointed from among persons to perform the duties concerning supervision and management of the implementation of mineral-related operations under the safety supervisor at a mine. Article 20 When the concessionaire appointed a safety supervisor and its representative in accordance with Article 13, Paragraph 3 of the Law, the appointments shall be notified the Minister in charge of mines sector within thirty (30) days following the format that is available from the “Regulation on procedures and items of mentioned provided in Mine Safety Law and its regulations”. Article 21 1 The concessionaire who employs more than thirty (30) mineworkers at all times in accordance with Article 13, Paragraph 5 of the Law, shall appoint necessary technical safety staffs listed in the following provisions as to scale of mine and working formation at a mine. 1) A technical safety staff for surface safety & blasting is needed on open-pit mining. 2) A technical safety staff for underground safety & blasting is needed in underground mining.

as prescribed in this Law and ministerial ordinance based on the Law.	3) A technical safety staff for machinery is needed at a mine where the full power of 1,000 kilowatts(KW) or more of vehicle type mine machineries or automobiles are installed, the motors with total output a hundred (100) KW or more are installed, or a machinery to generate high pressure gas volume over a hundred (100) m3/day is established. 4) the technical safety staff for electricity is needed at a mine where electrical facilities over 10 volts are established in Coal mines (Class-A coal pit and Class-B coal pit), or special voltage facilities or total output a hundred (100) KW or more high voltage facilities are established in Metal mines and Non-metal mines. 5) the technical safety staff for prevention of mine pollution is needed at a mine in which facilities are subject to regulations regarding water pollution prevention, air pollution prevention, and prevention of soil contamination as well as noise regulation and vibration regulation based on the “Law on Environmental Protection and Natural Resource Management”. 6) the technical safety staff for boilers is needed at a mine in which a boiler or a special type boiler with maximum operating pressure 0.4 MPa or more is established; 7) the technical safety staff for explosives at a mine which an explosives service station is established; 8) the technical safety staff for poisonous and deleterious substances at a mine which a poisonous and deleterious depot is established. 2 The technical safety staffs prescribed in preceding Paragraph above shall be assigned competent personnel who have graduated from technical college or

	vocational school in charge of mining-related subject, or have superior scholarship ability, and have three (3) years or more mining business practice and experience. (Duties of a safety supervisor, technical safety manager and technical safety staffs) Article 22 1 A safety supervisor manages the following matters in accordance with Article 14, Paragraph 1 of the Law. 1) concerning formulation and implementation of the safety plan; 2) concerning prevention of mine pollution; 3) concerning installation of safety facilities, modification, or management; 4) concerning establishment and modification of safety rules; 5) concerning safety training; 6) concerning countermeasures and investigation of causes of mine disaster, and; 7) other safety matters. 2 The technical safety manager manages technical matters prescribed in preceding Paragraph assisting the safety supervisor in accordance with Article 14, Paragraph 2 of the Law. Article 23 Under supervision of the safety supervisor or the technical safety manager (hereinafter referred to as "administrator"), the technical safety staffs shall share the following provisions. 1) The technical safety staff for surface safety & blasting is to supervise safety

	matters on the surface, and carriage, charging, wiring, ignition of explosives and related matters of blasting work. The staff for surface safety & blasting also combines with management of explosives in case an explosives service station isn't established at a mine. 2) The technical safety staff for underground safety & blasting is to supervise safety matters in the underground, and carriage, charging, wiring, ignition of explosives and related matters of blasting work. The staff for underground safety & blasting also combines with management of explosives in case an explosives service station isn't established at a mine. 3) The technical safety staff for machinery is to manage safety matters regarding machineries which require safety cautions. 4) The technical safety staff for electricity is to manage safety matters regarding electrical facilities which require safety cautions. 5) The technical safety staff for prevention of mine pollution is to manage preventive measures in mineral-related operations. 6) The technical safety staff for boilers is to manage safety matters of a boiler and a special type boiler with maximum operating pressure of 0.4 MPa or more which require safety cautions. 7) The technical safety staff for explosives is to manage preservation, delivery, transportation and other related handling of explosives. 8) The technical safety staff for poisonous and deleterious substances is to manage preservation, delivery, transportation and other related handling of the aforesaid substances.

	Article 24 1 The concessionaire shall clearly determine the concrete scope of duties for a safety supervisor, a technical safety manager and technical safety staffs at a mine prescribed in the preceding Article 22 and 23 of the Regulation. 2 When the scope of duties for a safety supervisor, a technical safety manager and technical safety staffs should be established or changed, the concessionaire shall record and placard the contents of their duties at the mine office. Article 25 The concessionaire must not let other mineworkers perform a safety supervisor, a technical safety manager and technical safety staffs' duties at a mine. (Items to be conducted by safety supervisor, technical safety manager and technical safety staffs) Article 26 1 A safety supervisor shall obey following provisions in accordance with Article 6 of the Law. 1) to examine facilities, materials and method of mineral-related operations for safety, and to maintain them; 2) to take immediate preventive measures or appropriate rescue measures when the risk of dangerous incidents may occur or disaster occurred; 3) to take immediate preventive measures or appropriate rescue measures when the risk of mine pollution may occur or mine pollution occurred; 4) to review and save the records of important safety matters.

	2 A technical safety manager shall obey the technical matters in each preceding Paragraph above with assisting the safety supervisor. Article 27 A technical safety staff for surface safety & blasting shall obey following provisions in accordance with Article 6 of the Law. 1) to patrol in the surface mineral working fields (quarries), mine roads and the surface places where the number of mineworkers working, and especially cause dangerous or likely danger places to examine the presence of hazards more than one times in working hours; 2) to patrol in the machinery room, fuel oil depot, deleterious depot and explosives service station to examine the presence of hazards every day; 3) to examine the explosives, rock conditions before and after blasting, and to treat necessary measures ensuring safety; 4) to combine with the duties of the technical safety staff for explosives concerning management of explosives in case an explosives service station isn't established at a mine; 5) to give necessary instructions to mineworkers, immediately suspension of work, traffic interception, alarming indications and other aid measures when dangerous incidents likely to occur, and to report to the administrator; 6) to write down in the "diary for surface safety and blasting" about operation states of safety works in each place, implementation of blasting, preservation states of all facilities, measures taken for safety and results, and matters to be noted to the next shift staff, in every patrol.

	Article 28 A technical safety staff for underground safety & blasting shall obey following items in accordance with Article 6 of the Law. 1) to patrol in the working fields, main passageways, main transportation tunnels (galleries) where the number of mineworkers working, and especially cause dangerous or likely danger places to examine the presence hazards of roof fall, collapse, explosion, spontaneous combustion, fire, flood more than one times in working hours; 2) to patrol in passageways, transportation drifts, the machinery room, fuel oil depot, deleterious depot, main exhausting drifts and explosives service station, and likely danger places to examine the presence of hazards every day; 3) to check the preservation states of evacuation facilities for mine workers such as evacuation shelters and others periodically; 4) to examine the explosives, roof and rock conditions, and in addition to measure flammable gases before and after blasting in a coal mine, and to take necessary measures ensuring safety; 5) to manage the duties of the technical safety staff for explosives in case an explosives service station isn't established at a mine; 6) to give necessary instructions to mineworkers, immediately suspension of work, traffic interception, alarming indications and other aid measures when dangerous incidents or likely danger occur, and to report to the administrator; 7) to write down in the "diary for underground safety and blasting" about operation states for safety works in each place, implementation of blasting,

	preservation states of all facilities, measures taken for safety and results, and matters to be noted to the next shift staff, in every patrol. Article 29 A technical safety staff for machinery shall obey following provisions in accordance with Article 6 of the Law. 1) to examine the main fan, winding machines, belt conveyors, and other machineries and instruments which require safety cautions regarding abnormalities every working day; 2) to record the results of detailed periodic inspections for machineries and instruments which require especially safety cautions to the " record management for machineries and instruments" every time; 3) to supervise installation and repair of machineries and instruments; 4) to take prompt repairs, and to report to the administrator when the abnormality or unusual states of the machinery or instruments were found; 5) to write down in "the diary for machinery safety" to about operation, maintenance, repair and intermission states of machineries and instruments, and other important matters for safety, in every inspection. Article 30 A technical safety staff for electricity shall obey following provisions in accordance with Article 6 of the Law. 1) to examine main transformers, main electrical motors, electrical locomotives, appliances, wiring, moving cables and ground earth, and other electrical

	equipment which requires safety cautions regarding abnormalities every working day; 2) to examine electrical machines, appliances, portable safety lamps, wiring, moving cables, grounding (earth) and wire-way which requires safety cautions regarding abnormalities periodically; 3) to record the results of detailed periodic inspections for electrical machines, appliances, wiring, moving cables and grounding (earth) work which require especially safety cautions to the “record management for electrical machines and equipment” every time; 4) to supervise installation and repair of electrical machines, appliances, wiring, moving cables and ground earth; 5) to record the checking results of the insulation performance for insulation protective equipment, insulating protective preserver, live-line working equipment and conductors work equipment (limited to those used for charging circuits exceeding 300 volts), once per six (6) months periodically; 6) to take prompt repairs, and to report to the administrator when the abnormality or unusual states of the insulation performance prescribed in the preceding Paragraph above were found; 7) to write down in the “diary for electricity safety” about operation, maintenance, repair and intermission states of electrical machines, appliances, portable safety lamp, wiring, moving cables, grounding (earth) and wire-way, and other important matters for safety in every inspection. Article 31

	A technical safety staff for prevention of mine pollution shall obey following provisions in accordance with Article 6 of the Law. 1) to examine mine smoke generating facilities and mine smoke treatment facilities, dust generating facilities and dust treatment facilities, mine water or wastewater treatment facilities, dioxin-kinds incinerators, noise generating facilities in noise regulation mines and noise prevention facilities, vibration generating facilities in vibration regulation mines and vibration prevention facilities, mining wastes treatment facilities and other necessary facilities to prevent mine pollution periodically and to examine for abnormalities; 2) to measure the necessary items and analyses in the facilities to prevent mine pollution prescribed in the preceding Paragraph above periodically, and to write down the results of periodic measurements in the “record management for prevention of mine pollution”; 3) to take prompt repairs, and to report to the administrator when the risk of mine pollution may occur or mine pollution occurred; 4) to write down in the “diary for prevention of mine pollution” about operation states of each facilities, treatment on mine pollution prevention and other important matters for safety, in every inspection. Article 32 A technical safety staff for boilers shall obey following provisions in accordance with Article 6 of the Law. 1) to examine a boiler and a special type boiler with maximum operating pressure of 0.4 MPa for abnormalities every working day;

	2) to record the results of detailed periodic inspections for a boiler and a special type boiler prescribed in the preceding Paragraph above to the “record management for boilers” every time; 3) to supervise installation and repair of a boiler and a special type boiler; 4) to take prompt repairs, and to report to the administrator when abnormality or unusual states of the boiler or special type boiler were found; 5) to write down in the “diary for boilers safety” about operation, maintenance, repair and intermission states of the boiler or special type boiler, and other important matters for safety, in every inspection. Article 33 A technical safety staff for explosives (including a safety staff for surface safety & blasting, and a safety staff for underground safety & blasting) shall obey following provisions in accordance with Article 6 of the Law. 1) to examine the management of explosives at an explosive service station, the anti-theft system, and ledger of explosives every working day; 2) to examine a container storing Ammonium Nitrate Fuel Oil (ANFO) explosives which is installed a mobile mixture facility for manufacturing ANFO explosives regarding abnormalities, and to clarify the situation of dealing and handling in ANFO explosives manufactured by aforesaid facility every working day; 3) to take prompt repairs, and to report to the administrator when there are abnormalities or unusual states in an explosive service station, in a container holding ANFO explosives and in transportation of explosives, and some of

	explosives are lost or stolen; 4) to write down in the “diary for explosives safety” about management of explosives and its facilities, the situation of dealing and handling in explosives ,and other important matters for safety in every inspection. Article 33-2 A technical safety staff for poisonous and deleterious substances shall obey following provisions in accordance with Article 6 of the Law. 1) to examine the poisonous and deleterious substances which are managed at a poisonous and deleterious depot, to prevent its theft regarding abnormalities, and to clarify the situation of dealing in aforesaid substances every working day; 2) to take prompt repairs, and to report to the administrator when there are abnormalities or unusual states in a poisonous and deleterious depot, and some of poisonous and deleterious substances are lost or stolen; 3) to write down in the “diary for poisonous and deleterious substances safety” about management of poisonous and deleterious substances, and its depots, the situation of dealing and handling in aforesaid substances, and other important matters for safety in every inspection. Article 34 1 A safety supervisor, a technical safety manager and a safety technical staff shall carry necessary instruments such as a tape measure, gas detectors for flammable gas or harmful gas, a hammer for rock percussion and others when they patrol at a

	mine. 2 The concessionaires of underground Coal mine (Class-At coal pit and Class-B coal pit) shall provide precise flammable gas detectors at mines in accordance with Article 5 of the Law when the technical safety staffs for underground safety & blasting patrol underground to measure flammable gas.

The draft of Mine Safety Law	The draft of Mine Safety Regulation (phase 1)
(Safety committee) Article 16 1 Concessionaires of mines that employ more than thirty (30) mineworkers at all times shall establish the safety committee to research and deliberate important matters related to safety according to the procedures prescribed by the ministerial ordinance. 2 When the concessionaire is punished by the Minister or the Director General in charge of mines sector, as prescribed in this Law or ministerial ordinance based on the Law, the concessionaire shall inform the safety committee the details of the punishment, without delay. 3 When a mineworker recognizes that damage occurs or there is a risk of such damage occurring at the working places of a mine, the worker must report and request the safety committee to research and deliberate such facts for clearance of the damage or risk. Article 17 1 Half of the members of the safety committee shall be appointed by the concessionaire from among mineworkers, and remained half of the members shall be selected in	**Section 7 Safety Committee** (Establishment of safety committee) Article 35 1 The concessionaires who employ more than 30 mineworkers at all times in accordance with Article 16, Paragraph 1 of the Law, shall establish the safety committee at mines. 2 The concessionaires may establish the safety committee as necessary at mines ignoring the preceding Paragraph. (Committee meeting) Article 36 1 The meeting of safety committee shall be held once a month or more. 2 The safety committee shall discuss and adopt the following matters. 1) the draft safety rules and modified safety rules; 2) the measures against mine disasters; 3) the survey of mine safety conditions; 4) safety training curriculums, and; 5) other important matters for ensuring safety. 3 The concessionaires shall keep the records of safety committee' meetings for three (3) years.

mineworkers on the recommendation of mineworkers at the mine. 2 The safety supervisor shall be the chairperson of the safety committee. The safety supervisor may appoint a technical safety manager to undertake the duties of the chairperson of the safety committee. 3 The chairperson shall call the safety committee, and items on the agenda shall be determined by the majority of attendees. When the vote is tied, the chairperson shall cast the deciding vote.	(Deputy chairman) Article 37 When a safety supervisor cannot perform the chairman of the safety committee because of emergency duties in accordance with Article 17, Paragraph 2 of the Law, a safety technical manager shall undertake the chairman of the committee in behalf of the supervisor. (Administration) Article 38 Necessary matters regarding administration of the safety committee except provisions of the Law and the Regulation, shall be defined during the safety committee' s meeting. (Notice of punishment) Article 39 The concessionaires shall notify the details of punishment items in accordance with Article 16, Paragraph 2 of the Law, to the safety committee without delay. 1) the notification of punishment by the Minister in charge of mines sector against Article 23 of the Law; 2) the notification of punishment by the Minister against Article 24, Paragraph 2 to Article 26 inclusive of the Law (including the punishment by the mine safety inspector , as prescribed in Article 36, Paragraph 2 or 3 of the Law); 3) the notification of punishment by the Director general in charge of mines

(The survey of mine safety conditions) Article 18 1 When concessionaires of mines that employ more than thirty (30) mineworkers at all times shall start, temporarily stop (more than one month) , restart and expire the mineral-related operations at mines, and when methods of the operations change considerably, as prescribed in the ministerial ordinance, the survey of mine safety conditions shall be carried out before those actions, and appropriate measures taken to deal with items recognized as matters for improvement. 2 The concessionaires shall record and conserve the results of the survey according to the procedures prescribed by the	sector against Article 24, Paragraph 1 of the Law (including the punishment by mine safety inspector , as prescribed in Article 36, Paragraph 1 of the Law); 4) the notification of orders or indications by the Minister according to the Law and the Regulation, other punishment prescribed in preceding Items 1 to 3 above. **Section 8 The Survey of Mine Safety Conditions** (Execution of the survey of mine safety conditions) Article 40 The concessionaires must execute the survey of mine safety conditions as following items in accordance with Article 18, Paragraph 1 of the Law. 1) to start mineral-related operations at a mine after getting permission by the Minister in charge of mines sector; 2) to suspend mineral-related operations for more than one month, and to renew the operations; 3) to have significant modification of mineral-related operations, and; 4) to renounce the right of mineral-related operations at a mine or to abolish the operations. (Items of the survey of mine safety conditions) Article 41 The concessionaires must find out and evaluate risk factors at mines, and take

ministerial ordinance. **(Safety for contractual work)** Article 19 1 When the concessionaire makes a deal with a contractor other than a mineworker to be engaged more than one month at work places of a mine according to the procedures prescribed by the ministerial ordinance, a “contractual work plan” which includes measures to ensure the safety shall be drafted by the concessionaire, and shall be submitted to the Minister in charge of mines sector. This shall also apply when the plan is modified. 2 The Minister has the power to order the concessionaire to modify the plan if, with given reason, it is deemed necessary to ensure safety.	appropriate measures that need improving as the effect of the survey of mine safety conditions as following items in accordance with Article 18, Paragraph 1of the Law. 1) the conditions of mineral working field and its neighboring; 2) the conditions of surroundings at a mine; 3) necessary measures for safety that the concessionaire must take, in accordance with Article 5 of the Law; 4) harmful items that cause mine disaster or mine pollution, except each preceding Item above. (Records of the survey of mine safety conditions) Article 42 The concessionaires shall record and conserve the results of the survey for five (5) years from the date of the survey was executed in accordance with Article 18, Paragraph 2 of the Law. **Section 9 Safety for Contractual Work** (Notification of contractual work plan) Article 43 1 When the concessionaire makes a deal with a contractor to be engaged more than one month in the underground work places, or to be hauling or disposal of mining wastes in or outside a mine that specific work are designated in the “ Regulation on procedures and items of mentioned provided in Mine Safety

(Permission for special mineral operations plan) Article 20 1 In case a concessionaire plans to dig for minerals under the sea, rivers, lakes or any place where there is a risk of mine pollution, impacts or mine disaster by flood occurring, the “special mineral operations plan” shall be drafted and submitted to the Minister in charge of mines sector for permission. This shall also apply when the plan is modified. 2 The items to be included in the “special mineral operations plan” shall be prescribed by the ministerial ordinance. 3 The Minister has the power to order the concessionaire to modify the plan if, with given reason, it is deemed necessary to ensure safety. 4 The concessionaire must never dig for minerals underground prescribed in Paragraph 1above, without the permission of the Minister.	Law and its regulations”, the “contractual work plan” which includes measures to ensure the safety shall be drafted based on the aforesaid Regulation and be submitted to the Minister in charge of mines sector in accordance with Article 19, Paragraph 1 of the Law. 2 When the concessionaire modifies items of the aforesaid plan, the modified plan shall be drafted and submitted to the said Minister as same procedures as in the preceding Paragraph above. 3 When the concessionaire submits the aforesaid plan or the modified plan to the said Minister prescribed in the preceding Paragraph1 and 2, copies of the agreement about the contractual work shall be attached. **Section 10 Permission for Special Mineral Operations Plan** (Permission for special mineral operations plan) Article 44 1 When the concessionaire of underground Coal mine (Class-A coal pit and Class-B coal pit) has a plan to dig under the sea, rivers, lakes or any places where there is a risk of mine pollution, impacts or mine disaster by flood occurring, the “special mineral operations plan” shall be drafted based on the “Regulation on procedures and items of mentioned provided in Mine Safety Law and its regulations”, and be submitted to the Minister in charge of mines sector for permission in accordance with Article 20, Paragraph 1 of the Law. 2 When the authorized concessionaire prescribed in the preceding Paragraph above changes the aforesaid plan, the new “special mineral operations plan” attached

	the modified reason shall be drafted and submitted to the Minister for permission as same procedures as the preceding Paragraph above. 3 When there is the risk of mine pollution, impacts or mine disaster by flood for digging under the sea, rivers or lakes, the Minister can designate the area as the necessity for permission of the “special mineral operations plan” prescribed in the preceding Paragraph 1 in advance. 4 When there is a high risk of mine pollution, impacts or mine disaster by flood according to the result of the survey of geological conditions prescribed in the following Article 45, Paragraph 1, and the measurement of the surface subsidence prescribed in the following Article 46, Paragraph 2, the Minister can order the concessionaire to review the mineral working method and items necessary for safety. (Survey of geological conditions) Article 45 1 When the concessionaire of underground Coal mine (Class-A coal pit or Class-B coal pit) drafts the “special mineral operations plan”, the survey of geological conditions from surface to coal seam by drillings or other appropriate methods must be carried out in the proposed mining area and its surroundings in advance. 2 The drilling holes prescribed in preceding Paragraph above, must be filled up with cement or other proper materials after survey, if it is necessary. (Measurement of surface subsidence) Article 46

	1 The concessionaires of underground Coal mine (Class-A coal pit or Class-B coal pit) must measure the surface subsidence due to mineral-related operations of authorized area in according to the “special mineral operations plan”. 2 The concessionaires shall determine the method, area and frequency of measurement of the surface subsidence prescribed in the preceding Paragraph, and also shall report the results of measurement to the Minister in charge of mines sector once a year periodically during mineral-related operations of authorized area. 3 The concessionaires must obey the instructions given by the Minister regarding method, area and frequency of measures of the surface subsidence due to the “special mineral operations plan”. (Prevention of mine pollution, impacts and mine disaster by flood) Article 47 1 The concessionaires of underground Coal mine (Class-A coal pit or Class-B coal pit) must take advanced drillings or other appropriate methods to prevent mine pollution, impacts and mine disaster by flood in the tunneling field for unknown geological conditions area prescribed in Article 44 due to the “special mineral operations plan”. 2 The concessionaires must take advanced drillings more than ten (10) m from the heading of the tunnel (gallery) to unknown geological conditions area for confirmation, and must keep the space of five (5) m or more between the heading of the tunnel (gallery) and bottom of the borehole at all times. The directions of drillings shall be carried out along to the extension line of the

	tunnel (gallery), and also other directions, if necessary. 3 The concessionaires must operate coal mining with a block method, and intercept in each parcel by the bank of water blocking with a gate. 4 The concessionaires must establish the bank of water blocking with a gate at the tunnel (gallery), and also take cement injections and concrete linings to roof and side walls of the tunnel (gallery) which passes through faults that tend to flood risk. 5 In case prescribed in Paragraph 1, the concessionaires must take appropriate measures such as cement injections and concrete linings to roof and side walls of the tunnel (gallery) to prevent mine pollution, impacts or mine disaster caused by a large amount of water leakage. (Notification of special safety diagrams) Article 48 1 The concessionaires of underground Coal mine (Class-A coal pit or Class-B coal pit) shall draw-up special safety diagrams as the following items, to be kept in the mine office, and regularly submit copies to the Minister in charge of mines sector once a year periodically in accordance with Article 30, Paragraph 1 of the Law. 1) the states of coal working fields and goaf (old working fields); 2) depth from the surface at underground major points; 3) location and logging data of drillings, and geological survey; 4) location, kind, strike dip and drop of the fault; 5) location, direction and length of advanced drillings;

	6) major facilities such as the bank of water blocking, shelter spots in a pit. 2 The scale of the special safety diagrams shall be more than 1/6000. 3 This special safety diagrams shall be available to the location clearly between the surface and underground areas.

The draft of Mine Safety Law	The draft of Mine Safety Regulation (phase 1)
(Mine pollution prevention measures and Reserve Fund System) Article 21 1 The concessionaire shall draft a “mine pollution prevention measures” with regard to the prevention of mine pollution from facilities such as waste stone dumps, slag dumps, and tailings dams attached to processing plants or mine water treatment facilities, and tunnels (galleries)(a level, an inclined shaft and a vertical shaft) for when mines are closed in the future, and submit this measures to the Minister in charge of mines sector. 2 The concessionaire shall draft a “mine pollution prevention measures” with regard to the perpetual treatment of contaminated mine water and wastewater that is not expected to meet water quality standards after the mine has closed, and submit this measures to the Minister in charge of mines sector. 3 Items to be included in the “mine pollution prevention measures” as stipulated in Paragraphs	**Section 11 Mine Pollution Prevention Measures and Reserve Fund System** (Mine pollution prevention measures) Article 49 1 The concessionaires shall draft the “mine pollution prevention measures” in accordance with Article 21, Paragraph 1 of the Law, with regard to the prevention of mine pollution from facilities such as a waste stone dump, a slag dump, and a tailings dam attached to a processing plant or mine water treatment facilities, and tunnels (galleries) (a level, an inclined shaft and a vertical shaft) based on the “Regulation on procedures and items of mentioned provided in Mine Safety Law and its regulations”. 2 Concerning the season of notification prescribed in the preceding Paragraph, the concessionaires shall submit the “mine pollution prevention measures” regarding a waste stone dump, a slag dump, and a tailings dam to the Minister in charge of mines sector after permission of “facility plan”, as prescribed in Article 9, Paragraph 1 of the Law, while the aforesaid prevention measures regarding tunnels (galleries)(a level, an inclined shaft and a vertical shaft) shall be submitted at the beginning of mineral-related operations. 3 The concessionaires shall draft the “mine pollution prevention measures” in accordance with Article 21, Paragraph 2 of the Law, with regard to perpetual treatment of contaminated mine water or wastewater based on the “Regulation on procedures and items of mentioned provided in Mine Safety Law and its regulations”. 4 Concerning the season of notification in the preceding Paragraph 3, the concessionaires shall submit the “mine pollution prevention measures” regarding the perpetual treatment of

1 and 2 above shall be prescribed by the ministerial ordinance. 4 The Minister has the power to order the concessionaire to modify the measures if, with given reason, it is deemed necessary to ensure safety. **(Reserve fund system)** Article 22 1 Every year, the concessionaire must save the amount of money notified by the Minister in charge of the mines sector to the "reserve fund system for mine pollution prevention" in a financial institution designated by the said Minister. 2 The reserve fund amount shall be calculated according to the calculation standards prescribed by the ministerial ordinance, based on the costs necessary to carry out the mine pollution prevention measures and the period of use of the respective facilities, and to be indicated by the Minister. 3 When the concessionaire implements the project mentioned in the "mine pollution prevention	contaminated mine water or wastewater, when the contaminated conditions and quantity of mine water from a tunnel (gallery), or wastewater from a waste stone dump, a slag dump, and a tailings dam should be identified constantly not to meet effluent standard provided in "Law on Environmental Protection and Natural Resource Management" and relevant regulations. (Reserve fund system for mine pollution prevention) Article 50 1 The Minister in charge of mines sector shall indicate the reserve fund amount calculated in each specific facility at a mine that has been installed or existed at beginning of fiscal year and also targeted reserve fund system, to the concessionaires until end of March every year. 2 The concessionaires must deposit the amount of money notified by the Minister to the "reserve fund system for mine pollution prevention" in the designated financial institution within three (3) months counting from the issue of the notification. 3 The Minister can accept the deposit of the reserve fund amount on installments within one (1) year if the concessionaire's request is deemed reasonable and acceptable. 4 The concessionaires who intend to deposit the reserve fund amount on installments in the preceding Paragraph 3, shall request to the Minister before one (1) month of the deadline of the deposit, based on the "Regulation on procedures and items of mentioned provided in Mine Safety Law and its regulations". (The projects for mine pollution prevention measures, and formulas for reserve fund) Article 51 1 The projects for mine pollution prevention measures targeted to the reserve fund system are as follows.

measures" prescribed in Article 21, Paragraph 1 to 2 inclusive of this Law, after using of the facility has closed, the reserved funds relating to the respective facilities can be returned to the concessionaire with the permission of the Minister according to the procedures prescribed by ministerial ordinance.

(Administrative measures to be supervised)

Article 23

In case a serious disaster or mine pollution occurs, or mineral resources or mine facilities are seriously damaged, or there is a risk of such damage, the Minister in charge of mines sector has the power to suspend the mineral-related operations or cancel the license of the concessionaire with given reason.

Article 24

1 In case the concessionaire is found to have violated this Law or ministerial ordinance based on the Law, the Director General in charge of mines sector has the power to issue the warning or

1) the project of soil covering and vegetation at a waste dump, a slag dump or a tailings dam
2) the project of blockage or sealing of a tunnel (gallery)(including a level, an inclined shaft and a vertical shaft)
3) the project of establishment of the treatment facilities on mine water or wastewater, and management of the facilities
4) the project for perpetual treatment of mine water or wastewater that contaminated conditions and quantity exceed the effluent standard
5) the projects designated by the Minister in charge of mines sector after consulting to the Mine Safety Advisory Committee prescribed in Article 38 of the Law

2 Formulas for reserve fund computation on mine pollution prevention measures prescribed in Article 22, Paragraph 2 of the Law, are as follows.

1) The project of soil covering and vegetation of a waste stone dump, slag dump or tailings dam

A1 = C1 × (S1 /T1) – V1	
A1	:The reserve fund amount of the year concerned
C1	:The cost, which is necessary for soil covering and vegetation of a waste stone dump, a slag dump or a tailings dam
S1	:The amount of sludge in the dump or dam in which will pile up until the end of this year
T1	:The amount of sludge in the dump or dam which will pile up until end of use
V1	:The amount of reserve fund that was deposited until a degree of the previous year

2) The project of blockage or sealing of a tunnel (gallery) (including a level, an inclined shaft

directing to the concessionaire for clearance of violated items speedily with given reason.

2 When the concessionaire is found to fail to the warning or directing as prescribed in Paragraph 1 above, the Minister in charge of mines sector has the power to order the concessionaire to suspend mineral-related operations for a set period of up to one year.

Article 25

In case encroaching outside the mining area causes harm to safety or there are risks of the safety being influenced, the Minister in charge of mines sector has the power to order the concessionaire to execute closure of that area and take necessary measures to ensure safety, with given reason.

Article 26

In case it is recognized that there is an urgent need to rescue victims of a mine disaster (including places outside the mining area), the Minister in charge of mines sector has the power to order the concessionaire to take necessary measures.

and a vertical shaft

$A_2 = C_2 \times (S_2 / T_2) - V_2$	
A_2	:The reserve fund amount of the year concerned
C_2	:The cost, which is necessary for, blockage or sealing of a tunnel (gallery)
S_2	:The number of months that a tunnel (gallery) is used from setting up to the end of this year
T_2	:The number of months that a tunnel (gallery) will be used from setting up to disuse schedule
V_2	:The amount of reserve fund that was deposited until a degree of the previous year

3) The project of establishment of the treatment facilities on mine water or wastewater, and management of the facilities

$A_3 = C_3 \times (S_3 / T_3) - V_3$	
A_3	:The reserve fund amount of the year concerned
C_3	:The cost, which is necessary for establishment of the treatment facilities of mine water or wastewater, and management of the facilities
S_3	:The number of months that a tunnel (gallery) is used from setting up to the end of this year, or a waste stone dump, a slag dump or a tailings dam piling up until the end of this year
T_3	:The number of months that a tunnel (gallery) will be used from setting up to disuse schedule, or a waste stone dump, a slag dump or a tailings dam piling up until end of use
V_3	:The amount of reserve fund that was deposited until a degree of the previous year

Article 27

1 The Minister in charge of mines sector has the power to order former concessionaires to set up necessary facilities for preventing injuries and mine pollution due to mineral-related operations, up to five (5) years after the mineral license has been renounced.

2 The recipient of the above ministerial order shall be considered to be the concessionaire within the scope necessary to execute the items ordered.

Article 28

1 In case the Minister in charge of mines sector intends to issue the orders or cancel the license as prescribed in Article 23; Article 24, Paragraph 2; Article 25 or Article 27, Paragraph 1, the concessionaire or former concessionaire shall be notified of a date and location of a public hearing, in advance.

2 The recipients of such notifications can express their opinions to the Minister at the hearing.

The project for perpetual treatment of mine water or wastewater

B = 20×D × (M /N) – W	
B	:The reserve fund amount of the year concerned
D	:The cost, which is necessary for treatment of mine water or wastewater a year
M	:The number of months that the reserve is executed from beginning to this year
N	:The number of months that the reserve will be executed (Maximum 240 months)
W	:The amount of reserve fund that was deposited until a degree of the previous year

3 The Minister indicates review and modification on calculation basis of the reserve fund amount prescribed in the preceding Paragraph 2, that are targeted in the “mine pollution prevention measures” to the concessionaires in accordance with new invented technologies and scale of mineral-related operations.

4 The reserved funds shall be allowed interest.

(Retrieve the reserved funds and execution of the projects)

Article 52

1 When the concessionaire retrieves the reserved funds in accordance with Article 22, Paragraph 3 of the Law, the application for refund of the reserved funds shall be drafted and submitted to the Minister in charge of mines sector based on the “Regulation on procedures and items of mentioned provided in Mine Safety Law and its regulations” after closing the mine.

(Mine safety reports) Article 29 1 The concessionaire must submit mine safety reports to the Minister or Director General in charge of mines sector according to the procedures prescribed by the ministerial ordinance. 2 In the case of a major disaster prescribed by the ministerial ordinance occurs, the concessionaire shall report immediately the contents of the disaster to the Director General in charge of mines sector by phone or other suitable methods.	2 In case the term of the project for mine pollution prevention measures exceeds one (1) year, the concessionaire shall draft and submit the application for refund of the reserve funds with contents of the project and amount of its cost prescribed in preceding Paragraph to the Minister every year. 3 When the application for refund of the reserved funds prescribed in the preceding Paragraph 1, was admitted reasonable contents and a cost of the project, the Minister shall issue “the verification for refund of the reserved funds” to the concessionaire within fourteen (14) working days. 4 When the concessionaire wants to withdraw the reserved funds, “the verification for refund of the reserved funds” prescribed in the preceding Paragraph 3, shall be submitted to the designated financial institution which manages “reserve fund system for mine pollution prevention”. 5 The financial institution shall pay amount of money with corresponded interests to the concessionaire according to “the verification for refund of the reserved funds” prescribed in the preceding Paragraph 4. 6 The said concessionaire must execute the project for prevention of mine pollution with spending retrieved funds based on the “mine pollution prevention measures” prescribed in Article 21 of the Law. **Section 12 Mine Safety Reports** (Mine safety reports) Article 53 In accordance with Article 29, Paragraph 1 of the Law, the Minister or Director General in charge of mines sector can request the concessionaire to make reports on mine safety as necessary.

	(Reports of a mine disaster and an accident) Article 54 1 When a mine disaster or an accident in following items occurs at a mine, the concessionaire must report immediately an outline of the mine disaster or accident to the Director General in charge of mines sector through the telephone or other proper means available in accordance with Article 29, Paragraph 1 of the Law. 1) mine fire, gas or coal dust explosion, gas outburst, rock burst, spontaneous combustion, flood disaster, typhoon disaster, earthquake disaster, gushing out of poisonous gas, lost or theft of explosives, and other accidents relating to explosives; 2) death accident, and serious injury that needs more than four (4) weeks or more for medical treatment; 3) in addition to the preceding Paragraphs above, if all or a part of the mineral-related operations shall be suspended because of a mine disaster. 2 In case of the preceding Paragraph, “the detail report of the mine disaster or accident and taken measurements” based on the “Regulation on procedures and items of mentioned provided in Mine Safety Law and its regulations”, must be reported to the said Director-General within thirty (30) days counting from the date of the mine disaster or accident occurred, and the records shall be saved for three (3) years. 3 In case of the preceding Paragraph 1, Item 2, the concessionaire shall draw a sketch of the exact spot where the mine disaster or accident occurred, and also shall temporary preserve the spot for investigation. If it needs to rescue the victim, or prevention of secondary mine disaster or accident, this provision is not applied.
(Mine safety diagrams) Article 30 1 The concessionaire shall draw-up mine safety diagrams to be kept in the mine office, and	

regularly submit copies to the Director General in charge of mines sector , once a year. 2 Items to be included in the mine safety diagrams shall be prescribed by the ministerial ordinance.	(Monthly safety report) Article 55 In accordance with Article 29, Paragraph 2 of the Law, the concessionaires must prepare “the monthly safety report” regarding safety conditions of mineral working fields and occurrence of mine disasters or accidents at mines every end of month based on the “Regulation on procedures and items of mentioned provided in Mine Safety Law and its regulations”, and must submit the aforesaid report to the Director General in charge of mines sector not later than 10th of next month. **Section 13 Mine Safety Diagrams** (Notification of mine safety diagrams) Article 56 1 The concessionaires must prepare “mine safety diagrams” regarding present conditions of mineral-related operations as of every end of December in accordance with Article 30, Paragraph 2 of the Law, and must submit copies of the aforesaid diagrams to the Director General in charge of mines sector until end of next March every year. 2 The mine safety diagrams shall be drawn-up complying with the following items. 1) the safety diagrams shall be drawn on a scale of 1/6000 or larger; 2) symbols used are designated in the notification based on the “Regulation on procedures and items of mentioned provided in Mine Safety Law and its regulations”; 3) the diagrams of plane figure (2D) and cross sections for open pit mining or underground mining shall be drawn; 4) the safety diagrams for underground mining shall be required to contain the following items;

	mine mouth, tunnels (galleries)(a level, an inclined shaft and a vertical shaft), mineral working field, tunneling field, old working field, old pit, underground mining wastes landfill, magazine, explosives service station, fuel oil depot, oil and grease depot, location of fan, drainage facilities, fire-fighting devices and others; 5) the underground facilities except Item 4 above shall be drawn-up as same as the preceding Items; 6) the safety diagrams for open-pit mining shall be required to contain the following items; mineral working field, mineral processing plant, refinery & smelting, waste stone dump, slag dump, tailings dam, surface mining wastes landfill, mine water or wastewater treatment facilities, drainage exit, magazine, explosive service station, fuel oil depot, fuel oil service station, oil and grease depot, poisonous and deleterious depot, and other hazardous materials depot, fire-fighting devices and others; 7) the safety diagrams shall be drawn public facilities and buildings such as school, hospital, park and railroad around a mine.

The draft of Mine Safety Law	The draft of Mine Safety Regulation (phase 1)
(Commission to ministerial ordinance) Article 31 1 The necessary measures with regard to following subjects to be taken by the concessionaire, as stipulated in Article 5 of this law, shall be prescribed by the ministerial ordinance. 2 The necessary items with regard to following subjects to be obeyed by mineworkers, as stipulated in Article 6 of this law, shall be prescribed by the ministerial ordinance. Subjects: Rescue activities and mechanisms at the time of mine disasters; Rock-fall and collapse; Explosives and blasting; Vehicle type mine machines and automobiles; Haulage; Mine fires and spontaneous combustion; Measurements of old pits; Prevention of mine pollution (mine smoke, dusts, mine water or wastewater, dioxin-kinds, poisonous and deleterious substances, noise, vibration, excavation of land, mining wastes, dumping of waste stones, slag and tailings); Electricity; Underground passage and working places; Ventilation and mine gas; Coal dusts; Surface passage and working places; Handling poisonous and deleterious substances.	**Chapter Ⅲ Rescue Activities and Mechanisms at the time of Mine Disaster** **Section 1 General Rules** (Rescue activities and mechanisms at the time of mine disaster) Article 57 Safety for rescue activities and mechanisms at the time of mine disaster, the concessionaires must take necessary measures prescribed in Articles 5 of the Law, and mineworkers must obey items necessary prescribed in Article 6 of the Law, shall be stipulated in the ChapterⅢ in accordance with Article 31 of the Law. **Section 2 Rescue Activities at the time of Mine Disasters** **(Installation of communication systems, air supply equipment and shelters)** Article 58 1 For occurrence of the mine disaster such as mine fire, explosion of gas or coal dusts, gas outburst, flood and others in underground field, the concessionaires of underground Coal mines (Class-A coal pit and Class-B coal pit) must install the appropriate communication system such as underground induction radio to contact between the surface mine office and the working places where large numbers of mineworkers working.

	2 The concessionaires must establish shelters equipped with air or oxygen supply equipment (hereinafter referred to as “air supply equipment”) for all mineworkers in the working places. 3 The concessionaires must make known the methods of operation, caution items of the communication system and air supply equipment, and location of shelters to underground mineworkers prescribed in the preceding Paragraph 1 and 2. (Self life-saving equipment for carbon monoxide(CO) and so on) Article 59 1 The concessionaires of underground Coal mine (Class-A coal pit and Class-B coal pit) must instruct mineworkers going to underground to carry the self life-saving equipment for carbon monoxide, oxygen-generating life -saving equipment or light weight life-saving equipment to protect from carbon monoxide poisoning due to mine disaster such as mine fire and explosion of gas or coal dust. 2 In addition to the preceding Paragraph, the concessionaires must install the self life-saving equipment for carbon monoxide, oxygen-generating life-saving equipment or light weight life-saving equipment at the appropriate underground spots if necessary. 3 The concessionaires must make known the methods of operation, caution items of the self life-saving equipment for carbon monoxide, oxygen-generating life -saving equipment or light weight life-saving equipment to underground mineworkers prescribed in the preceding Paragraph 1 and 2. **Section 3 Rescue Mechanisms**

	(Evacuation training) Article 60 1 the preparedness for occurrence of mine disasters due to mine fire, explosion of gas or coal dusts, gas outburst, flood and others, the concessionaires of underground Coal mines (Class-A coal pit and Class-B coal pit) must carry out evacuation training to underground mineworkers once or more in six (6) months periodically. 2 The technical safety staffs for underground safety & blasting and other required personnel must be trained the education on evacuation guidance and the preparedness for occurrence of mine disasters due to mine fire, explosion of gas or coal dusts, flood and others once or more in six (6) months periodically. (First aid equipment) Article 61 1 The concessionaires must install first-aid equipment and materials to be used for injury at proper spots near working places, and must make known the methods of first-aid, and location of first-aid kits to underground mineworkers. 2 The first-aid equipment and supplies prescribed in the preceding Paragraph shall be provided following items. 1) bandage materials, tweezers and disinfectant; 2) oils and other ointment medicines for burn at the working places where handling the molten materials, and other places where there is a risk of burn; 3) tourniquets, stretchers, set of splints at the working places where there is a high risk of serious injury; 3 The first-aid equipment and supplies prescribed in the preceding Paragraph 2, shall

	be kept always clean. Article 62 The safety supervisor, safety technical manager or people concerned must inform to a medical doctor immediately and provide an ambulance, and care for rescue measures to the serious injured person. (Mine rescue crews) Article 63 1 The concessionaires of underground Coal mines (Class-A coal pit and Class-B coal pit) must organize mine rescue crews to prepare the occurrence of mine disaster such as mine fire, explosion of gas or coal dust, gas outburst, flood and others. 2 The concessionaires of underground Metal mine or Non-metal mine may organize mine rescue crews if it is necessary for ensuring safety. 3 In the preceding Paragraph 1 and 2, the concessionaires can organize the joint mine rescue crews in corporation with other concessionaire of a mine. 4 The mime rescue crews or joint rescue crews shall be organized with three (3) groups or more and each group will comprise of five (5) or more at a mine. 5 Oxygen respirators and their accessories which are used by members of mine rescue crews must be provided and checked periodically, and must be kept them in usable condition. 6 The rescue training for members of the mine rescue crews and joint mine rescue crews must be carried out once or more in six (6) months regularly.

	7 The concessionaires who organize the mine rescue crews must take appropriate measures for assembling the members of the mine rescue crews speedy. **Chapter Ⅳ Roof Fall and Collapse** **Section 1 General Rules** Article 64 Safety for prevention of roof fall and collapse, the concessionaires must take necessary measures prescribed in Articles 5 of the Law, and mineworkers must obey items necessary prescribed in Article 6 of the Law, shall be stipulated in the ChapterⅣ in accordance with Article 31 of the Law. (Training on prevention of roof fall and collapse) Article 65 1 The concessionaires of underground mining must instruct underground mineworkers on safety measures for prevention of roof fall and collapse by showing proper methods of checking roof, side walls and face of tunneling, and taking appropriate necessary measures after checking in accordance with Article 7, Paragraph 1 of the Law. 2 The concessionaires of open-pit mining must instruct mineworkers posted on the surface mineral working place on safety measures for prevention of collapse and fall hazards in accordance with Article 7, Paragraph 1 of the Law. (Suitable equipment for removal of loosed rocks) Article 66

	The concessionaires of underground mining shall provide suitable equipment for removal of loosed rocks at the roof and side walls of the tunnels (galleries). **Section 2 Working Places in Underground Mining** (Supports) Article 67 1 When there is a risk of roof fall or collapse in the underground mineral working place, the concessionaires of underground mining must provide suitable supports or other equipment depending on the conditions of the roof and side walls of the working place immediately. 2 If it is necessary to ensure safety, rescue measures like as temporary timbering shall be taken. 3 In addition to the preceding Paragraph 1 and 2, head protection and face supports must be taken at the face of tunneling. 4 Supports materials shall be provided in the proper working places. Article 68 1 The concessionaires of underground mining must promptly exchange or reinforce the broken or decayed timbers for supports in the working places and tunnels (galleries). 2 When supports have moved during working or they fall down due to the blasting work at the tunnel (gallery), the supports must be promptly restored.

	Article 69 The concessionaires of underground mining must assign to skilled mineworkers for recovering coal pillars or ore pillars which were remained in the mineral working places, with using safety methods after it has been confirmed that such disposal will be safety. Article 70 The safety staffs for underground safety & blasting must indicate mine workers to take proper recovery method of supports, or remained coal pillars or ore pillars in the working places where there is a risk of hazards. Article 71 1 The concessionaires of underground mining must secure appropriate coal pillars or ore pillars concerning size and arrangement suited to the bedrock conditions, if it is necessary for ensuring safety. 2 The concessionaires of underground mining must take appropriate measures (e.g., installation of supports, filling with soil or other materials) in sections where the mineral working has been completed and such measures are necessary for ensuring safety. Article 72 The underground mineworkers who are posted in the mineral working places must take items necessary for examining the roof , side walls and face of the tunnels (galleries) before and during the work, and take necessary measures (e.g., removal of

	loosed rocks) if there is a risk of danger. **Section 3 Working places in Open-pit Mining** Article 73 The concessionaires of open-pit mining must take necessary measures as following provisions to prevent the danger of bedrock collapse and falling of loosed rocks on the surface mineral working field. 1) the removal of the surface soil in advance that may cause danger to surface mineral working; 2) installation of steps with appropriate height and width to secure safety, and holding a safe slope of mineral walls at a mineral working field; 3) the removal of loosed rocks with safety methods in advance, or provide appropriate protection facilities to prevent danger caused by falling loosed rocks; 4) maintenance of a safe slope suited to the bed-rock and other conditions to prevent collapse of residual walls after mineral working. (fall-prevention equipment for mineworkers) Article 74 The concessionaires of open-pit mining must install appropriate scaffolding and prepare safety nets, ropes or other appropriate fall-prevention equipment, when mineworkers have to work with a high risk of falling.

	(Prohibition of the work directly above and below at a mineral working place) Article 75 The concessionaires of open-pit mining must not let mineworkers work simultaneously directly above and below other mineworkers at a mineral working field if there is a risk of danger caused by falling loosed rocks or rolling stones. (Stopping operations at the time of a high risk of danger) Article 76 The concessionaires of open-pit mining must stop operations and take appropriate measures (e.g., prohibition of access to the dangerous section) if there is a high risk of danger caused by rainfall in or around the mineral working field. (Prevention of danger surrounding out of the mine) Article 77 The concessionaires of open-pit mining must install appropriate protective equipment or establish off-limit areas, post watchmen, or stick warning signs up or take other measures to prevent entry of the surrounding area if there is a high risk of danger caused by flying stones or rolling stones out of the mine. (Prevention of falling over of vehicle type mine machines and automobiles) Article 78 The concessionaires of open-pit mining must install car-stops and take other appropriate measures to prevent vehicle type mine machines and automobiles from falling over when using them to throw ores into an ore stock bin or crushers.

	(Measures of closure of mineral-related operations) Article 79 When the concessionaires of open-pit mining intend to close the mineral-related operations or suspend its operations, the following provisions shall be done. 1) residual walls and mineral working walls must be maintained safety slope angles suited to the bed-rock conditions to prevent collapse, and; 2) necessary measures to prevent falling, rolling stones and other dangers must be taken. Article 80 The technical safety staffs for surface safety & blasting must examine the sections with a high risk of looseness, slide and other types of collapse of bedrock, and examine sections near the surface soil if stones or rocks are likely to be loosed in the mineral working field once or more every working hours. Article 81 The mineworkers who are posted in surface mineral working fields must examine the bedrock conditions before and during the work, and take necessary measures such as removal of loosed rocks using appropriate equipment if there is a high risk of danger. **Chapter Ⅴ Explosives and Blasting Work** **Section 1 General Rules**

	Article 82 Safety for explosives and blasting work, the concessionaires must take necessary measures prescribed in Articles 5 of the Law, and mineworkers must obey items necessary prescribed in Article 6 of the Law, shall be stipulated in the Chapter Ⅴ in accordance with Article 31, Paragraph 1 and 2 of the Law. **Section 2 Handling Explosives** (An explosives service station) Article 83 1 When the concessionaires who use explosives in the mineral-related operations establish the magazine, an explosives service station for delivery of explosives must be established at a mine. 2 When an explosives service station is established at a mine, the concessionaires must not deliver explosives except the aforesaid service station. However, concerning ANFO explosives manufactured by a mobile mixture facility, and utilizing the facility and deliver the explosives immediately shall not be applied. 3 When an explosives service station is not established, the concessionaires must locate a safe place for delivery of explosives, and necessary measures such as placing a warning sign, posting a guard preventing theft, and setting up fences. 4 When a safe place for delivery of explosives has located at a mine, the concessionaires must not deliver explosives except the aforesaid place. However, concerning ANFO explosives manufactured by a mobile mixture facility, and utilizing the facility and deliver the explosives immediately shall not be applied.

	Article 84 1 A container storing explosives (except ANFO explosives) in an explosive service station or a safe place prescribed in Article 83, Paragraph 3 of the Regulation must be strongly made of non-conductive materials such as wood or others, and there shall be no iron-kind inside. The containers storing explosives (except ANFO explosives) must be kept separately from pyrotechnics such as safety fuse, detonating fuse, industrial detonator and electric detonator. 2 A container storing ANFO explosives in an explosive service station or a safe place prescribed in Article 83, Paragraph 3 of the Regulation must be made of non-conductive materials such as polyethylene, polyvinyl chloride or others with non-promoting resolution of ANFO explosives, and structure of the container is suitable for prevention of oil leakage, humidity and mixing in of a foreign body. The containers storing ANFO explosives must be kept separately from pyrotechnics such as safety fuse, detonating fuse, industrial detonator and electric detonator. (A mobile mixture facility for ANFO explosives) Article 85 The container storing ANFO explosives which is installed a mobile mixture facility must be made of non-conductive materials such as polyethylene, polyvinyl chloride or others with non-promoting resolution of ANFO explosives, and structure of the container is suitable for prevention of oil leakage, humidity and mixing in of a foreign body, and the container of ANFO explosives must be separated from the containers of

	explosives, and the containers of pyrotechnics such as safety fuse, detonating fuse, industrial detonator and electric detonator. (A surface explosives service station) Article 86 A surface explosives service station prescribed in Article 83, Paragraph 1 of the Regulation must be established in the following provisions. 1) the location of the station must be safe distance from passageways, mine mouth, electric wire-way, fire handling place and mine buildings where people are present, and shall have low humidity; 2) the building of the station must be a one-storied, and the side walls must be constructed of reinforced concrete, concrete, or concrete blocks for fireproofing and fire prevention and prevention of theft. The roof of the building must be made of non-combustible materials such as metal plate, slate plate and tile to prevent theft on the roof. Inside of the building must be boarding and no exposed iron kind, and equipped with an appropriate ventilator; 3) entrance door of the building must be double doors, and outside door shall be made of steel plate with two (2) mm or more in thickness for a fireproof ,and locks must be fitted to both outside and inside doors. The outside and inside doors must be equipped with a structure that cannot remove easily; 4) the windows of the building must be fitted as follows; Steel rods ten (10) mm or more in diameter with 0.1 m or less in interval must

	be fixed in windows; The inside window is a sliding type with opaque glass, and the outside window must be equipped with a structure that cannot remove easily; 5) wire net must be put on the roof or ceiling and a ventilation window (a width of 0.2 m or more) fitted with steel rod ten (10) mm or more in diameter and 0.1 m or less in interval; 6) the building must be equipped with a lightening conductor; 7) height of the floor must be 0.3 m or more; 8) explosives must be kept separately from pyrotechnics such as safety fuse, detonating fuse, industrial detonator and electric detonator; 9) never using fire inside the building; 10) an appropriate boundary fence must be installed surrounding an explosives service station, and warning signs such as [EXPLOSIVES], [OFF LIMIT] and [FIRE PROHIBITED] must be posted; 11) the necessary caution items for handling of explosives must be posted at a convenient place near the explosives service station, and; 12) A good condition of an alarming sound equipment must be installed and maintained. (An underground explosives service station) Article 87 An underground explosives service station prescribed in Article 83, Paragraph 1 of the Regulation, must be provided in the preceding Article, Items 7 to 12 inclusive, in addition to the provisions of following provisions.

	1) the location of the station must be 7.5 m or more distance from the transportation road, underground mine office, places where many mineworkers gather such as a station, and wiring locations and also shall have low humidity; 2) the building of the station must be a one-storied. the outside of the building must be constructed by fireproofing materials, and inside of the building must be boarding and no exposed iron kind on the floor, and equipped with an appropriate ventilator; 3) the entrance door of the building must be made of steel plate with two (2) mm or more in thickness. a lock must be fitted to the door and the structure of the door cannot remove easily for prevention of theft; 4) sufficient rock dusting must be scattered near the station; 5) facilities for preventing of roof fall must be installed; 6) lighting facility must be installed a fixed light with a safety device, and the wiring must be carried out by wiring work with a synthetic resin pipe or a cable; 7) a switch or an automatic switch of lighting facility must be put outside of the building; (Management of explosives) Article 88 1 The concessionaire must manage explosives at an explosive service station as following provisions. 1) storage amount of explosives at the station must not exceed in two working days; 2) persons not related to handling explosives must not enter the building; 3) smoking or the usage of fire inside the station must be prohibited. the storage of

	materials that ignite or bum easily must not be provided; 4) when using a light, a safety portable lamp shall be available. 2 In case the low consumption of explosives less than five (5) kg of two working days, the maximum amount of explosives shall be stored until five (5) kg at the station of a mine nevertheless prescribed in preceding Paragraph. Article 89 1 The quantity of explosives delivered at the safe place prescribed in Article 83, Paragraph 3 of the Regulation must not exceed the quantity expected to be used in one (1) working day. 2 In the safe place prescribed in the preceding Paragraph, the explosives must not be stored for a time longer than necessary. Article 90 1 The quantity of ANFO explosives which are manufactured by a mobile mixture facility prescribed in Article 85 of the Regulation, must not exceed to be expected using in one (1) working day. 2 The quantity of ANFO explosives stored in the container of a mobile mixture facility prescribed in preceding Paragraph of the Regulation, must not exceed to be expected using in one (1) working day. Article 91 The technical safety staffs for explosives must obey the following provisions at a mine that an explosives service station is established.

	1) containers of explosives must be kept separately from the container of pyrotechnics such as safety fuse, detonating fuse, industrial detonator and electric detonator; 2) providing tools except handling for explosives inside the station must be prohibited; 3) moisture absorption and solidity of explosives must be checked; 4) when abnormal explosives are found by the preceding check, the abnormal explosives shall be returned to a magazine, and the facts must be reported to the administrator. (Delivery of explosives) Article 92 The technical safety staffs for explosives must obey the following provisions for delivering explosives at mines. 1) to keep a delivery book for explosives and note the necessary items, and make clear the balance of explosives; 2) to return the explosives to the magazine not expected to be used in two working days, or mineral working operations are expected to be suspended more than two working days at a mine; 3) the safety staffs must not deliver the explosives except the mineworkers who bring a request slip for explosives that was made out by a technical safety staff for surface safety & blasting or a technical safety staff for underground safety & blasting.

	Article 93 1 A technical safety staff for an underground safety & blasting or a surface safety & blasting (a technical safety staff for explosives, if not appointed) shall hold the post of a technical safety staff for explosives concurrently at a mine that does not establish an explosives service station. 2 A technical safety staff for an underground safety & blasting or a surface safety & blasting must obey the following provisions for delivering of explosives. 1) containers of explosives must be kept separately from the container of pyrotechnics such as safety fuse, detonating fuse, industrial detonator and electric detonator at a safe place prescribed in Article 83, paragraph 3 of the Regulation; 2) the safety staff must keep a delivery book for explosives and note the necessary items, and make clear the balance of explosives; 3) the safety staff must return the remainder of explosives to a magazine immediately after the work. Article 94 1 a technical safety staff for an underground safety & blasting or a surface safety & blasting shall hold the post of a technical safety staff for explosives concurrently for delivering ANFO explosives which are manufactured by a mobile mixture facility at a mine. 2 A technical safety staff for an underground safety & blasting or a surface safety & blasting must obey the following provisions for delivering ANFO explosives. 1) the safety staff must keep a delivery book for ANFO explosives and note the necessary items, and make clear the balance of ANFO explosives;

	2) delivering the quantity of ANFO explosives to the mineworker engaged for blasting must not exceed the quantity expected to be used in one (1) working day. 3) the safety staff must return the remainder of ANFO explosives to a magazine or an explosive service station immediately after the work. (Surface transportation) Article 95 In the area of surface transportation of explosives, the concessionaires must obey the following provisions. 1) the transportation of explosives in the area of surface, the special car or cage must be used, and the explosives must be loaded in different car or cage from pyrotechnics such as safety fuse, detonating fuse, industrial detonator and electric detonator; 2) when an automobile is used for transportation of explosives, measures for prevention of overheating to explosives by the engine must be taken; 3) an automobile loaded with explosives must be equipped an appropriate extinguisher; 4) the transportation of explosives in outside must be protected from direct sunshine; 5) a small flag showing [EXPLOSIVES] on red cloth in daytime and a portable safety lamp at night time must be used. **Section 3 Blasting Work** (The work for blasting)

	Article 96 1 In the underground Coal mine (Class-A coal pit and Class-B coal pit), blasting work must be carried out only by a safety technical staff for underground safety & blasting. 2 Metal mine, Non-metal mine in underground mining, and Coal mine, Metal mine and Non-metal mine in open-pit mining, blasting works must be carried out by a safety technical staff for underground safety & blasting, a safety technical staff for surface safety & blasting, and a worker who have trained regarding blasting (hereinafter referred as “the worker qualified for blasting”). (Carrying on explosives) Article 97 A technical safety staff and the worker qualified for blasting must obey following provisions when they carry on explosives. 1) a bag or box holding explosives for carrying must be made of nonconductive materials such as cloth or wood, and must not have exposed iron-kind inside; 2) a bag or box holding ANFO explosives must be made of nonconductive materials such as polyethylene, polyvinyl chloride or others and non-promoting resolution of ANFO explosives, and structure of the bag or box shall be suitable for prevention of oil leakage, humidity and mixing in of a foreign body; 3) the bag or box can be loaded only explosives prescribed in the preceding Item 1 and 2; 4) warning signs such as [EXPLOSIVES] and others must be put on the bag or

	box for carrying explosives on; 5) When releasing the bag or box for carrying on explosives, and pyrotechnics such as safety fuse, detonating fuse, industrial detonator and electric detonator from the body, they must take appropriate measures for prevention of theft, and put the bag or box on a safety place and distance separating one (1) meter or more from the electric wiring, moving cable and rail road. (Stemming materials for blasting) Article 98 1 The concessionaires must provide stemming materials for blasting with non-combustible materials such as clay, sand or a pack of water, and a tamping pole for loading explosives with a safe against friction, impact and static electricity. 2 In addition to the preceding Paragraph, the concessionaires of underground Coal mines (Class-A coal pit and Class-B coal pit) must provide a funnel, leading pipes and other safe tools for loading explosives. 3 The concessionaires of Metal mine and Non-metal mine must take measures for water-proof such as application of grease and others to safety fuse or electric fuse which are used in mineral working fields with much water. (Loading machines for ANFO explosives) Article 99 When the loading machines for ANFO explosives are used by compressed air, the concessionaire must accommodate following provisions. 1) Internal materials of the loading machines are made of anti-corrosion such as

	stainless steel, aluminum, and non-promoting resolution of ANFO explosives. 2) The properties of the hose for loading ANFO explosives can not be charged static electricity. 3) The loading machines must have terminal of the grounding (earth). 4) The structure of the loading machines shall be easy and suitable for cleaning. (Blasting work) Article 100 1 The concessionaires of underground Coal mines (Class-A coal pit and Class-B coal pit) must not conduct blasting work in a working place where the concentration of flammable gas is 0.5% or higher. An electric ignition method using a delay electric detonator that completes the blasting within 100 milliseconds after firing in a working place where the concentration of flammable gas is 1.5% or lower shall not apply. 2 The concessionaires must conduct the natural ignition method which the industrial detonator or electric detonator is placed on the upper side of mouth of blasting hole. Article 101 1 The concessionaires of underground Metal mines and Non-metal mines must prepare power supply and firing switch, and, if necessary, a current adjusting device, when conducting blasting work using light lines or power lines as the power source is carried out. 2 The switch mentioned in the preceding Paragraph must be double-pole field switch, and the firing switch must open automatically after firing.

	3 An current of one (1) ampere or more in the electric path of the electric detonator or electric fuse must be flowed prescribed in preceding Paragraph 1. (An evacuation area) Article 102 The concessionaires of underground mining must secure an evacuation area at a safe position or with a safe structure to prevent the danger of flying stones when conducting blasting work. (Appropriate measures for blasting work) Article 103 The concessionaires of open-pit mining must use appropriate amount of explosives, install appropriate protective equipment or establish an off-limit area, post watchmen, stick warning signs up and take other appropriate measures to prevent entry of surrounding area if there is a risk of danger caused by flying stones and rolling stones outside a mine at the time of blasting work. (Obedience items of the technical safety staffs and worker qualified for blasting) Article 104 The safety technical staffs for underground safety & blasting, safety technical staffs for surface safety & blasting, workers qualified for blasting must obey following provisions. 1) electric detonators or electric safety fuses must be fixed to explosives at a safe place;

	2) industrial detonators and safety fuses must be connected using safety tools at a safe place; 3) the end of leading wires on electric detonators or electric safety fuses must be twisted before connection with a blasting cable; 4) when blasting work is carried out in underground Coal mines (Class-A coal pit and Class-B coal pit), measurement of concentration of flammable gas and existing areas must be conducted by a precise gas detector before firing of the blasting every time; 5) the following items must be carried out before firing of the blasting; - Post watchmen in advance at passage ways to dangerous areas, - Define off-limit measures for entering inside except related personnel, - Set an alarm to inform mineworkers in the vicinity of the blasting location, and, - Confirm the safety that there is not a risk of danger. 6) a circuit test and firing in electric ignition method must be carried out at a safe place. a continuity checker must be used with a power that passes a current less than one (1) milli-ampere (mA), and; 7) when explosives being loaded into blasting holes at working places, usage of fire or smoking must be prohibited. (A blasting cable) Article 105 The concessionaires must provide a blasting cable with mechanically strong of electric wire, being insulated by cotton or rubber, sufficient length between the place of firing

	in the evacuation area prescribed in Article 102 of the Regulation and the blasting place. Article 106 A safety technical staff for underground safety & blasting, safety technical staff for surface safety & blasting, worker qualified for blasting must obey following provisions of a blasting cable. 1) the terminal of the blasting cable which connects to an exploder, the leading wires of the cable must always be twisted except firing of the blasting; 2) the other side of terminal of the cable which connects to the electric detonator or electric safety fuse, the leading wires of the cable must be unequal length to prevent twisting; 3) the cable must be set up with a safe distance from electrical wiring, moving cable and other chargers that there is a risk of electrification. 2 If there is a risk of an accidental explosion due to the generation of induced voltage in the electric blasting circuit caused by a thunderbolt at surface working places on open-pit mining, the terminal of the leading wires of the blasting cable for the exploder must be open notwithstanding the provision of preceding Paragraph, Item 1. (Misfire) Article 107 When the charged explosives do not explode after firing of blasting or the explosion cannot be confirmed, a safety technical staff for underground safety & blasting, safety technical staff for surface safety & blasting, worker qualified for blasting must obey

	following provisions. 1) when the blasting work is carried out by the electric ignition method, the leading wires of the blasting cable must be removed from an exploder, and the terminal of the cable must be twisted, and prevention of re-firing measure must be taken; 2) nobody must approach the place where explosives are loaded within five (5) minutes in case of electric ignition method, and within fifteen (15) minutes in other blasting methods. Article 108 When the charged explosives do not explode after firing of blasting, a safety technical staff for underground safety & blasting, safety technical staff for surface safety & blasting, worker qualified for blasting must take appropriate measures as following provisions. 1) drilling holes shall be made in parallel way with a distance of 0.5 m or more from the misfired blasting hole, and misfired explosives must be treated by additional blasting; 2) loading additional explosives into the misfired blasting hole, and the blasting; 3) washing stemming materials and explosives out of the misfired blasting hole with high pressure water or compressed air, and recover the explosives; 4) after recovering the misfired explosives prescribed in the preceding Items 3, loading new explosives into the hole and the blasting. 2 When misfired explosives cannot be recovered by the measures in the preceding Paragraph, mine cars in which misfired explosive may have been mixed with rocks or minerals must be marked properly, and a technical safety staff or worker qualified for

	blasting must report the administrator speedily. (Measures after blasting work) Article 109 1 When blasting work is completed in the underground mining, a safety technical staff for underground safety & blasting and the worker qualified for blasting must obey following provisions. 1) a safety technical staff of Coal mine (Class-A coal pit and Class-B coal pit) must measure concentration of flammable gas, examine the roof conditions, check misfired explosives and others, and, if there is a high risk of danger, take the measures of off-limits for mineworkers, and report to the administrators speedily. 2) a safety technical staff and the worker qualified for blasting of Metal mine and Non-metal mine must not approach to the blasting place or permit other mineworkers to approach to the blasting place before harmful gas caused by the blasting has spread out. 3) a safety technical staff and the worker qualified for blasting of Metal mine and Non-metal mine must examine the roof conditions, check misfired explosives and others, and, if there is a high risk of danger, take measures of off-limits for mineworkers, and report to the administrators speedily. 4) a safety technical staff of Coal mine (Class-A coal pit and Class-B coal pit), Metal mine and Non-metal mine shall write down in “the diary for underground safety and blasting” following items in each blasting location. a) kinds and quantities of explosives and pyrotechnics, and received, used and returned of them;

	b) number of times of the blasting; c) kinds and quantity of explosives loaded in each blasting hole; d) results of measurement of concentration of flammable gas in Coal mine (Class-A coal pit and Class-B coal pit) before and after firing of the blasting; e) treatment of misfire. 2 When a blasting is completed in the open pit-mining, a safety technical staff for surface safety & blasting and the worker qualified for blasting must obey following provisions. 1) a safety technical staff and the worker qualified for blasting of Coal mine, Metal mine and Non-metal mine must examine rock conditions and collapse, check misfired explosives and others, and, if there is a high risk of danger, take measures of off-limits for mineworkers, and report to the administrators speedily. 2) a safety technical staff shall write down in “the diary for surface safety and blasting” following items in each blasting location. a) kinds and quantities of explosives and pyrotechnics, and received, used and returned of them; b) number of times of the blasting; c) kinds and quantity of explosives loaded in each blasting hole; d) treatment of misfire. Article 110 When ANFO explosives are used for blasting work, a safety technical staff for underground safety & blasting, safety technical staff for surface safety & blasting and worker qualified for blasting must obey the provisions of preceding Article 104 of the

	Regulation and following provisions. 1) the loading machines must have the grounding (earth) when using, and the grounding (earth) must not connect to rail roads, steel pipes or electrical grounding (earth) system; 2) the length of hosepipe attached to the loading machines shall have enough longer than drilling holes.

The draft of Mine Safety Law	The draft of Mine Safety Regulation (phase 1)
	Chapter Ⅵ Vehicle Type Mine Machines and Automobiles **Section 1 General Rules** Article 111 Safety for vehicle type mine machines and automobiles, the concessionaires must take necessary measures prescribed in Articles 5 of the Law, and mineworkers must obey items necessary prescribed in Articles 6 of the Law, shall be stipulated in the Chapter Ⅵ in accordance with Article 31, Paragraph 1 and 2 of the Law. (Indication of vehicle number and others) Article 112 The concessionaire must indicate vehicles and automobiles' number, limited loading weight, the maximum working load, and other items for operation and management of the vehicle type mine machines and automobiles at a proper position that can be seen easily. **Section 2 Capability Standard of Vehicle Type Mine Machines and Automobiles** (Capability standard of vehicle type mine machines and automobiles) Article 113 1 The concessionaire must follow the "Regulation on procedures and items of

	mentioned provided in Mine Safety Law and its regulations” when using a vehicle type mine machine or automobile inside a mine, and must not use a vehicle or automobile which does not meet the construction standard. 2 The concessionaires of underground Metal mine and Non-metal mine must follow the provisions “Regulation on procedures and items of mentioned provided in Mine Safety Law and its regulations” when using a vehicle type mine machine or automobile inside a mine, and must not use a vehicle or automobile which emits exhaust gases that does not meet the criteria, and must not use a fuel that does not meet the criteria. (Head guard) Article 114 The concessionaires must install a robust head guard on each vehicle type mine machine or automobile used in areas with high risk of rock falling or other reasons.

The draft of Mine Safety Law	The draft of Mine Safety Regulation (phase 1)
	Section 3 Inspections (Examining a vehicle or automobile before starting the work) Article 115 The worker who has trained regarding operating a vehicle type mine machine or automobile (hereinafter referred as “the worker qualified for operating a vehicle or automobile”) shall check the vehicle or automobile before starting the work. (Periodical inspection) Article 116 1 The technical safety staff for machinery at a mine must inspect vehicle type mine machines or automobiles at least once a month concerning followings. 1) abnormalities of the brakes, clutch, controls and working devices; 2) damage of ropes and chains; 3) damage of buckets and dippers, and; 4) abnormalities of alarms or other safety devices. 2 The technical safety staff for machinery shall appoint workers who have trained regarding maintenance of vehicle type mine machines or automobiles (hereinafter referred as “the worker qualified for maintenance of a vehicle or automobile”) to conduct inspections described in the preceding Paragraph. In such a case, the technical safety staff for machinery must confirm the results of inspections.

	3 The technical safety staff for machinery shall record the results of inspections to the “management record of vehicle type mine machines and automobiles” prescribed in preceding Paragraph 1 and 2. (Detailed inspection) Article 117 1 The concessionaires must conduct periodic detailed inspections of abnormalities of the parts of vehicle type mine machines or automobiles at least once a year and record the results of inspections in the “management record of vehicle type mine machines and automobiles”. 2 If a concessionaire appoints a person officially qualified for maintenance of vehicle type mine machines or automobiles to conduct detailed inspections prescribed in preceding Paragraph, it shall be deemed that such inspections have been conducted by the concessionaire. (Safety measures during inspection and maintenance) Article 118 The concessionaires must use safety pillars and blocks, and take other appropriate measures when appointing the qualified workers to conduct inspection, maintenance, repair or other works under a raised boom, arm or other parts of vehicle type mine machines or automobiles at mines. **Section 4 Prevention of Danger Caused by Operation**

	(Obligation of safety operation) Article 119 The worker qualified for operating a vehicle or automobile at a mine must operate a vehicle or automobile with safety speed and the observance of common traffic rules. (Restrictions on purpose of use and observance of limited loading weight) Article 120 1 The workers qualified for operating a vehicle or automobile must use those vehicles or automobiles for their main purpose exclusively. 2 Non vehicles or automobiles can be used to carry loads or passengers that exceed the limits loading weight or number of passengers. 3 When operating a vehicle type mine machine, the structurally adequate stability level and maximum working load must not be exceeded to prevent of danger caused by falling or destruction of the boom, arm or other working devices. 4 The workers qualified for operating a vehicle or automobile must not allow mineworkers to board anywhere else than in the passenger seats of such vehicles or automobiles. (Measures to be taken when leaving a vehicle or automobile) Article 121 When the worker qualified for operating a vehicle or automobile leaves the vehicle or automobile, the said worker must obey following items. 1) lower the bucket or dipper down to the ground;

	2) stop the engine and brake or take other anchoring measures, and; 3) remove and carry the key to prevent unqualified persons from driving the vehicle or automobile. **Section 5 Mine Roads and Tunnels (Galleries)** (Mine roads) Article 122 1 The concessionaires must obey following provisions to ensure safety on mine road structures in consideration of the topography, geology, weather and other conditions surrounding mine, as well as the driving conditions of vehicle type mine machines or automobiles. 1) in case geology of the road surface is softened, lay such as gravel or aggregate on the soft parts of the road to maintain stability of the road surface; 2) install stockades (fences), blocking walls or other appropriate facilities in the areas with high risk of damage to the mine road structures caused by falling rocks or land-slide from a slope beside the road; 3) install channels and other appropriate drainages on the mine road in much rainfall parts; 4) establish a turnout of vehicle interaction at the necessary place where large vehicles drive on the mine road. 2 The mine road shall have traffic signs, fences for fall prevention, curved-mirrors and other safety facilities at the necessary sections.

	(Longitudinal slope and width of mine road) Article 123 1 The concessionaires must construct longitudinal slope of mine road with inclination of 12 % or less in principle at mines. However, it shall not apply if the maximum speed of vehicle type mine machines or automobiles is limited in 20 km/h or less, the longitudinal slope can be constructed with inclination of 18 % or less. 2 The minimum width of mine road that the maximum width of driving vehicles or automobiles is 2.5 m or less must be 4.0 m or more. In case the maximum width of driving vehicles or automobiles exceeds 2.5 m, the minimum width of the road must be maximum width of driving vehicles or automobiles plus 2.5 m or more in addition. (Tunnels (Galleries)) Article 124 1 For tunnels (galleries) of a mine where vehicle type mine machines or automobiles run constantly, the concessionaire must obey following items. 1) maintain a road surface to be leveled at all time for safety driving; 2) secure a sufficient passage width of the tunnels (galleries) for vehicle type mine machines or automobiles; 3) secure adequate space from roof or obstacles in the tunnels (galleries) to prevent vehicle type mine machines or automobiles from getting caught or colliding with them; 4) install road signs, traffic signals and other safety facilities as necessary, and;

	5) install lightning facilities as necessary. 2 A tunnel (gallery) where vehicle type mine machines or automobiles run constantly must not be used as a passage for mineworkers. However, this shall not apply if the necessary measures for the safe passage of mineworkers have been taken, evacuation areas have been constructed at appropriate intervals or sidewalks of 0.75 m or more in width beside the passage of vehicles or automobiles have been created. **Chapter Ⅶ Haulage by a belt conveyor, a hoisting device and a locomotive** **Section 1 General Rules** Article 125 Safety for haulage by a belt conveyor, a hoisting device and a locomotive, the concessionaires must take necessary measures prescribed in Articles 5 of the Law, and mineworkers must obey items necessary prescribed in Articles 6 of the Law, shall be stipulated in the Chapter Ⅶ in accordance with Article 31, Paragraph 1 and 2 of the Law. (Inspections) Article 126 The technical safety staff for machinery must examine the conditions of following facilities, equipment, devices and parts at an underground mine in every working day and write down the results of examination in “the diary for machinery”.

	1) the mechanical safety device used in a hoisting device for transportation of personnel; 2) the mechanical safety device, driving unit, extension unit, brake, roller, pulley and frame of a belt conveyor; 3) the mechanical safety device, rope, brake and clutch of a hoisting device; 4) the metal couplings (a rope socket, a link, chain and a pin) attached to rope of a hoisting device, and; 5) a cage of a shaft-hoisting device and man riding cars of a hoisting device. Article 127 The technical safety staff for machinery must take periodic detailed inspections of facilities, equipment and parts prescribed in preceding Article 125 at least once three (3) months and record the results of inspections in the “management record of the mechanical safety device”. Article 128 1 The technical safety staff for machinery must examine the abnormality of the electrical signal units and electrical safety device of the hoisting equipment and the belt conveyor for transportation of personnel, and examine the abnormality of electrical safety device of the belt conveyor for transportation except personnel in every working day. The said technical safety staff shall also write down the results of examination in “the diary for machinery”. 2 The technical safety staff for electricity must take periodic detailed inspections of

	the electrical signal units and electrical safety devices of the facilities described in preceding Paragraph at least once three (3) months and record the results of inspections in the “management record of the mechanical safety device”. Article 129 1 The technical safety staff for machinery must examine the abnormality of the hoisting device and its railroad for transportation of personnel installed in a shaft and inclined shaft, and tunnel(gallery) and railroad which locomotives are operated for transportation of personnel, and tunnel(gallery) which belt conveyors are installed for transportation of personnel in every working day at a mine. The said technical safety staff shall also write down the results of examination in “the diary for machinery”. 2 The technical safety staff for machinery must inspect the abnormality of the railroad of hoisting device for transportation except personnel periodically and write down the results of inspection in “the diary for machinery”. **Section 2 General Safety Equipment** (Brakes) Article 130 The concessionaires must manage and maintain the brakes of the hoisting device installed in a shaft and inclined shaft, and the brakes of the belt conveyor for transportation of personnel to be able to promptly stop the cage, bucket, skip, train or belt under the maximum total load at any place and also save it.

	(Safety factor) Article 131 1 When the concessionaires use rope and attached metal couplings to support the cage of a shaft hoisting device that lifts personnel up and down or man riding cars of a inclined-shaft hoisting device that transport personnel at mines, the safety factor of the rope and attached metal couplings must be at least ten (10) for the maximum static load and five (5) for the maximum total load. 2 The safety factors described in the preceding Paragraph above shall be calculated in accordance with the provisions of the “Regulation on procedures and items of mentioned provided in Mine Safety Law and its regulations”. Article 132 1 When the concessionaires use rope and attached metal couplings to support the bucket, skip, or mine cars of a hoisting device that transport except personnel at mines, the safety factor of the rope and attached metal couplings must be at least six (6) for the maximum static load and three (3) for the maximum total load. 2 When the concessionaires use rope for an endless hoisting device in the inclined-shaft at mines, the safety factor of the rope must be at least three (3) for the maximum static load and two (2) for the maximum total load. 3 When the concessionaires use rope and attached metal couplings to support the scaffold in a shaft at mines, the safety factor of the rope and attached metal couplings must be at least six (6) for the maximum static load and three (3) for maximum total load.

	4 The safety factors described in the preceding Paragraph 1 to 3 inclusive shall be calculated in accordance with the provisions of the “Regulation on procedures and items of mentioned provided in Mine Safety Law and its regulations”. Article 133 1 When the concessionaires install the belt conveyor for transporting personnel at mines, the safety factor of the belt must be at least ten (10) for the maximum static load and five (5) for the maximum total load. 2 The safety factors described in the preceding Paragraph above shall be calculated in accordance with the provisions of the “Regulation on procedures and items of mentioned provided in Mine Safety Law and its regulations”. (Signal equipment) Article 134 1 The concessionaires must set up signal devices in tunnels (galleries) where shaft-hosting device, automatic hosting device or endless hoisting device is installed. 2 The concessionaires must set up two or more signal devices including an audio signal type at each platform and hoisting operation site of a shaft or inclined-shaft with passenger lifting up and down. In such a case, a telephone shall be deemed an audio-type signal device. 3 One of signal devices prescribed in the preceding Paragraph 2 must be able to send signals to the hoisting operation site from any position along the inclined shaft. However, this shall not apply if there is a device that can stop the hoisting device

	completely at any time by riding passengers on the man riding cars. 4 The concessionaires must install telephone, underground inductive radio system or other necessary devices in each platform which can contact to other platforms, and also install a signal device that can send signals to passengers from the platform in the belt conveyer tunnel(gallery) for transportation of personnel at mines. 5 A signal device in a cage carrying personnel at a mine shall be deemed the device prescribed in preceding Paragraph 2 if it can send signals to the hoisting operation site from any position in the shaft. (anchoring measures) Article 135 1 When a connection of mine cars is operated by a hosting device, automatic hoisting device, endless hoisting device at a mine, the concessionaire must install a device of anchoring measures fixing in the body of the mine car or necessary places of inclined-shaft to stop the mine cars under runaway, or other necessary devices (hereinafter referred as “devices of anchoring measures). 2 When a connection of a self driven mine car runs on the railroad at a mine and there is a risk of danger for out of control, the concessionaire must install the device of speed controller at the car and warning alarm system. 3 When a connection of a mine car pushing by manpower runs on the railroad at a mine and there is a risk of danger for out of control, the concessionaire must install the device of speed controller at the car. (Measures to be taken in dangerous places)

	Article 136 1 The concessionaires must post watchmen, fix red lights, set warning signs up or take other necessary measures at the working place of haulage tunnels (galleries), under repair work or construction work underground and surface, if there is a risk of danger for haulage by a belt conveyor, a hoisting device and a locomotive. 2 Lighting devices must be fixed in the main switchyards of haulage intake air tunnel (gallery) and other places needed cautions for safety in underground mines. **Section 3 Transportation of Personnel** (A shaft-hoisting device lifting personnel up and down) Article 137 1 The concessionaires must obey following provisions concerning with shaft-hoisting devices lifting personnel up and down at mines. 1) a depth indicator is installed at hoisting operation site; 2) a device for preventing over-run winding of rope and over-speed of a hoisting, which causes danger, is installed at hoisting operation site; 3) a device to stop cage during electric power cutting off or abnormality conditions of the power is installed at hoisting operation site; 4) equipment such as an automatic safety door or manual safety door in the platforms of mine mouth and intermediates to protect personnel from falling down is installed; 5) platforms of the bottom or intermediates of a shaft for getting on/off should have connecting tunnel (gallery) from one side to other side;

	6) the cage has a metallic head guard, enclosure of sides, and doors, safety chains or bars at the backward and forward for preventing personnel from falling down; 7) the cage has grips or chains that passengers keep themselves in steady positions to grab them; 8) the cage is provided spare hanging chains; 9) twisted rope or rope has joints must not be used; 10) The results of examination regarding to corrosion, strain, wear, and breaking of rope shall be taken into consideration, and the safety factor of rope drops to eighty (80) % or less prescribed in Article 131, Paragraph 1 of the Regulation, the rope must not be used; 11) The signal method concerning with the hoisting is noticed to the qualified worker at shaft-hoisting operation site and nearby the signal unit of each platform; 12) the number of permitted passengers to get on one cage is indicated in each platform. 2 Measuring method of the reduced safety factor prescribed in the preceding Paragraph, Item 10 is notified in accordance with the provisions of the “Regulation on procedures and items of mentioned provided in Mine Safety Law and its regulations”. (An inclined shaft-hoisting device for transportation of personnel) Article 138 The concessionaires must obey the provisions prescribed in the preceding Items 1

	to 3 inclusive, 9, 11 and 12 of Article 137, Paragraph 1 and following provisions in addition concerning for an inclined shaft-hoisting device for transportation of personnel at mines. 1) the width of a side wall or obstacle of the tunnel (gallery) should be 0.75 m or more from man riding cars and the other width should be 0.3 m or more from the cars; 2) a man riding car has a head guard, and enclosure, safety chains or bars for the both sides; 3) the space between the head guard of a man riding car and roof or obstacle of the tunnel (gallery) is 0.3 m or more; 4) an anchor device or a manual stopping device of a hoisting is installed to stop man riding cars when rope was cut or over-speed of the hoisting; 5) when the coupling of each mine car, and connecting between a mine car and a rope-socket are connected by metal couplings (chains or a link), spare parts of metal couplings and rope must be provided; 6) The results of examination regarding to corrosion, strain, wear, and breaking of rope shall be taken into consideration, and the safety factor of rope drops to eighty (80) % or less prescribed in Article 131, Paragraph 1 of the Regulation, the rope must not be used; 7) equipment for preventing derailment is fixed to rail road using at the slope that has an inclination of thirty (30) degrees or more. 2 Measuring method of the reduced safety factor prescribed in the preceding Paragraph, Item 6 is notified in accordance with the provisions of the “Regulation on procedures and items of mentioned provided in Mine Safety Law and its

	regulations”. (Belt conveyor for transportation of personnel) Article 139 The concessionaire must obey following provisions concerning with a belt conveyor for transportation of personnel at a mine. 1) lighting facilities at the platforms and its vicinity are installed to ensure the safety of passengers getting on/off a belt conveyor; 2) a device for preventing excess riding on the belt and excess speed of the conveyor is installed; 3) a device for emergency brake of the conveyor is installed that can stop promptly by passengers on the belt; 4) a device to stop the conveyor during electric power cutting off or abnormality conditions of the power is installed; 5) a device for preventing biased running of the belt is installed; 6) the rollers of a belt conveyor are set a proper space between floor of a tunnel (gallery) or any obstacles and rolling parts of the belt to prevent friction flush and ignition; 7) the space between the belt and roof or any obstacles at platform and its vicinity is 1.8 m or more and the space of them is 1.2 m or more in other places; 8) the belt conveyor tunnel (gallery) shall be concrete lining, brick walling or other appropriate measures to prevent rock falling. 2 When a belt conveyor is stopped by any reasons, nobody can start the continuation

	of the conveyor before the technical safety staff has ensured safety. (Belt conveyor for transportation of materials) Article 140 The concessionaires must obey following provisions concerning with a belt conveyor for transportation of materials that capacity of the motor is twenty (20) kW or more at mines. 1) a device for emergency brake is installed to stop the conveyor in case trouble happened; 2) in case the conveyor installed in a inclined shaft, a device to stop the conveyor during electric power cutting off or abnormality conditions of the power is fixed; 3) a device for preventing slipping of the belt is installed; 4) a device for preventing biased running of the belt is installed; 5) the rollers of the belt conveyor are set a proper space between foot of the tunnel (gallery) or any obstacles and the rotating parts of the belt to prevent connection, friction flush and ignition; 6) a device for preventing friction flush and ignition of rolling parts of belt and piled coal is installed at a transshipment place of coal in Coal mines (Class-A coal pit and Class-B coal pit). (Prohibition on transporting of personnel and materials at the same time) Article 141 1 The concessionaires must not load machineries, apparatus and materials on the

	same vehicles with personnel in a vertical shaft, inclined shaft or level at mines. 2 When personnel are transported by a belt conveyor, minerals, waste rocks, machinery, apparatus and materials must not load at the same time. **Section 4 Haulage by a Locomotive** (Locomotive) Article 142 The concessionaires must provide the tools to repair from derailment of a locomotive itself or a mine car, an alarm device, and head lights in a locomotive at mines. (Watching of running direction) Article 143 When a worker who has trained regarding operating a locomotive (hereinafter referred as “the worker qualified for operating a locomotive”) operates a locomotive, the worker must always watch running direction, and stop or slow down of the locomotive if there is a risk of danger at a mine. (Prohibition of pushing a train of mine cars backward) Article 144 The worker qualified for operating a locomotive must not push a train of mine cars backward by operating a locomotive in a haulage tunnel (gallery) at a mine. However, this shall not apply when a train of mine cars is operated in the

	switchyard, under the guidance by the designated mineworker and safety is confirmed. (Measures to be taken when leaving a locomotive) Article 145 When the worker qualified for operating a locomotive leaves the locomotive, the said worker must obey following provisions. 1) to stop the engine (motor) and brake or take other anchoring measures, and; 2) to remove and carry the operation lever to prevent unqualified persons from operating the locomotive. (A lamp fixing a train of mine cars) Article 146 1 The worker qualified for operating a locomotive must fix a tail lamp or appropriate sign at the last of a mine car when operating a locomotive at night or in the tunnel (gallery). 2 When a train of mine cars is operated by an inclined shaft-hoisting device, a red lamp or appropriate sign must be fixed at the last of a mine car. (Transportation of long sized materials) Article 147 When mineworkers try to transport long sized materials, heavy ones or hazardous materials loading mine cars, the technical safety staff for haulage must instruct mineworkers to take measures for preventing danger caused by collapse of the

	loads or connection with other objects.

The draft of Mine Safety Law	The draft of Mine Safety Regulation (phase 1)
	Chapter Ⅷ Mine Fires and Spontaneous Combustion **Section 1 General Rules** Article 148 Safety for mine fires and spontaneous combustion, the concessionaires must take necessary measures prescribed in Articles 5 of the Law, and mineworkers must obey items necessary prescribed in Articles 6 of the Law, shall be stipulated in the Chapter Ⅷ in accordance with Article 31, Paragraph 1 and 2 of the Law. **Section 2 Prevention of Mine Fires in Underground mine** (Fire-proof construction) Article 149 1 The concessionaires of underground mining must establish a hoisting operation site, a pump operation site, a fan room, transformer apparatus site (except main transformer apparatus), a compressor operation room, sites of driving pulley and main pulley of a belt conveyor, and a charger room for battery type locomotive using materials of fire-proof construction, and also install fire fighting devices in each room or site. 2 The said concessionaires must establish a main oil switch apparatus room, an oil and grease depot, and main transformer apparatus room using materials of fire-resisting construction, and install fire-fighting devices in each room or site. The construction of aforesaid rooms, sites or depot can be intercepted from other

	places if it is necessary. 3 When the electric apparatus and electrical appliances infused flammable oil in transformer apparatus site or main transformer apparatus site prescribed in the preceding Paragraph 1 and 2 are installed, the concessionaires must spread enough quantity of sand on the floor of the sites to absorb leakage oil or to take appropriate measures. 4 The said concessionaires must establish a fuel oil depot or fuel oil service station with fire-resisting construction, and install fire-fighting devices in the depot or station, and spread enough quantity of sand on the floor of the depot or station to absorb leakage oil or to take appropriate measures. The construction of the aforesaid depot or station can be intercepted from other places if it is necessary. 5 The concessionaires in Coal mines (Class-A coal pit and Class-B coal pit) must establish a compressor operation room prescribed in preceding Paragraph 1 and a main transformer apparatus room prescribed in preceding Paragraph 2 in the independent ventilation of air way. Article 150 1 The fire-proof construction shall have a structure that is covered by incombustible materials such as mortar with iron mesh and plaster inside tunnel (gallery). 2 The fire-resisting construction shall have a structure that is strongly constructed using incombustible materials such as concrete and bricks inside tunnel (gallery). (Fire-fighting devices in underground)

	Article 151 The concessionaires of underground Coal mines (Class-A coal pit and Class-B coal pit) must install automatic fire-fighting devices in the compressor operation room, oil and grease depot, main transformer apparatus room and main oil switch apparatus room. However, this shall not apply if a watchman is posted anytime and manual type fire-fighting device with inert gas is installed. Article 152 1 The concessionaires of underground Coal mines (Class-A coal pit and Class-B coal pit) must install hydrants in the following places. 1) starting point and terminal of the tunnel (gallery), and within 100 m or less in intervals of it, where belt conveyor is installed, internal-combustion engine or electric trolley locomotives is driven, or electric power cables are wired; 2) the site where the electrical appliances infused oil (except main transformer apparatus and main oil switch apparatus) are installed. 2 The capacity of hydrants prescribed in the preceding above must have a head pressure of 0.15 MPa (1.5 bar) or more, and the quantity of water supply must exceed 300 liter per minutes (l/min). 3 The nozzle and hoses for a hydrant must be provided in the convenient places where they can be connected to hydrants smoothly. Article 153 The concessionaires of underground Metal mines and Non-metal mines must install

	fire-fighting devices in the mine office, main electric apparatus, fuel oil depot, fuel oil service station and other necessary places. (Oil and grease) Article 154 1 The concessionaires of underground mining must keep oil and grease into incombustible vessels with a cover in underground working places and its vicinity. 2 Oil and grease must be stored in sealed incombustible containers in the oil and grease depot. (Restriction on handling fire at the time of refueling) Article 155 The concessionaires of underground Metal mines and Non-metal mines must prohibit mineworkers from handling fire, and must stop the engine of a vehicle type mine machine or an automobile at the time of refueling. **Section 3 Handling Fire on Surface** (Mine buildings and facilities on surface) Article 156 1 The concessionaires must keep enough space of 1.5 m or more for evacuation between the main structure and its adjoining boundary or between two or more main structures when establishing or modifying the structures for mineral-related operations on the surface.

	2 To prevent fire, sufficient space must be secured between furnaces, heaters, chimneys or other facilities with a high fire risk and structures and other flammable materials or such flammable materials must be protected with heat shielding materials. 3 Furnaces and other metal mine facilities that handle large amounts of high-temperature substances must be a structure that can prevent infiltration of ground water and rain water. (A charger room of safety cap-lamps) Article 157 1 The concessionaires of underground Coal mines (Class-A coal pit and Class-B coal pit) must establish a charger room of cap-lamps on the surface. 2 A charger room of safety cap-lamps prescribed in the preceding Paragraph above must have appropriate measures to prevent fire and to obey following items. 1) the room must be fire prohibition; 2) the room must have an appropriate structure to prevent stagnation of flammable gas that is caused by charging the batteries of safety cap-lamps. (Fire fighting devices on surface) Article 158 1 The concessionaires must install fire-fighting devices such as ponds, hydrants, extinguishers, extinguishing sand or water tanks in accordance with scale of mine buildings in necessary places on surface. 2 The fire-fighting devices prescribed in the preceding Paragraph must be provided

	in accordance with working condition and nature of fires. Section 4 Spontaneous Combustion (Prevention of spontaneous combustion, and sealing) Article 159 1 The concessionaires of underground Coal mines (Class-A coal pit and Class-B coal pit) and Metal mines must install fire-fighting devices in advance at a site where spontaneous combustion is likely to occur, and provide fire proof materials for sealing smoothly and other appropriate measures in the area. 2 The said concessionaires must take filling, sealing of tunnels (galleries) and appropriate measures in the goaf (old working field) where spontaneous combustion occurs or is likely to occur. 3 Not allow return air (exhaust) prescribed in the preceding Paragraph above pass through other working places or main haulage tunnels (galleries). 4 The said concessionaires of Coal mines must take cement injection and other appropriate measures in the coal seam or drilling holes where spontaneous combustion occurs or is likely to occur. (Obedience items of the technical safety staff for underground safety) Article 160 1 The technical safety staffs for underground safety & blasting of Coal mines (Class-A coal pit and Class-B coal pit) and Metal mines must measure the air temperature, humidity and gas density, and check the smells, and pay attention of changes once

	a day or more nearby the site of tunnel (gallery) where spontaneous combustion occur or is likely to occur. 2 The said technical safety staffs of Coal mines must measure concentration of gas in the main gas drainage pipes once a day or more, and pay attention of changes. 3 When the tunnel (gallery) nearby the site prescribed in preceding Paragraph 1 is sealed, the said technical safety staffs of Coal mines and Metal mines must measure and check the items of same as Paragraph 1, and check abnormalities of the sealing and analyze the gases (concentration, kinds of gases) inside sealing of tunnel (gallery), if it is necessary. 4 the said technical safety staffs of Coal mines and Metal mines shall write down in "the diary for underground safety and blasting" for the results of measures or analysis prescribed in preceding Paragraph 1 to 3 inclusive. when abnormalities are found in the results of measures or analysis, the technical safety staff must report the contents to the administrator speedily. (Sealing) Article 161 1 When the tunnel (gallery) connecting to goaf where spontaneous combustion occur or is likely to occur is sealed, the technical safety staff for underground safety & blasting of Coal mines (Class-A coal pit and Class-B coal pit) and Metal mines must install a steel pipe into the sealing of tunnel (gallery) to measure the inner air. 2 When the gas explosion is likely to occur while sealing tunnel (gallery) nearby the site that spontaneous combustion occurred, the said technical safety staff must take piling up sandbags at the backside of sealing spot of tunnel (gallery) or appropriate

	safety measures under the administrator's direction before starting the sealing work. 3 When the sealed tunnel (gallery) connecting to goaf where spontaneous combustion occurred is going to clear the sealed materials, the technical safety staff must take safety method under the administrator's direction. 4 When the tunnel (gallery) and the site where spontaneous combustion occurs or is likely to occur is sealed or filled, the technical safety staff of Coal mines and Metal mines shall make detailed drawings of sealing of the tunnel (gallery) or filling of the site, and preserve them for the period of being its sealed or filled. 5 The general structure of sealing method shall be standardized in accordance with the provisions of the "Regulation on procedures and items of mentioned provided in Mine Safety Law and its regulations". **Chapter Ⅸ Measures in Approaching to Old Pit** **Section 1 General Rules** Article 162 Safety for measures in approaching old pit, the concessionaires must take necessary measures prescribed in Articles 5 of the Law, shall be stipulated in the Chapter Ⅸ in accordance with Article 31, Paragraph 1 of the Law. **Section 2 Measures in Approaching to Old Pit, etc.** (Measures in approaching to old pit, etc.)

	Article 163 1 The concessionaires of underground mining must take advanced drillings or other appropriate measures when the heading of tunnel (gallery) approaches to the old pit that submerged or there is a risk of submergence, or filled with flammable gas and other gases or there is a risk of filling with flammable gas or other gases, and to the nearest water vein within fifty (50) meter. 2 In case prescribed in Paragraph 1, the concessionaires must install the bank of water blocking or other water blocking facilities at proper spot of the tunnel (gallery) if there is a high risk of flood. 3 In case prescribed in Paragraph 1, the concessionaires must take advanced drillings more than ten (10) m from the heading of tunnel (gallery) , and must keep the space of five (5) m or more between heading of the tunnel (gallery) and bottom of borehole at all times. The directions of the drillings must be carried out along to the extension line of the tunnel (gallery), and also upward and downward, right and left side of the extension. (Protection areas against old pit) Article 164 The concessionaires of underground mining must keep proper thickness of walls or protection areas against the old pit that submerged or there is a risk of submergence for prevention of mine pollution, impacts or mine disaster by flood.

The draft of Mine Safety Law	The draft of Mine Safety Regulation (phase 1)
	Chapter X Prevention of Mine Pollution **Section 1 General Rules** Article 165 Safety for prevention of mine pollution, the concessionaires must take necessary measures prescribed in Articles 5 of the Law, and mineworkers must obey items necessary prescribed in Articles 6 of the Law, shall be stipulated in the Chapter X in accordance with Article 31, Paragraph 1 and 2 of the Law, and shall also be regulated in the " Law on Environmental Protection and Natural Resource Management" and relevant regulations. (Reporting) Article 166 1 When mine pollution occurs or is highly likely to occur such as followings, the concessionaire must immediately report the state of incident, list of emergency measures taken, and plans for restoration work and the list of completed work to the Director General in charge of mines sector in accordance with Article 29, Paragraph 1 of the Law. 1) the mine smoke that does not conform to the emission standard is emitted or is likely to be emitted; 2) the dust causes mine pollution or if there is a risk of such pollution; 3) the mine water or wastewater that does not conform to the effluent standard is

	discharged or is likely to be discharged; 4) the dioxin kinds that do not conform to the emission standard are emitted or are likely to be emitted, or do not conform to the effluent standard are discharged or are likely to be discharged; 5) the poisonous or deleterious substances has been scattered, or has leaked and flowed out causing mine pollution or if there is a risk of such pollution; 6) the noise that does not conform to the noise control standard is occurred or is likely to be occurred; 7) the vibration that does not conform to the vibration control standard is occurred or is likely to be occurred; 8) there is a risk of danger in the landfill disposal site or underground disposal site of mining wastes, and; 9) there is a high risk of danger in a waste stone dump, a slag dump or tailings dam because of rainstorm, electric power failure, accidents of the facilities and other reason. 2 In case mine pollution occurs or is highly likely to occur except preceding Paragraph above at a mine, the concessionaire must immediately report to the Director General in charge of mines sector in accordance with Article 29, Paragraph 1 of the Law. **Section 2 Prevention of Mine Pollution caused by Mine Smoke** (Obedience to the emission standard of mine smoke) Article 167

	1 The concessionaires must not emit the mine smoke that does not conform to the emission standard of the " Law on Environmental Protection and Natural Resource Management" at an emitting point of mine smoke generating facility to prevent the mine pollution caused by mine smoke. 2 When the mine smoke that does not conform to the emission standard is emitted or is likely to be emitted because of an accident, being broken, electric power cutting off or other troubles of the mine smoke generating facility or the mine smoke treatment facility, the concessionaires must take emergency measures for prompt repair from the incident. (Further strict regulation of the emission standard) Article 168 1 In case it is necessary to prevent mine pollution caused by mine smoke emitted from the mine smoke generating and treatment facilities at a mine, the Minister in charge of mines sector can establish the further strict regulation of the emission standard in accordance with the results of mine smoke measurements and analysis emitted from the aforesaid facilities that has taken several times at the mine, and environment circumstance in vicinity of the mine. 2 The concessionaire must strictly follow further strict regulation of the emission standard set by the said Minister. (Obedience items of the technical safety staff for prevention of mine pollution) Article 169

	In order to prevent mine pollution caused by mine smoke, the technical safety staffs for prevention of mine pollution must obey the following provisions. 1) to examine the mine smoke generating facility and mine smoke treatment facility in every working day, and write down the results of examination in "the diary for prevention of mine pollution". 2) to measure and analyze necessary substances of mine smoke periodically that emits from the mine smoke generating facility based on the provisions of the " Law on Environmental Protection and Natural Resource Management" and relevant regulations, and write down the results of measurements and analysis in the "management record for prevention of mine pollution concerning mine smoke"; 3) In case mine pollution caused by mine smoke is likely to be occurred on the results of examination, measures and analysis prescribed in the preceding Paragraph 1 and 2, the technical safety staff must immediately report to the administrator. **Section 3 Prevention of Mine Pollution caused by Dust** (Management of facilities) Article 170 1 The concessionaires must obey the following provisions to prevent mine pollution caused by the dust at mines. 1) If there is a risk of the dust scattering from a mineral ore storage facility, waste stone dump, slag dump or tailings dam, or mining wastes landfill site of

	1,000 square meter (m^2) or larger, one of the following requirements shall be applied. a) the facility is established in a structure that is resistant to the dust scattering; b) water is sprinkled using sprinkling equipment; c) the material is used to cover in order to prevent dust scattering; d) a chemical solution is sprayed to pave the surface layer; e) the surface layer is compacted by a roller machine or a bulldozer, and; f) other measures equivalent to or more effective than the above are taken. 2) When a crusher with a rated motor output of seventy-five (75) kW or more (except for wet-type and closed-type), or a mill or screen with a rated motor output of fifteen (15) kW or more (except for wet-type and closed-type) is installed on surface of a mine, one of the following requirements shall be applied. a) the facility is established in a structure that is resistant to the dust scattering; b) a hood and a dust collector are installed; c) water is sprinkled using sprinkling equipment; d) the facility is covered with a dustproof cover, and; e) other measures equivalent to or more effective than the above are taken. 3) When belt conveyor (0.75 m or more belt width) or bucket conveyor (0.03 cubic meter (m^3) or more in internal volume of the bucket) is installed on surface of a mine, except for wet-type and closed-type, the following requirements shall be applied if there is a risk of the dust scattering. a) the facility is established in a structure that is resistant to the dust scattering; b) a hood and a dust collector are installed at the loading and unloading parts

	of the conveyor and a water sprinkling device or a dustproof cover is at other parts with a risk of the dust scattering, and; c) other measures equivalent to or more effective than the above are taken. 4) When a mechanical slaked lime production facility that the dust scattered is installed on surface of limestone mine (including dolomite mine), one of the following requirements shall be applied. a) a dust collector is installed; b) water is sprinkled using sprinkling equipment, and; c) other measures equivalent to or more effective than the above are taken. 2 The concessionaire of Metal mine must not scatter the dust of asbestos that does not conform to the emission standard at the boundaries dividing sites of the dust of asbestos generating facilities from the outside prescribed in the preceding Paragraph 1, Item 2 to prevent of mine pollution caused by the dust of asbestos. 3 When mine pollution occurs caused by the dust or is likely to occur because of causing an accident, being broken, electric power failure or other troubles of the dust generating facility or facility that scattering the dust and dust treatment facility, the concessionaire must take emergency measures for prompt recovery from the incident. Article 171 In addition to the preceding Article above, the concessionaire must obey the instructions given by the Minister in charge of mines sector to take appropriate measures to prevent mine pollution caused by the dust, if necessary.

	(Obedience items of the technical safety staff for prevention of mine pollution) Article 172 In order to prevent mine pollution caused by the dust, the technical safety staffs for prevention of mine pollution must obey the following provisions. 1) to examine a mineral ore storage facility, waste stone dump, slag dump or tailings dam, or mining wastes landfill site of 1,000 square meter (m^2) or larger in every working day, and write down the results of examination in “the diary for prevention of mine pollution”; 2) to examine a crusher with a rated motor output of seventy-five (75) kW or more, a mill or screen with a rated motor output of fifteen (15) kW or more, belt conveyor (0.75 m or more belt width) ,bucket conveyor 0.03 m^3 or more in internal volume, and scattering the dust of a mechanical slaked lime production facility in every working day, and write down the results of examination in “the diary for prevention of mine pollution”; 3) to measure the concentration of the dust of asbestos periodically at the boundaries outside a mine that products minerals containing asbestos, based on the provisions of the “ Law on Environmental Protection and Natural Resource Management” and relevant regulations, and write down the results of measurements in the “management record for prevention of mine pollution concerning the dust of asbestos”, and; 4) in case mine pollution caused by the dust is likely to occur on the results of examination and measurements prescribed in the preceding Items 1 to 3 inclusive, the technical safety staffs must immediately report to the

	administrator. (Prevention of mine pollution caused by hazardous air pollutant substances) Article 173 The concessionaires have to measure the actual state of emission and scattering of the hazardous substances in the air such as sulfur oxide, nitrogen oxide, soot and dust, cadmium and its compounds, and lead and its compounds to spread over the air caused by mineral-related operations at mines, and must take necessary measures to control emitting and scattering the hazardous substances. **Section 4 Prevention of Mine Pollution caused by Mine Water or Wastewater** (Reports reference to mine water or wastewater) Article 174 1 The concessionaires must report the states of mine water and wastewater not conform with effluent standard of the “Law on Environment Protection and Natural Resource Management” and relevant regulations, and amount of water flow in each drainage system discharged from a tunnel (gallery) or a waste stone dump, slag dump and tailings dam used for mineral-related operations, to the Minister in charge of mines sector prescribed in Article 29, Paragraph 1 of the Law. 2 Contaminated status and amount of water flow in each drainage system of mine water or wastewater prescribed in the preceding Paragraph above, the results of

	measurements and drawing drainage system must be attached to the report. (Obedience to the effluent standard) Article 175 1 The concessionaires must not discharge contaminated mine water or wastewater that does not conform to the effluent standard pursuant the " Law on environmental Protection and Natural Resource Management" and relevant regulations into public waters. 2 The concessionaires must not penetrate contaminated mine water or wastewater that does not conform to the effluent standard into the underground to prevent the mine pollution caused by mine water or wastewater. 3 When the contaminated mine water or wastewater that does not conform to the effluent standard is discharged or is likely to be discharged because of an accident, being broken, electric power cutting off or other troubles of the water treatment facility, the concessionaire must take emergency measures for prompt repair from the incident. In case the contaminated mine water or wastewater that does not conform to the effluent standard is penetrated or is likely to be penetrated, the concessionaires must take the same measures as the preceding provision. 4 When the oil is leaked outside of a mine because of an accident, being broken, electric power failure or other troubles of the facility in the mineral-related operations, and mine pollution occurs or is highly likely to be occurred, the concessionaires must take emergency measures for prompt repair from the incident.

	Article 176 1 When the mine water that does not conform to the effluent standard pursuant to the " Law on Environmental Protection and Natural Resource Management" and relevant regulations, is discharged from a tunnel (gallery) that was used in the mineral-related operations, the concessionaire must block or seal the tunnel (gallery), establish treatment facilities for contaminated mine water or take appropriate measures. 2 Designing and construction of the sealing in a tunnel (gallery) prescribed in the preceding Paragraph above shall be standardized in accordance with the "Regulation on procedures and items of mentioned provided in the Mine Safety Law and its regulations ". (Further strict regulation of the effluent standard) Article 177 1 In case it is necessary to prevent mine pollution caused by mine water or wastewater discharged from the mine water or wastewater treatment facilities at a mine, the Minister in charge of mines sector can establish the further strict regulation of the effluent standard depending on the results of measurements and water analysis of mine water or wastewater discharged from the aforesaid facilities that have taken several times at the mine, and environment circumstance in vicinity of the mine. 2 The concessionaire who is instructed the further strict regulation of the effluent standard prescribed in the preceding Paragraph above must strictly follow further

	strict regulation of the effluent standard set by the said Minister. (Obedience items of the technical safety staff for prevention of mine pollution) Article 178 In order to prevent mine pollution caused by mine water or wastewater, the technical safety staffs for prevention of mine pollution must obey the following provisions. 1) to examine the treatment facilities on mine water or wastewater in every working day, and write down the results of examination in “the diary for prevention of mine pollution”; 2) to measure and analyze necessary substances to define contaminated status and amount of water flow from the water treatment facilities periodically based on the “Law on Environment Protection and Natural Resource Management” and relevant regulations, , and write down the results of measurements and analysis in the “management record for prevention of mine pollution concerning mine water or wastewater”, and; 3) In case mine pollution caused by mine water or wastewater is occurred or likely to occur based on the results of examination, measurements and analysis prescribed in the preceding Item 1 and 2, or there is a risk of danger to the mine water or wastewater treatment facilities caused by rainstorm, electric power cutting off and other reason, the technical safety staffs must immediately report to the administrator.

	Section 5 Prevention of Mine Pollution caused by Dioxin-kinds (Obedience to the emission standard or effluent standard of dioxin-kinds) Article 179 1 The concessionaires must not emit or discharge the dioxin-kinds that do not conform to the emission standard or effluent standard pursuant to the " Law on Environmental Protection and Natural Resource Management" and relevant regulations at an emitting exit of dioxin-kinds incinerator or the discharging exit of the water treatment facility to prevent the mine pollution caused by dioxin-kinds. 2 When the dioxin-kinds that do not conform to the emission standard or effluent standard are emitted or discharged or are likely to be emitted or to be discharged, because of an accident, being broken, electric power cutting off or other troubles of the dioxin-kinds incinerator or the water treatment facility, the concessionaires must take emergency measures for prompt repair from the incident. Article 180 In addition to the preceding Article above, the concessionaires must obey the instructions given by the Minister in charge of mines sector to take appropriate measures such as restriction of emitting the gas emission including dioxin-kinds or discharging the drainage including of dioxin-kinds to prevent mine pollution caused by dioxin-kinds, if necessary. (Obedience items of the technical safety staff for prevention of mine

	pollution) Article 181 In order to prevent mine pollution caused by dioxin-kinds, the technical safety staffs for prevention of mine pollution must obey the following provisions. 1) to examine the dioxin-kinds incinerator in every working day, and write down the results of examination in “the diary for prevention of mine pollution”; 2) In case mine pollution caused by dioxin-kinds is likely to occur based on the results of examination prescribed in the preceding Items above, the technical safety staffs must immediately report to the administrator. **Section 6 Prevention of Mine Pollution caused by Poisonous or Deleterious Substances** (Measures of incidents caused by poisonous or deleterious substances) Article 182 If a poisonous or deleterious substance has been scattered, or has been leaked, flowed out, leached out or has infiltrated into the ground causing mine pollution, or if there is a risk of such pollution, the concessionaires must take emergency measures for prompt restores from the incident. (Obedience items of the technical safety staff for prevention of mine pollution) Article 183 In order to prevent mine pollution caused by poisonous or deleterious substances,

	the technical safety staffs for prevention of mine pollution must obey the following provisions. 1) to examine poisonous and deleterious depots, mining facilities where poisonous or deleterious substances are used and treatment facilities for wastewater including poisonous or deleterious substances in every working day, and write down the results of examination in “the diary for prevention of mine pollution”; 2) In case mine pollution caused by poisonous or deleterious substances is likely to occur based on the results of examination prescribed in the preceding Items above, the technical safety staffs must immediately report to the administrator. (The instructions for cleaning of poisonous or deleterious substances, etc.) Article 184 If the Minister in charge of mines sector specially deems it necessary, and instruct cleaning of poisonous or deleterious substances, elimination of the toxic quality of such substances, or taking of other measures necessary to prevent mine pollution, the concessionaire must follow the instructions. **Section 7 Prevention of Mine Pollution caused by Noise** (Obedience of noise control standard) Article 185 1 The concessionaires (subject to noise regulations) must not generate noise that does not conform to the noise control standard pursuant to the “Law on

	Environmental Protection and Natural Resource Management" and relevant regulations at the boundaries outside mines to prevent mine pollution caused by such noise. 2 When mine pollution occurs caused by noise or is likely to occur because of an accident, being broken or other troubles of the noise generating facility or noise prevention facility, the concessionaires (subject to noise regulations) must take emergency measures for prompt repair from the incident. Article 186 In addition to the preceding Article above, the concessionaires (subject to noise regulations) must obey the instructions given by the Minister in charge of mines sector to take appropriate measures to prevent mine pollution caused by noise, if necessary. (Obedience items of the technical safety staff for prevention of mine pollution) Article 187 In order to prevent mine pollution caused by noise, the technical safety staffs for prevention of mine pollution at mines (subject to noise regulations) must obey the following provisions. 1) to examine the noise generating and prevention facilities in every working day, and write down the results of examination in "the diary for prevention of mine pollution"; 2) to measure noise levels periodically at the boundaries outside mines based on

	the “Law on Environment Protection and Natural Resource Management” and relevant regulations, and write down the results of measurements in the “management record for prevention of mine pollution concerning noise”, and; 3) In case mine pollution caused by noise is likely to occur on the results of examination and measurements prescribed in the preceding Item 1 and 2, the technical safety staffs must immediately report to the administrator. **Section 8 Prevention of Mine Pollution caused by Vibration** (Obedience of vibration control standard) Article 188 1 The concessionaires (subject to vibration regulations) must not generate vibration that does not conform to the vibration control standard pursuant to the “Law on Environmental Protection and Natural Resource Management” and relevant regulations at the boundaries outside mines to prevent mine pollution caused by such vibration. 2 When mine pollution occurs caused by vibration or is likely to occur because of an accident, being broken or other troubles of the vibration generating facility or vibration prevention facility, the concessionaires (subject to vibration regulations) must take emergency measures for prompt repair from the incident. Article 189 In addition to the preceding Article above, the concessionaire (subject to vibration Regulations) must obey the instructions given by the Minister in charge of mines

	sector to take appropriate measures to prevent mine pollution caused by vibration, if necessary. (Obedience items of the technical safety staff for prevention of mine pollution) Article 190 In order to prevent mine pollution caused by vibration, the technical safety staffs for prevention of mine pollution at mines subject to vibration regulations must obey the following provisions. 1) to examine the vibration generating and prevention facilities in every working day, and write down the results of examination in “the diary for prevention of mine pollution”; 2) to measure vibration levels periodically at the boundaries outside mines based on the “Law on Environment Protection and Natural Resource Management” and relevant regulations, and write down the results of measurements in the “management record for prevention of mine pollution concerning vibration”, and; 3) In case mine pollution caused by vibration is likely to occur on the results of examination and measurements prescribed in the preceding Item 1 and 2, the technical safety staffs must immediately report to the administrator. **Section 9 Prevention of Mine Pollution caused by Land Excavation** (Prevention of mine pollution caused by land excavation)

	Article 191 1 The concessionaires of underground mining must take appropriate measures concerning the methods of mining, filling and drainage to prevent mine pollution caused by land excavation when there is a risk of the surface subsidence due to mineral-related operations at mines. 2 If the Minister in charge of mines sector specially deems it necessary, and instruct method, area and frequency of measures of the surface subsidence to prevent mine pollution caused by land excavation, the concessionaires must follow the instructions. (Measures on closure of mineral-related operations) Article 192 1 When the concessionaire of underground mining abolishes mineral-related operations, the necessary measures, such as filling unused tunnels (galleries) with soil or sealing with concrete, and filling old mineral working fields with soil, should be taken to prevent mine pollution after its closure. 2 When the concessionaire of open-pit mining abolishes mineral-related operations, the necessary measures, such as soil covering and vegetation on old surface mineral working fields, must be taken to prevent mine pollution after its closure. 3 Designing and construction of the sealing by concrete in an unused tunnel (gallery) prescribed in the preceding Paragraph 1 shall be stipulated in the provision of Article 176, Paragraph 2 of the Regulation. **Section 10 Prevention of Mine Pollution caused by Mining Wastes**

	(Prohibition of dumping, and management of storage for mining wastes) Article 193 1 The concessionaires must not dump mining wastes generated by mineral-related operations at mines without permission. 2 The concessionaires must take necessary measures, such as management of storage, to prevent mining wastes from scattering, out flowing or infiltrating into underground, until the transport and disposal of such wastes. (Obedience of regulatory disposal standard) Articles 194 1 The concessionaires must not transport mining wastes by a wrong method against the regulatory disposal standard pursuant to the “Law on Environmental Protection and Natural Resource Management” and relevant regulations to prevent mine pollution caused by mining wastes. 2 The concessionaires must not dispose of mining wastes by burying using a method not to conforming to the regulatory disposal standard pursuant to the “Law on Environmental Protection and Natural Resource Management” and relevant regulations to prevent mine pollution caused by mining wastes. 3 The concessionaires must not dispose of mining wastes in a landfill disposal site not to conforming to the technical standard for disposal of mining wastes pursuant to the “Law on Environmental Protection and Natural Resource Management” and relevant regulations to prevent mine pollution caused by mining wastes.

	4 The concessionaires must not dispose of harmful mining wastes by burying in goaf (old mineral working field) or unused tunnels (galleries) as underground landfill site. (Contractual work of mining wastes) Article 195 When the concessionaire entrusts a third party with transport or disposal of mining wastes, the method of such transport or disposal must conform to the regulatory disposal standard pursuant to the “Law on Environmental Protection and Natural Resource Management” and relevant regulations. Article 196 The concessionaires must obey the instructions given by the Minister in charge of mines sector to take appropriate measures to prevent mine pollution caused by mining wastes, if necessary. (Obedience items of the technical safety staff for prevention of mine pollution) Article 197 1 In order to prevent mine pollution caused by mining wastes, the technical safety staffs for prevention of mine pollution must obey the following provisions with regard to the mining wastes treatment facility. 1) to examine the treatment facility such as an incinerator in every working day, and write down the results of examination in “the diary for prevention of mine

	pollution"; 2) In case mine pollution caused by mining wastes is likely to occur on the results of examination, the technical safety staffs must immediately report to the administrator. 2 the technical safety staffs must obey the following provisions with regard to the surface mining wastes landfill site to prevent mine pollution caused by mining wastes. 1) to examine the mining wastes landfill site on the surface in every working day, and write down the results of examination in "the diary for prevention of mine pollution"; 2) to measure and analyze the water quality of underground water nearby mining wastes landfill site on the surface in accordance with the provisions of the "Law on Environmental Protection and Natural Resource Management" and relevant regulations, and write down the results of measurements and analysis in the "management record for prevention of mine pollution concerning mining wastes", and; 3) in case mine pollution caused by mining wastes is likely to occur on the results of examination, measurements and analysis prescribed in the preceding Item 1 and 2, the technical safety staffs must immediately report to the administrator. 3 the technical safety staffs must obey the following provisions with regard to the underground mining wastes landfill site to prevent mine pollution caused by mining wastes. 1) to examine water level in the mining wastes landfill site in the underground,

	water flow into other tunnels (galleries) and other conditions in every working day, and write down the results of examination in “the diary for prevention of mine pollution”; 2) to measure and analyze the water quality of spilled water out the landfill site once a month or more periodically in accordance with the provisions of the “Law on Environmental Protection and Natural Resource Management” and relevant regulations, and write down the results of measurements and analysis in the “management record for prevention of mine pollution concerning mining wastes”, and; 3) in case mine pollution caused by mining wastes is likely to occur on the results of examination, measurements and analysis prescribed in the preceding Item 1 and 2, the technical safety staffs must immediately report to the administrator. (Keeping the disposal record of the harmful mining wastes) Article 198 1 The concessionaires must record all kinds of the generation amount, transport and method of disposal regarding the harmful mining wastes every a month in the “disposal record of the harmful mining wastes”. 2 The concessionaires must close the “disposal record of the harmful mining wastes” prescribed in the preceding Paragraph above in every end of year, and have kept the disposal record for five (5) years after closure. **Section 11 Prevention of Mine Pollution caused by Accumulations of**

	Waste Stones and Slag, and sedimentation of Tailings (Establishment facilities for prevention of collapse and outflow) Article 199 1 The concessionaires must establish an embankment, blocking walls or other appropriate facilities to prevent mine pollution caused by collapsing the accumulations of waste stones or slag, or flowing out the sediments such as tailings. 2 The concessionaires must not establish a waste stones dump or a slag dump, a tailings dam at the sites where there is a high risk of danger or occurrence of mine pollution due to collapse, landslide, etc. 3 The concessionaires must establish a waste stones dump, slag dump and tailings dam to keep a minimum distance of thirty (30) m from housings, offices, schools and public facilities such as rivers, railways, public roads, etc. (Establishment of a mountain stream drainage, emergency drainage, etc.) Article 200 1 In a tailings dam setting up an embankment or blocking wall, the concessionaires must establish a mountain stream drainage, hillside channels, culvert or other appropriate facilities to prevent off-site water such as mountain streams, hillside water and other water from flowing into inside the dam site, and also establish an inside water drainage for any water such as included sediments, rainwater and spring water. 2 The concessionaires must establish an emergency drainage at proper positions of

	outside dam site to prepare inflowing large amounts of off-site water in addition to the facilities listed in the preceding Paragraph above. Article 201 1 The concessionaires must establish a mountain stream drainage and emergency drainage described in the preceding Article 200 on the ground outside dam site. 2 If the provision of the preceding Paragraph cannot be obeyed due to the topography of the dam site, the mountain stream drainage and emergency drainage must be established by cutting the foundation ground, and such drainage must have a robust structure with sufficient discharge potential and an interior that can be inspected. 3 Driftwood stopper or other appropriate facilities must be established upstream of mountain stream drainage to prevent the blockage of channels caused by driftwood, soil, stones, etc. (Management of tailings dams) Article 202 1 The concessionaires must maintain the water level inside tailings dam site at least one (1) m lower than top of an embankment or blocking wall of a tailings dam, and install a measurement scale at a proper place inside the dam. However, this shall not apply if the embankment or blocking wall is made of concrete. 2 The concessionaires must satisfy the following requirements in a tailings dam established an embankment or blocking wall. However, this shall not apply if the embankment or blocking wall is made of concrete.

	1) tailings or sediments shall be discharged from the side of the embankment or blocking wall to the inside of dam site. 2) the surface of tailings or sediments shall be at least 0.5 m lower than the top of embankment or blocking wall. (Soil covering and vegetation for disused dumps and dams) Article 203 When a waste stones dump, a slag dump or a tailings dam is disused, the concessionaires must take necessary measures, such as soil covering and vegetation inside dam site and the embankment to prevent mine pollution caused by outflow of wastewater or sediments. Article 204 The concessionaires must obey the instructions given by the Minister in charge of mines sector to take appropriate measures to prevent mine pollution caused by the accumulation of waste stones or slag, or sedimentation of tailings, if necessary. (Obedience items of the technical safety staff for prevention of mine pollution) Article 205 1 In order to prevent mine pollution caused by a waste stones dump, a slag dump and a tailings dam setting up an embankment or blocking wall, the technical safety staffs for prevention of mine pollution must obey the following provisions. 1) to examine the a waste stones dump or a slag dump (checking for an

	embankment or a blocking wall, whether or not collapsing of accumulated materials, land slide and so on) and tailings dam (checking for an embankment or a blocking wall, a mountain stream drainage, hillside channels, inside water drainage and so on) in every working day, and write down the results of examination in “the diary for prevention of mine pollution”; 2) to measure the rising height of deposited tailings or sediments and water level of inside the dam site once a month or more periodically, and write down the results of measurements in the “management record for prevention of mine pollution concerning a waste stones dump, slag dump or tailings dam”, and; 3) when there is found effects such as cracks on the surface of the embankment, subsidence of the embankment, collapse and landslide, the said technical safety staffs must instruct mineworkers on take shelter, take prompt measures, and report to administrator speedily. 2 When there is a heavy rain around a waste stones dump, slag dump and tailings dam sites, frequency of the examination prescribed in the preceding Paragraph, Item 1 must be increased for confirming the abnormality or not at the embankment or a blocking wall, outbreak of collapse at the accumulated materials and outbreak of land slide regarding to the waste stones dump or slag dump, and confirming the abnormality or not at the embankment or a blocking wall, a mountain stream drainage, hillside channels, inside water drainage, driftwood stopper and emergency drainage regarding to the tailings dam, and measurement of rainfall volume must be executed, and recorded in the “management record for prevention of mine pollution concerning a waste stones dump, slag dump or tailings dam”.

he draft of Mine Safety Law	The draft of Mine Safety Regulation (phase 1)
	Chapter ⅩⅠ Electrical Equipment **Section 1 General Rules** Article 206 Safety for electrical equipment, the concessionaire must take necessary measures prescribed in Articles 5 of the Law, and mineworkers must obey items necessary prescribed in Articles 6 of the Law, shall be stipulated in the ChapterⅩⅠin accordance with Article 31, Paragraph 1 and 2 of the Law. (Restriction on installation of electrical equipment) Article 207 1 The concessionaires of underground Coal mines (Class-A coal pit and Class-B coal pit) must not install electrical equipment at the place where the concentration of flammable gas normally exceeds 1.5%. 2 However, the preceding provision shall not apply to a telephone that operates on a weak current shall not cause the ignition of flammable gas due to a short circuit of the instruments or wiring. In case the wiring of this instruments must be provided a sufficient distance from other electrical apparatus or wiring to prevent the risks of a short circuit with large current cables. (Interruption of the power supply)

	Article 208 1 The technical safety staffs for electricity of underground Coal mines (Class-A coal pit and Class-B coal pit) must immediately interrupt the power supply to the area where the concentration of flammable gas exceeds 1.5%. However, this shall not be applied to the small instruments such as portable safety lamps, precise flammable gas detectors and anemometers, and wiring passing in the ground. 2 When re-supply electricity to the area that was interrupted in preceding provision, the said technical safety staffs must confirm the safety under the administrator's direction before starting the power supply to the area. (Prevention of electric shock, and measures of off-limits) Article 209 1 The concessionaires of underground mining must appropriately protect terminals of electrical equipment and other exposed live parts to prevent contact with people or outside objects. 2 Sections in underground mines with electrical equipment that must not be handled by other mineworkers than the technical safety staffs for electricity, must be closed to public access and be protected with fences and "Off-limits" signs. 3 High-voltage transformers, switchboards and other high-voltage electrical devices must have "Danger – high voltage" signs in the underground mines. High-voltage switchboards must also have appropriate insulating stands to be operated. Article 210 1 When conducting repair of live parts of electrical devices, inspection involving

	contact with exposed live parts or other similar works on the surface at mines after switching the power supply off, the technical safety staffs for electricity or workers who have been trained regarding the installation, maintenance and repair of electrical equipment described in Article 7, Paragraph 2 of the Law (hereinafter referred to as “workers qualified for electrical equipment”) must obey the following provisions. 1) to ensure that the power supply is interrupted by cutting off the power source, notice a sign indicating the power outage for the work and lock the switches; 2) to confirm that the power is cut using an electroscope; 3) to test the detection performance of the electroscope in the preceding Item 2 before use, and; 4) if the power that is cut has high-voltage or extra high-voltage, use the grounding instrument to ensure the short-circuit grounding to prevent danger of electric shocks due to erroneous supply or cross contact with or induction from other electrical pathways. Article 211 1 When the technical safety staffs for electricity or workers qualified for electrical equipment repair live parts of electrical equipment of 300 volts or higher voltage or when they conduct inspection or other work involving contact with exposed live parts without cutting the power supply on the surface at mines, the concessionaire must take appropriate measures, such as assuring that they wear electrical insulating rubber gloves and other insulating protective equipment or use apparatuses or devices for live line work.

	2 When the technical safety staffs for electricity or workers qualified for electrical equipment conduct repair, inspection or other works electrical equipment next to an exposed live part of 300 volts or higher voltage on the surface at mines, the concessionaire must take appropriate measures, such as the installation of rubber insulating pipes or other insulating devices of the exposed live part. 3 The persons conducting the works in the preceding Paragraph 1 and 2 must check if there are any abnormalities of the insulating protective equipment, insulating devices and apparatuses or devices for live line work before use. **Section 2 The Grounding (Earth)** (The grounding (earth)) Article 212 1 The concessionaires of underground Coal mines (Class-A coal pit and Class-B coal pit) must ground metal bodies used for coating of electric wires, metal electric wire connection boxes and iron beds/outer cases of electrical equipment at mines by Type-A grounding (earth) work (earth resistance value: 10 ohms (Ω) or lower). 2 The concessionaires of underground Metal mines and Non-metal mines must ground metal bodies used for coating of electric wires, metal electric wire connection boxes and iron beds/outer cases of electrical equipment at mines by Type-A grounding (earth) work for voltage exceeding 300 volts, and Type-D grounding (earth) work (earth resistance value: 100 ohms (Ω) or lower)for 300 volts or lower. 3 When the grounding (earth) two (2) or more pieces of electrical equipment at a

	mine, such pieces must not be connected in series. Article 213 1 The concessionaires of underground mining must ground transformers at mines by Type-B grounding (earth) work (earth resistance value is determined by calculation) at the neutral point on the low-voltage side to prevent the danger of cross contact between high-voltage and low-voltage. However, if such grounding (earth) is difficult at the neutral point of the transformer, either of the following methods may be available. 1) to ground (earth) a metal cross contact prevention plate placed between the primary and secondary winding wires; 2) to ground (earth) one of wires on the low-voltage side if the voltage used lower than 300 volts in the electrical pathway. 2 Measures to prevent the danger of cross contact between high-voltage and low-voltage in the preceding Paragraph above must be taken for each position where a transformer is installed. (The grounding (earth) conductor and grounding (earth) plate) Article 214 1 The concessionaires of underground mining must use annealed copper wire that is eight (8) mm^2 or thicker as the grounding (earth) conductor at mines. However, this shall not apply if a core wire cable that is thinner than eight (8) mm^2, cabtyre cable or another kind of wire with quality equivalent or a higher effect and strengths is used as such conductor.

	2 The grounding (earth) conductor at mines must be installed so that it can be inspected easily and is protected from damage by external forces, and must be securely connected using screws, rivets, soldering, sleeve connections, appropriate lengths of Britannia joints or other methods. 3 The position where main grounding (earth) plate is buried must be indicated at mines. (Inspection of the earth resistance value) Article 215 The technical safety staffs for electricity of underground mining must inspect and measure the earth resistance value of the major grounding works of electrical equipment once a year or more periodically at underground mines, and write down the results of inspection and measurements in the “management record of electrical equipment”. **Section 3 Protection of Excess Current** (Requirements for protective devices) Article 216 The concessionaires of underground Coal mines (Class-A coal pit and Class-B coal pit) must install the automatic overloaded protectors at a proper spot of electrical motors and transformers for protecting from excess current. **Section 4 Electrical Motors and Attachments**

	(Voltage of electrical machineries for work) Article 217 1 The concessionaires of underground Coal mines (Class-A coal pit and Class-B coal pit) must operate a coal-drill and other portable electric equipment on a voltage of 250 volts or lower, and electric equipment used at or nearby coal working field and heading of tunneling field on a voltage of 3,300 volts or lower. 2 The switch for cutting the power supply must be installed near an operation switch in the remote operation type electrical equipment at underground mines. (Use of measuring instruments) Article 218 The technical safety staffs for electricity or workers qualified for electrical equipment in the underground Coal mines (Class-A coal pit and Class-B coal pit) must not use of measuring instruments such as an earth tester and a megger at the place where there is a risk of danger for existing of flammable gas before contacting to the technical safety staff for underground safety & blasting and concentration of flammable gas has been measured, and safety around area has been confirmed. **Section 5 Underground Wiring** (Use of armor cables) Article 219

	The concessionaires of underground mining must use the armor cables for main underground wiring, and should also have a spare armor cable at least one line or more, if it is necessary for safety. (Kinds of the wiring) Article 220 The concessionaires of underground mining must obey the following provisions with regard to underground wiring and moving cables. 1) the lighting lines, signal lines and control lines must be used cabtyre (cabtire) cables or other cables that effect and strength are equivalent or higher than such cabtyre cable, or the wires insulated by rubber with a diameter of more than 1.6 mm or other wires that effect, strength and diameter are equivalent or higher than such wires insulated by rubber; 2) the low-voltage power lines must be used the armor cables or chloroprene cabtyre cables of Type 3, or other cables that effect and strength are equivalent or higher than such cables, and; 3) the high-voltage power lines must be used the armor cables. (Voltage of signal lines and control lines) Article 221 The concessionaires of underground mining must operate the voltage of lightning Equipment, signal lines and control lines to be 220 volts or lower.

	(Separation distance of underground wiring) Article 222 1 The concessionaires of underground mining must maintain separation distance of 0.15 m or longer between the wiring using insulated wires or cabtyre cables of Type 1 with a voltage of lower than 300 volts and other weak current wires, steel tubes or other metals. However, this shall not apply if the aforesaid insulated wires or cabtyre cables of Type 1 to be conducted in a sheath with an adequate length, or the insulated wires to be conducted in hard vinyl piping work. 2 The concessionaires of underground mining must maintain separation distance of of 0.15 m or longer between wiring using insulated wires and other wiring involving insulated wire, or low-voltage or high-voltage wiring using armored cables. 3 The insulated wires used for wirings at mines must be a sufficient separation distance to avoid mutual contact with each other. However, this shall not apply if hard vinyl piping work has been conducted. (Section switches) Article 223 The concessionaires of underground Coal mines (Class-A coal pit and Class-B coal pit) must install section switches at the spot of mine mouth, power receiving ends and main branches in the high-voltage wiring at mines. In case the low-voltage wiring, the section switches must be installed at the spot of mine mouth, the area where there is a risk of danger of gas outburst and others.

	Article 224 1 The concessionaires of underground mining must use the section switches for high-voltage to be a stationary type or pole mounted type. 2 In case the section switch for the pole mounted type, the section switch must be installed on a framed iron box placed on a firm base, and not put on the supports nor a post. (Connections, branches and terminals of cables) Article 225 1 The concessionaires of underground mining must inject an insulating filler material into metal connections, branch and terminal boxes placed on paper-insulated lead-covered armored cables, their branches and terminals, respectively, at mines. However, installation of terminal boxes may be omitted at sections where the voltage is 300 volts or lower. 2 The insulating filler materials into metal connections, branch and terminal boxes prescribed in preceding Paragraph above shall be used synthetic rubber, resin or other insulation materials with quality equivalent or higher. 3 Connections, branches and terminals of uncoated cables or cabtyre cables at mines must be adequately coated using an insulation material with quality equivalent or higher than the insulation material used for the parts of cables, and must be protected appropriately to avoid external damage, except in case of couplers are used. (Indication on the location of buried cable)

	Article 226 The concessionaires of underground mining must indicate the positions of cables buried at mines. (Lightning arresters) Article 227 1 The concessionaires of underground mining must install lightning arresters near mine mouths to prevent accidents of high-voltage wiring at mines caused by lightning strike or abnormal voltage. 2 Fuse breakers and lightning arresters must be installed for telephone circuits at mines to prevent accidents caused by lightning strike or connection with lightning lines or power lines. **Section 6 Underground Lighting Equipment** (Use of portable safety lamps) Article 228 The mineworkers of underground Coal mines (Class-A coal pit and Class-B coal pit) who use portable safety lamps must obey following provisions. 1) never open the lid of battery case and cover glass for a lamp bulb in the underground, and; 2) when damage or trouble is found at the portable safety lamp, the mineworker immediately exchanges a complete one at the mine office or place where spare lamps are reserved.

The draft of Mine Safety Law	The draft of Mine Safety Regulation (phase 1)
	Chapter ⅩⅡ Underground Passage, Working Places and Management of Scattered Dust **Section 1 General Rules** Article 229 Safety for underground passage, working places and scattered dust, the concessionaire must take necessary measures prescribed in Article 5 of the Law, and mineworkers must obey items necessary prescribed in Article 6 of the Law, shall be stipulated in the Chapter ⅩⅡ in accordance with Article 31, Paragraph 1 and 2 of the Law. **Section 2 Underground Passages** (Connected passages) Article 230 1 The concessionaires of underground mining must set up two or more passages for access between inner parts of working places and the ground surface at mines. 2 The passages prescribed in the preceding Paragraph above must have adequate space, and the walking must not be obstructed. 3 One of the multiple passages prescribed in Paragraph 1 falls under any of the following items and all other passages are vertical shafts or those with an incline

	of forty (40) degree or more, one of these other passages must have a hoisting device for the emergency evacuation of mineworkers. 1) a level 2) an inclined shaft with less than forty (40) degrees 3) a vertical shaft or an inclined shaft of forty (40) degrees or more that have a hoisting device to lift mineworkers up and down (An emergency ladder path) Article 231 The concessionaires of underground mining must install an emergency ladder path in inclined more than forty (40) degrees for accessing to the ground surface in case of emergency while hosting devices have any trouble. (Prohibition of passage on rail road) Article 232 1 The concessionaires of underground mining shall not use tunnels (galleries), where main belt conveyors or locomotives are regularly operated, as passages for mineworkers. However, this shall not apply if there is a space of 0.75 m or wider between conveyors, locomotives or mine cars and side walls or obstacles. 2 Traversing paths must be established in positions where mineworkers have to move across conveyors to prevent contacting operating belt. (Protection personnel from falling down) Article 233

	1 When the concessionaires of underground mining post mineworkers to work on a tower, near entrance or inside of a vertical shaft, safety nets, safety ropes or other appropriate measures must be taken to protect such workers from falling down. 2 When throwing ores or other materials into a vertical shaft using vehicle type mine machines or automobiles in underground mines, a car stop or other appropriate measures must be taken to protect such vehicles or automobiles from falling down. (Disused shaft and tunnel (gallery)) Article 234 1 The concessionaires of underground mining must construct a blockage at the mouth of a vertical shaft or a tunnel (gallery) to protect personnel falling down when the shaft or tunnel (gallery) is disused. 2 The disused vertical shaft or inclined shaft with forty (40) degrees or more prescribed in preceding Paragraph above must be installed blockage, fences and other appropriate fall-prevention equipment, and must be indicated warning signs to protect personnel falling down. 3 underground goaf (old working places) must be installed fences and other appropriate equipment for interception of passage, and must be indicated warning signs of off-limits. (Ladder path) Article 235 When establishing ladder paths with an incline of forty (40) degrees or more at mines, the concessionaires of underground mining must use ladders sound

	structure and fulfill the following requirements. 1) ladder paths must be adequately spaced from walls of vertical shafts or inclined shafts and have an incline of eighty (80) degrees or less. 2) there must be landing places at intervals of ten (10) m or less for ladder paths that are fifteen (15) m or longer. 3) ladders must be complete with safety measures, such as top ends protruding 0.6 m or more. 4) when using a hoisting device in addition to a ladder path in a vertical shaft or inclined shaft, partition boards or other barriers must be installed. 5) steps of a ladder must be spaced at equal intervals. 6) fixing and other appropriate measures must be taken to prevent the displacement of ladders. (Signposts) Article 236 The concessionaires of underground mining must indicate signposts such as name of a tunnel (gallery) and exit direction at a fork of underground passages or other necessary spots where mineworkers are posted. **Section 3 Working Places and Management of Scattered Dust** (Identification method) Article 237 The concessionaires of underground mining must identify the names and work

	locations of mineworkers when they get into underground, and keep the records at mine office outside mines. (Communication devices) Article 238 The concessionaires of underground mining must install communication devices such as telephone systems and inductive radio devices at major working places and other necessary parts of mines. (Prevention of dust scattering for sake of health protection of mineworkers) Article 239 1 The concessionaires of underground mining must sprinkle water, collect dust or other appropriate measures to prevent dust scattering for sake of health protection of mineworkers at working places where dust scattering occurs remarkably at mines. 2 When measures prescribed in the preceding Paragraph above are taken and if necessary for safety reasons, the foresaid concessionaires must instruct mineworkers to wear dust respirators complying with the standards (hereinafter referred to as “standard dust respirators”). 3 When mineworkers working at working places mentioned in Paragraph 1 have to take a break for sake of health protection of mineworkers, the foresaid concessionaires must provide space for such a break in a place without dust scattering.

	Article 240 The mineworkers who are posted at working places that occur remarkable dust scattering must obey instructions of wearing standard dust respirators at underground mines. Article 241 1 The concessionaires of underground mining must sprinkle water surrounding bedrock at working place before drilling work is practiced at mines. 2 Impact rock drills used at working places must be of the wet type. In this case, mineworkers who operate the wet type impact rock drill must also wear standard dust respirators. 3 When using wet type impact rock drills at working places, water distribution pipes must be installed to supply the necessary water to the drills. Article 242 When using wet type impact rock drills at underground working places, mineworkers must supply necessary water to the drills during drilling work. (Measurement of dust concentrations at underground working places) Article 243 1 The technical safety staffs for underground safety & blasting in underground mining must measure the dust concentration in the air and content rate of free silicic acid into the dust once every three (3) months periodically at underground working places that dust scattering occurs remarkably.

	2 In underground Metal mines, the technical safety staffs for underground safety & blasting should measure the concentration of asbestos dust at working places in accordance with the provisions of the preceding Paragraph above if it is necessary. 3 The technical safety staffs for underground safety & blasting must write the results of measurement mentioned in the preceding Paragraph 1 and 2 in the "Measurement records of dust management" and report these results to administrator at a mine. 4 The concessionaires must keep the "Measurement records of dust management" mentioned in the preceding Paragraph above for five (5) years. (Evaluation on environment of underground working places) Article 243-2 1 The concessionaires of underground mining must evaluate environment of working places in terms of scattered dust concentration in the air and content rate of the free silicic acid into the dust at underground working places that dust scattering occurs remarkably in accordance with the provisions of "Regulation on procedures and items of mentioned provided in Mine Safety Law and its regulations" based on the results of measurements conducted by the technical safety staff for underground safety & blasting in such working places as provided in Article 243, Paragraph 1. 2 The foresaid concessionaires must keep records of evaluation on environment of such working places described in the preceding Paragraph for five (5) years. (Necessary measures based on the evaluation on environment of

	underground working places) Article 243-3 The concessionaires of underground mining must make efforts to take the necessary measures to improve the scattered dust concentration in underground working places that are classified as management class NO. 2 or 3 prescribed in the preceding Article, Paragraph 1.

The draft of Mine Safety Regulation (phase 1) in the Kingdom of Cambodia

November 2015 (revised on June 2016)

The draft of Mine Safety Law	The draft of Mine Safety Regulation (phase 1)
	Chapter ⅩⅢ Ventilation and Mine Gas **Section 1 General Rules** Article 244 Safety for ventilation and mine gas, the concessionaires must take necessary measures prescribed in Articles 5 of the Law, and mineworkers must obey items necessary prescribed in Articles 6 of the Law, shall be stipulated in the Chapter ⅩⅢ in accordance with Article 31, Paragraph 1 and 2 of the Law. **Section 2 Underground Mine Air** (Content of oxygen and carbon dioxide in mine air) Article 245 1 The concessionaires of underground mining must keep oxygen content at 19% or more and carbon dioxide content at 1% or less in the underground mine air where mineworkers are posted or pass through the roadways. 2 The provision of preceding Paragraph shall not apply to the working place where lifesaving or activity regarding safety is conducted in a safe way. (Flammable gas content in the main return air) Article 246

	The concessionaires of underground mining must keep flammable gas content at 1.5% or less in the return air of main air ways and underground working places. (Underground temperature) Article 247 The concessionaires of underground mining must keep temperature at 37°C (Celsius) or less in underground working places. However, aforesaid provision shall not be applied to the working place where lifesaving or activity regarding safety is conducted in a safe way. (Ventilation quantity) Article 248 1 The concessionaires of underground Coal mines (Class-A coal pit and Class-B coal pit) must decide the ventilation quantity of underground working places based on number of mine workers, outflow of flammable gas or harmful gas , temperature, humidity and possibility of spontaneous combustion. 2 Air current and flow volume in underground working places must be kept adequate speed and volume to sweep away flammable gas, harmful gas and fumes of blasting. (Ventilation speed) Article 249 The concessionaires of underground Coal mines (Class-A coal pit and Class-B coal pit) must keep ventilation speed at 450 m/min. or less in underground

	working places and tunnels (galleries). However, the speed may increase up to 600 m/min. at an exclusive vertical shaft for ventilation. **Section 3 Ventilation Facilities** (General ventilation facilities) Article 250 1 The concessionaires of underground mining must install ventilation facilities in order to supply a sufficient quantity of air to underground working places for safety. 2 A barometer and a thermometer must be installed at an underground proper place where thirty (30) mineworkers or more are placed for their assignments in a pit. (Intake and return airway, and main fan) Article 251 1 The concessionaires of underground mining must install intake airways and return air ways separately. 2 A main fan room must be established using materials of fire-proof construction, and the main fan must be installed at a proper place on the ground where a return air from underground does not draw into the intake air. 3 The main fan must be operated in succession except special reasons. (Auxiliary ventilation) Article 252

	The concessionaires of underground Coal mines (Class-A coal pit and Class-B coal pit) must obey following provisions to provide underground mine air using the auxiliary ventilation. 1) The auxiliary fan shall be installed at a proper place where a return air not be supplied into an intake air, and the air volume shall be more than the capacity of the fan to prevent from recirculation of air. 2) The auxiliary fan shall be operated in succession except special reasons. 3) An air duct of the auxiliary ventilation shall be maintained in good condition with measures of preventing leakage, and head of the air duct shall be kept setting within 7 m from the face of mineral working field or head of tunneling. Article 253 The technical safety staffs for underground safety & blasting of underground Coal mines (Class-A coal pit and Class-B coal pit) must obey following provisions to provide underground mine air using the auxiliary ventilation. 1) When operation of the auxiliary fan has failure and there is a risk of danger for safety, the technical safety staffs shall immediately interrupt the power supply to the area and give instructions to mineworkers to take shelter at a safe place. 2) When the power supply is interrupted by the source of the power trouble, the technical safety staffs shall break switches of electric auxiliary fans and other electrical devises in the area. 3) When re-supply electricity to the auxiliary fans and other electrical devises in the area that was interrupted in the preceding provision, the said technical

	safety staffs must confirm the safety and check concentration of flammable gas before starting the power supply to the area. Article 254 When clearance of flammable gas that is stagnant in the area is effected using the auxiliary ventilation and there is a high risk danger due to the gas's fluidity, the technical safety staffs for underground safety & blasting of underground Coal mines (Class-A coal pit and Class-B coal pit) must take the work with safe methods under the administrator's direction. (Interception wall and air door) Article 255 1 The concessionaires of underground Coal mines (Class-A coal pit and Class-B coal pit) must install interception walls or air doors at the place of a connection tunnel (gallery) between an intake airway and a return airway of vertical shafts, main airway tunnels (galleries). 2 Two or more air doors in the preceding Paragraph must be installed with a proper room between the doors. However, one air door can be installed in case of natural ventilation in Class-B coal pit. 3 Air doors must always be closed, but this shall not be applied if required for safety. (Change of main ventilation system) Article 256

	The concessionaires of underground Coal mines (Class-A coal pit and Class-B coal pit) must change the main ventilation system at the time when nobody is placed for one's assignment except mineworkers engaged at the work and the workers designated by administrators at a mine. **Section 4 Measurement of ventilation quantity** (Measurement of ventilation quantity in underground) Article 257 1 The technical safety staffs for underground safety & blasting of underground Coal mines (Class-A coal pit and Class-B coal pit) that more than thirty (30) mineworkers are employed at all times must obey following provisions. 1) to measure the atmospheric pressure and temperature in underground using a barometer and a thermometer in every working day, and write down the results of measurements in "the record for management of ventilation quantity in underground", and report immediately to the administrator in case any abnormality happened; 2) to measure the velocity and quantity of underground ventilation using an anemometer, and measure concentration of flammable gas using the precision flammable gas detector once or more every month in all underground places; 3) to measure as same as in preceding Items in each occasion, when there is an abnormality in underground airflow or ventilation, when ventilation system or volume changed, and; 4) to write down the results of measurements prescribed in the preceding Items 2

	and 3 in “the record for management of ventilation quantity in underground”. 2 The concessionaires of underground mining that employ less than thirty (30) mineworkers at all times must obey the instructions given by the Minister in charge of mines sector to measure the items prescribed in preceding Paragraph by the technical safety staffs. (Measures against abnormal ventilation) Article 258 1 When there is an abnormality in the direction of ventilation or distribution of ventilation quantity in underground, the technical safety staffs for underground safety & blasting of underground Coal mines (Class-A coal pit and Class-B coal pit) must take appropriate measures, and write down the results in “the record for management of ventilation quantity in underground”. 2 when it is necessary to change the ventilation system or distribution of ventilation quantity in underground prescribed in the preceding Paragraph, the said technical safety staffs must report them immediately to the administrator. (Measurements of temperature and humidity in underground) Article 259 The technical safety staffs for underground safety & blasting of underground mining must measure the temperature and the humidity in underground once or more in every month, and write down the results of measurements in “the record for management of ventilation quantity in underground”.

	Section 5 Underground Gas (Reports of inflammable gas detection) Article 260 When the concessionaires of underground Coal mines (Class-B coal pit) get the facts that the concentration of flammable gas detected at a level of 0.25 % or more in return airway in a tunnel (gallery) or at a level of 0.5 % or more in a mineral working field in a pit, the facts must be reported immediately to the Minister in charge of mines sector in accordance with the Article 29, Paragraph 1 of the Law. (Measurement of harmful gases) Article 261 1 If the content of carbon monoxide or other harmful gases fulfill the following items, the concessionaires of underground mining must investigate the cause and take measures, such as increasing the air flow rate to reduce the harmful gas content or closure of boreholes. 1) Carbon monoxide (CO) 0.01% or more 2) Hydrogen sulfide (H_2S) 0.001% or more 3) Sulfurous acid gas (SO_2) 0.002% or more 4) Nitrogen Oxides (NO_x) 0.0025% or more 2 If the harmful gas content cannot be reduced by the measures prescribed in the preceding Paragraph, the use of protective equipment, blockage of passage or other measures have to be taken to prevent the danger of harmful gases to mineworkers.

	(Measurement of harmful gases) Article 262 1 The technical safety staffs for underground safety & blasting of underground mining must measure the content and radius of carbon monoxide or other harmful gases using a gas detector once or more every month at the places where the emission of harmful gases exist or are expected. 2 The technical safety staffs for underground safety & blasting of underground Metal mines and Non-metal mines must measure the content and radius of carbon monoxide or other harmful gases using a gas detector once or more every month at the working places where vehicle type mine machines and automobiles with internal-combustion engines operate, or necessary spots. However, measurements must be taken once or more in every working hours instructed by administrator, if it is necessary for safety. 3 The technical safety staffs must write down the results of measurements prescribed in the preceding Paragraph 1 and 2 in “the record for management of ventilation quantity in underground”. (Measures for flammable gas) Article 263 1 When the concentration of flammable gas in underground working places or return airway exceeds 1.5% or more and there is a risk of danger for safety, the technical safety staffs for underground safety & blasting of underground mining must immediately cut off the power supply to the area, give instructions to

	mineworkers to take shelter at a safe place and post an alarm sign at the area. 2 The concentration of flammable gas prescribed in the preceding Paragraph shall not apply until amount of 2% at the places where electrical devices are not installed, there is particularly much emission of flammable gas for special source, and measurement of the content of the gas is taken frequently under control of the administrator during the work. 3 The said technical safety staffs must install fences for blockage of passage at the place where the concentration of flammable gas exceeds 2%. 4 The provisions of preceding Paragraph 1 to 3 inclusive shall not apply to the working place where lifesaving, improvement of ventilation quantity or activity regarding safety is conducted in a safe way. Article 264 1 The concessionaires of underground Coal mines (Class-A coal pit and Class-B coal pit) must take appropriate measures such as advanced drilling or absorption and induction of flammable gas, when there is a high risk of danger due to increasing the gas remarkably during excavation of tunnel (gallery) or tunneling field. 2 The said concessionaires must take filling, sealing of tunnels (galleries), ventilation and appropriate measures in the goaf (old working field) or disused tunnel (gallery) where a great deal of flammable gas exists. 3 Not allow return airway in the preceding Paragraph passing through other working places or haulage tunnels (galleries) where passage of mineworkers are frequent.

	Section 6 Restrictions for Use of Open Fire (Restriction for use of open fire) Article 265 1 The mineworkers in underground mining must not use open fire. 2 The preceding Paragraph shall not apply at the working when the technical safety staffs for electricity practice electric welding, electric fusing or use open fire for repairing, injecting insulating filler materials into metal connection box for armored cable under the instructions of administrator with safety methods at a safe place. 3 When electric welding or electric fusing should be practiced, or open fire should be used prescribed in the preceding Paragraph, the construction of working place must be established by the fire-proof construction materials, or fire-fighting devices must be installed. (Prohibition for carrying of ignition tools) Article 266 1 The concessionaires of underground Coal mines (Class-A coal pit and Class-B coal pit) must check mineworkers' things of ignition tools, smoking implements and tobacco at a pit mouth in every time before entering the pit. 2 The mineworkers of underground Coal mines (Class-A coal pit and Class-B coal pit) must not carry ignition tools, smoking implements and tobacco when they enter the pit.

The draft of Mine Safety Law	The draft of Mine Safety Regulation (phase 1)
	Chapter ⅩⅣ Surface Passage, Working Places and Management of Scattered Dust **Section 1 General Rules** Article 267 Safety for surface passage and working places, the concessionaires must take necessary measures prescribed in Articles 5 of the Law, and mineworkers must obey items necessary prescribed in Articles 6 of the Law, shall be stipulated in the Chapter ⅩⅣ in accordance with Article 31, Paragraph 1 and 2 of the Law. **Section 2 Management of Scattered Dust** (prevention of scattered dust) Article 268 1 The concessionaires must sprinkle water, collect dust, seal machinery or equipment or take other appropriate measures to prevent dust scattering because of health preservation of mineworkers near a crushing plant, a tippler, a processing plant, a smelting & refinery, a coal preparation plant, open pits and other working places outside mines where there is significant dust scattering. 2 When the measures prescribed in the preceding Paragraph are taken, and if it is necessary for safety reasons, the concessionaires must instruct mineworkers to wear standard dust respirators.

	Article 269 1 When mineworkers working at working places outside mines prescribed in the Paragraph 1 and 2 of the preceding Article have to take a break, the concessionaires must provide a space for such a break for sake of health protection of mineworkers in the place without dust scattering. 2 In the space for a break prescribed in the preceding Paragraph, there must be equipment for mineworkers to remove dust adhering to their working clothes. (Measurement of dust concentration at indoor working places outside mine) Article 270 1 The technical safety staffs for surface safety & blasting must measure dust concentration in the air and content rate of free silica acid in the dust once every three (3) months periodically at the following indoor working places that dust scattering occurs remarkably. 1) Crushing, grinding or sieving of stones, rocks or minerals using power-driven tools 2) Cutting or finishing of rocks or minerals using power-driven tools (excluding cutting or finishing by pouring jet water or using fire) 3) Polishing or deburring of rocks, or minerals or metals with abrasives, or cutting metals using power-driven tools (excluding for polishing or cutting by pouring jet water) 4) Mixing or blending of powdered minerals 5) Bagging of powdered minerals or products and fly ash

	2 In Metal mines, the technical safety staffs for surface safety & blasting must measure the concentration of asbestos dust at working places in accordance with the provisions of the preceding Paragraph above if it is necessary. 3 The said technical safety staffs must write the results of measurement prescribed in the preceding Paragraph 1 and 2 in the “management record of scattered dust” and report these results to administrator at a mine. 4 The concessionaires must keep the “management record of scattered dust” prescribed in the preceding Paragraph above for five (5) years. (Evaluation on environment of the indoor working places) Article 270-2 1 The concessionaires must evaluate environment of indoor working places outside mine in terms of scattered dust concentration in the air and content rate of the free silicic acid into the dust at indoor working places that dust scattering occurs remarkably in accordance with the provisions of “Regulation on procedures and items of mentioned provided in Mine Safety Law and its regulations” based on the results of measurements conducted by the technical safety staff for surface safety & blasting in such working places as provided in Article 270, Paragraph 1. 2 The foresaid concessionaires must keep records of evaluation on environment of indoor working places described in the preceding Paragraph for five (5) years. (Necessary measures based on evaluation on environment of indoor working places) Article 270-3

	1 The concessionaires must take necessary measures immediately to improve the dust concentration at indoor working places outside mines that are categorized as management class NO. 3 as a result of evaluation on working environment prescribed in the preceding Article, Paragraph 1, to improve the management class of such places to class NO. 1 or 2. 2 When necessary measures are taken mentioned in the preceding Paragraph, the foresaid concessionaires must instruct the technical safety staffs for surface safety & blasting to measure scattered dust concentration in the air and content rate of the free silicic acid into the dust, and also evaluate environment of foresaid working places in accordance with the provisions of "Regulation on procedures and items of mentioned provided in Mine Safety Law" to confirm the result of improvement immediately. 3 The concessionaires must make efforts to take the necessary measures to improve the dust concentration at indoor working places outside mines that are classified as management class NO. 2 prescribed in the preceding Article, Paragraph 1. **Section 3 Surface Passage** (Staircases) Article 271 The concessionaires must fulfill the following requirements when erecting staircases at mine buildings. 1) Staircases must be of sound structure 2) Riser height and stair tread depth must be constant 3) There must be landing places at intervals of up to ten (10) m for staircases of

	ten (10) m or higher 4) There must be handrails on the one side Article 272 1 The concessionaires must provide two or more staircases that are positioned appropriately on the respective floors and are connected to safe outdoor locations inside underground structures or structures of two or more stories where thirty (30) or more mineworkers are working at all times. 2 The staircases mentioned in the preceding Paragraph must fulfill the following requirements. 1) Riser height must not exceed 0.2 m and tread depth must be at least 0.2m 2) The inclination must be 40 degree or less 3) If a staircase is 3.6m or higher, there must be landing places of at least 1.2m at intervals of 3.6m 4) Staircases must be at least 1.2m wide in the clear 5) Spiral staircases must not be used 6) Handrails 0.8 m or higher must be provided on the outer side 7) There must be no obstacles within a height of 1.7m above each step (Handrails) Article 273 The concessionaires must provide handrails on the side of staircases, scaffolds or elevated walkways.

	(Working place floors, passage) Article 274 1 The concessionaires must keep the working place floors safe and free from danger of tripping and slipping. 2 There must be safe passages for mineworkers in sections inside and connected to working places and such passages must be kept passable. 3 For indoor working places where ignitable or flammable substances are handled or thirty (30) or more mineworkers work at all times, the concessionaires must provide two or more appropriate passages through which the workers can easily escape to safe places during emergencies. 4 Doors of the passages prescribed in the preceding Paragraph must be sliding doors or be opened by pushing to the outside. In addition, appropriate signs must be posted on the main passages or exits, passages or staircases for emergency use. **Section 4 Preservation of Safety Equipment and Wearing Protective Equipment** (Installation of safety equipment) Article 274-2 1 The concessionaires must install fences, coverings or other safety equipment at dangerous sections, including axes at a height of two (2) m or less from the floor or table surfaces, projecting axial ends, and interlocking devices using belts, chains or ropes. 2 Clutches, switches or other power blocking devices must be installed on each of

	the power driven machines. (Wearing protective equipment) Article 274-3 1 The concessionaires must take appropriate measures to prevent the danger of explosion or leaking of high-temperature substances in blast furnaces or converters in Metal mines and other sections where large amounts of high-temperature substances are handled. 2 Sections mentioned in the preceding Paragraph must have appropriate protective gloves/boots and other protective equipment to be used by qualified workers handling burning and molten materials. Article 274-4 1 The concessionaires must separate sections where arc welding is conducted and other sections where danger is caused by strong light emission from other working places. 2 At sections mentioned in the preceding Paragraph, appropriate protective gloves/boots and other protective equipment must be available to be used by qualified workers conducting arc welding. (Security measures during repair or inspection) Article 274-5 When conducting repair or inspection of mine machineries and equipment by stopping machine operation at mines, the technical safety staffs for machinery or other persons

	designated by the technical safety staff must set warning signs of the suspension of machine operation during such repair or inspection, lock starting devices and take sufficient security measures to prevent others from operating such mine machinery or equipment. (Preservation of safety equipment) Article 274-6 1 Mineworkers must not damage or alter warning signs, fences or other passage blocking equipment or safety-related machinery, tools or equipment. 2 Mineworkers must not obstruct or stop/prevent the maintenance or operation of particularly necessary equipment for safety, including ventilation facilities in Coal mines and the water treatment facilities for mine water or wastewater in Coal, Metal and Non-metal mines. 3 Other persons designated by safety supervisor, technical safety managers or technical safety staffs must not enter places where passages are blocked with fences or off-limit areas. **Chapter ⅩⅤ Management of Poisonous and Deleterious Substances** **Section 1 General Rules** Article 275 Safety for management of poisonous and deleterious substances, the concessionaires must take necessary measures prescribed in Articles 5 of the Law,

	and mineworkers must obey items necessary prescribed in Articles 6 of the Law, shall be stipulated in the Chapter ＸＶ in accordance with Article 31, Paragraph 1 and 2 of the Law. **Section 2 Management of Poisonous and Deleterious Substances** (Transportation of poisonous and deleterious substances) Article 276 The concessionaires must take necessary measures to prevent splashing, leakage, outflow or leaching of poisonous or deleterious substances when transporting such substances inside mines. Article 277 When storing poisonous or deleterious substances at mines, the concessionaires must fulfill the following requirements. 1) Poisonous and deleterious substances must be stored separately from other substances. 2) Tanks, drums and other containers used to store poisonous and deleterious substances must be free from danger of scattering, leakage or leaching of such substances. 3) The poisonous and deleterious depot, or other facilities where poisonous and deleterious substances are stored without using containers must be free from danger of scattering, infiltration into the ground or outflow of such substances.

	(Theft prevention of poisonous and deleterious substances) Article 278 1 The concessionaires must lock the facilities storing poisonous and deleterious substances at mines to prevent theft. If such facilities cannot be locked due to their nature, robust fences must be provided around them. 2 In addition to the provision of the preceding Paragraph, the said concessionaires must take appropriate measures to prevent theft or loss of poisonous or deleterious substances. (Facilities using poisonous and deleterious substances) Article 279 The concessionaires of Metal mines must establish a processing plant, a smelting and refinery, and other facilities where poisonous or deleterious substances are used with following constructions and items to be furnished. 1) to be constructed with concrete, wooden or similar structures free from the danger of scattering, leakage, leaching, outflow or infiltrating to the ground of such substances, and; 2) to have facilities to treat wastewater including poisonous and deleterious substances, and to keep devices or chemicals to eliminate toxic quality of such substances. (Disposal of poisonous and deleterious substances) Article 280 The concessionaires of Metal mines producing or handling poisonous or

	deleterious substances have to suspend such production or handling consecutively for six (6) months or longer due to the suspension of mineral-related operations or have to terminate such production or handling due to the expiration of the mineral-related license, the remaining amounts of such substances must be transferred to third parties producing or handling such substances or they should be disposed by one of the following methods within one (1) month from the date of the suspension or termination of the operation. 1) Turning them into substances that are not poisonous or deleterious by neutralization, hydrolysis, oxidization, reduction, dilution or other methods. 2) Releasing them in small amounts or volatilizing them in a place where there is no danger of a safety hazard or mine pollution, if such substances are gaseous or volatile. 3) Burning them in small amounts in a place where there is no danger of a safety hazard or mine pollution, if such substances are combustible. 4) Transferring them to other mines or their attached facilities that produce or handle poisonous or deleterious substances. 5) If it is difficult to apply any of the provisions in the preceding Items, burying them at a depth of at least one (1) m in the ground in a place where there is no danger of polluting the groundwater. (Obedience items of the technical safety staff for poisonous and deleterious substances) Article 281 1 In order to prevent mine disaster or mine pollution by poisonous or deleterious

	substances, the technical safety staffs for poisonous and deleterious substances must examine the poisonous and deleterious depot, mining facilities where poisonous or deleterious substances are used, and treatment facilities for wastewater including poisonous or deleterious substances in every working day at mines, and write down the results of examination in “the diary for management of poisonous and deleterious substances” 2 In case mine disaster or mine pollution caused by poisonous or deleterious substances is likely to occur based on the results of examination prescribed in the preceding Paragraph, the said technical safety staffs must immediately report to the administrator at mines.

The draft of Mine Safety Law	The draft of Mine Safety Regulation (phase 1)
(Use of land in emergencies) Article 32 1 When it is necessary to prevent imminent danger, the concessionaire can – with the permission of the minister in charge of mines sector – enter onto a third party's land, or use that land temporarily. 2 In the case prescribed in Paragraph 1 above, the concessionaire shall immediately inform the owner of the land, accordingly. 3 In case a person enters or uses a third party's land as prescribed in Paragraph 1above, that person shall carry documents to prove that the minister's permission has been granted, and have to produce the document if requested by the landowner. 4 In case, as prescribed in Paragraph 1above, land belonging to a third party is entered onto or used temporarily, any loss or damages incurred shall be compensated for at current value.	**Chapter ⅩⅥ Use of Land in Emergencies** **Section 1 General Rules** Article 282 When the concessionaires enter onto a third party's land, or use that land temporarily in accordance with the provision of Article 32 of the Law, the application mentioned the third party's address and the official name, the address of the land, the purpose of enter or use of the third party's land shall be drafted based on the "Regulation on procedures and items of mentioned provided in Mine Safety Law and its regulations", and be submitted to the Minister in charge of mines sector for permission.

The draft of Mine Safety Regulation (phase 2) in the Kingdom of Cambodia

The Regulation (phase 2) will be enforced within five(5) years after enforcement of Mine Safety Law November 2015 （revised on July 2016）

The draft of Mine Safety Law	The draft of Mine Safety Regulation (phase 2)
Chapter I General Provisions (Purpose of the law) Article 1 The law aims to prevent injuries to mineworkers, to prevent mine pollution and to promote rational development of mineral resources in consonance with the Law on Management and Exploitation of Mineral Resources in the Kingdom of Cambodia. (Definition) Article 2 Terms used in this law shall be interpreted as follows: 1 “Mineral licenses are classified into six categories: “artisanal mining licenses” are issued by the states or provincial governments that have jurisdiction over the mineral sector in the region in question, while “pits and quarries mining licenses,” “gem mining licenses,” “mineral (gemstone) cutting licenses,” “mineral exploration licenses” and “industrial mining licenses” are issued by the minister in charge of the mineral sector.	**Chapter I General Provisions** **Section 1 General Rules** (Definition) Article 2 15 In the Regulation, “centralized monitoring” means centralized monitoring of measured or detected results by a continuous measuring system for flammable gases, a detection system for occurrence of danger or a fire, and other facilities. (Preservation the records by electromagnetic formats) Article 3-2 1 The concessionaires, safety supervisors, safety technical managers and safety technical staffs at the mines may prepare and keep diaries, safety records, management records and other records prescribed in the provisions of this Regulation in electromagnetic formats (i.e., electronic, magnetic or other formats not directly recognizable by human senses). 2 In case records are kept pursuant to the preceding Paragraph, such records must be immediately viewable using computers or other devices as necessary.

2	“The concessionaire” is the individual or legal entity (corporation) that possesses a license to carry out mineral-related operations, issued by the respective provincial ministerial department or minister responsible for the area in question. However, “artisanal mining licenses” shall be issued only to Cambodian citizens.	
3	“Mineral-related operations” means projects related to the prospecting, exploration and exploitation of minerals, accompanying projects such as the processing, refining and smelting of minerals, as well as projects related to management of tailings dams, and restoration of former mine sites.	
4	“Mine” means any place of work where mineral-related operations are carried out.	
5	“Mineworker” means a person employed by the concessionaire to carry out mineral-related operations at a mine.	
6	“Mine pollution prevention projects” means projects concerning the vegetation and soil cover of waste stone dumps, slag dumps, and sediment dams attached to processing plants and mine-water treatment facilities, as well as projects related to blockage of the drifts, and those related to the perpetual treatment of mine- and waste-water from facilities that are no longer used, which fail to meet standards concerning contamination levels and amounts.	

Article 3 1 In this law, “safety” indicates the following items concerning mineral-related operations. 1 Prevention of danger and injury to people at mines 2 Preservation of mineral resources 3 Maintenance and management of mine facilities 4 Prevention of mine pollution 5 Sanitation-related ventilation 6 Rescue activities at times of mine disaster (Validity) Article 4 1 This law shall be applicable to the mineral-related operations by the concessionaires as prescribed in Article 4 of the Law on Management and Exploitation on Mineral Resources or the mine facilities which former concessionaires had used for implementing the mineral-related operations within five (5) years after the mineral license has renounced. 2 The penalties prescribed in this Law, and procedures and other actions to be carried out by the concessionaire in accordance with the provisions of the Law shall also be valid with regard to the concessionaire’s successor.	

The draft of Mine Safety Law	The draft of Mine Safety Regulation (phase 2)
Chapter II Safety (Duties and obligations of the concessionaire) Article 5 The concessionaire shall carry out necessary measures to ensure the following: 1 Prevention of rock-falls, collapses, floods, gas outburst, gas or coal dust explosions, spontaneous combustion and fires in mines 2 Prevention of danger and injuries and/or mine pollution due to treatment and disposal of gas, dust, waste stones, slag, mine water and wastewater, and mine smoke 3 Prevention of damage and injuries related to the handling of machinery and equipment, as well as the handling of explosives, motive power and fires 4 Establishment of suitable ventilation and rescue mechanism 5 Conservation of mineral resources 6 Maintenance and management of machinery, equipment, buildings and structures 7 Prevention of mine pollution due to land excavation 8 Prevention of damage and injuries related to the	**Chapter II Safety** **Section 2 Training on Mine Safety** (Instruction regarding safety training for dangerous work) Article 6 1 The concessionaire shall give training to mineworkers who engage in the hazardous works mentioned in each following items, the period and contents of training shall be prescribed in "Regulation on procedures and items of mentioned provided in Mine Safety Law" 23-2) the operation of a main fan in underground Coal mine (Class-A coal pit and Class-B coal pit); 23-3) the operation of blowers for flammable gas induction in underground Coal mine (Class-A coal pit and Class-B coal pit); 24) the works or operations designated by the Minister in charge of mines sector after consulting to the Mine Safety Advisory Committee prescribed in Article 38 of the Law. **Section 3 Caution Items regarding Machinery, Equipment and so on** (Caution items) Article 9-2

establishment and/or modification of mine facilities in mine-related operations (Obligations of mineworkers) Article 6 Mineworkers must obey items necessary to the safety at the mines. (Training on mine safety) Article 7 (omission) (Caution items regarding machinery, equipment and so on) Article 8 1 The concessionaire shall not use or install in a mine particularly dangerous machinery, equipment, explosives, and various gas detectors, life-saving equipment and other materials according to the procedures prescribed by the ministerial ordinances, unless it has passed the examinations set by the Ministry in charge of mines sector. 2 The Minister in charge of mines sector has the power to prohibit the use or installation of especially dangerous machinery, equipment, explosives, and various gas detectors, life-saving equipment and other materials at mines if, with	1 In accordance with Article 8, Paragraph 1 of the Law, the concessionaires of underground Coal mines(Class-A coal pit) shall install or utilize the following materials, machineries, equipment, and other notified parts (hereinafter referred as "mine requisites"), all which shall pass categorized approval tests or inspection tests for type approval. 1) rescue apparatus; a) oxygen generation type life saving equipment in Class-A coal pit; 2) explosives; a) explosives in Class-A coal pit; b) safety sheath for explosives in Class-A coal pit; 3) electrical equipment; a) electrical blasting machine in Class-A coal pit; b) illumination appliances in Class-A coal pit; c) electrical machineries and electrical instruments in Class-A coal pit; d) electrical cables in Class-A coal pit; e) electrical wires for low weak current in Class-A coal pit; 4) machineries and equipment; a) machineries or vehicles which use an internal combustion engine for motive power in Class-A coal pit; b) anemometers in Class-A coal pit. Article 9-3 The concessionaires of underground Coal mines (Class-A coal pit) must only use explosives which have passed inspection tests for type approval at the places of the

given reason, it is deemed necessary to ensure safety. 3 The said Minister can outsource the examination prescribed in Paragraph 1 above, to a qualified external institution. (Permission regarding facility plans) Article 9 1 When the concessionaire establishes or modifies buildings, structures or other facilities for use in mineral-related operations, “facility plan” shall be drafted and submitted to the minister in charge of mines sector for permission according to the procedures prescribed by the ministerial ordinance. 2 Items to be included in the “facility plan” for the establishment or modification of buildings, structures or other facilities to be used in mineral-related operations shall be prescribed by the ministerial ordinance. 3 The concessionaire shall submit the plan to the minister in charge of mines sector no later than thirty (30) days before the work is due to begin. 4 The minister has the power to prohibit work on such facilities or order the plan to be modified by the concessionaire if, with given reason, it is deemed necessary to ensure safety. 5 When the plan prescribed in Paragraph 1 above has been completed, or such buildings, structures or other facilities have been scrapped, the concessionaire shall notify the minister	mineral working field or tunneling field where there is high risk of scattering the explosive coal dust. **Section 4 Permission Regarding Facility Plans** (Permission regarding facility plans) Article 13 1 When the concessionaire intends to establish or modifies following mine buildings, structures or other facilities in accordance with Article 9, Paragraph 1 of the Law, “facility plan” shall be drafted and submitted the Minister in charge of mines sector for permission no later than 30 days before the work is due to beginning based on “Regulation on procedures and items of mentioned provided in Mine Safety Law”. 19-2) a main fan and a spare fan; 19-3) flammable gas induction facilities in underground Coal mine (Class-A coal pit and Class-B coal pit); 20) the mine buildings, structures or other facilities designated by the Minister in charge of mines sector after consulting to the Mine Safety Advisory Committee prescribed in Article 38 of the Law.

within thirty (30) days. (Dumps and tunnels (galleries)) Article 10 (omission) (Safety rules) Article 11 to 12 (omission)	

The draft of Mine Safety Law	The draft of Mine Safety Regulation (phase 2)
(Appointment of a safety supervisor, technical safety managers, technical safety staffs and a representative of safety supervisor) Article 13 (omission) **(Duties of the safety supervisor, technical safety managers and technical safety staffs)** Article 14 to 15 (omission) **(Safety committee)** Article 16 to 17 (omission) **(The survey of mine safety conditions)** Article 18 (omission)	**Chapter V Explosives and Blasting** **Section 3 Blasting Work** (Blasting work at the vigilance area against the gas outburst) Article 100-2 The concessionaires of underground Coal mines (Class-A coal pit) must conduct blasting work as follows in a working place nominated as the precaution area against gas outburst. 1) to take firing of blasting by the electric ignition method after mineworkers evacuated at a safe place against the gas outburst; 2) to take firing of blasting in the safety facility or intake airway at a safe place against the gas outburst; 3) to approach nobody of mineworkers to the blasting place where loaded explosives were blasted and there is risk of gas outburst, and; 4) to use explosives with the safety sheath or with quality equivalent or higher than the insulation materials used for the explosives. (Restrictions for explosives) Article 100-3 The concessionaires of underground Coal mines (Class-A coal pit) must conduct blasting work as follows in working places where concentration of flammable gas increases more remarkable than usual or explosive coal dust occurs scattering significantly.

	1) to designate kinds and quantity of using explosives, of electric detonators and exploders, and; 2) to use safety sheath for explosives. (Obedience items of the technical safety staffs for blasting) Article 104-2 The safety technical staffs for underground safety & blasting of Coal mines (Class-A coal pit) must obey following provisions. 1) when the blasting work is carried out at the area where explosive coal dust scatters or there is a risk of the dust scattering, any abnormalities of the explosive coal dust should be checked in the radius of five (5) m distance from the blasting point on every ignition of explosives. 2) when the blasting work perforates other side of tunnel (gallery) through at the area where explosive coal dust scatters or there is a risk of the dust scattering, any abnormalities of the explosive coal dust and flammable gas should be checked in the other side of tunnel (gallery) before ignition of explosives, too. 3) when there is danger of explosive coal dust scattering, of concentration of flammable gas increasing remarkably or of gas outburst occurring, two (2) or more blasts all at once at the same place cannot be carried out except using electric ignition method. **Chapter Ⅷ Mine Fires and Spontaneous Combustion** **Section 5 Centralized Monitoring**

	(Establishment of a centralized monitoring room) Article 161-2 1 The concessionaires of underground Coal mines (Class-A coal pit) must establish a centralized monitoring room on the ground providing the measurement device for concentration of flammable gas and monitoring devices for specific substances using sensors continuously in underground. 2 The concessionaires of underground Coal mines (Class-B coal pit), Metal mines or Non-metal mines can establish a centralized monitoring room on the ground if it is necessary for safety. (Installation of continues measurement devices for the concentration of flammable gas and so on) Article 161-3 1 The concessionaires of underground Coal mines (Class-A coal pit) must install continuous measurement devices for concentration of flammable gas in the return airways of main exhaust tunnels (galleries), the precaution areas against gas outburst and other necessary sections in a centralized monitoring room on the ground.

The draft of Mine Safety Law	The draft of Mine Safety Regulation (phase 2)
(Safety for contractual work) Article 19 (omission) **(Permission for special mineral operations plan)** Article 20 (omission) **(Mine pollution prevention measures and Reserve Fund System)** Article 21 (omission) **(Reserve fund system)** Article 22 (omission) **(Administrative measures to be supervised)** Article 23 to 28 (omission)	2 A centralized monitoring room must have devices for continuous measurement of concentration of the carbon monoxide in the return airways of main exhaust tunnels (galleries), gas pipes in flammable gas induction facilities and other necessary sections of mines. 3 A centralized monitoring room must have devices for sensors that detect the outbreak or danger of fires based on the increasing of carbon monoxide concentration, generation of smoke or other changes of environmental conditions at the places of hoisting device rooms, compressor rooms, pump rooms, main fan rooms, sections with transformer facilities, oil and grease depots, main oil-filled switch rooms, tunnels (galleries) where belt conveyors and lifts for transportation of personnel are operated, and other necessary sections of mines. Article 161-4 When the concessionaires of underground Coal mines (Class-A coal pit) establish a centralized monitoring room, a technical safety staff for underground safety & blasting must be posted to the room. (Obedience items of the technical safety staffs for underground safety & blasting) Article 161-5 A technical safety staff for underground safety & blasting posted to the centralized monitoring room must obey following items. 1) to check any abnormalities of gas or explosive coal dust explosion,

(Mine safety reports) Article 29 (omission) **(Mine safety diagrams)** Article 30 (omission) **(Commission to ministerial ordinance)** Article 31 1 The necessary measures with regard to following subjects to be taken by the concessionaire, as stipulated in Article 5 of this law, shall be prescribed by the ministerial ordinance. 2 The necessary items with regard to following subjects to be obeyed by mineworkers, as stipulated in Article 6 of this law, shall be prescribed by the ministerial ordinance. Subjects: Rescue activities and mechanisms at the time of mine disasters; Rock-fall and collapse; Explosives and blasting; Vehicle type mine machines and automobiles; Haulage; Mine fires and spontaneous combustion; Measurements of old pits; Prevention of	spontaneous combustion, fires and others dangers through the centralized monitoring; 2) to communicate with other technical safety staffs and mineworkers worked in underground concerning necessary items for safety using radio induction communication system; 3) to give necessary instructions to mineworkers, suspend the working, take shelter from working place, take prompt measures and report to the administrator of the mine speedily, and; 4) to write down in “the diary for centralized monitoring” for measures conducted for safety and taking items over to the successor. **Chapter Ⅺ Electrical Equipment** **Section 7 Overhead Type Electric Railway** (Restriction on installation of overhead type electric railway) Article 228-2 The concessionaires of underground Coal mines (Class-A coal pit) cannot install overhead type electric railway at mines. (Furnished items on the circuits for overhead type electric railway) Article 228-3 The concessionaires of underground Coal mines (Class-B coal pit), Metal mines and Non-metal mines must fulfill the following requirements when installing

mine pollution (mine smoke, dusts, mine water or wastewater, dioxin-kinds, poisonous and deleterious substances, noise, vibration, excavation of land, mining wastes, dumping of waste stones, slag and tailings); Electrical equipment; Underground passage and working places; Ventilation and mine gas; Coal dusts; Surface passage and working places; Handling poisonous and deleterious substances.	trolley wires and contact wires for overhead type electric railway within mines or directly connecting the inside and outside of mines. 1) The voltage of trolley wires must be direct current with a low voltage. 2) The height of trolley wires and contact wires for overhead type electric railway must be 1.8 m or higher above the rail surface. 3) Such trolley wires and contact wires prescribed in the preceding Item must not have electrical contact with roofs, side walls, air doors or supports of the tunnels (galleries). 4) Switches must be provided at main junction of tunnels (galleries) and at appropriate intervals on the circuits. 5) At curved parts, the installation of stretched wire at appropriate intervals and other appropriate measures must be taken to avoid loosening of trolley wires. 6) Stretched wires prescribed in the preceding Item must be insulated at a position of 0.6 m or less from the trolley wires and be fixed securely. 7) Sections where mineworkers cross must have appropriate equipment to avoid danger. (Furnished items on the rails of overhead type electric railway) Article 228-4 The concessionaires of underground Coal mines (Class-B coal pit), Metal mines and Non-metal mines must fulfill the following requirements when installing rails of overhead type electric railway at mines. 1) to be connected electrically by welding or twisted bare copper wire with a diameter of over 50 mm^2 or other bonding materials with equivalent or higher

	conductive capacity, and in Coal mines (Class-B coal pit), to be installed an auxiliary return line; 2) to have adequate conductive capacity and be connected with rails on both sides at one or more sections per every ten rail joints concerning the auxiliary return lines in Coal mines (Class-B coal pit) and cross bonds in Metal and Non-metal mines, and; 3) to be five(5) meters or less concerning contact resistance of bonds in terms of the resistance of such rails. Article 228-5 The concessionaires of underground Coal mines (Class-B coal pit), Metal mines and Non-metal mines must insulate or isolate rails used as return lines from other adjoining rails and iron pipes to prevent current leakage at mines. (Keeping the insulation resistance) Article 228-6 1 Concerning the insulation resistance of the insulating parts of electric railways and third rails at mines, the concessionaires of underground Coal mines (Class-B coal pit), Metal mines and Non-metal mines must keep the current leakage at a maximum working voltage of 100 milli-amperes or less per kilometer of the rail length. 2 The technical safety staffs for electricity must measure the insulation resistance of the insulating parts of electric railways and third rails prescribed in the preceding Paragraph once every year or more periodically, and write down the results of

	measurements in the “management record of electrical equipment”.

The draft of Mine Safety Law	The draft of Mine Safety Regulation (phase 2)
	Chapter ⅩⅢ Ventilation and Mine Gas **Section 5 Mine Gas** (Installation of automatic flammable gas alarms) Article 264-2 1 The concessionaires of underground Coal mines (Class-A coal pit) must install one or more automatic flammable gas alarms in the following sections. 1) Mineral working fields; 2) Tunneling fields (except for rock tunneling fields without the danger of flammable gas discharges); 3) working places where concentration of flammable gas is one (1) % or more at all times and electrical equipment is installed, and; 2 sections where flammable gas may stagnate when there is abnormality in ventilation and there is electrical equipment, and other necessary sections. 3 Automatic flammable gas alarms mentioned in the preceding Paragraph must be installed in a manner that flammable gas can be monitored effectively. 4 When installing automatic flammable gas alarms mentioned in the preceding Paragraph 1 in the precaution area against gas outburst or sections with a high risk of danger caused by a significant increase in flammable gas, power transmission to electrical equipment in such zones or sections must be automatically stoppable when concentration of the flammable gas in such zones or sections exceeds 1.5%.

	Section 5-2 Prevention of Danger caused by Gas Outburst (Precaution area against gas outburst) Article 264-3 1 The concessionaires of underground Coal mines (Class-A coal pit) must designate the area with a high risk of danger due to gas outburst as the precaution area against gas outburst when conducting tunneling and other excavation works at the mines. 2 The foresaid concessionaires must notify about the precaution area against gas outburst prescribed in the preceding Paragraph to mineworkers with posting a notice on the outside wall of mine offices or other appropriate means. 3 The foresaid concessionaires must post a technical safety staff for underground safety & blasting each of tunneling field for excavation designated as the precaution area against gas outburst. Article 264-4 1 The concessionaires of underground Coal mines (Class-A coal pit) must conduct advanced drillings at the working place of tunneling where it is designated as the precaution area against gas outburst, and must maintain a safe distance of five (5) m or more between heading of the tunneling field and bottom of borehole at all times. 2 The direction, number of lines and drilling length of advanced drillings mentioned in the preceding Paragraph must fulfill the requirements for monitoring geological conditions and status of flammable gas. The pressure, amount and other matters concerning flammable gas spurting out at the mouth of the borehole must be measured to clarify the status of flammable gas in the hole, and attention must be

	paid to changes in measurement values if necessary. Article 264-5 1 The concessionaires of underground Coal mines (Class-A coal pit) must not conduct tunneling in the precaution area against gas outburst before absorption and induction of necessary amount of flammable gas based on the pressure and amount of the stored gas in the area where tunneling should be planned. 2 When drillings for absorption and induction of flammable gas mentioned in the preceding Paragraph should be conducted, the pressure, amount and other matters concerning flammable gas spurting out at the mouth of the borehole, and amount of gas induction must be measured for necessary terms periodically, and attention must be paid to changes in measurement values. Article 264-6 1 When conducting tunneling in the precaution area against gas outburst, the concessionaires of underground Coal mines (Class-A coal pit) must not pass the return air from the precaution area through the long-wall coal working field. 2 A tunneling toward upward should be prohibited in the precaution area against gas outburst. However, this shall not apply if there is appropriate measures for prevention of gas outburst, and the excavation method of tunneling is inevitable. Article 264-7 1 The concessionaires of underground Coal mines (Class-A coal pit) must provide air supply devices and safety facilities to take shelter for mineworkers appropriate spots

	in the precaution area against gas outburst. 2 Air or oxygen supply devices and communication system such as radio induction must be provided in the safety facilities to take shelter. Article 264-8 The concessionaires of underground Coal mines (Class-A coal pit) must obey the instructions given by the Minister in charge of mines sector to take appropriate measures to fix the precaution area against gas outburst or to prevent mine disaster caused by gas outburst at the mines. (Obedience items of the technical safety staffs for underground safety & blasting) Article 264-9 1 When the technical safety staffs for underground safety & blasting of Coal mines (Class-A coal pit) conducted advanced drilling or absorption and induction of flammable gas for prevention of gas outburst, they must write down the means and results in the “management record of advanced drilling and absorption of gas”, and there is found abnormality in the results, they must report to the administrator speedily. 2 When the foresaid technical staffs admit indications of the gas outburst, they must give instructions to mineworkers to take shelter, cut off the power supply to the area, take prompt measures and also report to the administrator speedily. **Section 5-3 Prevention of Danger caused by Static Electricity**

	(Appropriate measures for static electricity) Article 264-10 The concessionaires of underground Coal mines (Class-A coal pit) must fulfill the following requirements to prevent danger caused by static electricity at mines. 1) For facilities with a risk of danger caused by static electrification, vinyl pipes, vinyl sheets or other items should be subjected to antistatic treatment, or grounding (earth), sprinkling of water or other appropriate measures must be taken before these are used. 2) When conducting work with a risk of danger caused by static electrification, grounding (earth), sprinkling of water or other appropriate measures must be taken. **Chapter ⅩⅢ-2 Explosive Coal Dust** **Section 1 General Rules** Article 266-2 Safety for prevention of explosion caused by explosive coal dust, the concessionaire must take necessary measures prescribed in Article 5 of the Law, and mineworkers must obey items necessary prescribed in Article 6 of the Law, shall be stipulated in the Chapter ⅩⅢ-2 in accordance with Article 31, Paragraph 1 and 2 of the Law. **Section 2 Treatment of Explosive Coal Dust**

	(Treatment of scattered and accumulated explosive coal dust) Article 266-3 The concessionaires of underground Coal mines (Class-A coal pit) must do the coal dust cleaning periodically on haulage tunnels (galleries) and others due to the dust scattering and accumulation. (Water sprinkling or spread powder) Article 266-4 The concessionaires of underground Coal mines (Class-A coal pit) must take appropriate measures, such as water sprinkling, or water injection to the coal seam to settle down the explosive coal dust scattering in the following sections. 1) Coal working fields, tunneling fields and their surroundings where the explosive coal dust is likely to scatter due to the use of mine machinery for coal excavation and coal picks 2) Blasting places and their surroundings before and after coal seam blasting 3) Coal loading and transferring sites 4) Underground coal stock pile 5) Coal loading to mine-cars Article 266-5 1 The concessionaires of underground Coal mines (Class-A coal pit) must spread an adequate amount of powder generated rocks crushing at all times in underground sections where explosive coal dust scatters and accumulates. 2 The provision of the preceding Paragraph shall not apply to sections where the

	weight ratio of moisture adhering to explosive coal dust is 25 % or higher of the total weight of such coal dust and moisture. 3 The powder mentioned in the preceding Paragraph 1 must not be spread and put on powder shelves if it contains a large amount of free silicic acid. **Section 2 Barrier Shelves for Prevention of Explosion Extension** (Barrier shelves for prevention of explosion extension) Article 266-6 The concessionaires of underground Coal mines (Class-A coal pit) must install one of following barrier shelves to prevent explosion extension caused by explosive coal dust in main haulage tunnels (galleries), the entrance and exit of working places and other necessary sections at mines. 1) quantity of barrier shelves of the powder generated rocks crushing or of barrier shelves of water bags is 0.1 m^3 or more per one (1) m^2 of the average cross section of a tunnel (gallery) 2) quantity of the powder in the density powder zone which is spread such powder on the floor of a tunnel (gallery) is 0.3 m^3 or more per one (1) m^2 of the average cross section of such tunnel (gallery) (Installation methods on the barrier shelves of the powder, barrier of water bags and density powder zone) Article 266-7 1 The concessionaires of underground Coal mines (Class-A coal pit) must install

	barrier shelves of the powder or of water bags in a suitable state to be easily spread and to be dispersed to the whole cross section of the tunnel (gallery) caused by the impulse blowing of the explosion. 2 The barrier shelves of the powder or water bags must be installed in equal intervals along the tunnel (gallery), and the intervals shall be less than thirty (30) m of length. 3 The height of spread powder in the density powder zone must be 0.1 m or more on the floor of the tunnel (gallery). (Obedience items of the technical safety staffs for underground safety & blasting) Article 266-8 1 The technical safety staffs for underground safety & blasting of Coal mines (Class-A coal pit) must obey following items to treat and prevent explosion extension caused by the explosive coal dust. 1) to examine the explosive coal dust scattering and accumulating every day in the sections mentioned in the preceding Article 266-4, to check the treatment of explosive coal dust and prevention facilities for explosion extension such as barrier shelves of the powder and of water bags, and write down the results of examination in the “management record of explosive coal dust”, to report the administrator speedily if it is found abnormality, and; 2) to take accumulated dust that the powder was spread on the floor of a tunnel (gallery) as samples once or more every three (3) months, to measure the quantity of incombustible substance into the dust and to write down the results of examination in the “management record of explosive coal dust”.

	2 The sections where taking accumulated dust samples prescribed in the preceding Paragraph, Item 2, method of sampling and measurement of incombustible substance shall be prescribed in the provisions of the “Regulation on procedures and items of mentioned provided in Mine Safety Law”.

Regulation on Procedures and Items of Mentioned provided in Mine safety Law and its Regulations (NO.1)

February 2017

Article 1 **The "Items, period and contents of training to mineworkers who engage in the hazardous works", based on the provisions of Article 7, paragraph 2 of the Mine Safety Law (hereinafter "the Law"), and of Article 6, paragraph 1 of the Mine Safety Regulations (hereinafter "the Regulations"), are prescribed as follows.**

(1) The combustion work of a boiler with a maximum available pressure of 0.4 Mega-Pascal (MPa) or more

(Education items)	(Necessary period of education and apprenticeship)
1) Items regarding the structures of boilers	4 hours
2) Items regarding the handling of boilers	4 hours
3) Items regarding fuel and the burning thereof	2 hours
4) Items regarding the related Laws and Regulations	2 hours
5) The practices of supplying coal, or fuel, and operation methods of boilers	(period of apprenticeship 3 days)

※ **The apprenticeship period refers to the period during which a person having the proper certification for providing hands-on training accompanies a trainee during the entire period in question, and it shows a minimum period required for the completion of hands-on training. This definition shall apply hereinafter.**

(2) The operation of a special boiler with a maximum available pressure of 0.4 MPa or more

(Education items)	(Necessary period of education and apprenticeship)
1) Items regarding the structures of special boilers	4 hours
2) Items regarding the handling of special boilers	4 hours
3) Items regarding fuel and the burning thereof	2 hours
4) Items regarding the related Laws and Regulations	2 hours
5) The practices of operation methods of special boilers	(period of apprenticeship 3 days)

(3) The work of installation, maintenance and repair of electrical equipment

(Education items)	(Necessary period of education and apprenticeship)

1) Items regarding general matters of a power distribution 2 hours
2) Items regarding electrical work materials, electrical apparatus, and electric railways if they have installed. 2 hours
3) Items regarding electrical work methods 4 hours
4) Items regarding inspection methods and repair methods of electric equipment 4 hours
5) Items regarding wiring diagrams 4 hours
6) Items regarding the related Laws and Regulations 2 hours
7) The practices of installing, maintaining, and repairing electric equipment (period of apprenticeship 5 days)

(4) The maintenance work of portable cap lamps

(Education items) (Necessary period of education and apprenticeship)

1) Items regarding the structures of portable cap lamps 2 hours
2) Items regarding the handling and repair methods of portable cap lamps 2 hours
3) Items regarding necessary electrical knowledge, such as for charging and repairing portable cap lamps 2 hours
4) Items regarding the related Laws and Regulations 2 hours
5) The practices of maintaining portable cap lamps (period of apprenticeship 3 days)

(5) The operation of a hoist for transporting workers, or a hoist with a motor of 50 KW or more

(Education items) (Necessary period of education and apprenticeship)

1) Items regarding the structures of a hoisting device 4 hours
2) Items regarding the handling of a hoisting device 4 hours
3) Items regarding signal methods 2 hours
4) Items regarding electrical knowledge for operating a hoisting device 2 hours
5) Items regarding the related Laws and Regulations 2 hours
6) The practices of operating a hoisting device (period of apprenticeship 5 days)

(6) The operation of a locomotive

(Education items) (Necessary period of education and apprenticeship)

1) Items regarding the structures of a locomotive 4 hours
2) Items regarding the handling of a locomotive 4 hours
3) Items regarding signal methods 2 hours
4) Items regarding electrical knowledge for operating a locomotive 2 hours
5) Items regarding the related Laws and Regulations 2 hours
6) The practices of operating a locomotive (period of apprenticeship 5 days)

(7) The maintenance work of an internal-combustion engine or a diesel locomotive in underground mines

(Education items) (Necessary period of education and apprenticeship)

1) Items regarding the structures of an internal-combustion engine or a diesel locomotive 4 hours
2) Items regarding fuel and the burning thereof 2 hours
3) Items regarding checking methods and repair methods of an internal-combustion engine or a diesel locomotive 4 hours
4) Items regarding the related Laws and Regulations 2 hours
5) The practices of maintaining an internal-combustion engine or a diesel locomotive (period of apprenticeship 5 days)

(8) The maintenance work of a vehicle type mine machine (excluding the machine that an internal-combustion engine is out of use)

(Education items) (Necessary period of education and apprenticeship)

1) Items regarding the structures, functions, and handling methods of a vehicle-type mine machine 4 hours
2) Items regarding the methods of examination, repair, and inspection of a vehicle-type mine machine 4 hours
3) Items regarding the structures, functions, and handling of testing devices, measuring devices, and tools for maintaining a vehicle-type mine machine 4 hours
4) Items regarding fuel and the burning thereof 2 hours
5) Items regarding general knowledge for diagrams of structure on a vehicle-type mine machine 2 hours
6) Items regarding the related Laws and Regulations 2 hours
7) The practices of maintaining a vehicle-type mine machine

(period of apprenticeship 5 days)

(9) The maintenance work of an automobile

(Education items)	(Necessary period of education and apprenticeship)
1) Items regarding the structures, functions, and handling methods of an automobile	4 hours
2) Items regarding the methods of examination, repair, and inspection of an automobile	4 hours
3) Items regarding the structures, functions, and handling of testing devices, measuring devices, and tools for maintaining an automobile	4 hours
4) Items regarding fuel and the burning thereof	2 hours
5) Items regarding general knowledge for diagrams of structure on an automobile	2 hours
6) Items regarding the related Laws and Regulations	2 hours
7) The practices of maintaining an automobile (period of apprenticeship 5 days)	

(10) The operation of a crane with a lifting capacity of five (5) tons or more

(Education items)	(Necessary period of education and apprenticeship)
1) Items regarding the structures of a crane	4 hours
2) Items regarding handling of a crane	4 hours
3) Items regarding the related Laws and Regulations	2 hours
4) The practices of operating a crane (period of apprenticeship 5 days)	

(11) The operation of a vehicle type mine machine (excluding the machine that an internal-combustion engine is out of use)

(Education items)	(Necessary period of education and apprenticeship)
1) Items regarding the structures and handling of devices related to moving a vehicle-type mine machine	4 hours
2) Items regarding the structures, handling and operation of devices related to the operation of a vehicle-type mine machine	4 hours
3) Items regarding fuel and the burning thereof	2 hours
4) Items regarding the related Laws and Regulations	2 hours
5) The practices of operating a vehicle-type mine machine (period of apprenticeship 5 days)	

(12) The operation of an automobile

(Education items)	(Necessary period of education and apprenticeship)
1) Items regarding the structures and handling of devices related to the moving an automobile	4 hours
2) Items regarding the structures and handling of the hydraulic systems of an automobile	4 hours
3) Items regarding fuel and the burning thereof	2 hours
4) Items regarding the related Laws and Regulations	2 hours
5) The practices of operating an automobile	(period of apprenticeship 5 days)

(13) The blasting work

(Education items)	(Necessary period of education and apprenticeship)
1) Items regarding knowledge of explosives	4 hours
2) Items regarding the handling of explosives	4 hours
3) Items regarding blasting methods	4 hours
4) Items regarding the related Laws and Regulations	2 hours
5) The practices of blasting	(period of apprenticeship 10 days)

(14) The rescue work or joint rescue work wearing oxygen breathing apparatus

(Education items)	(Necessary period of education and apprenticeship)
1) Items regarding knowledge of harmful gases and ventilation, etc.,	2 hours
2) Items regarding the structures and handling of oxygen breathing apparatuses	4 hours
3) Items regarding the structures and handling of resuscitators	4 hours
4) Items regarding emergency response work	4 hours
5) Items regarding the prevention of hazards caused by static electricity	2 hours
6) Items regarding the related Laws and Regulations	2 hours
7) The practices of rescue trials wearing oxygen breathing apparatus	(period of apprenticeship 5 days)

(15) The maintenance work of oxygen breathing apparatus and simple life-saving equipment

(Education items) (Necessary period of education and apprenticeship)

1) Items regarding harmful gases and ventilation, etc., 2 hours

2) Items regarding the structures and handling of oxygen breathing apparatuses and simple life-saving equipment 4 hours

3) Items regarding the structures and handling of resuscitators 4 hours

4) Items regarding precise inspection of breathing apparatuses and simple life-saving equipment 4 hours

5) Items regarding the related Laws and Regulations 2 hours

6) The practices of maintaining oxygen breathing apparatuses and simple life-saving equipment

(period of apprenticeship 5 days)

(16) The operation of a coal mining machine which have a motor of 50 kW or more in underground Coal mine (Class-A pit and Class-B pit)

(Education items) (Necessary period of education and apprenticeship)

1) Items regarding the structures of a coal mining machine 4 hours

2) Items regarding the handling of a coal mining machine 4 hours

3) Items regarding signal methods 2 hours

4) Items regarding the electrical knowledge for operation of coal mining machines 2 hours

5) Items regarding the related Laws and Regulations 2 hours

6) The practices of operation of a coal mining machines

(period of apprenticeship 5 days)

(17) The operation of a tunnel heading machine and an enlarging machine which has a motor of 35 kW or more in underground Coal mine (Class-A pit and Class-B pit)

(Education items) (Necessary period of education and apprenticeship)

1) Items regarding the structures of a tunnel heading machine and an enlarging machine 4 hours

2) Items regarding the handling of a tunnel heading machine and an enlarging machine 4 hours

3) Items regarding signal methods 2 hours

4) Items regarding the electrical knowledge for operation of coal mining machines 2 hours

5) Items regarding the related Laws and Regulations 2 hours

6) The practices of operation of a tunnel heading machine and an enlarging machine (period of apprenticeship 5 days)

(18) The operation of a shuttle car in underground Coal mine (Class-A pit and Class-B pit)

(Education items)	(Necessary period of education and apprenticeship)
1) Items regarding the structures of a shuttle car	4 hours
2) Items regarding the handling of a shuttle car	4 hours
3) Items regarding signal methods	2 hours
4) Items regarding the electrical knowledge for operation of a shuttle car	2 hours
5) Items regarding the related Laws and Regulations	2 hours
6) The practices of operation of a shuttle car	(period of apprenticeship 5 days)

(19) The handling and management work of liquid-like substances containing poisonous or deleterious substance, or inorganic cyanides

(Education items)	(Necessary period of education and apprenticeship)
1) Items regarding the chemical properties of poisonous and deleterious substances	4 hours
2) Items regarding the handling and treatment of poisonous and deleterious substances	4 hours
3) Items regarding the related Laws and Regulations	2 hours
4) The practices of the handling and disposal methods of poisonous and deleterious substances	(period of apprenticeship 5 days)

(20) The work of electric welding

(Education items)	(Necessary period of education and apprenticeship)
1) Items regarding the structures of an electric welder	4 hours
2) Items regarding the handling of an electric welder	4 hours
3) Items regarding the electrical knowledge of electric welding	2 hours
4) Items regarding the related Laws and Regulations	2 hours
5) The practices of electric welding	(period of apprenticeship 3 days)

(21) The work of gas welding

(Education items) (Necessary period of education and apprenticeship)

1) Items regarding the structures of a gas welder 4 hours

2) Items regarding the handling of a gas welder 4 hours

3) Items regarding the knowledge of the flammable gases and of oxygen used in gas welding 4 hours

4) Items regarding the related Laws and Regulations 2 hours

5) The practices of gas welding (period of apprenticeship 3 days)

(22) The work of advanced drilling or a drilling of gas drainage in underground Coal mine (Class-A pit and Class-B pit)

(Education items) (Necessary period of education and apprenticeship)

1) Items regarding the structures of a drilling machine 4 hours

2) Items regarding the handling of a drilling machine 4 hours

3) Items regarding knowledge of geology 2 hours

4) Items regarding measures to be taken in case of an abnormality 4 hours

5) Items regarding the related Laws and Regulations 2 hours

6) The practices of advanced drilling and a drilling of gas drainage (period of apprenticeship 5 days)

(23) The handling of sultry and melting substances

(Education items) (Necessary period of education and apprenticeship)

1) Items regarding the handling and treatment of sultry and melting substances 4 hours

2) Items regarding the related Laws and Regulations 2 hours

3) The practices of the handling and treatment of sultry and melting substances (period of apprenticeship 3 days)

(24) The operation of a main fan in underground Coal mine (Class-A coal pit and Class-B coal pit)

1) Items regarding the structures of a main fan 4 hours

2) Items regarding the handling of a main fan 4 hours

3) Items regarding the electrical knowledge for operation of a main fan 2 hours

4) Items regarding the related Laws and Regulations 2 hours

5) The practices of the operation of a main fan

(period of apprenticeship 5 days)

(25) The operation of blowers for flammable gas induction in underground Coal mine (Class-A coal pit and Class-B coal pit)

1) Items regarding the properties of flammable gas induction 2 hours

2) Items regarding the structures of a blower for flammable gas induction 4 hours

3) Items regarding the handling of a blower for flammable gas induction 4 hours

4) Items regarding protective devices and gas induction piping systems 4 hours

5) Items regarding the electrical knowledge for operation of a blower for flammable gas induction 2 hours

6) Items regarding the related Laws and Regulations 2 hours

7) The practices of the operation of a blower for flammable gas induction (period of apprenticeship 5 days)

Article 2 The "Standards of the Inspection and Official Tests for a Mine particularly Dangerous Machinery, Equipment, Explosives, and other Materials", based on the provisions of Article 8, Paragraph 1 of the Law, and of Article 10, Paragraph 1 of the Regulations, are prescribed as follows.

1. The types and standards of the official approval system

(1) Individual official approval system

The individual official approval system is performed every targeted products such as particularly dangerous machineries, equipment and other materials individually, and those products adapting to the standards that the Minister in charge of mines sector establishes.

The machineries, equipment and other materials used in a mine that require individual official approval are as follows.

1) Second class pressure vessels (vessels in which gas having a gauge pressure of 0.2 MPa or higher is held, and the inner volume is 0.04 m^3 or more)

2) Small boilers

3) Small size pressure vessels (vessels in which gas having a gauge pressure of 0.1 MPa or lower is held, and the inner volume is no more than 0.04 m^3)

(2) Categorized official approval system

The categorized official approval system is performed to be practiced every models such as particularly dangerous machineries, equipment, explosives, and various gas detectors, life-saving equipment and other materials, and these products must be adapted to the standards that the Minister in charge of mines sector establishes.

An applicant (a foreign manufacturer in the case of import products) who is going to apply a categorized official approval should have facilities necessary for the examination such as the dangerous machineries, equipment, explosives, and various gas detectors, life-saving equipment and other materials.

The particularly dangerous machineries, equipment, explosives, and various gas detectors, life-saving equipment and other materials used in a mine that require categorized official approval are as follows.

1) Explosion-proof electrical apparatuses
2) Dust respirators
3) Gas masks
4) Automatic electric shock preventers for use with A/C arc welders
5) Personal insulating protective equipment
6) Insulating equipment
7) Hard hats
8) Air-purifying respirators with electric fans
9) Over-load protection devices for cranes or mobile cranes

2. Requirements for the installation of particularly dangerous machineries, equipment, explosives, and various gas detectors, life-saving equipment and other materials, etc. to pass the examination of official approvals

(1) The requirements for the installation of machines that require particularly dangerous work to be performed, such as boilers and cranes, are as follows.

1) A manufacturing license is required
2) An examination is required for manufactured and imported machines
3) Machines for which there is no certificate showing that examination has been passed cannot be used.

(2) Machineries, equipment, explosives, and various gas detectors, life-saving equipment and other materials, etc. that require dangerous work to be performed, require hazardous work to be performed, or are used in dangerous places including explosion-proof electrical apparatuses, gas masks, personal insulating protective

equipment, and insulating equipment, and the requirements for these products to be equipped are as follows.

1) Explosion-proof electrical apparatuses, gas masks, personal insulating protective equipment, and insulating equipment must be adapted to the standards that the Minister in charge of mines sector establishes.

2) These products above must be equipped with safety devices

(3) Machineries, equipment, explosives, and various gas detectors, life-saving equipment and other materials, etc. that are used for preventing hazards and for preventing health problems including dust respirators, hard hats, automatic electric shock preventers for use with A/C arc welders, and air-purifying respirators with electric fans, and the requirements for these products to be equipped are as follows.

1) Dust respirators, hard hats, automatic electric shock preventers for use with A/C arc welders, and air-purifying respirators with electric fans must be adapted to the standards that the Minister in charge of mines sector establishes.

2) These products above must be equipped with safety devices

Article 3 The items mentioned on "Construction Program" and "Detailed Design of Facility" attached the "Facility Plan" when mine buildings, structures or other facilities used in mineral-related operations intend to be established or modified, based on the provisions of Article 9, Paragraph 1 of the Law, and of Article 13, Paragraph 1 and 3 of the Regulations, are prescribed as follows.

1. A boiler or a specially designed boiler with a maximum pressure in normal use which exceeds 0.4 MPa

(1) Construction program

1) Purpose of use

2) Installation location

3) Planned starting date of construction

4) Planned completion date of construction

(2) Detailed design of facility

1) The models, structures, and principal dimensions of a boiler or a specially designed boiler, and the types, structures, and quantities of the safety valves thereof

2) Mine smoke (soot) generating facilities; raw fuel; and quantity of emission of mine smoke (soot)

a) The time schedule during which a boiler or a specially designed are operated per

day, and the total number of days in a month on which they are operated

b) The kinds, percentages of co-combustion, calorific value, and amount of content (sulfur, nitrogen, and ashes) of raw fuel

c) The amount of fuel consumption per hour

d) The quantity of emission of mine smoke (soot) (unit: cubic meters per hour converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: m^3/hN), temperature, and velocity of emission of mine smoke (soot)

e) The quantity of generating dust (unit: milligrams per public meter, converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3kPa: mg/m^3N)

f) The quantity of emission gas of sulfur oxides (unit: cubic meters per hour converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: m^3/hN)

g) The quantity of emission gas of nitrogen oxide (unit: cubic centimeters per cubic meter, converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: cm^3/m^3N)

3) The following items in regards to mine smoke (soot) treatment facilities, and exhaust gas treatment methods

a) The types, models, structures, maximum capacities (including collection efficiencies), quantities, and installation locations of the treatment facilities

b) The operation hours of mine smoke (soot) treatment facilities per day, and the number of days on which these facilities are operated in a month

c) The quantity of mine smoke (soot) treatment (unit: cubic meters per hour converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: m^3/hN), temperature, and velocity of emission of mine smoke (soot) that are to be specified separately before and after treatment

d) The concentration of oxygen in the mine smoke treatment (unit: percentage of capacity)

e) The actual height of a chimney, diameter or a cross section of the chimney

f) The quantity of generating dust (unit: milligrams per public meter, converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: mg/m^3N)

g) The quantity of emission gas of sulfur oxides (unit: cubic meters per hour converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: m^3/hN) that is to be specified separately before and after

treatment

h) The concentration of emission gas of nitrogen oxide (unit: cubic centimeters per cubic meter, converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: cm^3/m^3N) that is to be specified separately before and after treatment

4) The emission methods of mine smoke (soot)

5) The maximum pressure of a boiler or a specially designed boiler in normal use

6) The structures and floor areas of the building for a boiler or a specially designed boiler

7) The areas of grates and the heating surface areas of a boiler or a specially designed boiler

(3) Attached documents and diagrams

1) The design specifications and installation diagrams of a boiler or a specially designed boiler

2) The structures, materials, diameter, and actual height of a chimney

3) Diagrams on the chain of mine smoke (soot) treatment

2. An aerial ropeway

(1) Construction program

1) Purpose of use

2) Installation location

3) Planned starting date of construction

4) Planned completion date of construction

(2) Detailed design of facility

1) The methods, extended length, and maximum transportation volume of an aerial ropeway

2) The round-trip distance between both sides

3) The types of motors used and the kilowatt ratings (kW)

4) The structures, principal dimensions, and layout drawings of transmission devices and traction rope tension devices

5) The structures and principal dimensions of track cable tension devices

6) The types and structures of brakes

7) The structures of bucket and clip devices

8) The dead weights of a bucket, the maximum load capacities, and the distances

between buckets

9) The types, structures, lengths, diameters, and ultimate tensile strength of ropes

10) The types, structures, and principal dimensions of support columns and rope support devices

11) The maximum velocity of rope operation

12) The maximum inclination of rope

13) Safety rate of an aerial ropeway (attached including calculation statements)

14) Signal devices

15) Safety equipment for roadways, buildings, etc.

(3) Attached documents and diagrams

1) Plane figures (2D) of roadways (scale: 1/1,000 to 1/6,000),

2) Longitudinal section plans of roadways (horizontal scale: 1/1,000 to 1/6,000; vertical scale: 1/100 to 1/600)

3. Railroad tracks for a locomotive (except an electric locomotive)

(1) Construction program

1) Purpose of use

2) Installation location

3) Planned starting date of construction

4) Planned completion date of construction

(2) Detailed design of facility

1) The extended length of railroad tracks

2) The minimum curve radiuses and the maximum tilting angles

3) Track gauge, the weights of the unit lengths of tracks, and the structures of track beds, the difference between a single track and dual-tracked in rail gauges

4) The lengths, widths, and heights of haulage tunnels (galleries), and the distances from the center of haulage tunnels (galleries) to both ends

5) The types, models, dead weights, pulling capacities, principal dimensions, and quantities of locomotives

6) In case of a steam locomotive, the models, kilowatt ratings, and methods of connecting engines with driving wheels;

the structures, grate areas, heating areas, and maximum pressure in normal use of a boiler; the dates on which hydraulic testing was conducted and testing results thereof; the types, capacities, and quantities of feed engines attached to locomotives;

the loads of fuel and water supply of locomotives

7) In case of an internal combustion engine, the following items in regards to internal combustion engines used in underground mining, such as the types, models, kilowatt ratings, methods of connecting engines with driving wheels, and kinds and loads of fuel

a) The structures of internal combustion engines

b) The amount of fuel consumption per a kilowatt

c) The maximum explosion pressures and mean effective pressures

d) The components of emission gas and the structures of emission gas treatment devices

e) Layout drawings of fire extinguishing apparatuses and auxiliary equipment of an internal combustion locomotive

f) The ventilation methods and ventilation quantity in haulage tunnels (galleries) where these machines are operated

g) Location and structures of a gas filling station and fuel oil storage facility in underground mining

h) The transportation modes of fuel in underground mining

8) In case of a compressed-air locomotive, the structures and kilowatt ratings of motors, and the structures and the maximum pressure in normal use of compressed-air receivers

9) In case of a battery locomotive, the following items

a) The voltages and the types, capacities, quantities, and kilowatt ratings of storage batteries

b) The types and structures of brakes

c) Alarm and lighting systems

d) The structures, principal dimensions, dead weights, maximum loading capacities, and passenger limits of railcars

e) The maximum number of railcars that can be connected, and explanatory drawings illustrating the coupling devices between railcars

f) Maximum operation speeds

g) Signal devices

(3) Attached documents and diagrams

1) Design specifications of a locomotive

2) Plane figures (2D) of railroad tracks (scale: 1/1,000 to 1/6,000)

3) Longitudinal section plans of railroad tracks (horizontal scale: 1/1,000 to 1/6,000;

vertical scale: 1/100 to 1/600)

4. An internal combustion engine in underground mining (excluding those used in vehicle-type mine machines and in automobiles)

(1) Construction program

1) Purpose of use

2) Installation location

3) Planned starting date of construction

4) Planned completion date of construction

(2) Detailed design of facility

1) The types, models, and kilowatt ratings of an internal combustion engine

2) Explanatory drawings of the structures of the internal combustion engine

3) The kinds of fuel and the amounts of fuel consumption per kilowatt-hour

4) The maximum explosion pressures and the mean effective pressures

(3) Attached documents and diagrams

1) Components of emission gas, and the methods of emission gas treatment and the explanatory drawings thereof

2) The layout drawings of fire extinguishing apparatuses and auxiliary equipment of an internal combustion engine

3) The structures of engine rooms

4) The methods of ventilation, the quantity of ventilation, and the ventilation management system at the location where an internal combustion engine is installed

5) The location, structures, and drawings of a fuel oil depot in underground mining

5. Mine water treatment facilities

(1) Construction program

1) Purpose of use

2) Installation location

3) Planned starting date of construction

4) Planned completion date of construction

(2) Detailed design of facility

1) Mine water treatment facilities

a) Mine water treatment methods

b) The structures, maximum capacities, quantities, and installation locations of catchment facilities (including conduits)

c) Items in regards to the facilities used for neutralization, sedimentation, mixing, classification, flocculation, enrichment, absorption, deionization, decomposition, filtration, dehydration, and aeration, are as follows.

i) The types, models, structures, principal dimensions, maximum capacities, quantities, and installation locations

ii) The time schedule during which the facilities are operated per day, and the total number of days in a month on which they are operated

iii) The types, models, kilowatt ratings, purposes of use, and quantities of motors

iv) The kinds of chemicals used, and the daily usage of each kind of use

v) The structures where mine water treatment facilities are installed

d) The value and quantity of contamination level before treatment of the mine water

e) The value and quantity of contamination level after treatment of the mine water,

f) The sorts and content of sediments that are generated per a month, as a result of treating mine water, and the disposal methods thereof

g) The discharge methods of mine water (including the locations to which waste water is discharged)

h) The value and quantity of contamination level of the effluents in the drainage outlet

i) The value and quantity of contamination level in the river, lake, swamp, and ocean regions near areas from where mine water is discharged, and, in case of the river, the quantity of water flow

2) The treatment and disposal of mining wastes facilities

a) Disposal methods of mining wastes

b) The content of each type of mining wastes and the respective amounts that are generated per a month

c) The following items in regards to the facilities used for drying or solidifying mining wastes into concrete, and in regards to transportation systems (including transportation routes)

i) The types, models, structures, principal dimensions, maximum capacities, quantities, and installation locations

ii) The time schedule during which the facilities are operated per day, and the total number of days in a month on which they are operated

iii) The types, models, kilowatt ratings, purposes of use, and quantities of motors used in the facilities

iv) The methods for preventing permeation of thickener effluents, etc. into the floors and grounds where mining waste treatment facilities are installed

(3) Attached documents and diagrams

1) The structures of constructions where mining waste treatment facilities are installed

2) The diagrams of treatment flowchart of mine water

3) Block diagrams illustrating mining wastes, from its creation to its disposal

4) Layout drawings of fire prevention facilities and fire extinguishing apparatuses

6. A hauling facilities by a hoisting device

(1) Construction program

1) Purpose of use

2) Installation location

3) Planned starting date of construction

4) Planned completion date of construction

(2) Detailed design of facility

1) The types and kilowatt ratings of the motor of a hoisting device

2) The principal dimensions and structures of a hoisting device

3) The installation location of a hoisting device and the structures of the room of a hoisting device

4) The types and structures of the brakes of hoisting device

5) The types and structures of depth indicators of a hoisting device

6) The types, principal dimensions, and structures of scaffolding, and the principal dimensions and structures of head sheaves

7) The structures, materials, and principal dimensions of a vertical shaft, and the types, structures, and principal dimensions of guides of the shaft

8) The extended length, minimum curve radiuses, and maximum tilting angles of a hoisting device used in inclined shafts, and the weights of the unit lengths of tracks and the structures of track beds, the difference between a single track and dual-tracked in rail gauges

9) The widths, heights, and distances from the center of the track to both ends of the inclined shaft where a hoisting device is installed

10) The structures, materials, principal dimensions, dead weights, maximum numbers of passengers, and maximum payloads of cages or workers carry (for cages that are also used for transporting cargo other than people, the structures, principal dimensions, dead weights, and maximum payloads of railcars that are loaded are specified), and the maximum numbers of a man car that can be connected

11) The types, structures, lengths, diameters, ultimate tension strengths, and safety factor (calculation statements of the safety factor are to be included) of the rope

12) The structures and principal dimensions of coupling devices that connect the rope to cages or man riding cars

13) Tension angles of the rope

14) Rope speed limits

15) The types, structures, and principal dimensions of apparatuses that prevent hazards resulting from excessive hoisting or lowering and of safety apparatuses

16) The structures and arrangement conditions of disaster prevention apparatuses in mine-mouth, sublevels, areas near mine bottoms, and other platforms

17) The structures of derailment prevention devices

18) Signal equipment

(3) Attached documents and diagrams

1) Plane figures (2D) of railroad tracks for a hoisting device used in inclined shaft (scale: 1/1,000 to 1/6,000)

2) Longitudinal section plans of railroad tracks for a hoisting device used in inclined shaft (horizontal scale: 1/1,000 to 1/6,000; vertical scale: 1/100 to 1/600)

7. An automobile for transporting mineworkers in underground mining

(1) Construction program

1) Purpose of use

2) Installation location

3) Planned starting date of construction

4) Planned completion date of construction

(2) Detailed design of facility

1) The types, models, structures, principal dimensions, vehicle numbers, and the maximum number of passengers of an automobile

2) The structures of seats, boarding & alighting apparatuses, and apparatuses used for preventing passengers from falling,

3) The types and structures of brakes of an automobile

4) The types, models, and kilowatt ratings of internal combustion engine of an automobile

5) The maximum moving speeds of an automobile

6) The kinds of fuel, and the amount of fuel consumption per kilowatt-hour of an automobile

7) The components of emission gas of an automobile, and the treatment methods of the emission gas

8) The ventilation methods and ventilation quantity in locations in the underground mining where automobiles are operated

9) The signal equipment and lighting system of haulage tunnels (galleries) where automobiles are regularly operated

10) The maximum tilt angles of haulage tunnels (galleries) where automobiles are regularly operated

(3) Attached documents and diagrams

1) Layout plans of fire extinguishing apparatuses

2) Plane figures (2D) of haulage tunnels (galleries) where automobiles are regularly operated (scale: 1/1,000 to 1/6,000)

3) Longitudinal section plans of haulage tunnels (galleries) where automobiles are regularly operated (horizontal scale: 1/1,000 to 1/6,000; vertical scale: 1/100 to 1/600)

8. A fuel oil storage facility or a gas filling station in underground mining

(1) Construction program

1) Purpose of use

2) Installation location

3) Planned starting date of construction

4) Planned completion date of construction

(2) Detailed design of facility

A fuel oil storage facility or a gas filling station in underground mining

1) Maximum storage quantity

2) The structures of a fuel oil storage facility or a gas filling station

3) The methods of fuel oil storage

4) The methods of receiving and delivering fuel oil or the methods of refueling

5) Consumption quantity of fuel oil per month

6) Fire prevention measures

(3) Attached documents and diagrams

1) Plane figures (2D) (scale: 1/1,000 to 1/6,000), and Longitudinal section plans (vertical scale: 1/100 to 1/600) of a fuel oil storage facility and a gas filling station

2) The types, quantities, and layout drawing of fire extinguishing apparatuses

3) Diagrams illustrating the relationships between the locations of a fuel oil storage facility or a gas filling station and the adjacent facilities and ventilation systems in underground mining

9. A coal preparation plant using motor

(1) Construction program

1) Installation location

2) Planned starting date of construction

3) Planned completion date of construction

4) The amount of raw coal handled per month

5) The grades of each type of clean coal and the respective amounts that are produced per month

(2) Detailed design of facility

1) The types, models, structures, principal dimensions, capacities, and quantities of principal machines and devices of a coal preparation plant

2) The types, quantities, and kilowatt ratings of the motors of a coal preparation plant

3) The amounts of waste stones generated in a month, the content contained therein, and disposal methods of waste stones thereof

4) The mining wastes treatment facilities

a) The content of each type of mining wastes, and the respective amounts that are generated per a month

b) The disposal methods of mining wastes

c) The following items in regards to facilities and transportation systems (including transportation routes) used for oil-water separation, neutralization, and crushing, and in regards to facilities used for classification, sedimentation, enrichment, and filtration

i) The types, models, structures, principal dimensions, maximum capacities, quantities, and installation locations

ii) The time schedule of operation of facilities per day

iii) The types, models, kilowatt ratings, purposes of use, and quantities of motors

iv) The value and quantity of contamination level of waste water

v) The measures for preventing the permeation of thickener effluents into the floors or grounds where facilities are installed,

vi) The measures for preventing waste oil spills

vii) The measures for preventing scattering dust at crushing facilities

5) The following items in regards to flotation machines, heavy liquid separators, and jig separators between coal and wastes (hereinafter referred to as "separators")

a) The time schedule during which the separators are operated per day, and the total number of days in a month on which they are operated

b) The types of consumable materials used in the separators, their methods of use, and the average amount of use per day

c) The value and quantity of contamination level of waste water discharged from separators

6) Waste water treatment facilities installed in a coal preparation plant

a) The kinds of chemicals on neutralization and flocculation used, and the monthly usage amounts thereof

b) The values and quantity of contamination level before and after the treatment of wastewater at the treatment facilities

c) The methods of discharging effluents (including locations to which the effluents are discharged)

d) The value and quantity of contamination level of effluents in each port discharged

e) The types, amounts of sediments generated per a month

f) Disposal methods of sediments

(3) Attached documents and diagrams

1) Summary drawings of structures and designs of a coal preparation plant

2) The types, quantities, and layout drawings of fire extinguishing apparatuses

3) Layout drawings of motors, principal machines and devices

4) Drawings illustrating the topography, facilities, and the public waters to which the effluent wastewater discharge near the installation locations

5) Diagrams of flow charts of coal preparations

6) Diagrams of flow charts of wastewater generated from a coal separation plant

10. A processing plant or a crushing plant using motor

(1) Construction program

1) Installation location

2) Planned starting date of construction

3) Planned completion date of construction

4) The amount of raw ore handled per month

5) The grades of each kind of mineral concentrate, and the respective amounts that are produced per month

6) The contents of each kind of waste stones and sediments (tailings), and the respective amounts that are generated per month,

7) The contents of each type of poisonous and deleterious substances, and the respective amounts that are handled per month, as well as their purposes of use

8) The contents of each type of flotation reagents, and the respective amounts that are handled per month

9) The contents of each type of materials (except flotation reagents) and the respective amounts that are handled per month

10) The amount of industrial water used, according to the purpose of use

11) Working places where dust is scattered, and the methods of prevention of dust scattering

12) Working places where there is a risk of danger, and the methods of prevention of mine disasters

13) Working places where there is significant risk of harmful gases being generated or leaked, and appropriate measures to be taken

14) Summaries of fire prevention apparatuses and fire extinguishing apparatuses

15) The types, models, structures, capacities, and quantities of fire extinguishers

(2) Detailed design of facility

1) A processing plant or ore crushing facilities

a) Ore dressing methods or ore crushing methods

b) The following items in regards to crushers, washers, sieves, classifiers, ore grinders, concentrators, dehydrators, filters, flocculation or sedimentation apparatuses, and transportation facilities

i) The types, models, structures, principal dimensions, maximum capacities, quantities, and installation locations

ii) The time schedule during which the facilities are operated per day, and the total number of days in a month on which they are operated

iii) The types and grades of raw ores and materials, and the amounts supplied per

hour

c) Drying furnaces

i) The types, models, structures, principal dimensions, scales, maximum capacities, quantities, and installation locations

ii) The time schedule during which the facilities are operated per day, and the total number of days in a month on which they are operated

iii) The kinds, percentages of co-combustion, calorific value, and amount of content (percentages of sulfur, nitrogen, and ashes) of raw fuel, and amount of fuel consumption per hour

iv) The types and grades of raw ores and materials, and the amounts supplied per hour

v) The quantity of emission of mine smoke (soot) (unit: cubic meters per hour converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: m^3/hN), temperature, and velocity of emission of mine smoke (soot)

vi) The quantity of generating dust (unit: milligrams per public meter, converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: mg/m^3N)

vii) The quantity of emission gas of sulfur oxides (unit: cubic meters per hour converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: m^3/hN)

viii) The concentration of emission gas of nitrogen oxide (unit: cubic centimeters per cubic meter, converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: cm^3/m^3N)

ix) Treatment and emission methods of mine smoke (soot), and disposal methods of collected substances

x) Diagrams of flow charts of mine smoke (soot) treatment

xi) The amount of dust and other substances collected per month

d) The following items in regards to dust collection facilities, emission gas cleaning facilities, desulfurization facilities, and de-nitrification facilities

i) The types, models, structures, maximum capacities (including collection efficiencies), quantities, and installation locations

ii) The types, hourly usage amounts of chemicals, the concentrations of its solutions, and pH (the values before and after use are to be specified separately)

iii) The time schedule during which the facilities are operated per day, and the total number of days in a month on which they are operated

iv) The quantity of emission of mine smoke (soot) (unit: cubic meters per hour converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: m^3/hN), temperature, and velocity of emission of mine smoke (soot) that is to be specified separately before and after treatment

v) The concentration of oxygen in mine smoke treatment (unit: percentage)

vi) The actual height of a chimney, diameter or a cross section of the chimney

vii) The quantity of generating dust that is to be specified separately before and after treatment (unit: milligrams per public meter, converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: mg/m^3N)

viii) The quantity of emission gas of sulfur oxides that is to be specified separately before and after treatment (unit: cubic meters per hour converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: m^3/hN)

ix) The quantity of emission gas of nitrogen oxide that is to be specified separately before and after treatment (unit: cubic centimeters per cubic meter, converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: cm^3/m^3N)

x) The value and quantity of contamination level of wastewater discharged from the facilities

e) The types, models, kilowatt ratings, purposes of use, and quantities of motors

f) The structures of buildings where a processing plant or ore crushing facilities are installed

2) Treatment and disposal of sediments (tailings)

a) Disposal methods of sediments (tailings)

b) The contents of each type of sediments (tailings) and the respective amounts that are generated per month

c) The following items in regards to sediments (tailings) transportation facilities (including transportation routes) and to facilities used for classification, sedimentation, enrichment, dehydration, and filtration

i) The types, models, structures, maximum capacities, quantities, and installation locations

ii) The time schedule during which the facilities are operated per day, and the total number of days in a month on which they are operated

iii) The value and quantity of contamination level of waste water discharged from the facilities

iv) The types, models, kilowatt ratings, purposes of use, and quantities of motors in

the facilities

v) The structures of buildings where treatment facilities of sediments (tailings) are installed

3) Treatment and disposal of mining wastes

a) Disposal methods of mining wastes

b) The contents of each type of mining wastes and the respective amounts that are generated per month

c) The following items in regards to facilities used for drying, oil-water separation, neutralization, and crushing, and in regards to facilities used for transportation (including transportation routes), and in regards to facilities used for classification, sedimentation, enrichment, and filtration.

i) The types, models, structures, principal dimensions, maximum capacities, quantities, and installation locations

ii) The time schedule during which the facilities are operated per day, and the total number of days in a month on which they are operated

iii) The value and quantity of contamination level of wastewater discharged from the facilities

iv) The measures for preventing the permeation of thickener effluents into the floors or grounds where facilities are installed

v) The measures for preventing waste oil spills

vi) The measures for preventing scattering dust at crushing facilities

d) A mining wastes incinerator

i) The types, models, structures, principal structures, maximum capacities, quantities, and installation locations of a mining wastes incinerator

ii) The time schedule during which the facilities are operated per day, and the total number of days in a month on which they are operated

iii) The kinds, percentages of co-combustion, calorific value, and amount of content (percentages of sulfur, nitrogen, and ashes) of raw fuel, and amount of fuel consumption per hour

iv) The kinds of mining wastes, and the amount of mining wastes incinerated per hour

v) The quantity of emission of mine smoke (soot) (unit: cubic meters per hour converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: m^3/hN), temperature, and velocity of emission of mine smoke (soot) that are to be specified separately before and after treatment

vi) The quantities of generating dust and hydrogen chloride that are to be specified

separately before and after treatment (unit: milligrams per public meter, converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: mg/m^3N)

vii) The quantity of emission gas of sulfur oxides that is to be specified separately before and after treatment (unit: cubic meters per hour converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: m^3/hN)

viii) The concentration of emission gas of nitrogen oxide that is to be specified separately before and after treatment (unit: cubic centimeters per cubic meter, converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: cm^3/m^3N)

ix) Treatment and emission methods of mine smoke (soot), and disposal methods of collected substances

x) Diagrams of flow charts of mine smoke (soot) treatment

xi) The amount of dust and other substances collected per month

e) Dust collection facilities, emission gas cleaning facilities, desulfurization facilities, and de-nitrification facilities

i) The types, models, structures, maximum capacities (including collection efficiencies), quantities, and installation locations

ii) The kinds, hourly usage amounts of chemicals, the concentrations of its solutions, and pH (the values before and after use are to be specified separately)

iii) The time schedule during which the facilities are operated per day, and the total number of days in a month on which they are operated

iv) The quantity of emission of mine smoke (soot) (unit: cubic meters per hour converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: m^3/hN), temperature, and velocity of emission of mine smoke (soot) that is to be specified separately before and after treatment

v) The concentration of oxygen in the mine smoke treatment (unit: percentage)

vi) The actual height of a chimney, diameter or a cross section of the chimney

vii) The quantities of generating dust and hydrogen chloride that are to be specified separately before and after treatment (unit: milligrams per public meter, converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: mg/m^3N)

viii) The quantity of emission gas of sulfur oxides that is to be specified separately before and after treatment (unit: cubic meters per hour converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa:

m^3/hN)

ix) The concentration of emission gas of nitrogen oxide that is to be specified separately before and after treatment (unit: cubic centimeters per cubic meter, converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: cm^3/m^3N)

x) The value and quantity of contamination level of wastewater discharged from the facilities

xi) The methods for preventing the permeation of waste oil into the floors or grounds where dust collection facilities and the like are installed

xii) The methods for preventing waste oil spills

f) The types, models, kilowatt ratings, purposes of use, and quantities of motors in the above-mentioned facilities

g) The structures of buildings where dust collection facilities, emission gas cleaning facilities, desulfurization facilities, and de-nitrification facilities are installed

4) Wastewater treatment facilities

a) Wastewater treatment methods

b) Diagrams of flow charts of wastewater generated from a processing plant or a crushing plant

c) The structures, maximum capacities, quantities, and installation locations of catchment facilities (including conduits)

d) The following items in regards to facilities used for neutralization, sedimentation, mixing, classification, flocculation, enrichment, absorption, deionization, decomposition, filtration, dehydration, and aeration

i) The types, models, structures, principal dimensions, maximum capacities, quantities, and installation locations

ii) The time schedule during which the facilities are operated per day, and the total number of days in a month on which they are operated

iii) The types, models, kilowatt ratings, purposes of use, and quantities of motors

iv) The kinds of chemicals used, and the daily usage of each kind of use

v) The structures of buildings where wastewater treatment facilities are installed

e) The value and quantity of contamination level before treatment of wastewater

f) The value and quantity of contamination level after treatment of wastewater

g) The sorts and content of sediments that are generated per a month, as a result of treating wastewater, and the disposal methods thereof

h) The discharge methods of wastewater (including the locations to which the water is discharged)

i) The value and quantity of contamination level of the effluents in each drainage outlet

j) The value and quantity of contamination level in the river, lake, swamp, and ocean regions near areas from where wastewater is discharged, and in case of the river, the quantity of water flow

5) The following items in regards to reservoirs

a) The structures, maximum capacities, quantities, and installation locations of reservoirs

b) The topography, geography, amounts of rainfall, and catchment areas near the installation locations of reservoirs

c) The types and structures of embankments

6) Crushers and grinding mills having motors rated at 75 kilowatts or higher (excluding wet types and closed types), and sieves having motors rated at 15 kilowatts or higher (excluding wet types and closed types),

a) The methods for preventing the scattering of dust

b) The types and structures of sprinkler systems, and the amount of water sprinkled per amount of dust treated

c) The types and structures of dust covers

d) The types, structures, dust collection efficiencies, the rated output of motors, and the structures of hoods of dust collectors

e) The structures of buildings where crushers, grinding mills, and sieves are installed

7) Belt conveyors having a belt width of 0.75 meters or wider (excluding closed types) and bucket conveyors having buckets with a capacity of 0.03 cubic meters or higher (excluding closed types)

a) The methods for preventing the scattering of dust

b) The numbers of belt conveyors that are connected

c) The sorts of cargo

d) The types, structures, and installation locations of sprinkler systems, and the amount of water sprinkled per amount transported

e) The types and structures of dust covers

f) The types, structures, dust collection efficiencies, the rated output of motors, and the structures of hoods of dust collectors

g) The structures of buildings where belt conveyors or bucket conveyors are installed

8) Ore storage spaces having an area of 1,000 square meters or larger

a) The methods for preventing the scattering of dust

b) The kinds of minerals and the percentage of water contained therein

c) The types, structures, quantities, and sprinkling methods of sprinkler systems

d) The types of dust covers

e) The types of sprayed liquid chemicals and the spraying methods thereof

f) Methods of compacting surface layers

g) The structures of buildings where ore storage spaces are installed

9) Attached documents and diagrams

a) diagrams indicating the locations of the outlets of mine smoke (soot) and the drainage outlets of wastewater

b) Layout diagrams of fire prevention apparatuses and fire extinguishing apparatuses

c) Diagrams of flow charts of processing facilities or ore crushing facilities

d) Diagrams of flow charts of water system

e) Maps of areas neighboring processing facilities or ore crushing facilities (scale: 1/50,000 or more)

11. A calcination plant or a drying plant

(1) Construction program

1) Installation location

2) Planned starting date of construction

3) Planned completion date of construction

4) The grades of each kind of raw ore and the respective amounts that are handled per month

5) The grades of each kind of product and calcined ore and the respective amounts produced per month

6) The components of each type of deleterious substances and poisonous substances and the respective amounts handled per month, as well as their purposes of use, locations of handling, and methods of handling

7) Working places where dust is scattered, and the methods of prevention of dust scattering

8) Working places where there is a risk of danger, and the methods of prevention of mine disasters

9) Working places where there is significant risk of harmful gases being generated or leaked, and appropriate measures to be taken

10) Summaries of fire prevention apparatuses and fire extinguishing apparatuses

11) The types, models, structures, capacities, and quantities of fire extinguishers

(2) Detailed design of facility

1) A calcination plant or a drying plant and other facilities attached to these

a) The methods of calcination or methods of drying

b) Crushers, sieves, classifiers, and ore grinders

i) The types, models, structures, principal dimensions, maximum capacities, quantities, and installation locations

ii) The time schedule during which the facilities are operated per day, and the total number of days in a month on which they are operated

iii) The kinds and grades of raw ores and the amounts provided per hour

c) The following items in regards to a calcination plant or a drying plant

i) The types, models, structures, principal dimensions, maximum capacities, quantities, and installation locations

ii) The time schedule during which the facilities are operated per day, and the total number of days in a month on which they are operated

iii) The kinds, percentages of co-combustion, calorific value, and amount of content (percentages of sulfur, nitrogen, and ashes) of raw fuel, and amount of fuel consumption per hour

iv) The kinds and grades of raw ores and materials, and the amounts supplied per hour

v) The quantity of emission of mine smoke (soot) (unit: cubic meters per hour converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: m^3/hN), temperature, and velocity of emission of mine smoke (soot)

vi) The quantity of generating dust (unit: milligrams per public meter, converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: mg/m^3N)

vii) The quantity of emission gas of sulfur oxides (unit: cubic meters per hour converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: m^3/hN)

viii) The concentration of emission gas of nitrogen oxide (unit: cubic centimeters per cubic meter, converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: cm^3/m^3N)

ix) Treatment and emission methods of mine smoke (soot), and disposal methods of collected substances

x) Diagrams of flow charts of mine smoke (soot) treatment

d) The following items in regards to dust collection facilities, emission gas cleaning

facilities, desulfurization facilities, and de-nitrification facilities

i) The types, models, structures, maximum capacities (including collection efficiencies), quantities, and installation locations

ii) The types, hourly usage amounts of chemicals, the concentrations of its solutions, and pH (the values before and after use are to be specified separately)

iii) The time schedule during which the facilities are operated per day, and the total number of days in a month on which they are operated

iv) The quantity of emission of mine smoke (soot) (unit: cubic meters per hour converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: m^3/hN), temperature, and velocity of emission of mine smoke (soot) that is to be specified separately before and after treatment

v) The concentration of oxygen in mine smoke treatment (unit: percentage)

vi) The actual height of a chimney, diameter or a cross section of the chimney

vii) The quantity of generating dust that is to be specified separately before and after treatment (unit: milligrams per public meter, converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: mg/m^3N)

viii) The quantity of emission gas of sulfur oxides that is to be specified separately before and after treatment (unit: cubic meters per hour converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: m^3/hN)

ix) The quantity of emission gas of nitrogen oxide that is to be specified separately before and after treatment (unit: cubic centimeters per cubic meter, converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: cm^3/m^3N)

x) The value and quantity of contamination level of wastewater discharged from the facilities

e) Mechanical digestion facilities and ageing tanks of limestone (including dolomite)

i) The types, models, structures, principal dimensions, maximum capacities, quantities, and installation locations

ii) The methods of preventing the scattering of dust

iii) The types, models, dust collection efficiencies, and the rated outputs of motors of dust collectors

iv) The types, structures, and capacities of sprinkler systems, and the amount of water sprinkled per amount of dust treated

v) The time schedule during which the facilities are operated per day, and the total number of days in a month on which they are operated

f) The types, models, maximum capacities, and quantities of product fillers and packing facilities

g) The types, models, structures, maximum capacities, quantities, and installation locations of the vehicles of the above-mentioned facilities

h) The types, models, kilowatt ratings, purposes of use, and quantities of motors used in the above-mentioned facilities

3) Treatment and disposal of mining wastes

a) Disposal methods of mining wastes

b) The contents of each type of mining wastes and the respective amounts that are generated per month

b) The contents of each type of mining wastes and the respective amounts that are generated per month

c) The following items in regards to the facilities and transportation systems (including transportation routes) of mining wastes used for oil-water separation, neutralization, and crushing, and in regards to facilities used for classification, sedimentation, enrichment, and filtration.

i) The types, models, structures, principal dimensions, maximum capacities, quantities, and installation locations

ii) The time schedule during which the facilities are operated per day, and the total number of days in a month on which they are operated

iii) The value and quantity of contamination level of waste water discharged from the facilities

iv) The methods for preventing permeation of thickener effluents, etc. into the floors and grounds where mining wastes treatment facilities are installed

v) The methods for preventing waste oil spills

vi) The methods for preventing dust scattering at crushing facilities

d) Mining waste incinerators

i) The types, models, structures, principal dimensions, maximum capacities, quantities, and installation locations

ii) The time schedule during which the facilities are operated per day, and the total number of days in a month on which they are operated

iii) The kinds, percentages of co-combustion, calorific value, and amount of content (percentages of sulfur, nitrogen, and ashes) of raw fuel, and amount of fuel consumption per hour

iv) The kinds and grades of raw ores and materials, and the amounts supplied per hour

v) The quantity of emission of mine smoke (soot) (unit: cubic meters per hour converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: m^3/hN), temperature, and velocity of emission of mine smoke (soot)

vi) The quantity of generating dust (unit: milligrams per public meter, converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: mg/m^3N)

vii) The quantity of emission gas of sulfur oxides (unit: cubic meters per hour converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: m^3/hN)

viii) The concentration of emission gas of nitrogen oxide (unit: cubic centimeters per cubic meter, converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: cm^3/m^3N)

ix) Treatment and emission methods of mine smoke (soot), and disposal methods of collected substances

x) Diagrams of flow charts of mine smoke (soot) treatment

xi) The amount of soot and other substances collected per month

e) Dust collection facilities, emission gas cleaning facilities, desulfurization facilities, and de-nitrification facilities

i) The types, models, structures, maximum capacities (including collection efficiencies), quantities, and installation locations

ii) The kinds, hourly usage amounts of chemicals, the concentrations of its solutions, and pH (the values before and after use are to be specified separately)

iii) The time schedule during which the facilities are operated per day, and the total number of days in a month on which they are operated

iv) The quantity of emission of mine smoke (soot) (unit: cubic meters per hour converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: m^3/hN), temperature, and velocity of emission of mine smoke (soot) that is to be specified separately before and after treatment

v) The concentration of oxygen in the mine smoke treatment (unit: percentage)

vi) The actual height of a chimney, diameter or a cross section of the chimney

vii) The quantities of generating dust and hydrogen chloride that are to be specified separately before and after treatment (unit: milligrams per public meter, converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: mg/m^3N)

viii) The quantity of emission gas of sulfur oxides that is to be specified separately

before and after treatment (unit: cubic meters per hour converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: m^3/hN)

ix) The concentration of emission gas of nitrogen oxide that is to be specified separately before and after treatment (unit: cubic centimeters per cubic meter, converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: cm^3/m^3N)

x) The value and quantity of contamination level of wastewater discharged from the facilities

xi) The methods for preventing the permeation of waste oil into the floors or grounds where these facilities and the like are installed

xii) The methods for preventing waste oil spills

f) The types, models, kilowatt ratings, purposes of use, and quantities of motors in the above-mentioned facilities

4) Wastewater treatment facilities

a) Wastewater treatment methods

b) Diagrams of flow charts of wastewater generated from a calcination plant or a drying plant and other attached facilities

c) The structures, maximum capacities, quantities, and installation locations of catchment facilities (including conduits)

d) The following items in regards to facilities used for neutralization, sedimentation, mixing, classification, flocculation, enrichment, absorption, deionization, decomposition, filtration, dehydration, and aeration

i) The types, models, structures, principal dimensions, maximum capacities, quantities, and installation locations

ii) The time schedule during which the facilities are operated per day, and the total number of days in a month on which they are operated

iii) The types, models, kilowatt ratings, purposes of use, and quantities of motors

iv) The kinds of chemicals used, and the daily usage of each kind of use

v) The structures of buildings where wastewater treatment facilities are installed

e) The value and quantity of contamination level before treatment of wastewater

f) The value and quantity of contamination level after treatment of wastewater

g) The sorts and content of sediments that are generated per a month, as a result of treating wastewater, and the disposal methods thereof

h) The discharge methods of wastewater (including the locations to which the water is discharged)

i) The value and quantity of contamination level of the effluents in each drainage outlet

j) The value and quantity of contamination level in the river, lake, swamp, and ocean regions near areas from where wastewater is discharged, and in case of the river, the quantity of water flow

5) Crushers and grinding mills having motors rated at 75 kilowatts or higher (excluding wet types and closed types), and sieves having motors rated at 15 kilowatts or higher (excluding wet types and closed types),

a) The methods for preventing the scattering of dust

b) The types and structures of sprinkler systems, and the amount of water sprinkled per amount of dust treated

c) The types and structures of dust covers

d) The types, structures, dust collection efficiencies, the rated output of motors, and the structures of hoods of dust collectors

e) The structures of buildings where crushers, grinding mills, and sieves are installed

6) Belt conveyors having a belt width of 0.75 meters or wider (excluding closed types) and bucket conveyors having buckets with a capacity of 0.03 cubic meters or higher (excluding closed types)

a) The methods for preventing the scattering of dust

b) The numbers of belt conveyors that are connected

c) The sorts of cargo

d) The types, structures, and installation locations of sprinkler systems, and the amount of water sprinkled per amount transported

e) The types and structures of dust covers

f) The types, structures, dust collection efficiencies, the rated output of motors, and the structures of hoods of dust collectors

g) The structures of buildings where belt conveyors or bucket conveyors are installed

7) Ore storage spaces having an area of 1,000 square meters or larger

a) The methods for preventing the scattering of dust

b) The kinds of minerals and the percentage of water contained therein

c) The types, structures, quantities, and sprinkling methods of sprinkler systems

d) The types of dust covers

e) The types of sprayed liquid chemicals and the spraying methods thereof

f) Methods of compacting surface layers

g) The structures of buildings where ore storage spaces are installed

8) Attached documents and diagrams

a) diagrams indicating the locations of the outlets of mine smoke (soot) and the drainage outlets of wastewater

b) Layout diagrams of fire prevention apparatuses and fire extinguishing apparatuses

c) Diagrams of flow charts of calcination plants or drying plants

d) Diagrams of flow charts of water system

e) Maps of areas neighboring calcination plants or drying plants (scale: 1/50,000 or more)

12. A smelting and refining facility

(1) Construction program

1) Installation location

2) Planned starting date of construction

3) Planned completion date of construction

4) The amount of raw ore handled per month

5) The grades of each kind of mineral concentrate, and the respective amounts that are produced per month

6) The contents of each kind of slag and sediments (tailings), and the respective amounts that are generated per month

7) The contents of each type of poisonous and deleterious substances, and the respective amounts that are handled per month, as well as their purposes of use

8) The contents of each type of raw materials, fuel and ingredients, and the respective amounts that are handled per month, as well as their purposes of use

9) The amount of industrial water used, according to the purpose of use

10) Working places where dust is scattered, and the methods of prevention of dust scattering

11) Working places where there is a risk of danger, and the methods of prevention of mine disasters

12) Working places where there is significant risk of harmful gases being generated or leaked, and appropriate measures to be taken

13) Summaries of fire prevention apparatuses and fire extinguishing apparatuses

14) The types, models, structures, capacities, and quantities of fire extinguishers

(2) Detailed design of facility

1) Smelting and refining facilities

a) Refinement methods

b) The amounts of products and by-products produced per month

c) The types, models, principal dimensions, maximum capacities, quantities, and installation locations of apparatuses or facilities used for granulating, pelletizing, and refining raw ores (hereinafter referred to as "facilities")

d) The following items in regards to roasting furnaces, sintering furnaces (including pelletizing furnaces), calcining furnaces, dry furnaces, blast furnaces (including reverberatory furnaces for smelting), converters, heating furnaces, melting furnaces, and waste incinerators

i) The types, models, structures, principal dimensions, scales, maximum capacities, quantities, and installation locations

ii) The time schedule during which the facilities are operated per day, and the total number of days in a month on which they are operated.

iii) The kinds, percentages of co-combustion, calorific value, and amount of content (percentages of sulfur, nitrogen, and ashes) of raw fuel, and amount of fuel consumption per hour

iv) The types and grades of raw ores and materials, and the amounts supplied per hour (ton/h)

v) The quantity of emission of mine smoke (soot) (unit: cubic meters per hour converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: m^3/hN), temperature, and velocity of emission of mine smoke (soot)

vi) The quantity of generating dust (unit: milligrams per public meter, converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: mg/m^3N)

vii) The quantity of emission gas of sulfur oxides (unit: cubic meters per hour converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: m^3/hN)

viii) The concentration of emission gas of nitrogen oxide (unit: cubic centimeters per cubic meter, converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: cm^3/m^3N)

ix) The value and quantity of contamination level of wastewater discharged from the facilities

e) The following items in regards to electrolytic baths (including power supply rectifiers) and in regards to baths used for the storage, blending, compounding, fusion, decomposition, mixing, cleaning, exudation, oxidization, deoxidization, metathesis, compression, decompression, heating, cooling, evaporation, distillation,

classification, sedimentation, extraction, enrichment, crystallization, filtration, or dehydration of liquid substances or solid substances

i) The types, models, structures, principal dimensions, scales, maximum capacities, quantities, and installation locations

ii) The time schedule during which the facilities are operated per day, and the total number of days in a month on which they are operated.

iii) The value and quantity of contamination level of wastewater discharged from the facilities

f) The types, structures, maximum capacities, quantities, and installation locations of facilities that store raw ores, raw materials, fuel, or products

g) The types, models, maximum capacities, quantities, and installation locations of facilities that crush, grind, and sieve raw ores, raw materials, or products.

h) The types, models, structures, maximum capacities, quantities, and installation locations of the vehicles of the above-mentioned facilities

i) The types, models, kilowatt ratings, purposes of use, and quantities of motors used in the above-mentioned facilities

2) Mine smoke (soot) treatment facilities

a) Treatment and emission methods of mine smoke (soot), and disposal methods of collected substances

b) Diagrams of flow charts of mine smoke (soot) treatment

c) The amount of sulfuric acid and the by-products thereof and the amount of soot collected, per month

d) The following items in regards to dust collection facilities, waste gas cleaning facilities, desulfurization facilities, and denitrification facilities

i) The types, models, structures, maximum capacities (including collection efficiencies), quantities, and installation locations

ii) The types, hourly usage amounts, the concentrations of solutions, and the hydrogen ion concentrations of chemical agents used (the values before and after use are to be specified separately)

iii) The time schedule during which the facilities are operated per day, and the total number of days in a month on which they are operated.

iv) The amount, temperature that are to be specified separately before and after treatment, and emission rate of exhaust gas (unit: milligrams per cubic meter, converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: cm^3/m^3N).

v) The concentration of oxygen in exhaust gas (unit: percentage)

vi) The actual height of a chimney, diameter or a cross section of the chimney

vii) The quantities of generating dust and hazardous materials discharged that are to be specified separately before and after treatment (unit: milligrams per public meter, converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: mg/m^3N)

viii) The quantity of emission gas of sulfur oxides that is to be specified separately before and after treatment (unit: cubic meters per hour converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: m^3/hN)

ix) The concentration of emission gas of nitrogen oxide that is to be specified separately before and after treatment (unit: cubic centimeters per cubic meter, converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: cm^3/m^3N)

x) The value and quantity of contamination level of wastewater discharged from the facilities.

xi) The value and quantity of contamination level of wastewater discharged from the facilities

xii) The types, models, kilowatt ratings, purposes of use, and quantities of motors

3) A disposal facility of slags

a) Disposal methods of slags

b) The contents of each type of slags and the respective amounts that are generated per month

c) The following items in regards to facilities used for classification, sedimentation, enrichment, dehydration, filtration and transportation of slags (including transportation routes), and facilities used for concrete solidification and cyanogen decomposition.

i) The types, models, structures, principal dimensions, maximum capacities, quantities, and installation locations

ii) The time schedule during which the facilities are operated per day, and the total number of days in a month on which they are operated

iii) The value and quantity of contamination level of wastewater discharged from the facilities

iv) The types, models, structures, kilowatt ratings, purposes of use, and quantities of motors

4) A disposal facility of mining wastes

a) Disposal methods of mining wastes

b) The contents of each type of mining wastes and the respective amounts that are generated per month

c) The following items in regards to disposal facilities and transportation systems (including transportation routes) of mining wastes used for oil-water separation, neutralization, and crushing, and in regards to facilities used for classification, sedimentation, enrichment, and filtration.

i) The types, models, structures, principal dimensions, maximum capacities, quantities, and installation locations

ii) The time schedule during which the facilities are operated per day, and the total number of days in a month on which they are operated

iii) The value and quantity of contamination level of waste water discharged from the facilities

iv) The methods for preventing permeation of thickener effluents, etc. into the floors and grounds where mining wastes treatment facilities are installed

v) The methods for preventing waste oil spills

vi) The methods for preventing dust scattering at crushing facilities

5) A mining wastes incinerator

a) The types, models, structures, principal structures, maximum capacities, quantities, and installation locations of a mining wastes incinerator

b) The time schedule during which the facilities are operated per day, and the total number of days in a month on which they are operated

c) The kinds, percentages of co-combustion, calorific value, and amount of content (percentages of sulfur, nitrogen, and ashes) of raw fuel, and amount of fuel consumption per hour

d) The kinds of mining wastes, and the amount of mining wastes incinerated per hour

e) The quantity of emission of mine smoke (soot) (unit: cubic meters per hour converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: m^3/hN), temperature, and velocity of emission of mine smoke (soot) that are to be specified separately before and after treatment

f) The quantities of generating dust and hydrogen chloride that are to be specified separately before and after treatment (unit: milligrams per public meter, converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: mg/m^3N)

g) The quantity of emission gas of sulfur oxides that is to be specified separately before and after treatment (unit: cubic meters per hour converted in a state in

which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: m^3/hN)

h) The concentration of emission gas of nitrogen oxide that is to be specified separately before and after treatment (unit: cubic centimeters per cubic meter, converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: cm^3/m^3N)

i) Treatment and emission methods of mine smoke (soot), and disposal methods of collected substances

j) Diagrams of flow charts of mine smoke (soot) treatment

k) The amount of dust and other substances collected per month

6) Dust collection facilities, emission gas cleaning facilities, desulfurization facilities, and de-nitrification facilities

a) The types, models, structures, maximum capacities (including collection efficiencies), quantities, and installation locations

b) The kinds, hourly usage amounts of chemicals, the concentrations of its solutions, and pH (the values before and after use are to be specified separately)

c) The time schedule during which the facilities are operated per day, and the total number of days in a month on which they are operated

d) The quantity of emission of mine smoke (soot) (unit: cubic meters per hour converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: m^3/hN), temperature, and velocity of emission of mine smoke (soot) that is to be specified separately before and after treatment

e) The concentration of oxygen in the mine smoke treatment (unit: percentage)

f) The actual height of a chimney, diameter or a cross section of the chimney

g) The quantities of generating dust and hydrogen chloride that are to be specified separately before and after treatment (unit: milligrams per public meter, converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: mg/m^3N)

h) The quantity of emission gas of sulfur oxides that is to be specified separately before and after treatment (unit: cubic meters per hour converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: m^3/hN)

i) The concentration of emission gas of nitrogen oxide that is to be specified separately before and after treatment (unit: cubic centimeters per cubic meter, converted in a state in which the temperature is 0 degree and atmosphere of pressure is 101.3 kPa: cm^3/m^3N)

j) The value and quantity of contamination level of wastewater discharged from the facilities

k) The methods for preventing the permeation of waste oil into the floors or grounds where dust collection facilities and the like are installed

l) The methods for preventing waste oil spills

m) The types, models, kilowatt ratings, purposes of use, and quantities of motors in the above-mentioned facilities

n) The structures of buildings where dust collection facilities, emission gas cleaning facilities, desulfurization facilities, and de-nitrification facilities are installed

7) Wastewater treatment facilities

a) Wastewater treatment methods

b) Diagrams of flow charts of wastewater generated from a smelting and refining facility and other attached facilities

c) The structures, maximum capacities, quantities, and installation locations of catchment facilities (including conduits)

d) The following items in regards to facilities used for neutralization, sedimentation, mixing, classification, flocculation, enrichment, absorption, deionization, decomposition, filtration, dehydration, and aeration

i) The types, models, structures, principal dimensions, maximum capacities, quantities, and installation locations

ii) The time schedule during which the facilities are operated per day, and the total number of days in a month on which they are operated

iii) The types, models, kilowatt ratings, purposes of use, and quantities of motors

iv) The kinds of chemicals used, and the daily usage of each kind of use

v) The structures of buildings where wastewater treatment facilities are installed

e) The value and quantity of contamination level before treatment of wastewater

f) The value and quantity of contamination level after treatment of wastewater

g) The sorts and content of sediments that are generated per a month, as a result of treating wastewater, and the disposal methods thereof

h) The discharge methods of wastewater (including the locations to which the water is discharged)

i) The value and quantity of contamination level of the effluents in each drainage outlet

j) The value and quantity of contamination level in public waters (rivers, lakes, swamps, and ocean regions) from where wastewater is discharged, and in case of the river, the quantity of water flow

8) Crushers and grinding mills having motors rated at 75 kilowatts or higher (excluding wet types and closed types), and sieves having motors rated at 15

kilowatts or higher (excluding wet types and closed types)

a) The methods for preventing the scattering of dust

b) The types and structures of sprinkler systems, and the amount of water sprinkled per amount of dust treated

c) The types and structures of dust covers

d) The types, structures, dust collection efficiencies, the rated output of motors, and the structures of hoods of dust collectors

e) The structures of buildings where crushers, grinding mills, and sieves are installed

9) Belt conveyors having a belt width of 0.75 meters or wider (excluding closed types) and bucket conveyors having buckets with a capacity of 0.03 cubic meters or higher (excluding closed types)

a) The methods for preventing the scattering of dust

b) The numbers of belt conveyors that are connected

c) The sorts of cargo

d) The types, structures, and installation locations of sprinkler systems, and the amount of water sprinkled per amount transported

e) The types and structures of dust covers

f) The types, structures, dust collection efficiencies, the rated output of motors, and the structures of hoods of dust collectors

g) The structures of buildings where belt conveyors or bucket conveyors are installed

10) Ore storage spaces having an area of 1,000 square meters or larger

a) The methods for preventing the scattering of dust

b) The kinds of minerals and the percentage of water contained therein

c) The types, structures, quantities, and sprinkling methods of sprinkler systems

d) The types of dust covers

e) The types of sprayed liquid chemicals and the spraying methods thereof

f) Methods of compacting surface layers

g) The structures of buildings where ore storage spaces are installed

11) Attached documents and diagrams

a) Diagrams indicating the relationships between the topography of the areas and the main structures of a smelting and refining facility

b) Design drawings of a smelting and refining facility

c) diagrams indicating the locations of the outlets of mine smoke (soot) and the drainage outlets of wastewater

d) Layout diagrams of fire prevention apparatuses and fire extinguishing apparatuses

e) Diagrams of flow charts of a smelting and refining

f) Diagrams of flow charts of water system

g) Maps of areas neighboring a smelting and refining facility (scale: 1/50,000 or more)

13. A waste stone dump, a slag dump, and a tailings dam attached to mine water treatment facilities, a coal preparation plant, a mineral processing plant or a smelting & refinery facility

(1) Construction program

1) Installation location

2) Planned starting date of construction

3) Planned completion date of construction

4) Planned starting date of dumping

5) Planned closing date of dumping

6) The ingredients of each kind of waste stones, slags or tailings, and the respective amounts that are disposed per month

(2) Detailed design of facility

1) Name of the dump or dam space

2) Areas of and the amounts of sediments

3) The topography, geology, amounts of rainfall, and catchment areas in the areas near dump or dam spaces, and the amounts of mountain stream or spring water

4) Sedimentation methods, and embankment or blocking methods

5) The types and structures of an embankment or a blocking wall

6) The stability of an embankment and the calculation method thereof (the calculation results of stability analysis are to be attached)

7) The locations, structures, maximum drainage capacities, and calculation method (the calculation results are to be attached) of drainage facilities and an emergency drainage channel of water inside and outside the storage spaces

8) The types, structures, quantities, and installation locations of driftwood stoppers, soil-stopping facilities and other appropriate facilities

9) The value and quantity of contamination level of wastewater discharged from storage spaces

10) The treatment methods for wastewater discharged from storage spaces

11) Wastewater treatment facilities

a) Diagrams of flow charts of wastewater treatment methods

b) The structures, maximum capacities, quantities, and installation locations of

catchment facilities (including conduits)

c) The following items in regards to facilities used for neutralization, sedimentation, mixing, classification, flocculation, enrichment, absorption, deionization, decomposition, filtration, dehydration, and aeration

i) The types, models, structures, principal dimensions, maximum capacities, quantities, and installation locations

ii) The time schedule during which the facilities are operated per day, and the total number of days in a month on which they are operated

iii) The types, models, kilowatt ratings, purposes of use, and quantities of motors

iv) The kinds of chemicals used, and the daily usage of each kind of use

v) The structures of buildings where wastewater treatment facilities are installed

d) The value and quantity of contamination level before treatment of wastewater

e) The value and quantity of contamination level after treatment of wastewater

f) The sorts and content of sediments that are generated per a month, as a result of treating wastewater, and the disposal methods thereof

12) The discharge methods of wastewater (including the locations to which the water is discharged)

13) The value and quantity of contamination level of the effluents in each drainage outlet

14) The value and quantity of contamination level in public waters (rivers, lakes, swamps, and ocean regions) from where wastewater is discharged, and in case of the river, the quantity of water flow

15) Sediments spaces having an area of 1,000 square meters or larger

a) The methods for preventing the scattering of dust

b) The kinds of sediments and the percentage of water contained therein

c) The types, structures, quantities, and sprinkling methods of sprinkler systems

d) The types of sprayed liquid chemicals and the spraying methods thereof

e) Methods of compacting surface layers

16) The measures for preventing mine pollution resulting from wastewater, the run-off of sediments, or other factors after accumulation has finished, and the construction methods thereof

17) Attached documents and diagrams

a) Diagrams indicating the relationships between the topography around a waste stone dump, a slag damp or a tailings dam and the main structures

b) Plane figures (2D) of a waste stone dump, a slag damp or a tailings dam

c) Longitudinal section drawings and cross-sectional drawings of a waste stone dump,

a slag damp or a tailings dam, and the plans for accumulation

d) Design drawings of main structures, such as drainage canals

e) Drawings indicating the locations of the drainage outlets of wastewater

f) Maps of areas neighboring a waste stone dump, a slag damp or a tailings dam (scale: 1/50,000 or more)

14. Electric facilities operated more than ten (10) volts in Coal mines (Class-A coal pit and Class-B coal pit)

(1) Construction program

1) The purposes of use (the uses are to be specified separately according to electric lighting, electromotive power, electric heating, electric railway, and other electric uses)

2) The following items in regards to areas of use

a) Names and locations of places where these are used

b) The locations of the starting points and ending points of electric railways that are directly linked in an underground mine

c) Horizontal plans (the boundaries of electric use areas are to be indicated)

3) Maximum continuous power (the total of all load systems at usage locations inside the mine is to be specified) and the maximum voltage

4) Planned starting date of construction

5) Planned completion date of construction

(2) Detailed design facility

1) Power receiving facilities

a) Locations of power receiving points

b) The output of power receiving points (the continuous power, particular power, etc. of contracted power and the total of all of these)

c) The names of suppliers

d) Current modes (the phases and wire systems are to be specified separately according to DC and AC)

e) The receiving voltages and cycles per minutes

f) Circuit breakers that form responsibility boundary points in power transmission, and circuit breakers that can safety break incoming power

g) The types and structures of protective equipment

h) Drawings indicating the connections and responsibility boundary points of electric wires

2) Demand facilities

a) Current modes (the phases and wire systems are to be specified separately according to DC and AC)

b) The maximum voltages of electric lines (for underground or surface of mine, extra-high voltages, high voltages, and low voltages are to be specified separately, and in case of high voltage or low voltage, the primary voltage and secondary voltage of transformers are to be specified as well)

c) Structures of electric lines

i) The thicknesses, types, numbers of circuits, numbers of lines of electric lines (for underground or surface of mine, extra-high voltages, high voltages, and low voltages are to be specified separately, and in regards to cables or cabtire cables, the numbers of cables, types, the types of shielded insulators, and the types, quantities, and thicknesses of conductors are to be specified separately as extra-high voltages, high voltages, and low voltages, underground or surface of mine)

ii) The types and structures of supports

iii) The laying and connection methods of cables or cabtire cables (in the connection methods, the structures, etc. of connection boxes and junction boxes are to be specified)

iv) The distances of electric lines (for underground or surface of mine, extra-high voltages, high voltages, and low voltages are to be specified separately)

d) Special high voltage transformation installations

i) The kVA values, primary voltages, secondary voltages, tertiary voltages, phases, frequencies, connection methods, cooling methods, and quantities of transformers

ii) The types of electric generators, frequency converters, rotary converters, and rectifiers, and the kilowatt ratings, voltage ratings, phases, frequencies, and quantities by DC and AC

iii) The installation locations and structures of transformation installations

iv) Neutral point grounding methods (the resistance (in ohms), the types, and the current capacities of grounding systems)

v) The types and structures of protective equipment

vi) Control devices (the summaries of devices are to be specified separately according to manual types, automatic, and remote control types)

e) The load systems of usage locations (those used in underground or surface of mine are to be specified separately)

i) Voltage ratings, wattage ratings, and quantities of electric lamps and electric heaters

ii) The types, voltage ratings, kilowatt ratings, and quantities of electric motors

iii) The types, voltage ratings, kilowatt ratings, and quantities of motor generators, rotary converters, and rectifiers

iv) The types, voltage ratings, kilowatt ratings, and quantities of welders, electric furnaces, and electric boilers

v) The types, voltage ratings, kilowatt ratings, and quantities of other facilities

f) Attached drawings

i) Drawings indicating the structures of electric lines, installations of electrical machinery and apparatuses, and connections of electric wires

ii) The actual measurement plane figures of (at a scale of 1/1,000 to 1/6,000, the locations of transformation installations and main circuit breakers, the center lines of electric lines (cables or cabtire cables, and insulated wires are to be specified separately), weak current electric lines, and tracks are to be specified)

3) Electric train lines and tracks

a) Electric railroad methods (DC and AC are to be specified separately, and among these, they are to be further separated by phase and by method such as overhead single wire type and overhead double wire type)

b) Voltages of electric train lines

c) The structures of electric train lines and tracks

i) The types, thicknesses, conductor spacing, and suspension methods of electric train lines

ii) The structures of supports (limited to overhead wire types)

iii) The connection methods of the rails of tracks (limited to methods in which rails have return wires), and the types and thicknesses of bonds and auxiliary returns

d) The types of current collectors of electric locomotives, and the kilowatt ratings and quantities of motors

4) Electric railway feeders

a) The structures of electric railway feeders

b) The types, thicknesses, distances, and installation methods of insulated returns

c) Attached drawings

i) Structural drawings of electric train lines, electric railway feeders, and tracks

ii) The actual measurement plane figures of electric train lines, electric railway feeders, and tracks (must specify the locations of overhead electric railway

feeders, electric train lines, and tracks, at a scale between 1/1,000 and 1/6,000)

5) Emergency backup power systems

a) The types, kilowatt ratings, and quantities of internal combustion engines

b) The types of speed governing devices and emergency speed governing devices

c) The types of superchargers and the pressures and quantities of outlets

d) The volumes of coolant water apparatuses dependent upon internal combustion engines

e) Air compression apparatuses dependent upon internal combustion engines

i) The types, volumes, maximum allowable working pressures, principal dimensions, materials, and quantities of air reservoirs

ii) The types, principal dimensions, materials, quantities, and installation locations of safety valves of air reservoirs

iii) The types, volumes, discharge pressures, and quantities of air compressors

f) The types, capacities, power factors, voltages, phases, frequencies, rotation frequencies, connection methods, cooling methods, and quantities of generators, and, in case of generator motors, the outputs and quantities

g) The types, volumes, rotation frequencies, driving methods, and quantities of exciting arrangements,

h) The types of protection relays

i) The methods of connection with these with motors

j) The methods of switching to emergency power supplies

k) Attached documents and drawings

i) Instruction manuals of protective equipment

ii) Fuel block diagrams

iii) Strength calculations of air reservoirs attached to internal combustion engines

iv) Structural drawings and discharge pressure calculations of safety valves of air reservoirs of internal combustion engines

15. Special high voltage electric facilities (over 7,000 V), or high voltage electric facilities all output a hundred (100) kW or more in Metal mines and Non-metal mines

(1) Construction program

1) The purposes of use (the uses are to be specified separately according to electric lighting, electromotive power, electric heating, electric railway, and other electric uses)

2) The following items in regards to areas of use

a) Names and locations of places where these are used

b) The locations of the starting points and ending points of electric railways that are directly linked in an underground mine

c) Horizontal plans (the boundaries of electric use areas are to be indicated)

3) Maximum continuous power (the total of all load systems at usage locations inside the mine is to be specified) and the maximum voltage

4) Planned starting date of construction

5) Planned completion date of construction

(2) Detailed design of facility

1) Power receiving facilities

a) Locations of power receiving points

b) The output of power receiving points (the continuous power, particular power, etc. of contracted power and the total of all of these)

c) The names of suppliers

d) Current modes (the phases and wire systems are to be specified separately according to DC and AC)

e) The receiving voltages and cycles per minutes

f) Circuit breakers that form responsibility boundary points in power transmission, and circuit breakers that can safety break incoming power

g) The types and structures of protective equipment

h) Drawings indicating the connections and responsibility boundary points of electric wires

2) Demand facilities

a) Current modes (the phases and wire systems are to be specified separately according to DC and AC)

b) The maximum voltages of electric lines (for underground or surface of mine, extra-high voltages, high voltages, and low voltages are to be specified separately, and in case of high voltage or low voltage, the primary voltage and secondary voltage of transformers are to be specified as well)

c) Structures of electric lines

i) The thicknesses, types, numbers of circuits, numbers of lines of electric lines (for underground or surface of mine, extra-high voltages, high voltages, and low voltages are to be specified separately, and in regards to cables or cabtire cables, the numbers of cables, types, the types of shielded insulators, and the types, quantities, and thicknesses of conductors are to be specified separately as

extra-high voltages, high voltages, and low voltages, underground or surface of mine)

ii) The types and structures of supports

iii) The laying and connection methods of cables or cabtire cables (in the connection methods, the structures, etc. of connection boxes and junction boxes are to be specified)

iv) The distances of electric lines (for underground or surface of mine, extra-high voltages, high voltages, and low voltages are to be specified separately)

d) Special high voltage transformation installations

i) The kVA values, primary voltages, secondary voltages, tertiary voltages, phases, frequencies, connection methods, cooling methods, and quantities of transformers

ii) The types of electric generators, frequency converters, rotary converters, and rectifiers, and the kilowatt ratings, voltage ratings, phases, frequencies, and quantities by DC and AC

iii) The installation locations and structures of transformation installations

iv) Neutral point grounding methods (the resistance (in ohms), the types, and the current capacities of grounding systems)

v) The types and structures of protective equipment

vi) Control devices (the summaries of devices are to be specified separately according to manual types, automatic, and remote control types)

e) The load systems of usage locations (those used in underground or surface of mine are to be specified separately)

i) Voltage ratings, wattage ratings, and quantities of electric lamps and electric heaters

ii) The types, voltage ratings, kilowatt ratings, and quantities of electric motors

iii) The types, voltage ratings, kilowatt ratings, and quantities of motor generators, rotary converters, and rectifiers

iv) The types, voltage ratings, kilowatt ratings, and quantities of welders, electric furnaces, and electric boilers

v) The types, voltage ratings, kilowatt ratings, and quantities of other facilities

f) Attached drawings

i) Drawings indicating the structures of electric lines, installations of electrical machinery and apparatuses, and connections of electric wires

ii) The horizontal survey plans (at a scale of 1/1,000 to 1/6,000, the locations of transformation installations and main circuit breakers, the center lines of electric

lines (cables or cabtire cables, and insulated wires are to be specified separately), weak current electric lines , and tracks are to be specified)

3) Electric train lines and tracks

a) Electric railroad methods (DC and AC are to be specified separately, and among these, they are to be further separated by phase and by method such as overhead single wire type and overhead double wire type)

b) Voltages of electric train lines

c) The structures of electric train lines and tracks

i) The types, thicknesses, conductor spacing, and suspension methods of electric train lines

ii) The structures of supports (limited to overhead wire types)

iii) The connection methods of the rails of tracks (limited to methods in which rails have return wires), and the types and thicknesses of bonds and auxiliary returns

d) The types of current collectors of electric locomotives, and the kilowatt ratings and quantities of motors

4) Electric railway feeders

a) The structures of electric railway feeders

b) The types, thicknesses, distances, and installation methods of insulated returns

c) Attached drawings

i) Structural drawings of electric train lines, electric railway feeders, and tracks

ii) The horizontal survey plans of electric train lines, electric railway feeders, and tracks (must specify the locations of overhead electric railway feeders, electric train lines, and tracks, at a scale between 1/1,000 and 1/6,000)

5) Emergency backup power systems

a) The types, kilowatt ratings, and quantities of internal combustion engines

b) The types of speed governing devices and emergency speed governing devices

c) The types of superchargers and the pressures and quantities of outlets

d) The volumes of coolant water apparatuses dependent upon internal combustion engines

e) Air compression apparatuses dependent upon internal combustion engines

i) The types, volumes, maximum allowable working pressures, principal dimensions, materials, and quantities of air reservoirs

ii) The types, principal dimensions, materials, quantities, and installation locations of safety valves of air reservoirs

iii) The types, volumes, discharge pressures, and quantities of air compressors

f) The types, capacities, power factors, voltages, phases, frequencies, rotation frequencies, connection methods, cooling methods, and quantities of generators, and, in case of generator motors, the outputs and quantities

g) The types, volumes, rotation frequencies, driving methods, and quantities of exciting arrangements,

h) The types of protection relays

i) The methods of connection with these with motors

j) The methods of switching to emergency power supplies

k) Attached documents and drawings

i) Instruction manuals of protective equipment

ii) Fuel block diagrams

iii) Strength calculations of air reservoirs attached to internal combustion engines

iv) Structural drawings and discharge pressure calculations of safety valves of air reservoirs of internal combustion engines

16. An explosives service station

(1) A surface explosives service station

1) Construction program

a) Installation location

b) Planned starting date of construction

c) Planned completion date of construction

2) Detailed design of facility

a) Maximum amount of explosives that can be stored (the numbers for the following are to be specified separately: low explosives, high explosives, industrial detonators, electric detonators, safety fuses, electric fuses, and detonating fuses)

b) The conditions of the buildings and the surrounding areas thereof where explosives are handled

c) Summary of a lightning conductor

d) Theft prevention apparatuses

i) The types and installation places of door locks

ii) The dimensions of the meshing of wire netting stretched out on the roof or in the attic, the diameter of the wires, and the method and place of installment

iii) The types, structures, and installation places of alarms

e) The types and structures of ventilation systems

f) Summaries of lighting systems

g) The types and structures of heating systems

h) The methods of separating low explosives, high explosives, detonating fuses, and blasting supplies such as industrial detonators, electric detonators and safety fuses from each other

i) The types, quantities, and layout drawings of fire extinguishing apparatuses

(2) An underground explosives service station

1) Construction program

a) Installation location

b) Planned starting date of construction

c) Planned completion date of construction

2) Detailed design of facility

a) Maximum amount of explosives that can be stored (the numbers for the following are to be specified separately: low explosives, high explosives, industrial detonators, electric detonators, safety fuses, electric fuses, and detonating fuses)

b) Theft prevention apparatuses used in places where explosives are handled

i) The types and installation places of door locks

ii) The types, structures, and installation places of alarms

c) The types and structures of ventilation systems

d) Summaries of lighting systems

e) The methods of separating low explosives, high explosives, detonating fuses, and blasting supplies such as industrial detonators, electric detonators and safety fuses from each other

f) The types and quantities of fire extinguishing apparatuses

(3) Attached documents and drawings

1) The structures and design drawings of locations where explosives are handled surface or underground of a mine

2) Drawings illustrating the topography of the areas surrounding the installation locations of places where explosives are handled surface of a mine, and the relative positions of the facilities in question and the mine pit

3) Drawings illustrating the relationships between the installation locations of places where explosives are handled underground of a mine and the electric train lines, overhead electric railway feeders, distribution lines, main transportation roadways, and main intake and return air ways

17. A high pressure gas production facility handling a hundred (100) cubic meter

per a day (m^3/day) or more

(1) Construction program

1) Purpose of use

2) Installation location

3) Kinds of high pressure gas manufactured

4) Planned starting date of construction

5) Planned completion date of construction

(2) Detailed design of facility

1) The volume of gas that can be treated per day using compression, liquefaction, or other method, and the daily refrigeration capacity

2) The materials and strength calculations of high-pressure equipment (in case of equipment that use cooling facilities, this is the performance of the proof pressure and air tightness)

3) The models, principal dimensions, quantities, and capacities of high-pressure equipment

4) Compressors

a) Rotation frequencies, maximum allowable working pressures, and the numbers of stages of compression

b) The pressure at each stage of the compressor and the amount of compression per hour

c) The types and kilowatt ratings of motors

d) The methods of connecting to motors

e) Cooling methods

f) The types, structures, and principal dimensions of load reduction devices

(3) Attached documents and drawings

1) Drawings illustrating the layout and piping of equipment in facilities that manufacture high-pressure gas

2) Design drawings of rooms where high-pressure equipment is installed or of rooms housing gas cylinders

3) Drawings of high-pressure equipment (excluding compressors and piping)

4) Drawings indicating the locations of compressors and the conditions of the neighboring areas

18. A high pressure gas storage facility with a volume of three-hundreds (300) m^3

or more

(1) Construction program

1) Installation location

2) Kinds of high pressure gas stored

3) Planned starting date of construction

4) Planned completion date of construction

(2) Detailed design of facility

1) Maximum storage volume of high-pressure gas

2) The types and structures of ventilation systems

(3) Attached documents and drawings

1) The structures and design drawings of high-pressure gas storage spaces

2) Drawings indicating the locations of high-pressure gas storage spaces and the conditions of the neighboring areas

19. A landfill disposal site of mining wastes

(1) Construction program

1) Installation location

2) Planned starting date of construction

3) Planned completion date of construction

4) Planned starting date of disposal of mining wastes

5) Planned closing date of disposal of mining wastes

6) The components of each kind of mining wastes, and the respective amounts that are disposed by burying per month

7) The values of the state of elution of mining wastes subject to landfill disposal

(2) Detailed design of facility

1) Name of landfill disposal site of mining wastes

2) Areas of and the amounts of landfill disposal site

3) The types and structures of landfill disposal site

4) The topography, geology, state of ground water around landfill disposal site

5) The locations, structures, maximum drainage capacities of drainage facilities inside and outside landfill disposal site

6) The value and quantity of contamination level of wastewater discharged from landfill disposal site

7) The treatment methods for wastewater discharged from landfill disposal site

8) Wastewater treatment facilities

a) Diagrams of flow charts of wastewater treatment methods

b) The structures, maximum capacities, quantities, and installation locations of catchment facilities (including conduits)

c) The following items in regards to facilities used for neutralization, sedimentation, mixing, classification, flocculation, enrichment, absorption, deionization, decomposition, filtration, dehydration, and aeration

i) The types, models, structures, principal dimensions, maximum capacities, quantities, and installation locations

ii) The time schedule during which the facilities are operated per day, and the total number of days in a month on which they are operated

iii) The types, models, kilowatt ratings, purposes of use, and quantities of motors

iv) The kinds of chemicals used, and the daily usage of each kind of use

v) The structures of buildings where wastewater treatment facilities are installed

9) The discharge methods of wastewater (including the locations to which the water is discharged)

10) The value and quantity of contamination level of the effluents in each drainage outlet

11) The value and quantity of contamination level in public waters (rivers, lakes, swamps, and ocean regions) from where wastewater is discharged, and in case of the river, the quantity of water flow

12) Landfill disposal site having an area of 1,000 square meters or larger (in a limited site for scattering of dust)

a) The methods for preventing the scattering of dust

b) The kinds of mining wastes and the percentage of water contained therein

c) The types, structures, quantities, and sprinkling methods of sprinkler systems

d) The types of cover for prevention of scattering of dust

e) The types of sprayed liquid chemicals and the spraying methods thereof

f) Methods of compacting surface layers

13) The measures for preventing mine pollution resulting from wastewater, the run-off of mining wastes, or other factors after disposing has finished, and the construction methods thereof

14) Attached documents and diagrams

a) Diagrams indicating the relationships between the topography around a landfill

disposal site of mining wastes and the main structures

b) Plane figures (2D), longitudinal section drawings and cross-sectional drawings of a landfill disposal site

d) Drawings indicating the locations of the drainage outlets of wastewater from a landfill disposal site

f) Maps of areas neighboring a landfill disposal site (scale: 1/50,000 or more)

20. When the Minister in charge of mines sector designates the mine buildings, structures, and other facilities for use in mineral-related operations in accordance with Article 9, paragraph 1 of Mine Safety Law and Article 13, paragraph 1 of its Regulation to draft and submit the "facility plan".

Article 4 "Cases in which the concessionaire establishes or modifies mine buildings, structures, or other facilities for use in mineral-related operations" based on the provisions of Article 9, Paragraph 1 of Mine Safety Law and of Article 13, Paragraph 1 of its Regulation therein, "Cases in which the construction of the buildings, structures, or other facilities have been completed, or mine buildings, structures, or other facilities have been scrapped" based on the provisions of Article 9, Paragraph 5 of the Law and of Article 14, Paragraph 1 of the Regulation therein, and "Cases in which the concessionaire has suspended the use of buildings, structures, or other facilities" based on the provisions of Article 9, Paragraph 5 of the Law and of Article 14, Paragraph 2 of the Regulation therein, are prescribed as follows.

1. When the concessionaire establishes or modifies mine buildings, structures, or other facilities for use in mineral-related operations, the "Application for Permission of Establishment (or Modification) of Facility Plan" shall be submitted to the Minister in charge of mines sector using following fixed form NO. 1.

2. When the concessionaire completes establishment or modification of mine buildings, structures, or other facilities for use in mineral-related operations in accordance with "facility plan", the "Notification for Completion of Establishment (or Modification) of the Facility" shall be submitted to the said Minister using following fixed form NO. 2.

3. When the concessionaire abolishes mine buildings, structures, or other facilities for use in mineral-related operations, the "Notification for Abolition of the Facility" shall be submitted to the said Minister using following fixed form NO. 3.

Fixed Form NO.1

DD/MM/YYYY

To: the Minister in charge of mines sector
From: Name of the concessionaire (representative of corporation) and signature

In accordance with the provisions of Article 9, Paragraph 1 of the Mine Safety Law and of Article 13, Paragraph 1 of its Regulation, the following "Facility Plan" shall be submitted for permission to establish (or modify) the facility for use in mineral-related operations.

Application for Permission of Establishment (or Modification) of Facility Plan	
Type of the facility	
Name of mine (kinds of minerals)	
Licensed number of mining area	
Location of the mine (telephone number)	
Installation location of the facility	
Reason for establishment or modification of the facility	
Relevant documents	**1 Construction program** **2 Detailed design of facility**

Fixed Form NO.2

DD/MM/YYYY

To: the Minister in charge of mines sector
From: Name of the concessionaire (representative of corporation) and signature

In accordance with the provisions of Article 9, Paragraph 5 of the Mine Safety Law and of Article 14, Paragraph 1 of its Regulation, the establishment (or

modification) of the facility has been completed, and following details matters shall be submitted for notification.

Notification for Completion of Establishment (or Modification) of the Facility	
Type of the facility	
Name of mine (kinds of minerals)	
Licensed number of mining area	
Location of the mine (telephone number)	
Installation location of the facility	
Capacities, scale and quantities of the facility	
Completion date of establishment (or modification)	
Planned starting date of the facility	

Fixed Form NO.3

DD/MM/YYYY

To: the Minister in charge of mines sector
From: Name of the concessionaire (representative of corporation) and signature

In accordance with the provisions of Article 9, Paragraph 5 of the Mine Safety Law and of Article 14, Paragraph 2 of its Regulation, the facility shall be abolished, and following details matters shall be submitted for notification.

Notification for Abolition of the Facility	
Type of the facility	
Name of mine (kinds of minerals)	
Licensed number of mining area	
Location of the mine (telephone number)	
Installation location of the facility	
Capacities, scale and quantities of the	

facility	
Planned date for abolition of the facility	
Reason for abolition of the facility	

Article 5 **The "Notification regarding the suspension of the accumulation of a waste stone dump, a slag dump, a tailings dam or a landfill site of mining wastes for more than one year", or "Notification regarding the resumption of accumulation of a waste stone dump, a slag dump, a tailings or landfill site of mining wastes" based on the provisions of Article 9, Paragraph 5 of Mine Safety Law and of Article 14, Paragraph 3 of its Regulation therein is prescribed as follows.**

1. When the concessionaire has not used a waste stone dump, a slag dump, a tailings dam or a landfill site of mining wastes for more than one year, the "Notification for Suspension of the Facility" shall be submitted to the Minister in charge of mines sector using fixed form No. 4.

2. When the concessionaire resume to use a waste stone dump, a slag dump, a tailings dam or a landfill site of mining wastes after suspension, the "Notification for Resumption in using the Facility" shall be submitted to the said Minister using fixed form No. 5.

Fixed Form NO.4

DD/MM/YYYY

To: the Minister in charge of mines sector
From: Name of the concessionaire (representative of corporation) and signature

In accordance with the provisions of Article 9, Paragraph 5 of the Mine Safety Law and of Article 14, Paragraph 3 of its Regulation, the facility shall be suspended for more than one year, and following details matters shall be submitted for notification.

Notification for Suspension of the Facility	
Type of the facility	

Name of mine (kinds of minerals)	
Licensed number of mining area	
Location of the mine (telephone number)	
Name of the facility	
Installation location of the facility	
Planned term for suspension of the facility	
Reason for suspension of the facility	

Fixed Form NO.5

DD/MM/YYYY

To: the Minister in charge of mines sector

From: Name of the concessionaire (representative of corporation) and signature

In accordance with the provisions of Article 9, Paragraph 5 of the Mine Safety Law and of Article 14, Paragraph 3 of its Regulation, the facility shall resume to be used after suspension, and following details matters shall be submitted for notification.

Notification for Resumption in Using the Facility	
Type of the facility	
Name of mine (kinds of minerals)	
Licensed number of mining area	
Location of the mine (telephone number)	
Name of the facility	
Installation location of the facility	
Planned term for resumption in using the facility	

Article 6 The "Notification of Safety Rules" based on the provisions of Article 11, paragraph 1 of the Mine Safety Law and of Article 15, Paragraph 1 of its Regulations is prescribed as follows.

When the concessionaire establishes own safety rules to ensure safety at the mine or modifies contents of the rule, the "Notification (or Modification) of Safety Rules" shall be submitted to the Minister in charge of mines sector using fixed form No. 6.

Fixed Form NO.6

DD/MM/YYYY

To: the Minister in charge of mines sector

From: Name of the concessionaire (representative of corporation) and signature

In accordance with the provisions of Article 11, Paragraph 1 of Mine Safety Law and of Article 15, Paragraph 1 of its Regulation, the own safety rules have been established and following details matters shall be submitted for notification.

Notification (or Modification) for Safety Rules	
Name of mine (kinds of minerals)	
Licensed number of the mining area	
Location of the mine	
Name of the safety supervisor	
Contents of safety rules	**(Seeing attached documents)**
Relevant documents	**The documents that the safety committee of the mine approved contents of safety rules.**

Article 7 The contents of specifications that are incorporated into the safety rules, based on the provisions of Article 11, Paragraph 3 of the Law and of Article 16, Paragraph 1 of the Regulations shall be prescribed as follows.

Furthermore, how to making safety rules, refer to the model case of the "Safety Rules at ABE mine" in Attachment-1.

1. The following specifications that the safety supervisor, technical safety manager and technical safety staff must obey shall be incorporated into own "safety rules" by the concessionaire.

(1) Items regarding the locations and the periods requiring specific attention during

patrolling and examining at the mine.

(2) Items regarding the locations requiring specific attention during patrolling and examining at the mine by technical safety staff.

(3) Items regarding liaison methods to use in the event of a major disaster.

(4) Items regarding examining at the mine on public holidays, and the liaison system.

(5) Items regarding the safety diaries, the measurement records, and the handover to successor.

2. The following specifications that mineworkers must obey shall be incorporated into own "safety rules".

(1) Items regarding the cleaning and arranging of working places.

(2) Items regarding the arranging of work materials and the maintenance of machines and tools.

(3) Items regarding work uniforms.

3. The specifications regarding training items as well as extent and methods of safety training to mineworkers who engage in the hazardous works, based on the provisions of all paragraphs of Article 6 of the Regulations shall be incorporated into own "safety rules".

4. The specifications regarding evacuation training and evacuation guidance, based on the provisions of Article 60, paragraphs 1 to 2 of the Regulations shall be incorporated into own "safety rules".

5. The specifications regarding organization of mine rescue crews, rescue training, mobilization methods, and the methods for periodic inspection of the main tools, such as oxygen breathing apparatus and their accessories, based on the provisions of Article 63, paragraphs 1 to 7 of the Regulations shall be incorporated into own "safety rules".

6. The following specifications in safety regarding prevention of roof fall and collapse, based on the provisions of Articles 64 to 77 of the Regulations shall be incorporated into own "safety rules".

(Items related to underground mines)

(1) Items regarding providing suitable supports and other equipment.

(2) Items regarding securing appropriate ore pillars concerning size and arrangement suited to the bedrock conditions in metal mines.

(3) Items regarding the standard of supports.

1) The standard of supports subjected to main tunnels (galleries)

2) The standard of supports subjected to temporary tunnels (galleries)

3) The standard of supports subjected to mineral working places

(4) Items regarding setting supports.

(5) Items regarding checking periods and methods of supports.

(6) Items regarding re-opening of sealed tunnel (gallery).

(Items related to open-pit mines)

(7) Items regarding the removal of the surface soil in advance.

(8) Items regarding installation of steps with appropriate height and holding a safe angle slope of mineral walls.

(9) Items regarding the restoration of mineral working places of open-pit mines or the redevelopment of the sites.

7. The following specifications in safety regarding explosives and blasting, based on the provisions of Articles 82 to 110 of the Regulations shall be incorporated into own "safety rules".

(1) Items regarding the temporary storage methods of explosives near blasting areas.

(2) Items regarding boring (drilling), and charging and firing of explosives at metal mines.

(3) Items regarding a circuit test before firing of blasting.

(4) Items regarding the execution methods of blasting.

(5) Items regarding the management of exploder and blasting cables used for blasting.

(6) Items regarding standard of boring (drilling).

(7) Items regarding the precautions to be taken during blasting work.

(8) Items regarding the measures to be taken in the event of there being lost or stolen explosives.

(9) Items regarding items of mentioned in the diary for blasting by the technical safety staff.

8. The following specifications in safety regarding vehicle type mine machines and automobiles, based on the provisions of Articles 111 to 124 of the Regulations shall be incorporated into own "safety rules".

(1) Items regarding the safety speed and the observance of common traffic rules of vehicle-type mine machines and automobiles.

(2) Items regarding the restriction passage of vehicle type mine machines and

automobiles, and the repairing of either of these.

(3) Items regarding signals and traffic signs used at mine roads.

(4) Items regarding the management, checking, and maintenance of mine roads and tunnels (galleries) through which vehicle type mine machines and automobiles pass.

9. The following specifications in safety regarding fire prevention and fire handling, based on the provisions of Articles 148 to 158 of the Regulations, and regarding restriction for use of open flames and prohibition for carrying ignition tools and smoking implements, based on the provisions of Articles 265 to 266 of the Regulations shall be incorporated into own "safety rules".

(1) Items regarding the installation and management of fire-fighting devices.

(2) Items regarding fire-fighting and evacuation from fires.

(3) Items regarding sealing of tunnels (galleries) that mine fire or spontaneous combustion occurs in coal mines.

(4) Items regarding installation of the zones where fires are prohibited in metal mines and coal mines.

(5) Items regarding the prohibition for carrying smoking implements into metal mines and coal mines.

10. The following specifications regarding prevention of mine pollution caused by soot in coal mines or by mine smoke in metal mines, based on the provisions of Articles 167 to 169 of the Regulations shall be incorporated into own "safety rules".

(1) Items regarding the management of mine smoke (soot) generating facility and mine smoke (soot) treatment facility.

(2) Items regarding the confirmation of the sulfur content of fuel used in the mine smoke (soot) generating facility.

(3) Items regarding the measurement of the amount of exhaust gas and measurement of the amount of sulfur oxide and harmful substances contained in the mine smoke (soot) that discharges into the atmosphere, and items concerning the observation of the wind direction and wind velocity.

(4) Items regarding emergency measures when mine pollution problems occur or is likely to occur caused by mine smoke (soot) because of causing accident, being broken or other troubles of mine smoke (soot) generating facility or mine smoke (soot) treatment facility, or heavy rain or other special reasons.

11. The following specifications in safety regarding prevention of mine pollution caused

by dust in mines, based on the provisions of Articles 170 to 172 of the Regulations shall be incorporated into own “safety rules”.

(1) Items regarding management of dust generating facility and dust treatment facility.

(2) Items regarding prevention of dust generating and scattering.

(3) Items regarding emergency measures when mine pollution problems occur or is likely to occur caused by dust because of causing accident, being broken or other troubles of dust generating facility or dust treatment facility, or heavy rain or other special reasons.

12. The following specifications in safety regarding prevention of mine pollution caused by hazardous air pollutant substances such as sulfur oxide, nitrogen oxide, cadmium and its compounds, and lead and its compounds, based on the provisions of Article 173 of the Regulations shall be incorporated into own “safety rules”.

(1) Items regarding the ascertainment of actual state of emission and scattering of hazardous air pollutant substances into the atmosphere.

(2) Items regarding measures to be taken in order to control emitting or scattering of

(3) Items regarding emergency measures when mine pollution problems occur or is likely to occur caused by hazardous air pollutant substances because of causing accident, being broken or other troubles of the generating facility or treatment facility for hazardous substances, or heavy rain or other special reasons.

13. The following specifications in safety regarding prevention of mine pollution caused by mine water or wastewater, based on the provisions of Articles 174 to 178 of the Regulations shall be incorporated into own “safety regulation”.

(1) Items regarding treatment of mine water or wastewater, and management of the treatment facility.

(2) Items regarding measurement of pH level, amount of water flow and water quality analysis.

(3) Items concerning emergency measures when mine pollution problems occur caused by mine water or wastewater or is likely to occur because of causing troubles of the water treatment facility such as an accident, being broken, electric power cutting off ,or heavy rain or other special reasons.

14. The following specifications in safety regarding prevention of mine pollution caused by noise, based on the provisions of Articles 185 to 187 of the Regulations shall be

incorporated into own “safety rules”.

(1) Items regarding the management of noise generating facility and noise prevention facility.

(2) Items regarding the measurement of noise levels.

(3) Items regarding emergency measures when mine pollution problems occur caused by noise or is likely to occur because of causing accident, being broken or other troubles of noise generating facility or noise prevention facility, or heavy rain or other special reasons.

15. The following specifications in safety regarding prevention of mine pollution caused by vibration, based on the provisions of Articles 188 to 190 of the Regulations shall be incorporated into own “safety rules”.

(1) Items regarding the management of vibration generating facility and vibration prevention facility.

(2) Items regarding the measurement of vibration levels.

(3) Items regarding emergency measures when mine pollution problems occur caused by vibration or is likely to occur because of causing accident, being broken or other troubles of vibration generating facility or vibration prevention facility, or heavy rain or other special reasons.

16. The following specifications in safety regarding prevention of mine pollution caused by mining wastes, based on the provisions of Articles 193 to 198 of the Regulations shall be incorporated into own “safety rules”.

(1) Items regarding storage and transportation of mining wastes.

(2) Items regarding the disposal of mining wastes.

(3) Items regarding measurement and analysis on harmful substances such as lead and cadmium in the mining wastes contained.

(4) Items regarding measurement and analysis on the water quality of ground water nearby mining wastes landfill site.

(5) Items regarding management of the incinerator such as the intermediate treatment facility for mining wastes

(6) Items regarding the management of mining wastes landfill sites.

(7) Items regarding the management of underground mining wastes landfill sites.

17. The following specifications in safety regarding prevention of mine pollution caused by a waste stones dump, a slags dump or a tailings dam, based on the provisions of

Articles 199 to 205 of the Regulations shall be incorporated into own "safety rules".

(1) Items regarding daily management of a waste stones dump, a slag dump or a tailings dam.

(2) Items regarding management of protective structures, such as a blocking wall and an embankment, of a waste stones dump, a slag dump or a tailings dam.

(3) Items regarding installation of an inside water drainage, a mountain stream drainage, hillside channels and other appropriate facilities to prevent off-site water flowing into inside a tailings dam, and installation of an emergency drainage at proper positions of outside dam site to prepare inflowing large amounts of off-site water into the tailings dam of which the embankment is established by soil materials.

(4) Items regarding necessary measures, such as soil covering and vegetation inside dam site and the slope of the embankment, to be taken for prevention of mine pollution problems when a waste stones dump, a slag dump or a tailings dam is disused.

18. The following specifications in safety regarding electrical equipment, based on the provisions of Articles 206 to 228 of the Regulations shall be incorporated into own "safety rules".

(1) Items regarding the installation, transfer, and modification of electrical equipment.

(2) Items regarding the measures to be taken in the event of an unexpected power failure at the mine.

(3) Items regarding examination and maintenance of electrical appliances, electric lines, wiring, and moving cables.

(4) Items regarding examination and measurement of grounding (earth) work and earth resistance value.

(5) Items regarding handling of explosion-proof equipment at coal mines.

(6) Items regarding the handling of portable safety lamps at coal mines.

(7) Items regarding work methods and safety countermeasures to repair live parts of electrical equipment without cutting power supply.

19. The following specifications in safety regarding underground passages and working places, based on the provisions of Articles 229 to 238 of the Regulations shall be incorporated into own "safety rules".

(1) Items regarding identification methods of the names and work locations of

mineworkers when they get into underground, and keep the records at mine office outside mine.

(2) Items regarding management of an emergency ladder path and connected underground passages at coal mines and metal mines.

(3) Items regarding mine lighting in mines where underground mining is performed.

(4) Items regarding installation of communication devices, such as telephone systems and inductive radio devices at major working places and other necessary part of underground mines and management of communication devices.

20. The following specifications in safety regarding prevention of dust scattering for sake of health protection of mineworkers and measurement of dust concentration at underground mines, based on the provisions of Articles 239 to 243 of the Regulations shall be incorporated into own "safety rules".

(1) Items regarding the management and wearing of standard dust respirators.

(2) Items regarding the prevention of scattering dust, such as water sprinklers and dust collectors, at underground working places.

(3) Items regarding installation and management of a break space that prevents dust scattering for sake of health protection of mineworkers where dust scattering remarkably at underground working places.

(4) Items regarding periods, evaluation and recording of measurement of dust concentration at underground working places.

Article 8 The "Notification for Appointment of a Safety Supervisor or a Representative of the Safety Supervisor" based on the provisions of Article 13, Paragraph 4 of the Mine Safety Law and of Article 20 of the Regulation is prescribed as follows.

1. When a safety supervisor has been appointed by the concessionaire at the mine, the "Notification for Appointment of the Safety Supervisor" shall be submitted to the Minister in charge of mines sector using fixed form NO.7.

2. When a representative of the safety supervisor has been appointed by the concessionaire at the mine, the "Notification for Appointment of the Representative of the Safety Supervisor" shall be submitted to the said Minister using fixed form NO.7.

Fixed Form NO.7

DD/MM/YYYY

To: the Minister in charge of mines sector

From: Name of the concessionaire (representative of corporation) and signature

In accordance with the provisions of Article 13, Paragraph 4 of Mine Safety Law and of Article 20 of the Regulation, the safety supervisor (or a representative of the safety supervisor) has been appointed at the mine, and following details matters shall be
submitted for notification.

Notification for Appointment of the Safety Supervisor (or the Representative of Safety Supervisor)	
Name of mine (kinds of minerals)	
Licensed number of the mining area	
Location of the mine	
Name of the safety supervisor (or the representative of safety supervisor)	
Date of appointment of the safety supervisor (or the representative of safety supervisor)	
The position (title in the organization of the mine) of the safety supervisor	
The scope of work duties of the safety supervisor (or the representative of safety supervisor)	
The academic history of the safety supervisor (or the representative of safety supervisor)	
The employment history of the safety supervisor (or the representative of safety supervisor)	**(The details of the employment history are to be included in a separate document.)**
In the case that administrative disposition has been received from the Minister within the past three years, the details thereof.	

Article 9 The "Drafting and Notification of a Contractual Work Plan" based on

the provisions of Article 19, Paragraph 1 of the Mine Safety Law and of Article 43, Paragraph 1 of the Regulation is prescribed as follows.

1. When the concessionaire makes a deal with a contractor to be engaged following work at the mine, the "Contractual Work Plan" shall be submitted to the Minister in charge of mines sector using fixed form NO. 8 for notification.

1) The work to be engaged for more than one month in the underground working places.

2) The work to be hauling or disposal of mining wastes in or outside of the mine.

3) The specific work designated by the Director General of GDMR.

2. When the concessionaire modifies items of the aforesaid plan, the modified plan shall be submitted to the said Minister using fixed form NO. 8 as same procedures as in the preceding paragraph above.

Fixed Form NO.8

DD/MM/YYYY

To: the Minister in charge of mines sector

From: Name of the concessionaire (representative of corporation) and signature

In accordance with the provisions of Article 19, Paragraph 1 of Mine Safety Law and of Article 43, Paragraph 1 of the Regulation, the following details matters of "Contractual Work Plan" shall be submitted for notification.

Notification (or Modification) for Contractual Work Plan	
Name of mine (kinds of minerals)	
Licensed number of the mining area	
Location of the mine	
Name of the safety supervisor	
1) Details of contractual work **2) Names of responsible persons in contractual Work** **3) Number of workers** **4) The details of safety training to be provided to**	

workers participating in contractual work	
5) Term of contractual work (start – completed)	
Relevant documents	**(copies of the documents containing the details of the contractual work agreement)**

Article 10 The "Drafting and Application for Permission of Special Mineral Operations Plan" based on the provisions of Article 20, Paragraph 1 of Mine Safety Law and of Article 44, Paragraph 1 of the regulation is prescribed as follows.

1. When the concessionaire plans to dig for minerals under the sea, rivers, lakes or any places where there is a risk of mine pollution or mine disaster by flood occurring, the "Special Mineral Operations Plan" shall be drafted and submitted to the Minister in charge of mines sector using fixed form NO. 9 for permission.

2. When the concessionaire modifies items of the aforesaid plan, the modified plan shall be submitted to the said Minister using fixed form NO. 9 as same procedures as in the preceding paragraph above.

Fixed Form NO.9

DD/MM/YYYY

To: the Minister in charge of mines sector

From: Name of the concessionaire (representative of corporation) and signature

In accordance with the provisions of Article 20, Paragraph 1 of Mine Safety Law and of Article 44, Paragraph 1 of the Regulation, the following details matters of "Special Mineral Operations Plan" shall be submitted for permission.

Application (or Modification) for Permission of Special Mineral Operations Plan	
Name of mine (kinds of minerals)	
Licensed number of the mining area	

Location of the mine	
Name of the safety supervisor	
Digging area of special mineral operations plan	
Items of mentioned regarding special mineral operations plan	**(seeing attached documents)**
Planned date of starting for special mineral operations plan	

3. When the concessionaire of underground coal mine or underground metal mine has a plan to dig under the sea, rivers, lakes or any places where there is a risk of mine pollution, impacts or mine disaster by flood occurring, following documents "Items regarding special mineral operations plan" must be drafted and attached in the application form.

Attached documents)

"Items of mentioned regarding special mineral operations plan"

1. Survey of geological conditions at the area of special mineral operations

1) Conditions of the geology (mineral deposits, upper and lower beds)

2) Conditions of faults

3) Conditions of the sea, river, or lake/swamp bottoms

4) The depths of the water, the thickness of each type of layer from the seabed, riverbed, or lake/swamp bottom to the mineral deposits (seam of coal), and the characteristics of these

5) The conditions of safety facilities of coastlines, rivers, lakes, or swamps

6) The effects to surface facilities, agricultural lands, etc.

2. Items regarding the special mineral operations plan

1) Names, strikes, and slopes of produced mineral deposits (seam of coal) and the heights of mineral deposits (seam of coal), in special mineral operations areas

2) Ore reserves and reserves of minable ore in special mineral operations areas

3) Special mineral operations plans (ground plans and cross-sectional plans are to be at a scale between 1/1,000 and 1/10,000)

4) The effects to the safety facilities of coastlines, rivers, lakes, or swamps, or to the seabed, riverbed, or lake/swamp bottom

3. Items regarding waterproofing and drainage

1) Plans on the establishment of water blocking bank

2) Advanced boring implementation plans

3) Drainage plans of mine water and spring water

4. Items regarding safety measures to be taken in the occurrence of a mine disaster

1) Mine evacuation route plans

2) Types of alarm transmission apparatuses

3) Emergency contact systems

5. Underground and surface drawings of the mine that includes special mineral operation areas (the plane figures and cross-sectional plans are to be at a scale between 1/1,000 and 1/6,000)

Article 11 The "Drafting and Notification of Mine Pollution Prevention Measures" based on the provisions of Article 21, Paragraphs 1 to 2 of the Mine Safety Law and of Article 49, Paragraphs 1 and 3 of the Regulation therein is prescribed as follows.

1. The concessionaire must draft the "Mine Pollution Prevention Measures" with regard to the prevention of mine pollution for when the mine is closed in the future, the measures shall be submitted to the Minister in charge of mines sector using fixed form NO. 10 for notification.

Fixed Form NO.10

DD/MM/YYYY

To: the Minister in charge of mines sector

From: Name of the concessionaire (representative of corporation) and signature

In accordance with the provisions of Article 21, Paragraph 1 to 2 of Mine Safety Law and of Article 49, Paragraph 1 and 3 of the Regulation, the following details matters of "Mine Pollution Prevention Measures" shall be submitted for notification.

Notification for Mine Pollution Prevention Measures	
Name of mine (kinds of minerals)	

Licensed number of the mining area	
Location of the mine	
Specific facilities at which mine pollution prevention measures are to be taken **1) Types and names of the facility** **2) Installation location**	**(The details are to be specified in the following table, for each applicable facility. The same applies hereinafter.)**
The details of mine pollution prevention work	
The construction period of mine pollution prevention work	
The total of funds necessary for mine pollution prevention work and the procurement methods of the funds in question	

NO.1 Concerning tunnels (a level, an inclined shaft and a vertical shaft)	
Name of tunnels and installation location	
Structure of tunnels (the distinction and principal dimensions of a level, an inclined shaft and a vertical shaft)	
The quantities and contamination level of mine water	
The periods of use of tunnels (the periods from the start of use to the end of use of tunnels)	
The details of mine pollution prevention work	
The construction period of mine pollution prevention work	
The amount of necessary funds for mine pollution prevention work and the procurement methods of the funds in question	**(documents on calculation evidence should be attached that prove the amount of necessary funds)**

Note) The details table is to be specified in each applicable tunnel.

NO.2 Concerning a waste stone dump, a slag dump and a tailings dam		
Names and installation location of a dump or a dam		
Kinds of a dump or a dam		
	The areas and sediment amounts of a dump or a dam	
	The types and structures of embankment or blocking walls	
	The types and structures of drainage systems	
The conditions of wastewater (quantities and contamination levels of wastewater)		
The periods of use of a dump or a dam (the periods from the start of use to the end of use of a dump or a dam)		
The details of mine pollution prevention work		
The construction period of mine pollution prevention work		
The amount of necessary funds for mine pollution prevention work and the procurement methods of the funds in question		**(documents on calculation evidence should be attached that prove the amount of necessary funds)**

Note) The details table is to be specified in each applicable a waste stone dump, a slag dump and a tailings dam.

NO.3 Treatment facilities on mine water or wastewater	
The names and installation locations of treatment facilities on mine water or wastewater	
The structures of treatment facilities on mine water or wastewater	
The conditions of mine water or wastewater (quantities and contamination levels of mine water or wastewater)	

The amount of necessary funds for mine pollution prevention work and the procurement methods of the funds in question	**(documents on calculation evidence should be attached that prove the amount of necessary funds)**

Note) The details table is to be specified in each applicable treatment facility on mine water or wastewater.

2. In the drafting of "Mine Pollution Prevention Measures", the concessionaire shall make documents based on the following "Attached documents: The details of the mine pollution prevention work, the construction period of the mine pollution prevention work, the calculation of the amount of necessary funds for mine pollution prevention work"

Attached documents:

Concerning the details of the mine pollution prevention work, the construction period of the mine pollution prevention work, and the calculation of the amount of necessary funds for mine pollution prevention work.

(1) Layout drawings of facilities where mine pollution prevention measures are to be implemented.

(2) Drawings illustrating the topography of the areas surrounding facilities at which mine pollution prevention measures are to be implemented.

(3) Drawings detailing the structures of facilities which mine pollution prevention measures are to be implemented.

(4) The construction plan of the mine pollution prevention work and the period of time from the start to the end of the work in question.

(5) Construction design specifications of mine pollution prevention work.

(6) The documents on calculation evidence of the total amount of necessary funds for implementation of the mine pollution prevention work.

Article 12 The "Procedures for Notification for Installment Deposit of the Reserve Fund Amount" based on the provisions of Article 22, Paragraph 1 of the Mine Safety Law and of Article 50, Paragraph 4 of the Regulation therein are prescribed as follows.

When the concessionaire intends to deposit the reserve fund amount for the mine pollution prevention work on installments that is calculated and indicated by the Minister in charge of mines sector in each specific facility at the mine, the following details matters of the "Notification for Installment Deposit of the Reserve Fund Amount" shall be submitted to the said Minister using fixed form NO. 11 for notification.

Fixed Form NO.11

DD/MM/YYYY

To: the Minister in charge of mines sector

From: Name of the concessionaire (representative of corporation) and signature

In accordance with the provisions of Article 22, Paragraph 1 of Mine Safety Law and of Article 50, Paragraph 1 of the Regulation, concerning to the deposit of reserve fund amount for prevention of mine pollution in *YYYY*, following details matters of "Notification for Installment Deposit of the Reserve Fund Amount" shall be submitted for notification.

Notification for Installment Deposit of the Reserve Fund Amount	
Name of mine (kinds of minerals)	
Licensed number of the mining area	
Location of the mine	
Specific facilities at which mine pollution prevention measures are to be taken **1) Types and names of the facility** **2) Installation location**	
The reserve fund amount that is calculated and indicated by the Minister in charge of mines sector	
Details of installment deposit of the reserve fund amount **1) The number of installment deposit** **2) The amount of reserves to be paid in each**	

installment deposit **3) (the amount of reserves to be paid in each installment deposit) x (the number of installment deposit) = total amount**	
Reason for installment deposit of the reserve fund amount	

Article 13 The "Procedures on Application for Retrieve of the Reserve Fund for Mine Pollution Prevention" based on the provisions of Article 22, Paragraph 3 of the Mine Safety Law and of Article 52, Paragraph 1 of the Regulation therein are prescribed as follows.

When the concessionaire intends to retrieve the reserve fund amount, the following details matters of "Notification for Refund of the Reserve Fund Amount" shall be submitted to the Minister in charge of mines sector to get the issuance of the verification using fixed form NO. 12 for notification.

Fixed Form NO.12

DD/MM/YYYY

To: the Minister in charge of mines sector
From: Name of the concessionaire (representative of corporation) and signature

In accordance with the provisions of Article 22, Paragraph 3 of Mine Safety Law and of Article 52, Paragraph 1 of the Regulation, the following details matters of "Application for Refund of the Reserve Fund Amount" shall be submitted to get the issuance of the verification by the Minister.

Application for Refund of the Reserve Fund Amount	
Name of mine (kinds of minerals)	
Licensed number of the mining area	
Location of the mine	
Specific facilities at which mine pollution prevention measures are to be taken	

1) Types and names of the facility **2) Installation location**	
The total amounts of reserve funds for a specific facility at which mine pollution prevention measures are saved in the financial institution	
The total of returned amount from the reserves funds, the details of the mine pollution prevention work, and the details of the expenses thereof	

Article 14 **The procedures on the drafting and submission of the "Detail Report of the Mine Disaster or Accident and Taken Measurement" based on the provisions of Article 29, Paragraph 1 of the Mine Safety Law and of Article 54, Paragraph 2 of the Regulation are established as follows.**

Within thirty (30) days of counting from the date of the mine disaster or accident occurred, the concessionaire must report the details of conditions of the mine disaster or accident to the Director General in charge of mines sector using fixed form NO. 13 for notification.

Fixed Form NO.13

DD/MM/YYYY

To: the Director General in charge of mines sector
From: Name of the concessionaire (representative of corporation) and signature

In accordance with the provisions of Article 29, Paragraph 1 of Mine Safety Law and of Article 54, Paragraph 2 of the Regulation, the following details matters of "Detail Report of the Mine Disaster or Accident and taken Measurement" shall be submitted for notification.

Detail Report of the Mine Disaster or Accident and taken Measurement	
1. Name of mine (kinds of minerals)	

2. Licensed number of the mining area	
3. Location of the mine	
4. Name of the Safety Supervisor	
5. Occurrence date of the mine disaster or accident	
6. Kinds of the mine disaster or accident	
7. The occurrence site of the mine disaster or accident	
8. Fatalities/casualties (name, age, kind of occupation, victim degree)	
9. The occurrence situation and causes of mine disaster or accident	
10. The countermeasures against the mine disaster or accident by the safety supervisor	
11. The countermeasures against the mine disaster or accident and safety measures taken by the concessionaire	
12. The details of the measures taken by the concessionaire to the fatalities/casualties	
Attached documents	**(drawings explaining the circumstances at the time of the occurrence of the mine disaster or accident)**

Article 15 The procedures on drafting and submission of the "Monthly Safety Report" based on the provisions of Article 29, Paragraph 2 of the Mine Safety Law and of Article 55 of the Regulation therein are proscribed as follows.

The concessionaire must prepare the "Monthly Safety Report" regarding safety conditions of mineral working fields and occurrence of mine disasters or accidents at the mine every end of month, and the report must be submitted to the Director General in charge of mines sector using fixed form NO. 14 not later than 10th of next month for notification.

Fixed Form NO.14

DD/MM/YYYY

To: the Director General in charge of mines sector

From: Name of the concessionaire (representative of corporation) and signature

In accordance with the provisions of Article 29, Paragraph 2 of Mine Safety Law and of Article 55 of the Regulation, the following details matters of "Monthly Safety Report" shall be submitted for notification.

Monthly Safety Report	
1. Name of mine (kinds of minerals)	
2. Licensed number of the mining area	
3. Location of the mine	
4. Name of the Safety Supervisor	

5. Number of mine workers	**Surface**	**Underground**	**Total**
1) No. of technical safety staffs			
2) No. of mine workers			
3) No. of Contractual workers			

6. No. of mineral working fields and No. of tunneling fields	
1) No. of mineral working fields	**No. of underground:** **No. of surface:**
2) No. of tunneling fields	**No. of underground:**

7. Condition of production	
Production of crude ore **(grade of crude ore)**	**ton/M** **(%)**

8. The mine disasters or accidents that occurred the previous month

Occurrence date of mine disasters or accidents	**Contents of mine disasters or accidents**	**Number of casualties/ injured person**	

Note)

(1) The table is to be specified in each mine disaster or accidents

(2) Extent of injury in the status of the occurrence of the mine disaster or accident shall be handled as follows.

1) Injured persons who have healed in less than three 3 days are 'slight wounded'

2) Injured persons who have healed within 4 to 13 days are 'lightly wounded'

3) Injured persons who have healed after 14 days or more are 'severely injured'

Article 16 The "Graphical Symbols for Mines" used for the mine safety diagrams based on the provisions of Article 30, Paragraph 1 of Mine Safety Law and of Article 56, Paragraph 2 of the Regulation are prescribed as follows.

1. The mine safety diagrams shall be drawn-up using the graphical symbols for mines complying with the"Attachment-2: Graphical Symbols for Mines".

2. When an appropriate symbol is not available among the symbols for mines above, it is possible to use a symbol that concisely and simply represents the item.

Article 17 The "Structural Criteria of Vehicle-type Mine Machines and Automobiles" and "Restriction of the use of vehicle-type mine machines or automobiles that discharge exhaust gas that does not conform to the Standards, and restriction of the use of fuel oil and that does not conform to the Standards" based on the provisions of Article 31, Paragraph 1 of the Mine Safety Law and of Article 113, Paragraph 1 and 2 of the Regulation therein are prescribed as follows.

1. The structural criteria of vehicle-type mine machines and automobiles used in coal mines and metal mines are prescribed in accordance with the"Attachment-3: Structural Criteria of Vehicle-type Mine Machines and Automobiles".

2. The value acquired from multiplying by 1.355 the measurement value shown in the volume ratio of carbon monoxide (CO) contained in exhaust gas discharged into the atmosphere from exhaust pipes in a state in which motors are idling, in regards to the emission standards of the exhaust gas of vehicle-type mine machines and automobiles

used in mines such as coal mines and metal mines, must not be higher than 0.06 percent. The measurement of carbon monoxide (CO) shall be conducted using a measurement method conforming to the standards of JIS K0098 "analysis methods of carbon monoxide (CO) contained in exhaust gas" or a measurement method having an equal or higher level of precision.

The emission standards of the exhaust gas = CO (volume) x 1.355 < 0.06%

3. The standards of the fuel oil of vehicle-type mine machines or automobiles used in underground mine such as coal mines and metal mines shall conform to the standards of Japanese Industrial Standard (JIS) K2204 diesel fuel, and the standards are as follows.

The standards of Japanese Industrial Standard (JIS) for diesel fuel

Flash point（℃）	Cetane index	90% distillation temperature（℃）	Mass of sulfur content（%）
Over 45～50	Over 45～50	Less than 330～360	Less than 0.01%

Article 18 The "Calculation of the safety factor of ropes and of attached metal couplings to support the vertical shaft-hoisting device for lifting personnel up and down or the inclined shaft-hoisting device for transportation of personnel for raising and lowering at a mine" based on the provisions of Article 31, Paragraph 1 of the Mine Safety Law and of Article 131, Paragraph 2 of the Regulation therein are prescribed as follows. The calculation method of the safety factor of the rope and attached metal couplings is calculated according to the following calculation formula.

$$F_1 = \frac{Sr}{W} \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (1)$$

$$F_2 = \frac{Sr}{W + W\frac{a}{g} + E \times A \times \frac{d}{D}} \quad \cdots\cdots (2)$$

F_1 ; Safety factor of the maximum static load must be over 10

F_2 ; Safety factor of the maximum total load must be over 5

Sr ; The guaranteed break power indicated by the rope manufacturer (kilo newton)

W ; The maximum dead load (in kilograms) in inclined shafts is calculated according to the following calculation formula.

$$W = W_t \sin\theta + \alpha \cdot W_t \cos\theta + W_r \sin\theta' + \beta \cdot W_r \cos\theta' \quad \cdots\cdots\cdots (3)$$

W_t ; Maximum total weight of the train of mine cars (ton)
W_r ; The weight (in tons) of the rope at the position where W is at its maximum
Θ ; The angle value at the position where W is at its maximum
Θ'; The mean angle value of the entire line until the position where W is at its maximum
α ; Friction factor of the train of mine cars
β ; Friction factor of the rope
a ; Rate of acceleration (meters per second per second)
g ; The constant value (9.8 meters per second per second)
E ; Elasticity factor (calculated as 98 kilo newton per square millimeter)
A ; The effective sectional area of the rope (square millimeter)
d ; The maximum diameter of elementary wire of the strand (millimeter)
D ; The minimum diameters of the sheave or drum (millimeter)

Article 19 The "Calculation of the safety factor of ropes and attached metal couplings to support the bucket, skip, or mine cars of a hoisting devices that transport except personnel at a mine, the calculation of the safety factor of ropes for an endless hoisting device in the inclined shaft, and the calculation of the safety factor of ropes and attached metal couplings to support the scaffold in a vertical shaft" based on the provisions of Article 31, Paragraph 1 of the Mine Safety Law and of Article 132, Paragraphs 1 to 3 of the Regulation therein is prescribed as follows.

1. The calculation method of the safety factor of ropes and attached metal couplings to support the bucket, skip, or mine cars of a hoisting devices that transport except personnel, and the calculation method of the safety factor of ropes and attached metal couplings to support the scaffold in a vertical shaft, based on the provisions of Article 132, Paragraph 1 and 3 of the Regulation, shall be calculated according to the calculation formulas of the preceding article, and the safety factor of the maximum static load (F_1) must be over 6, and the safety factor of the maximum total load must be over 3.

2. The calculation method of the safety factors of ropes for an endless hoisting device in the inclined shaft based on the provisions of Article 132, Paragraph 2 of the Regulation shall be calculated according to the calculation formulas of the preceding article, and the safety factor of the maximum static load (F_1) must be over 3, and the safety factor of the maximum total load (F_2) must be over 2.

Article 20 The "Calculation of the safety factor of the belt conveyor for transporting personnel at a mine" based on the provisions of Article 31, Paragraph 1 of the Mine Safety Law and of Article 133, Paragraph 2 of the Regulation are prescribed as follows. The calculation method of the safety factor of the belt conveyor for transporting personnel shall be calculated according to the following calculation formula.

$$F_1 = S_B / F_M \times \eta_1 \times \eta_2$$

$$F_2 = S_B / (K_2 \cdot F_M \cdot T_B) \times \eta_1 \times \eta_2$$

F_1 ; Safety factor of the maximum static load must be over 10.

F_2 ; Safety factor of the maximum total load must be over 5.

S_B ; The guaranteed break power indicated by the belt manufacturer (kilo-newton)

F_M ; Maximum tensile strength (kilo-newton)

η_1 ; Fitting efficiency

η_2 ; Material safety factor

K_2 ; Acceleration factor (calculated as 138)

T_B ; The bending loads of belts are calculated according to the following calculation formula

$$T_B = E \times A \times d / D \times n$$

E ; Elasticity factor (calculated as 98 kilo newton per square millimeter)

A ; Effective cross section of steel cord (square millimeter)

d ; The maximum diameter of elementary wire of steel cord (millimeter)

D ; The diameter of the pulley when the maximum tensile strength is applied (millimeter)

n ; Number of steel cords

Article 21 **The "Measuring method of the reduced safety of vertical shaft hoisting device" based on the provisions of Article 31, Paragraph 1 of the Mine Safety Law and of Article 137, Paragraph 2 of the Regulation therein is prescribed as follows.**

1. The discard standards based on the inspection, measurement, and the results thereof of safety factor reductions of ropes are as follows.

(1) Inspection of disconnection: When, through visual inspection, it has been discovered that at least 10% of the total number of elementary wire of the strands in the outermost layer are disconnected between 1-ply wire rope or when it has been discovered that at least 20% of them are disconnected between 5-ply wire rope, the rope in question is to be discarded.

(2) Measurement of abrasion: In a measurement in which a vernier caliper or similar instrument is used, if the reduction in the diameter of the rope due to abrasion is more than of the 7% declared diameter, the rope in question is to be discard.

In case the declared diameter 10 mm of a rope

10 mm x 0.07 = 0.7 mm

10mm – 0.7mm = 9.3mm

This rope can be used continuously if measurement result of the diameter is 9.3mm or more.

(3) Inspection of corrosion: When, through visual inspection, it has been discovered that pit corrosion has occurred in the surfaces of strands of a rope, the rope has become pitted, or the strands of the rope have become loose due to corrosion inside the rope, the rope in question is to be discarded.

(4) Inspection of deformation: When, through visual inspection, it has been discovered that the shape of a rope has collapsed, there is a kink in the rope, or the rope has noticeably become flattened, bent, or caged, the rope in question is to be discarded.

2. The discard standards based on the inspection, measurement, and the results thereof of safety factor reductions of attached metal couplings are as follows.

(1) Inspection of deformations: When, through visual inspection, bending, twisting, distortion, or the like have been discovered in the attached metal couplings, the metal couplings in question are to be discarded.

(2) Inspection of marks: When, through visual inspection, a noticeable die mark or indentation mark has been discovered in the attached metal couplings, the metal couplings in question are to be discarded

(3) Visual inspection and measurement of cracks:

1) When, through visual inspection, a crack has been discovered in the attached metal couplings, the metal couplings in question are to be discarded.

2) When, with penetrant inspection test methods, a crack has been discovered in the attached metal couplings, the metal couplings in question are to be discarded.

3) When, with magnetic particle inspection test methods of ferrous materials, a crack has been discovered in the attached metal couplings, the metal couplings in question are to be discarded.

(4) Measurement of abrasion: In a measurement in which a vernier caliper or similar instrument is used, if the amount of abrasion of the attached metal couplings is more than 10% of its original dimensions, the metal couplings in question are to be discarded.

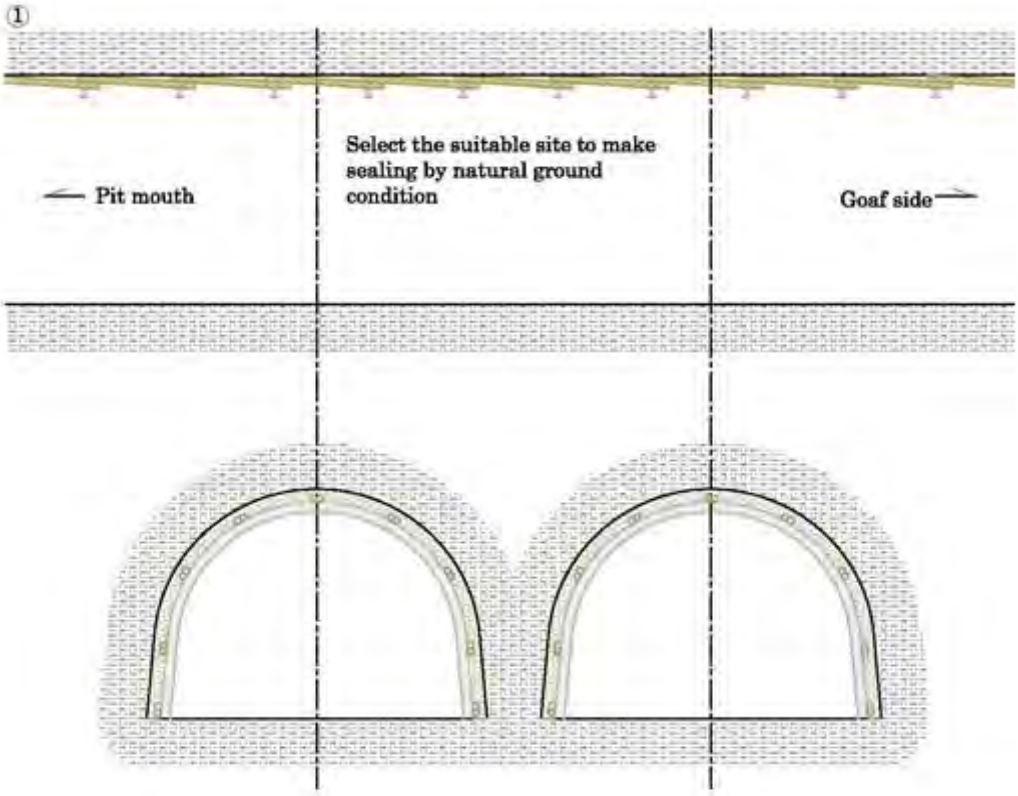
(5) Inspection of corrosion: When, through visual inspection, it has been discovered that the entire surface of the attached metal couplings is corroded or when noticeable corrosion has been discovered at a single location of the attached metal couplings, the metal couplings in question are to be discarded.

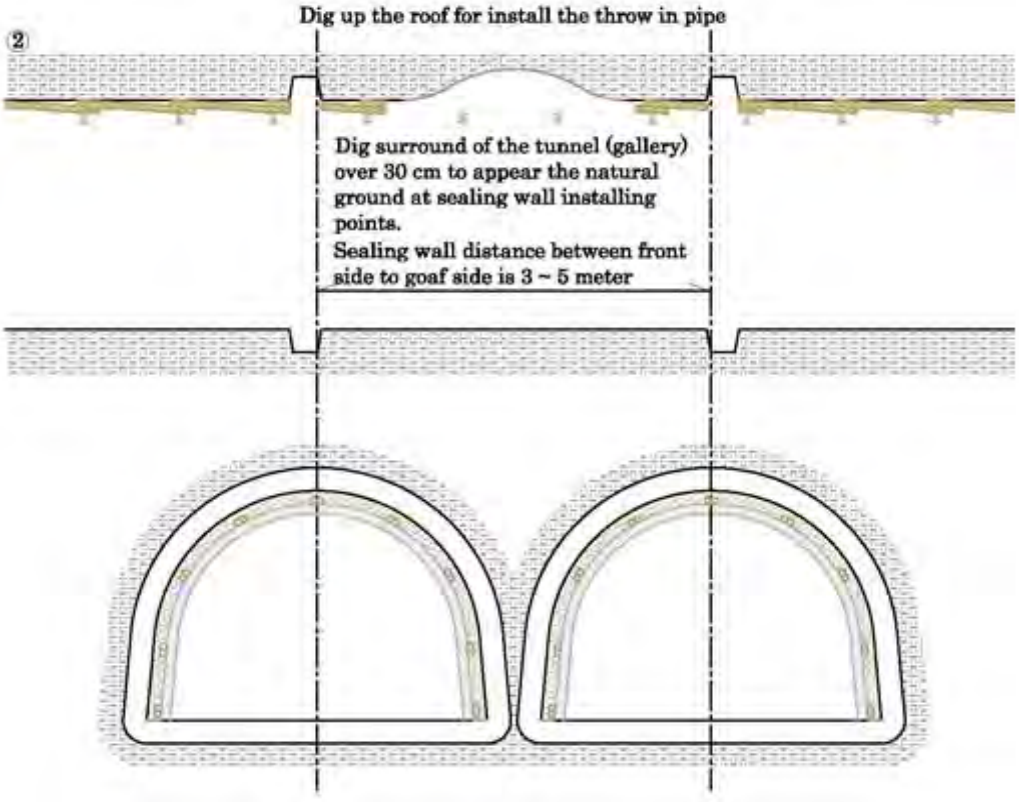
Article 22 The "Measuring method of the reduced safety factor of the inclined shaft-hoisting device for transportation of personnel" based on the provisions of Article 31, Paragraph 1 of the Mine Safety Law and of Article 138, Paragraph 2 of the Regulation therein is prescribed as follows.

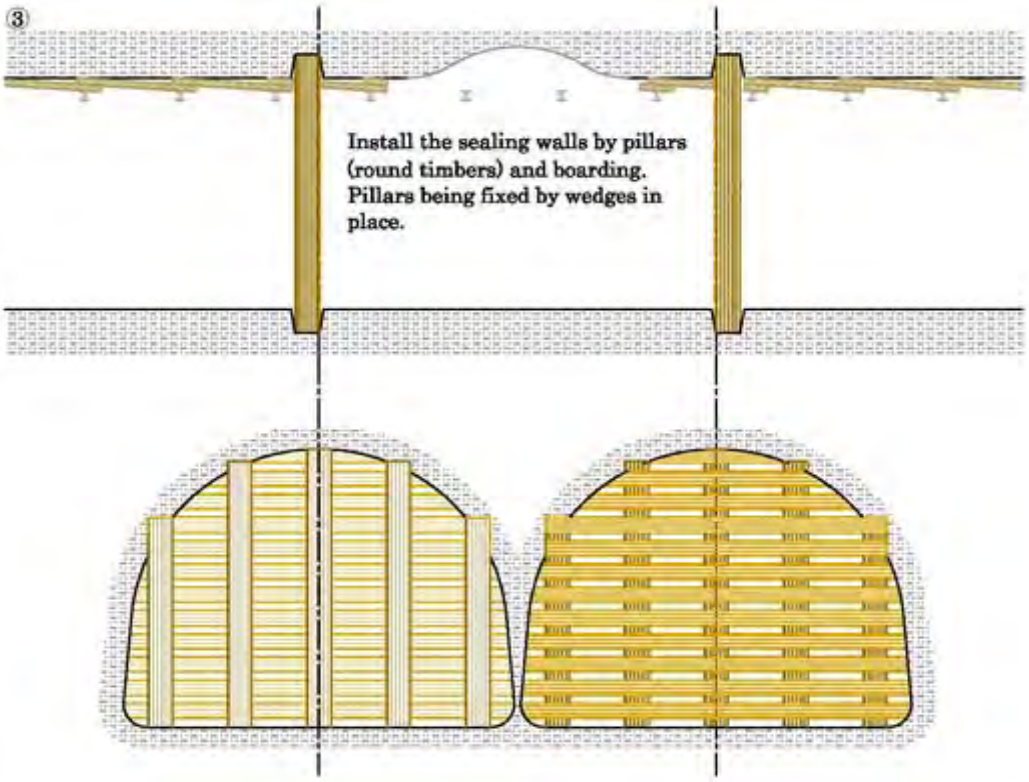
1. The discard standards based on the inspection, measurement, and the results thereof of the reduced safety factor of ropes shall be applied the content prescribed in the aforementioned Article 21.

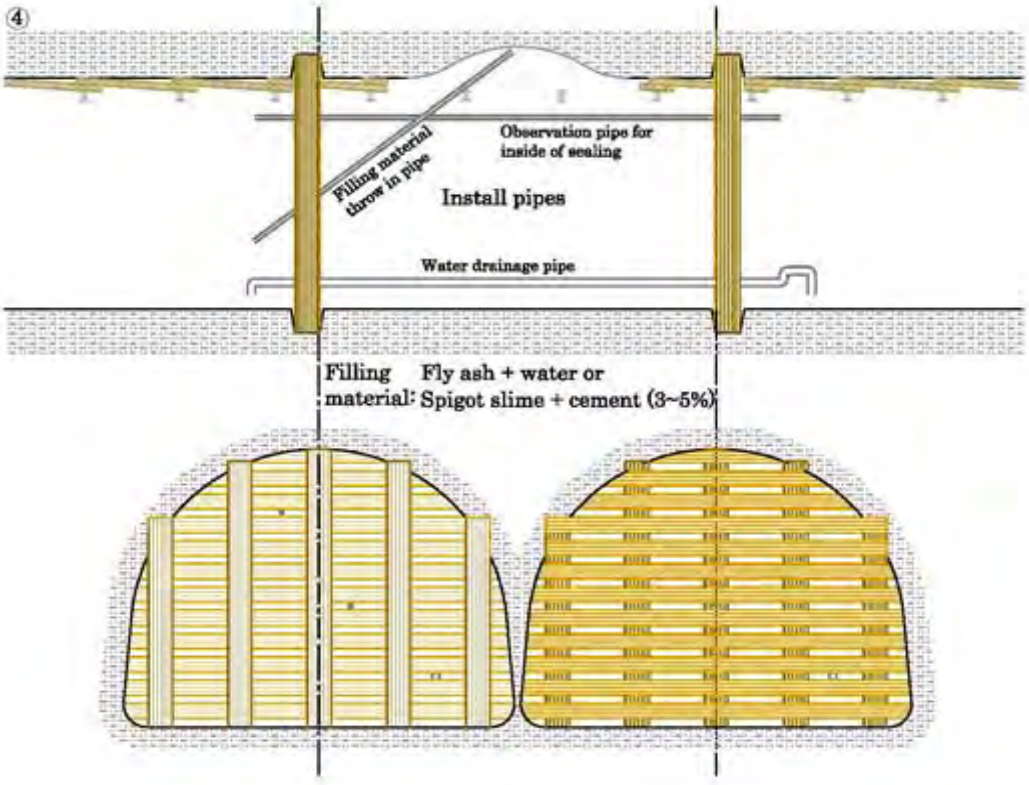
2. The disposal standards based on the inspection, measurement, and the results thereof of the reduced safety factor of attached metal couplings shall be applied the content prescribed in the aforementioned Article 21.

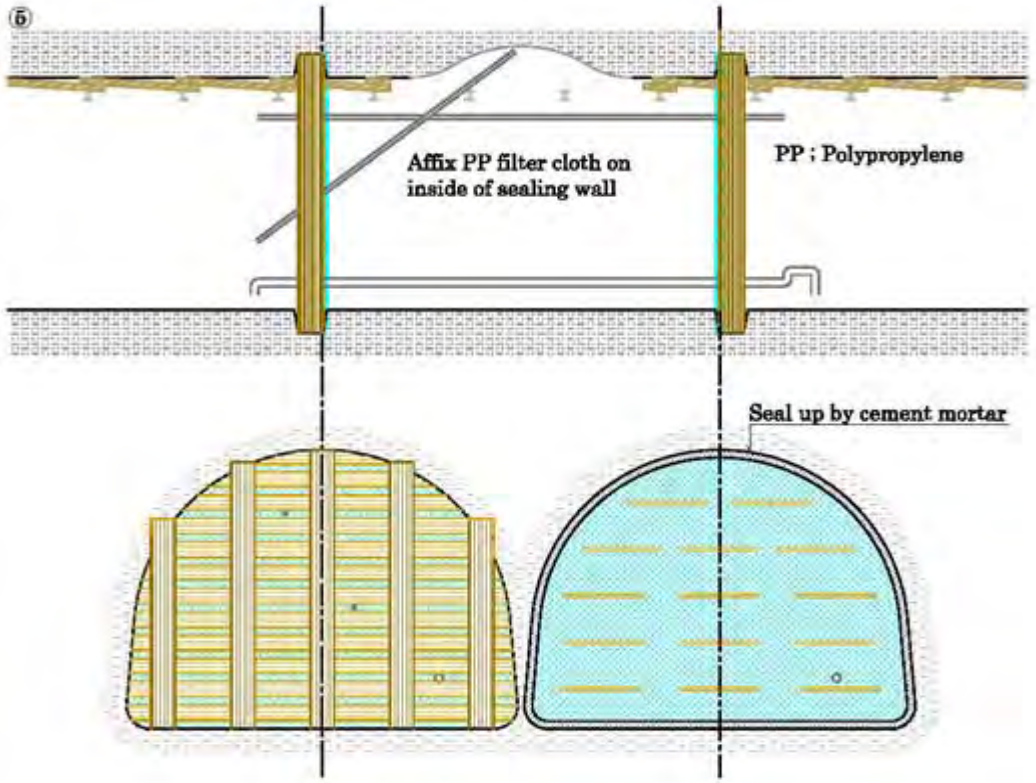
Article 23 The "General structure of sealing method used in sealing of tunnels (galleries) connecting to goaf where spontaneous combustion occurs or is likely to occur" based on the provisions of Article 31, Paragraph 1 of the Mine Safety Law and of Article 161, Paragraph 5 of the Regulation therein are prescribed as follows.

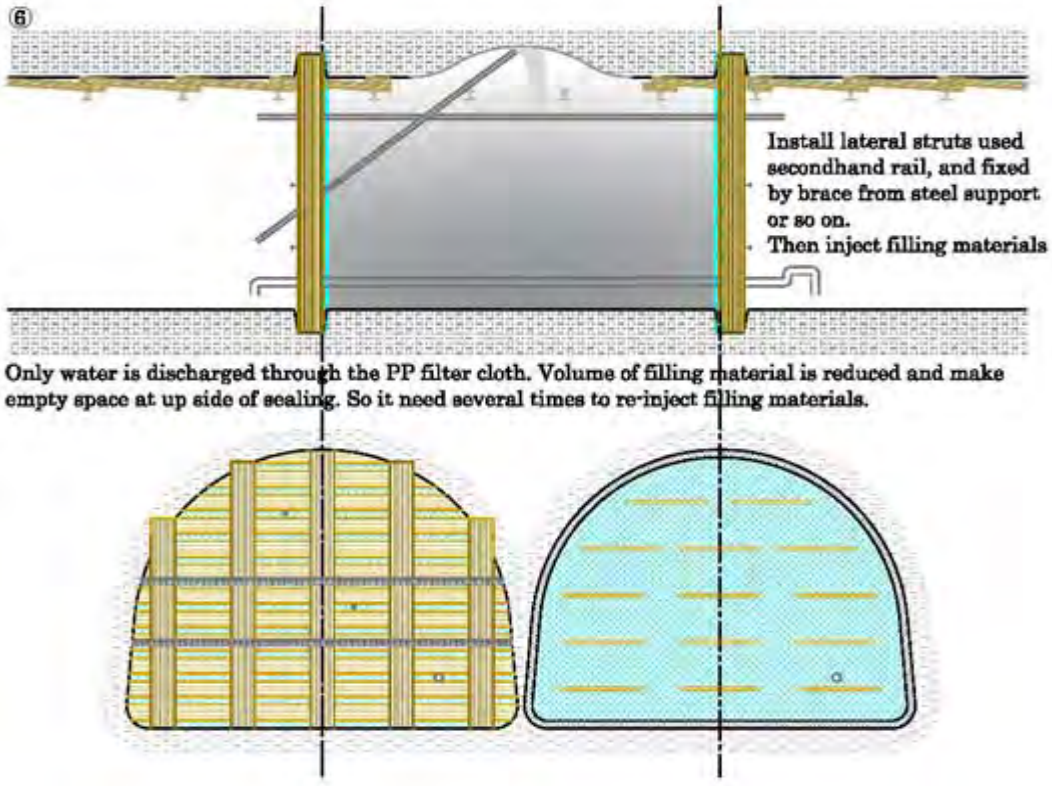

①
Select the suitable site to make sealing by natural ground condition
Pit mouth
Goaf side


Dig up the roof for install the throw in pipe
②
Dig surround of the tunnel (gallery) over 30 cm to appear the natural ground at sealing wall installing points.
Sealing wall distance between front side to goaf side is 3 ~ 5 meter


③
Install the sealing walls by pillars (round timbers) and boarding. Pillars being fixed by wedges in place.


④
Observation pipe for inside of sealing
Filling material throw in pipe
Install pipes
Water drainage pipe
Filling material:
Fly ash + water or
Spigot slime + cement (3~5%)


⑤
Affix PP filter cloth on inside of sealing wall
PP ; Polypropylene
Seal up by cement mortar


⑥
Install lateral struts used secondhand rail, and fixed by brace from steel support or so on.
Then inject filling materials
Only water is discharged through the PP filter cloth. Volume of filling material is reduced and make empty space at up side of sealing. So it need several times to re-inject filling materials.

Article 24 **The "Designing and construction of the sealing in a tunnel (gallery) for prevention of mine pollution from which mine water that does not conform to the effluent standard pursuant is discharged" based on the provisions of Article 31, Paragraph 1 of the Mine Safety Law and of Article 176, Paragraph 2 of the Regulation therein is prescribed as follows.**

1. In regards to the sealing techniques and construction in a tunnel (gallery): as sealing measures of tunnels (galleries), the traditional approach was to seal a tunnel (gallery) with concrete plugs in an abandoned mine in order to block mine water discharged from the adit mouth at the abandoned mine and to control contaminated mine water; however, the construction methods are that currently used are divided into the three types shown in the following figures.

a) Sealing construction method with complete sealing/water-sealing type

A construction method with which a tunnel (gallery) is sealed with concrete plugs in order to completely confine the mine water into cavities like the excavated areas at the abandoned mine so that no water is discharged from the adit mouth.

b) Sealing construction method with overflow type

Even if all adit mouths of tunnels (galleries) are sealed, the complete sealing/water sealing type of item above a) is not real possibility.

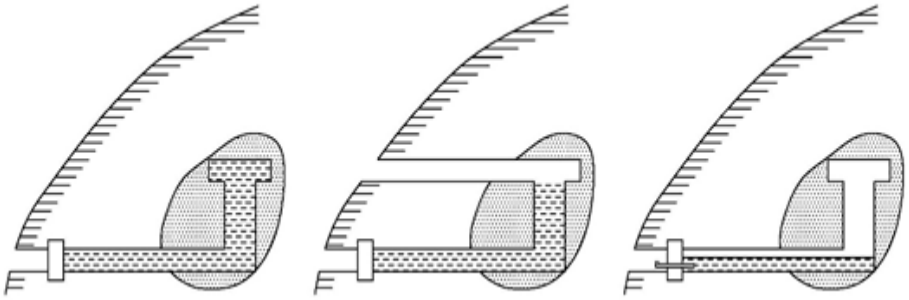
In general, mines have multiple adit mouths, and because each tunnels (galleries) runs through the underground mine, there are many cases in which the mine water that no longer has an outlet because of sealing a tunnel (gallery), overflows from other adit mouths and other locations. One advantage of the sealing construction method (overflow type) is that the flooding of mine water improves the quality of the contaminated water because the level of oxidation in the ore deposits decreases, and it is expected that by using this overflow type is that the quantities of mine water that seeps into the tunnel (gallery) connecting to the adit mouth because of the water pressure created from storing mine water into cavities of the abandoned mine, will decrease.

c) Sealing construction method that aims at sealing air

This technique that is considered in cases such as when it is difficult to install the appropriate sealing plug in a tunnel (gallery) and when the leakage of water to the surface makes it impossible to seal a tunnel (gallery). With this construction method, measures are taken in order to store a portion of the mine water into cavities of the mine and to prevent air that causes the oxidation of the ore deposits from entering

into the mine, and the shapes and sizes of the sealing plugs used in this method are completely different than those used in sealing above cases.

The outflow of mine water from adit mouths does not stop, but the result of preventing air from entering is that this creates an oxygen deficiency in the air inside the mine and thus the quality of the mine water is improved because the level of oxidation in the ore deposits deceases. Also, as cases in which mine water treatment is performed by utilizing a combination of these techniques and construction methods, methods such as 1) a method with which the valve of the sealing portion is manipulated in order to equalize and calibrate the flow rate of the mine water, and 2) a method with which multiple tunnels (galleries) near the adit mouth are sealed in order to unify mine water treatment, and using a combination of these methods makes it possible to reduce the costs associated with mine water treatment.



Complete sealing/water-sealing type Overflow type Sealing aims for air shut

2. When constructing a sealing plug with plain concrete for the implementation of a sealing construction method, the length of the sealing plug, as a rule, is calculated with following calculation formula.

$$L = \frac{PA}{\tau_a l} \times Fs$$

L : The length of the sealing plug (m)

p : The amount of water pressure applied to the sealing plug (t/m^2)

A : Cross-sectional area of the anterior surface of the sealing plug (m^2)

τ_a : The allowable shearing strength shall be 55 t/m^2 when the strength of the bedrock of a sealed area is more than the strength of the concrete or shall be the value of the bedrock obtained from testing and other

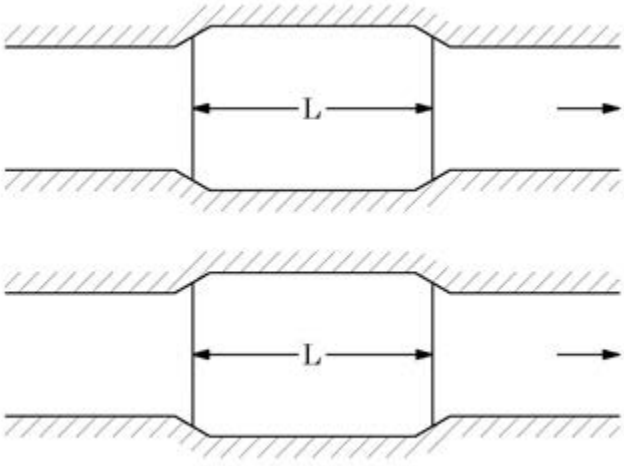
methods when the strength of the bedrock is less than the strength of the concrete. (t/m^2)

l : The mean circumference of the sealing plug (m)

Fs : Safety factor (= 2 as standard)

Plane figure (2D)

Direction to the adit mouth ⇒



Cross Section

Article 25 The "Evaluation of underground working places in items of scattered dust concentration in the air and content rate of free silicic acid into the dust at underground working places" based on the provisions of Article 31, Paragraph 1 of the Mine Safety Law and of Article 243-2, Paragraph 1 of the Regulation is performed according to the "II. Measurement value calculation method of dust concentration and evaluation of the measurement results" from the "Manual on Measurement and Evaluation of Dust Concentration at Mines"

Article 26 The "Spots where explosive coal dust samples scattered and accumulated should be collected, methods how to take the samples, and methods how to measure the quantity of incombustible substance into the samples" based on the provisions of Article 31, Paragraph 2 of the Mine Safety Law and of Article 266-8, Item 2 of the Regulation therein are prescribed as follows.

The spots where samples indicating explosive coal dust scattered and accumulated should be collected, the methods and periods for taking the samples, and the methods

for measuring the quantity of incombustible substance in the samples are prescribed as follows.

(1) Collection locations

The samples should be collected in the following locations (limited to the spots where explosive coal dust scatters and accumulates).

1) With the source being the shoulder and deep part of the coal working fields (or tunneling fields), and their surroundings approximately 30 meters apart at the intake air ways and return air ways

2) Five or more spots, within approximately 500 meters apart in main haulage tunnels (galleries) (excluding vertical shafts and levels)

3) The spots, within approximately 500 meters apart in haulage tunnels (galleries) that are not main haulage tunnels (galleries) (excluding vertical shafts)

4) Coal loading and transferring sites

5) Other spots where samples need to be collected

(2) Collection methods

Samples should be collected using the following methods.

1) Samples should be collected in areas having a width of 20 cm or more, along the circumference of the cross section of a tunnel (gallery), and from the ceilings and walls of a tunnel, and samples are to be collected from the entire area of accumulation, and from the floor, a depth of up to 2 cm of the area is to be collected.

2) Samples, with the exception of the items prescribed in the preceding Item, are to be separately collected at the floor area (this refers to the floor and the sidewalls at a location 2/3 the height of the tunnel. the same definition applies hereinafter.) and the ceiling area (this refers to ceiling and the areas of the sidewalls not included in the floor area.).

3) Samples are to be collected in order from the floor, the side walls, and the ceiling, and the samples are to be collected from leeward spots. It is important to make sure that the wind does not hinder the collection of these samples.

(3) Collection periods

1) When a new coal working field has been installed, samples are to be collected within one month following the installation of the coal working field in question, in tunnels (galleries) in which the installation of the working field resulted in the scattering and accumulation of explosive coal dust.

2) At other locations, samples are to be collected at least once every six months.

(4) Methods for measuring the quantity of incombustible substance

In the measurement of the quantity of incombustible substance, samples that have passed through wire sieves measuring 840 microns (20 meshes), as prescribed in Japanese Industrial Standard (JIS) Z8801, shall be measured using the following methods.

1) In regards to moisture, samples collected from sections containing coal in a coal bed with a free moisture value calculated with a technical analysis method (total moisture content analysis method) prescribed in Japanese Industrial Standard (JIS) M8811or with a moisture measuring device are to be measured with a method in which the constant moisture sample (inherent moisture) value measured with a technical analysis method established in JIS M8812 (constant moisture sample moisture analysis method) is added.

2) Incombustible substances other than moisture are to be measured with analysis methods using volumenometers or mine polarizing microscopes or technical analysis methods (ash content analysis methods) prescribed in JIS M8812.

Article 27 The "Evaluation of environment of indoor working places outside mine in terms of scattered dust concentration in the air and content rate of free silicic acid into the dust" based on the provisions of Article 31, Paragraph 1 of the Mine Safety Law and of Article 270-2, Paragraph 1 of the Regulation therein and the "Post-measure reevaluation based on the evaluation of environment of indoor working places outside of mines" based on provisions of Article 270-3, Paragraph 2 of the Regulation are prescribed as follows.

For the evaluation of environment of indoor working places outside mine in terms of scattered dust concentration in the air and content rate of free silicic acid into the dust, the evaluation is performed according to "II. Measurement value calculation method of dust concentration and evaluation of the measurement results" from the "Manual on Measurement and Evaluation of Dust Concentration at Mines".

Article 28 The "Procedures regarding enter onto a third party's land, or use that land temporarily with the permission of the Minister in charge of mines sector when it is necessary to prevent imminent danger" based on the provisions of Article 32, Paragraph 1 of the Mine Safety Law and of Article 282 of the Regulation therein are prescribed as follows.

Fixed Form NO.15

DD/MM/YYYY

To: the Minister in charge of mines sector

From: Name of the concessionaire (representative of corporation) and signature

In accordance with the provisions of Article 32, Paragraph 1 of Mine Safety Law and of Article 282 of the Regulation, the following details matters of "Application for Permission of Enter onto Third Party's Land, or Use of the Land in Emergencies" shall be submitted for application.

Application for Permission of Enter onto Third Party's Land, or Use of the Land in Emergencies	
1. Name of mine (kinds of minerals)	
2. Licensed number of the mining area	
3. Location of the mine	
4. Name of the Safety Supervisor	
5. Items concerning third party's land **1) Address of the land** **2) The official name of the land**	
6. The purpose of enter or use of the third party's land	

Regulation on procedures and items of mentioned provided in Mine Safety Law and its regulations (NO. 2)

February 2017

Attachment-1) Safety Rules in ABE mine (a model case)

(Contents)

Chapter 1　Structures of mine safety management

The concessionaire of ABE mine shall appoint a chief officer of the mine office to the safety supervisor and the director of Mining Department to the representative of safety supervisor and a technical safety manager.

1-1　Structures of mine safety management

In ABE mine, structures of mine safety management shall be established as follows in accordance with the organization of the mine office. Also, the concessionaire shall appoint the technical safety manager, the deputy technical safety managers, and the technical safety staff under the safety supervisor.

The "Structures of Mine Safety Management at ABE mine" shall be indicated in the diagram attached.

(1) When the safety supervisor is absent due to travel, illnesses or another accidents, the representative of safety supervisor shall perform the duties of the safety supervisor.

(2) The safety supervisor shall be the chief officer of the mine office, the technical safety manager shall be the director of Mining Department, deputy technical safety managers shall be directors or deputy directors of the Department that they are in charge of, and technical safety staff shall be a section chief, group manager and staff of the department that they are in charge of.

Chapter 2　Safety committee

The safety committee shall be an organization that makes decisions in regards to the safety measures at ABE mine, and it discusses, deliberates on, determines, and approves the necessary items regarding safety. In addition to cooperating in the duties of the safety supervisor and technical safety managers that are in regards to safety, the committee shall provide counseling and advice as necessary.

2-1　Methods for assignment of safety committee members

(1) The safety committee members shall be composed of the chairperson, which is the role filled by the safety supervisor, committee members nominated by the concessionaire, and other committee members nominated by a labor union (or mine workers) and the office staff.

(2) Half of the committee members shall be mine workers such as technical safety managers or technical safety staffs nominated by the concessionaire, and the other half shall be mine workers nominated by the labor union (or mine workers).

(3) The term of service of a committee member shall be one year, and committee members may be reappointed. In the event that a committee member has been replaced, the successor of the committee member in question shall be appointed and serve the remainder of the term of service of the predecessor.

(4) The office of the safety committee shall be under the charge of the Environmental Safety Department, and the secretary-general thereof shall be the director of the Environmental Safety Department.

(5) If decided and approved by the safety committee, participants other than committee members and observers may participate.

2-2 Frequency of committee meetings

Safety committee meetings shall be held once per month. However, when it has been determined to be necessary or when more than one half of the committee members have made a request, an extraordinary meeting shall be held.

2-3 Management of the safety committee

(1) When less than two thirds of committee members attend the meeting, the committee meeting cannot be held.

(2) The safety committee shall discuss and perform deliberation in regards to important matters to be reported, such as items regarding important safety measures, the execution status of safety measures, safety training curriculums and items regarding mine disasters/accidents or mine pollution problems, and items regarding the own Mine Safety Rules.

(3) Decisions to be made by the committee require a majority agreement from the committee members in attendance. In the case of a tie, the chairperson shall make a decision regarding the matter.

(4) Observers and temporary participants may express their opinions, but they do not have the right to vote.

2-4 Items regarding the recording of the results of deliberation

(1) The safety supervisor, with the cooperation of the safety committee members and the office staff (the Environmental Safety Department) thereof, will notify all mineworkers in regards to the proceedings, including details such as the deliberation results of the safety committee, by distributing copies of the proceedings or by some other method.

(2) The proceedings of the safety committee are to be drafted each time a meeting is

held, and they shall be kept for a period of three (3) years.

Chapter 3 Safety promotion activities

3-1 System for implementing safety promotion activities and the details

(1) Details of activities

1) Yearly safety plans

The safety supervisor shall provide instruction to the secretary-general of the safety committee (the director of the Environmental Safety Department) for the establishment of important safety measures for the year in question and shall implement the safety measures upon drafting a yearly safety plan for the definite promotion of the established safety measures.

2) On-going safety activities

In addition to the important safety measures established in the yearly safety plan, ABE mine shall tackle the following safety promotion activities as on-going safety activities.

a) Activities for promoting the reduction of risk factors

b) Activities for promoting the improvement of the reliability of facilities

c) Daily safety promotion activities

d) Activities for promoting safe operation

(2) Implementation systems

1) For the safety promotion activities, everyone, the organization of ABE mine shall be united, with the safety supervisor at the top, and this organization shall tackle these activities.

2) After the office of the safety committee (the Environmental Safety Department) has established the yearly safety plan and safety promotion activities in cooperation with the relevant departments and has received the approval of the safety supervisor, the yearly safety plan and safety promotion activities are to be implemented after discussion and deliberation in regards to the safety committee has been performed.

3) Each department at ABE mine shall incorporate the details of the yearly safety plan and safety promotion activities into their "yearly production/safety plan" and implements it.

(3) Evaluation

Refer to Section 7 "Implementing system, measures and evaluation methods for securing safety".

3-2 Items regarding the recording of safety promotion activities

In regards to the implementation status of the "yearly safety plan" and of the "yearly production/safety plan" of each department, the office of the safety committee (the Environmental Safety Department) shall record and keep the results of periodic hearings conducted by the safety supervisor and other relevant parties. Furthermore, those records are to be reflected in the safety plan of the following year.

Chapter 4 Safety training

4-1 Persons who are to receive safety training, the extent of safety training, and the methods of safety training

(1) Purpose of safety training and persons who are to receive safety training

The details of safety training and technical training to mineworkers (employees) in each field of work, in order for the mineworkers (employees) to execute the required duties safely and smoothly, are established.

(2) The safety training system consists of the following three fields.

1) Basic safety training

a) General safety training

b) Skills training courses in regards to Mine Safety Law, promoted by the concessionaire

2) Training in connection with the safety of the technical training program

3) Classroom learning for acquiring qualifications related to safety and the environment

(3) Items, details, extent, and methods of safety training

1) Basic safety training

a) General safety training

① The work of using explosives to carry out blasting work (and the mineworker qualified for blasting)

Education items in field of work	Details of safety training	Extent and methods of safety training
1. Details of academic training	Utilizing own	
1) Knowledge of explosives	Safety Rules, work	4 hours
2) Handling of explosives	manuals, and the	4 hours
3) Blasting work methods	individual or group	4hours
4) Related Laws and Regulations	training and on-	2hours

2. Practical training (OJT)	**the-job training based on technical documentation regarding safety**	**period of apprenticeship 10 days**

② Handling and management work of poisonous and deleterious substances (including inorganic cyanides)

Education items in field of work	Details of safety training	extent, and methods of safety training
1. Details of academic training **1) Chemical properties of poisonous and deleterious substances** **2) Handling and treatment of poisonous and deleterious substances** **3) Related Laws and Regulations** **2. Practical training on handling and disposal methods (OJT)**	**Utilizing own Safety Rules, work manuals, and the individual or group training and on-the-job training based on technical documentation regarding safety**	**4 hours** **4hours** **2hours** **period of apprenticeship 5 days**

③ New mineworkers (employees)

Education items in field of work	Details of safety training	Extent and methods of safety training
1. Details of academic training **1) Fundamentals regarding safety and health** **2) Fundamentals regarding traffic safety** **3) The general state of ABE mine** **4) Related Laws and Regulations** **2. Study tour of facilities in ABE mine**	**Group training with textbooks, videos, and other materials**	**2 hours** **2hours** **2hours** **2hours** **Study tour 4hours**

Annotations)

1) The person in charge of safety training shall, in principal, be appointed in the position of a technical safety staff or a higher rank of the mine.

2) Persons who have the proper certifications to be exempt from the training do not need to undergo safety training.

(4) Safety training for transferees and contractors

1) Transferees, in consideration of their work experience, shall receive the necessary safety training by utilizing the basic safety training and work manuals of the mine.

2) Responsible officers and directors of the contract, in consideration of their work experience, qualifications and abilities, shall receive the necessary safety training by utilizing work specifications, work manuals and safety training materials of the mine in order to allow the aforementioned persons to be able to safely and accurately perform construction.

3) Before beginning work, safety training is administered to all participating contractors, and the records thereof shall be kept.

4-2 The extent and methods of retraining

(1) Implementation of retraining

In the event of any of the following, the Environmental Safety Department in charge of safety training shall conduct retraining in cooperation with the relevant departments.

1) In the event that a mine disaster/accident or mine pollution problem has occurred

After the causes and countermeasures of the mine disaster/accident or mine pollution problem in question have been investigated and studied by the mine disaster/accident and mine pollution problem prevention and investigation committee (the Environmental Safety Department being the office, and the director of the Environmental Safety Department being the secretary-general), the necessary retraining shall be implemented to all mineworkers and safety technical staffs in the relevant departments.

(2) When safety problems have been discovered in the survey of mine safety conditions

1) After the causes and countermeasures have been investigated and studied by the mine disaster/accident prevention and investigation committee, the necessary retraining shall be implemented to all mineworkers and safety technical staff in the relevant departments.

2) Using risk assessment methods, the factors of hazards are discovered, analyzed, and evaluated, and countermeasures are investigated and then implemented.

4-3 Items regarding the recording of training

When safety training has been conducted, the department that conducted the training shall record in the "prescribed form" the period of the training, the names of instructors and persons receiving safety training, the results of the safety training, etc. and the department shall keep the data.

Chapter 5 Measures devised to deal with a mine disaster/accident or mine pollution problem

5-1 Contact system

(1) Contact system (Chain of emergency contact system, fundamentals of reports)

1) In order to make it possible to quickly contact the General Department of Mineral Resources, the related local bureaus, and parties related to the mine, in the event of a state of emergency such as a mine disaster/accident or mine pollution problem, the "chain of emergency contact system" is separately established and displayed at the all the required places, such as the headquarters, each department, and the main facilities in the mine.

2) In the event of changes in personnel or another similar event, a new version of the "chain of emergency contact system" shall be drafted and distributed immediately.

3) When reporting in the event of an emergency, a clear and concise report regarding the (when), (where), (who), (what), (why), and (how) of the event shall be made and thoroughly conveyed from higher rank of the mine to mineworkers.

4) When a mine disaster/accident or mine pollution problem has occurred, the measures are to be performed according to the separately established in the "Manual on measures devised deal with a mine disaster/accident or mine pollution problem".

(2) Measures for preventing the expansion of mine disasters/accidents or mine pollution problems

1) Initial response

a) In the event of a natural disaster caused by a typhoon or heavy rainfall, etc. or when an official warning thereof has been given, response is to be performed according to the "Manual on measures devised deal with a mine disaster/accident or mine pollution problem".

b) In the event of a mine disaster/accident or mine pollution problem

A person who discovered a mine disaster/accident or mine pollution problem has to immediately contact a technical safety staff or the headquarters of the mine according to the "chain of emergency contact system", and must be followed the instructions provided by the technical safety staff or a person concerned of the headquarters. Furthermore, in the event of a fire, the fire station is to be notified immediately.

c) In the event of a fire

① A person who discovered a fire has to immediately contact a technical safety staff or the headquarters of the mine according to the "chain of emergency contact system", and must be followed the instructions provided by the technical safety staff or a person concerned of the headquarters.

② When a fire has occurred near a gas induction facility or gas holder, the flammable gases in the induction facility or gas holder should be moved to a safe location or be released into the atmosphere using a safe method.

(3) Establishment of a mine disaster/accident response headquarters

1) When a mine disaster/accident or mine pollution problem has occurred, the "headquarters on measures devised deal with a mine disaster/accident (or mine pollution problem)" shall be established in the ABE mine in order to comprehensively deal with a disaster/accident or mine pollution problem and to effectively promote the implementation of measures, as follows.

a) When three or more mineworkers were injured at the mine

b) When an accident such as a large-scale fire or an explosion occurred at a mine facility

c) When an accident involving the run-off of tailings or sediments at a waste stone dump or tailings dam because of a factor such as the collapsing of an embankment has occurred

d) When, in the event of a mine disaster/accident (or mine pollution problem), the safety supervisor has determined that the "headquarters on measures devised deal with a mine disaster/accident (or mine pollution problem)" needs to be established

2) The "headquarters on measures devised deal with a mine disaster/accident (or mine pollution problem)" is established in a meeting room at ABE mine, and the safety supervisor shall be the general director of headquarters on measures of the mine disaster/accident (or mine pollution problem). Furthermore, when necessary, an "on-site headquarters on measures of the mine disaster/accident

(or mine pollution problem) is to be established at the on-site, and the technical safety manager shall be the chief of the on-site headquarters on measures of the mine disaster/accident (or mine pollution problem).

3) All other measures are to be implemented according to the "Manual on measures devised deal with a mine disaster/accident or mine pollution problem".

(4) Organization of fire-fighting crews

1) Firefighting crews of ABE mine

a) Fire-fighting crews shall be organized by staff members of the Mine Facilities Department as its nucleus and with the director of the Mine Facilities Department to be its chief.

b) The safety supervisor shall provide instruction for the organization of a fire-fighting crews being made up staff members other than the staff of the Mine Facilities Department, when necessary.

c) When it is necessary to change the staff members of the fire-fighting crews, staff members are to be reviewed accordingly by the chief of fire-fighting crews (the director of the Mine Facilities Department).

d) Members of fire-fighting crews implement following fire-fighting drills periodically according to the "Manual on measures devised deal with a mine disaster/accident or mine pollution problem".

① Using methods of fire-fighting apparatuses

② Fire-fighting methods in the event of a fire

③ Securing contact in the event of a fire or emergency

④ Rescuing injured persons (attendance of lifesaving training)

2) Duties of the fire-fighting crews

a) Quick dispatch to the scene of the fire

b) Support for first-aid fire-fighting performed with fire extinguishers

c) Guidance for public fire-fighters

d) Prevention of the spreading of fire and the issuance of alerts at the scene of the fire

e) Support for training in regards to the usage methods of fire extinguishing apparatuses

(5) Reports that need to be informed in regards to a mine disaster/accident or mine pollution problem to the General Department of Mineral Resources

Mine disaster/accident or mine pollution problem	Information and Submission deadline concerning a report

1) When a mine disaster that resulted in fatality or in injured persons having to take an estimated period of at least four weeks has occurred.	**A report is immediately informed to the General Department of Mineral Resources.**
2) When a mine pollution problem has occurred.	**A detailed report on "mine disaster/accident or mine pollution problem" is made and submitted within 30 days after occurrence of the mine disaster/ accident or mine pollution problem.**

(6) Recording of reports

In regards to the recording of the mine disaster/accident or mine pollution report, the report submitted by the Environmental Safety Department to the General Department of Mineral Resources shall be kept for five (5) years.

(7) The utilization of analysis results and measures

1) In the stage at which measures have been completed following the occurrence of a mine disaster/ accident or mine pollution problem, the safety supervisor will work to prevent the reoccurrence of the mine disaster/accident or mine pollution problem by acquiring the details of the status, studying the causes, reviewing the work manuals, making improvements, and performing safety retraining.

2) Items such as the analysis results of the cause of a mine disaster/accident or mine pollution problem and the measures for preventing reoccurrence are to be reflected in the improvements of the yearly safety plan and work manuals of the following year.

5-2 Evacuation methods

(1) When the technical safety staff has determined that mineworkers have been harmed or that there is a danger of mineworkers being harmed, the technical safety staff will take appropriate measures, including suspending work, in order to avoid harm.

(2) After an evacuation has been performed, the technical safety staff shall execute a roll-call to confirm that all mineworkers have evacuated.

5-3 Methods of rescuing injured persons

(1) When there is an injured person, the person/persons who discovered the mine

disaster will immediately arrange for the injured person to be transported to a hospital and will then report the incident to mine higher-ups and other relevant parties according to the separately established "chain of emergency contact system".

(2) After the vehicle that is to transport the injured person to the hospital has arrived, the person/persons who discovered the mine disaster shall accompany the injured person to the hospital when possible. Furthermore, when it is difficult to accompany the injured persons because of factors such as having to deal with the mine disaster in question, emergency contact in regards to that fact will be made to the Environmental Safety Department or the General Affairs Department, to ask them to handle the situation.

5-4 Measures for the occurrence of a mine disaster/accident or mine pollution problem at each mineral working field and mine facility

Departments shall implement the followings at mineral working fields and mine facilities that they are in charge of managing.

(1) Each department has to provide and install following first aid tools and materials necessary for treating injured persons near mineral working fields and mine facilities, and the installation locations and methods of use of first aid tools and materials shall be widely known to mineworkers in advance.

1) Bandage materials, bandage forceps and antiseptics

2) Ointments for burns are provided at a mineral working field where mineworkers handle heated materials that are extremely high temperatures and at other working fields where there is a high risk of being burned.

3) Tourniquets and wooden splits are provided at working fields where there is a risk of serious injury.

4) Stretchers

(2) Fire extinguishers are installed for first-aid fire-fighting at each mineral working field, mine facility and vehicles.

(3) During daily inspection, remove fallen trees and other objects that may damage the facilities in advance.

(4) Work manuals for suitable operation methods of mine facilities that assumes the occurrence of a mine disaster/accident or mine pollution problem shall be prepared.

(5) The minimum required emergency response materials shall be Secured.

(6) In order to prevent damage for mineral working fields and mine facilities due to the

malicious intent or gross negligence of a third party, signs clearly stating that the use of open flames is prohibited, that the entry to certain areas is prohibited, the names and location of persons to contact in case of an emergency, etc., shall be installed at each mineral working field and mine facility, and signs indicating the installation of underground facilities shall be installed.

(7) When construction by another company has been planned near a mine facility, this matter is brought to the attention of mineworkers, and, if it is considered that the construction will affect the facilities of ABE mine, person of the mine shall be attended during the construction if necessary. Also, the number of patrols is to be increased appropriately in order to assure safety.

(8) In order to prepare for natural disaster caused by heavy rainfall and typhoons, etc., the following measures are implemented as necessary.

1) Information from television, radio, the Internet, and other sources shall be collected by the Environmental Safety Department during the prediction stage and at the time of the occurrence of the disaster, and this information shall be provided to the relevant departments.

2) At locations requiring specific attention, the number of patrols is to be increased as necessary.

3) Measures such as rechecking the contact system and checking for, assuring, and waiting for emergency personnel, shall be taken in advance.

4) When digging work is being performed at mineral working field in a surface, it shall be instructed that the work thereof be suspended when safety measures have been implemented because of the current weather conditions.

5) The necessary materials for emergency measures and the personnel for performing repairs are to be secured.

6) After the passing of heavy rain, a typhoon, etc., comprehensive examination of each mineral working field and mine facility is to be conducted in order to check the safety.

Chapter 6 Concrete items for implementing measures that are taken by the concessionaire of the ABE mine

6-1 The use of machines, tools, and structures

The usage methods and operation methods of the devices and structures in question are separately established in the “use and examination standards of devices and structures in ABE mine”.

6-2 Prevention of roof fall and collapse in underground mining and of bed rock collapse and falling of loosed rocks in open-pit mining

(1) At the mineral working fields and tunneling working fields in underground mining, following necessary measures must be taken for prevention of roof fall and collapse.

1) Suitable supports or other equipment are installed depending on the conditions of the roof and side walls of mineral working places immediately when there is a risk of roof fall or collapse.

2) Head protection and face supports are taken at the face of tunneling.

3) Supports materials are provided in the proper working places.

4) The broken or decayed timbers for supports are promptly exchanged or reinforced.

5) Appropriate coal pillars or ore pillars are remained concerning size and arrangement suited to the bedrock conditions, if it is necessary for ensuring safety.

6) Appropriate measures such as installation of supports, or filling with soil or other materials are taken in sections where the mineral working has been completed and such measures are necessary for ensuring safety.

7) Items necessary for examining the roof, side walls and face of the tunnels before and during the work are taken. And, necessary measures such as removal of rocks are taken, if there is a risk of danger.

8) Suitable equipment for removal of loosed rocks for the roof and side walls of the tunnels are provided.

(2) At the surface mineral working fields and its neighboring area in open-pit mining, following necessary measures must be taken for prevention of bed rock collapse and falling of loosed rocks.

1) The surface soil is removed with safety method before conducting surface mineral working.

2) Benches with appropriate height and width are installed to secure safety at surface mineral working places. And, height and slope angle of mineral walls also are held safety.

3) Loosed rocks are removed with safety methods in advance. And, appropriate protection facilities are provided to prevent danger caused by falling loosed rocks.

4) Safe slope angles are suited to the bed-rock and other conditions maintained to prevent collapse of residual walls after mineral working.

5) Appropriate scaffolding are installed, when mineworkers have to work with a high risk of falling. And safety nets, ropes or other appropriate fall-prevention

equipment also are prepared.

6) Mineworkers are not worked simultaneously directly above and below of the bench with other mineworkers at the mineral working field, if there is a risk of danger caused by falling loosed rocks or rolling stones.

7) Operations are stopped and appropriate measures such as prohibition of access to the dangerous section are taken, if there is a high risk of danger caused by rainfall in or around the mineral working field.

8) Appropriate protective equipment are installed or off-limit area are established, watchmen are posted, or warning signs are put up or other measures to prevent entry of the surrounding area are taken, if there is a high risk of danger caused by flying stones or rolling stones out of the mine.

9) Car-stops are installed and other appropriate measures are taken to prevent vehicle-type mine machines and automobiles from falling over when using them to throw ores into an ore stock bin or crushers.

10) Residual walls and mineral working walls are maintained safe slope angles suited to the bed-rock conditions to prevent collapse when the mineral-related operations shall be intended to close or its operations are suspended. And, necessary measures also are taken to prevent falling, rolling stones and other dangers.

11) The technical safety staff for surface safety & blasting examines the sections with a high risk of looseness, slide and other types of collapse of bed-rock, and examines sections near the surface soil if stones or rocks are likely to be loosed in the mineral working field once or more every working hours.

12) Mineworkers who are posted in surface mineral working fields examines the bed-rock conditions before and during the work. And, necessary measures such as removal of loosed rocks also are taken using appropriate equipment if there is a high risk of danger.

6-3 Handling of explosives

(1) Mineworkers (technical safety staff) who only permit to handle explosives

1) The technical safety staff in charge of explosives and the technical safety staff in charge of blasting

Both of the technical safety staff in charge of explosives and the technical safety staff in charge of blasting are only permitted to handle the explosives at ASEAN mine are appointed by the concessionaire and noticed in the chain of the safety management system of Chapter 1, Safety management system, 1-1.

2) The mineworker who has trained regarding blasting (blasting assistant)

Those workers addressed by the safety training on Chapter 4, 4-1, who have completed the necessary amount of safety training as well as the necessary training for assisting blasting work as established by the safety training methods, shall engage in the assisting of blasting work according to the instructions provided by the technical safety staff in charge of blasting.

(2) Delivery and return of explosives

1) Measures for delivering explosives

a) When using explosives at a working field, the technical safety staff in charge of blasting shall ask the technical safety staff in charge of explosives to specify in the "explosives request form" the amount of explosives that are needed.

b) The technical safety staff in charge of explosives shall record the amount of delivered explosives in the "explosives delivery account book".

c) In the event that the technical safety staff in charge of blasting has explosives remaining after the performance of the blasting work in question, the technical safety staff will immediately return the remaining explosives to the technical safety staff in charge of explosives. The technical safety staff in charge of explosives will confirm the quantity of the explosives that were returned and will record that number in the "explosives delivery account book".

d) The technical safety staff in charge of blasting will record in the "safety diary for blasting" the quantity of explosives used in the blasting work, and, in the case that there are explosives remaining after the performance of the blasting work, the quantity of the explosives that were returned.

2) Temporary storage of explosives

a) At a mineral working field, explosives are able to be temporarily stored in a safety place where the blasting work is performed.

b) For a safety place where explosives are temporarily stored, the place through which vehicle-type mine machines and automobiles do not pass shall be chosen, fencing around the areas in question shall be installed, and warning signs such as "NO ENTRY" and "OPEN FLAMES PROHIBITED" shall be noticed near those areas.

(3) Measures for preventing hazards caused by explosives

1) Prevention of accidental firing

a) A Box or container that contains explosives shall be made of nonconductive materials such as polyethylene, polyvinyl chloride or wood, and must not have exposed iron-kind inside.

b) Pyrotechnics such as industrial detonators and electric detonators shall be

put separately from explosives in the box or container.

(4) Measures to be taken at a mineral working field where explosives are used (including a place where explosives are temporarily stored)

1) The use of open flames is to be prohibited.

2) Only items necessary for the handling of explosives are to be placed in the mineral working field.

3) Only persons certified to handle explosives are to be allowed to treat explosives.

(5) Appropriate measures for blasting work

1) The technical safety staff in charge of blasting shall fix industrial detonators and electric detonators to explosives in a safe place.

2) A warning is to be issued to mineworkers near the area where the blasting is to be performed, and the mineworkers are to be evacuated to a safe place.

3) Watchmen are posted, the safety of the area is confirmed, and then the siren that functions as the signal for blasting is sounded.

4) The technical safety staff in charge of blasting is to perform a circuit test and to fire the blasting after the test in a safe place.

5) After blasting, the technical safety staff in charge of blasting shall remove the leading wires of the blasting cable from the exploder, wait for at least five (5) minutes in case of electric ignition method or fifteen (15) minutes in case of other blasting methods, and then check for any dangers at the areas where the blasting work was performed.

(6) Measures for preventing hazards resulting from misfired blasting

1) When the charged explosives has not exploded after firing of blasting or the explosion cannot be confirmed, the following measures are to be taken.

a) After the leading wires of the blasting cable removing from the exploder, additional explosives shall be loaded into the misfired blasting hole, and then the blasting must be performed.

b) Washing stemming materials and explosives out of misfired blasting hole with high pressure water or compressed air, and the explosives must be recovered.

c) Drilling holes shall be made in parallel way with a distance of 0.5 m or more from the misfired blasting hole, and then additional blasting must be performed.

d) When misfired explosives cannot be recovered, the minerals and rocks are to be manually loaded, then the explosives are to be disposed in a safe

manner.

(7) Measures for preventing the loss and theft of explosives

1) Persons not certified to handle explosives are prohibited from entering areas where explosives are stored.

2) In the event of there being lost or stolen explosives or another accident regarding explosives, the technical safety staff in charge of explosives or the technical safety staff in charge of blasting shall immediately report the details of the incident to the technical safety manager and safety supervisor according to the "chain of emergency contact system" and shall report the incident to the General Department of Mineral Resources, police station and other relevant government offices.

6-4 Vehicle type mine machines and automobiles

Following necessary measures must be taken for securing safety when vehicle type mine machines and automobiles are operated in the mine.

1) The robust head guard on each vehicle type mine machine or automobile used in areas with high risk of rock falling, fall hazard itself or other reasons are installed.

2) A vehicle type mine machine or automobile must be checked before starting the work.

3) When operating a vehicle type mine machine or automobile, the vehicles or automobiles are not used to carry loads or passengers that exceed the limits loading weight or number of passengers.

4) When conducting inspection, maintenance, repair or other works under a raised boom, arm or other parts of vehicle type mine machines or automobiles at the mine, safety pillars and blocks, and other appropriate measures are used.

5) Vehicle type mine machines or automobiles at the mine are operated with safety speed and the observance of common traffic rules.

6) When the worker qualified for operating a vehicle type mine machine or automobile leaves the vehicle or automobile, the said worker must take following measures.

a) To take down the bucket or dipper to the ground.

b) To stop the engine and brake or take other anchoring measures.

c) To remove and carry the key to prevent unqualified persons from driving the vehicle or automobile.

7) Mine road structures in consideration of the topography, geology, weather and

other conditions surrounding mine, as well as the driving conditions of vehicle type mine machines or automobiles are installed, and fences, blocking walls or other appropriate facilities are installed if necessary.

6-5 Underground passages, underground working places and management of scattered dust in underground mining

(1) Underground passages

1) Two or more passages are set up for access between inner parts of working places and the ground surface at underground mine.

2) An emergency ladder path is installed for accessing to the ground surface in a vertical shaft or an inclined shaft of forty (40) degrees or more that has a hoisting device to lift mineworkers up and down.

3) When throwing ores or other materials into a vertical shaft using vehicle type mine machines or automobiles in underground mine, a car stop or other appropriate measures are taken to protect such vehicles or automobiles from falling down.

4) Blockage, fences and other appropriate fall-prevention equipment are installed, and warning signs are indicated at the mouth of disused vertical shaft or inclined shaft with forty (40) degrees or more to protect personnel falling down in underground mine.

5) Signposts such as name of a tunnel (gallery) and exit direction at a fork of underground passages are indicated in underground mine.

6) Advanced drillings or other appropriate measures are taken when the heading of tunnel (gallery) approaches to the old pit that submerged or there is a risk of submergence, or filled with flammable gas and other gases or there is a risk of filling with flammable gas or other gases, and to the nearest water vein within fifty (50) meter.

7) The bank of water blocking or other water blocking facilities are installed at proper spot of the tunnel (gallery) in case approaching to the old pit that submerged or there is a high risk of flood.

(2) Underground working places

1) The names and work locations of mineworkers are identified when they get into underground, and the records are kept at the mine office outside mine.

2) Communication devices such as telephone systems and inductive radio devices are installed at major working places and other necessary parts of underground mine.

(3) Management of scattered dust in underground mining

1) Measures such as sprinkling water, collecting dust or other appropriate measures are taken to prevent dust scattering for sake of health protection of mineworkers at working places where dust scattering occurs remarkably in underground mining.

2) Mineworkers must wear dust respirators complying with the standards at the working place where dust scattering occurs remarkably and if necessary for safety reasons in underground mining.

3) When mineworkers working at working places where dust scattering occurs remarkably, a space for a break at the place without dust scattering is installed for sake of health protection of mineworkers in underground mining.

4) The impact rock drills with wet type are provided and used at working places in underground mining.

In case, mineworkers who operate the wet type impact rock drill also must wear standard dust respirators.

5) The technical safety staff for underground safety & blasting in underground mining measures the dust concentration in the air and content rate of free silicic acid into the dust periodically at working places that occur remarkable dust scattering.

6-6 Surface passage, indoor working places and management of scattered dust outside mine

(1) Surface passage and indoor working places

1) The following requirements are fulfilled when erecting staircases outside mine buildings.

a) staircases must be of sound structure

b) riser height and stair tread depth must be constant

c) there must be landing places at intervals of up to ten (10) m for staircases of ten (10) m or higher

d) there must be handrails on the one side

2) Two or more staircases are provided that are positioned appropriately on the respective floors and are connected to safe outdoor locations inside underground structures or structures of two or more stories where thirty (30) or more mineworkers are working at all times.

3) Handrails are provided on the side of staircases, scaffolds or elevated walkways.

4) The working place floors are kept safe and free from danger of tripping and

slipping.

5) Safe passages are installed for mineworkers in sections inside and connected to working places and such passages are kept passable.

6) Fences, coverings or other safety equipment are installed at dangerous sections, including axes at a height of two (2) m or less from the floor or table surfaces, projecting axial ends, and interlocking devices using belts, chains or ropes in the indoor working places outside mine.

7) Appropriate measures are taken to prevent the danger of explosion or leaking of high-temperature substances in blast furnaces or converters in the mine and other sections where large amounts of high-temperature substances are handled.

8) Appropriate protective gloves/boots and other protective equipment are provided to be used by qualified workers handling burning and molten materials.

9) Appropriate protective gloves/boots and other protective equipment are provided to be used by qualified workers conducting arc welding.

10) When conducting repair or inspection of mine machineries and equipment by stopping machine operation at mines, the technical safety staff for machinery or other person designated by the technical safety staff sets warning signs of the suspension of machine operation during such repair or inspection, lock starting devices and takes sufficient security measures to prevent others from operating such mine machinery or equipment.

(2) Management of scattered dust outside mine

1) Sprinkling water, collecting dust, sealing machinery or equipment or taking other appropriate measures are taken to prevent dust scattering because of health preservation of mineworkers near a crushing plant, a tippler, a processing plant, a smelting & refinery, a coal preparation plant, open pits and other working places outside mine where there is significant dust scattering.

2) When the above-mentioned measures are taken, and if it is necessary for safety reasons, mineworkers are instructed to wear standard dust respirators.

3) A space for a break for sake of health protection of mineworkers is provided in the outside place applied to the above-mentioned 1) where there is significant dust scattering.

Equipment is prepared for mineworkers to remove dust adhering to their working clothes at a space for a break.

4) The technical safety staff for surface safety & blasting measures dust concentration in the air and content rate of free silica acid into the dust

periodically indoor working places that dust scattering occurs remarkably, write down the results of measurement and report these results to the technical safety manager at the mine.

6-7 Handling poisonous and deleterious substances, and treating wastewater containing poisonous and deleterious substances

(1) Measures for preventing mine pollution problem

1) When handling poisonous and deleterious substances, protective gloves, protective boots, personal protective equipment, gas masks, and protective goggles are to be worn at all times.

2) Poisonous and deleterious substances are to be stored separately from other substances.

3) Tanks, drums cans, and other containers that store poisonous and deleterious substances must be free from danger of scattering, leakage or infiltration into the ground.

4) The places where poisonous and deleterious substances are to be stored must be equipped with locks to prevent theft.

5) In the event that it is not possible to sufficiently lock the facility where poisonous and deleterious substances are stored, robust fences must be installed around them.

6) A custodian of poisonous and deleterious substances is to be appointed, and the custodian in question is to perform thorough storage management of these substances and to record the delivery and use of the substances.

7) In addition to implementing measures for the prevention of mine pollution problem, the contaminated waste water containing poisonous and deleterious substances that does not confirm to the effluent standard pursuant relevant lows and regulations must not be discharged into public rivers.

(2) Emergency measures

1) When the poisonous or deleterious substances are scattered, leaked, spilled, seeped, or filtrated into the ground, and there is a high risk of health damages for an unspecified or large number of people around the mine, the details of the incident are immediately communicated to the General Department of Mineral Resources, public health center, police station, and fire department, and the necessary emergency measures for preventing mine pollution problem, in regards to health damages, are to be taken.

2) In the event that poisonous or deleterious substances have been lost or stolen,

the details of that fact must be reported immediately to the technical safety manager and safety supervisor according to the "chain of emergency contact system", and shall be reported to the General Department of Mineral Resources and police station.

(3) Other items

The management methods of poisonous and deleterious substances are performed based on the separately established "management standards of poisonous and deleterious substance".

6-8 Handling of fires

(1) Measures for preventing fires

1) Handling of fires

a) In areas within eight (8) meters of mine facilities at which there is a significant risk of fire or explosion due to catching fire, the handling of fires and other hazardous types of flame is to be prohibited.

Furthermore, mine facilities at which there is a significant risk of fire or explosion due to catching fire, are such as a fuel oil storage facility, a gas filling station, a high-pressure gas production facility, and compressor operation rooms.

b) Mitigation measures

When any of the following safety measures have been taken and approved by the safety supervisor, it is possible to receive mitigation measures.

① When barriers having an adequate height between a facility and the areas where open flames are handled have been installed.

② When measures have been taken to install one or more automatic flame detector with alarms in the areas where open flames are handled.

③ When a mine facility where open flames are handled has been installed in materials of fire-proof construction, and fire-fighting devices are also provided.

2) Measures regarding the oil and grease depot and other combustible substances

a) The oil and grease depot and other combustible substances must be kept at a required distance away from other structures and from a mine mouth.

b) The oil and grease must be stored in sealed containers.

3) Measures installing flue or a chimney of mine smoke (soot)

a) The structures of flue or a chimney are easy to clean and examine the insides of it.

b) Parts that pass through structures of the buildings are protected with the inlaying of thimble stone or with nonflammable substances.

c) The openings of flue or a chimney are to be isolated from buildings by a distance of at least one (1) meter.

4) Other measures

a) Combustible substances must be protected with heat shielding materials.

b) Rags and wastepaper that have been soaked in waste oil are stored in nonflammable containers that have a lid.

c) The temporary use of open flames during construction

When the open flames use within eight (8) meters from the facility that is a risk of fire or explosion due to catching fire because a construction carries out reluctantly or some other reason, the form of "permission for temporary use of open flames" shall be submitted to the technical safety manager in order to receive approval in advance.

Items to be observed during the temporary use of open flames are:

① When using open flames, the "permission for temporary use of open flames" is to be carried and posted.

② Before using open flames, (measurement of flammable gas is carried out with a gas detector and) combustible substances are put away in the nearby area.

③ Fire extinguishers and fire-fighting apparatuses are to be provided.

d) Vehicle-type mine machines that are considered to be using open flames, in principal, shall not approach within eight (8) meters of the facilities at which there is a significant risk of fire or explosion due to catching fire.

However, in the event that a vehicle-type mine machine approaches within eight (8) meters of one of these facilities is unavoidable, a flame arrester must be set up the muffler of the machine in question or the concentration of flammable gas must be measured and confirmed in a safe before the machine approaches the facility.

(2) Measures for preventing the spreading of damages caused by fire

1) Evacuation space

When establishing or modifying the structures of mineral-related operations, the enough space (1.5m or more) for evacuation must keep between the main structure and its adjoining boundary or between two or more main structures.

2) Sufficient space for preventing fire

In order to prevent fires, sufficient space must be secured between furnaces,

heaters, chimneys or other facilities with a high fire risk and structures and other flammable materials.

3) Arrangement of fire-fighting apparatuses

a) In locations within the surface ground of the mine where the use of open flames has been permitted in advance and in locations for which a permission for temporary use of open flames has been approved, the fire extinguishers, fire-fighting apparatuses, and the like are to be provided nearby when electric or flame welding or fusing work is being performed.

b) In ABE mine, fire hydrants, fire extinguishers, water tanks, and other fire-fighting apparatuses are to be provided and installed in an amount that accommodates the size of the mine facility.

4) Fire-proof construction

Indoor receive transmitted electricity and compressor operation room shall be established by using materials of fire-proof construction.

5) Other items regarding the handling of fires

a) Notice of warning signs

Areas in which open flames are prohibited, because of there being a significant risk of fire or explosion, are to be equipped with warning signs such as "OPEN FLAMES PROHIBITED", and mineworkers are to be made aware of this fact.

b) Smoking spots

① Smoking is to be prohibited outside of designated smoking spot.

② Smoking in the mine office and mineral working fields is to be limited at the specific and designated spot, and the embers must be completely put out after smoking.

c) Management of oil and grease

① Oils and fuel oils are to be stored in sealed-type nonflammable containers or in the containers that have a lid.

② Spill prevention measures must be implemented in storage of oils and greases.

6-9 Implementation of drills for evacuation and rescuing persons

The Environmental Safety Department shall make following drills and periodically implement them in cooperation with the relevant departments.

(1) Practice drills for mine disasters/accidents or mine pollution problems shall be implemented periodically (at least once per year).

(2) In such drills, evacuation drills, mineworker rescue drills, and fire-fighting drills shall be performed.

(3) Once per year, call-out drills during the night time and on holidays of the mine shall be performed based on the "chain of emergency contact system" in order to check the effectiveness of the emergency contact system in the event of a mine disaster/accident or mine pollution problem.

(4) When the opportunity is available, at the time when workshops and other activities are being held at the fire station or other relevant organizations, the person concerned of the mine shall actively attend and study the rescue techniques.

6-10 Management of a waste stones dump, a slag dump and a tailings dam

(1) An embankment, blocking wall or other appropriate facilities are established in a waste stones dump, a slag dump or a tailings dam to prevent mine pollution problems caused by collapsing the accumulations of waste stones or slag, or flowing out the sediments such as slime.

(2) Waste stones dumps, slag dumps and tailings dams are established at the sites where there is a high risk of danger or occurrence of mine pollution problems due to collapse and landslide.

(3) Waste stones dumps, slag dumps and tailings dams are established to keep a minimum distance of thirty (30) m from residences, agricultural lands, mine offices and public facilities such as a public roads, rivers, bridges, multipurpose dams, parks, hospitals, schools.

(4) When a waste stones dump, a slag dump or a tailings dam is disused, necessary measures such as soil covering and vegetation inside dam site and the slope of the embankment is taken to prevent mine pollution problems caused by outflow of wastewater or sediments.

(5) In a tailings dam, an inside water drainage, a mountain stream drainage, hillside channels and other appropriate facilities are installed to prevent off-site water such as mountain streams, hillside water and other water from flowing into inside the dam site.

(6) An emergency drainage is installed at proper positions of outside dam site to prepare inflowing large amounts of off-site water into the tailings dam of which the embankment is established by soil materials.

(7) Management status of a waste stones dump, a slag dump, a tailings dam and facilities concerned is as follows.

1) An emergency system is maintained completely. The safety technical staff have trained periodically that emergency case assumed.

2) The emergency tools are prepared and stored properly.

3) The seepage level and rise of the water level inside the embankment of a tailings dam has been measured periodically. The measuring equipment is appropriate, and the maintenance and management of the equipment are adequate.

4) Drainage facilities of a tailings dam are checked and examined regularly.

(8) The structure of the embankment concerning a waste stones dump, a slag dump and a tailings dam

1) The banking materials of the embankment use proper ones to develop. The compaction method for banking is also proper.

2) Top of the embankment is wide enough.

3) The slope is covered with soil and vegetation after formation of an embankment without delay. It is free of scouring by rainfall.

(9) Dumping method of slime in a tailings dam

1) The slime that carried by a pipe-line is discharged from an embankment toward the upstream of a tailing dam.

2) Slime sediments are carried out evenly throughout a tailings dam, and slime level is raised equality inside the dam.

3) The water level inside a tailings dam is kept lower than top of the embankment by one (1) m or more.

4) Surface of slime sediments inside a tailings dam is kept lower than top of the embankment by 0.5 m or more.

(10) Safety technical staff for prevention of mine pollution obey following items to prevent mine pollution problems caused by collapsing the accumulations of waste stones or slag, or flowing out the sediments concerning a waste stones dump, a slag dump and a tailings dam.

1) To check and examine for a blocking wall or an embankment of a waste stones dump or a slag dump, whether or not collapsing of accumulated materials, land slide in every working day, and write down the results of examination in the safety diary.

2) To check and examine for a blocking wall, an embankment, a mountain stream drainage, hillside channels, an emergency drainage and inside water drainage in every working day, and write down the results of examination in the safety diary.

3) To take prompt measures, and report to the technical safety manager (or safety seniors) of the mine speedily when there is found effects such as cracks on the surface of the embankment, subsidence of the embankment, collapse or landslide around sites of the dump or dam.

(11) When there is a heavy rain around sites of a waste stones dump, a slag dump or a

tailings dam, safety technical staff for prevention of mine pollution increase frequency of the examination for confirming the abnormality or not at the embankment, or a blocking wall, outbreak of collapse of accumulated materials, and outbreak of land slide regarding to the waste stones dump or slag dump, and confirming the abnormality or not at the embankment, a mountain stream drainage, hillside channels, inside water drainage and an emergency drainage regarding to the tailings dam. The safety staff writes down results of the examination to the maintenance ledgers, too.

(12) Occurrence of mine pollution by a waste stone dump, a slag dump or a tailings dam

When mine pollution problem occurs or is highly likely to occur in a waste stone dump, a slag dump or a tailings dam, the state of incident, list of emergency measures taken, and plans for restoration work and the list of completed work are immediately reported to the Director General of GDMR or the Minister charge of mines sector.

6-11 Management of water generated facility and water treatment facility concerning mine water or wastewater

(1) Obedience to the effluent standard

Contaminated mine water or wastewater discharged from the mine into public waters must be thoroughly managed and be met with the effluent standard pursuant the "Law on Environmental Protection and Natural Resource Management" and relevant regulations.

(2) Emergency measures to be taken in the event that a mine pollution problem has occurred

When the contaminated mine water or wastewater that does not confirm to the effluent standard discharged into public waters because of an accident, being broken, or other troubles of the water generated facilities or water treatment facilities concerning mine water or wastewater, or in case the harmful substances that designated by the Minister of Environment or the Minister in charge of mines sector penetrated clearly into the underground together with mine water or wastewater, the following emergency measures for prompt repair from the mine pollution problem must be taken urgently.

1) The discharged mine water or wastewater to public waters must be suspended and be temporarily stored in reservoirs or pits in the mine site.

2) When there is a danger influence outside of the mine, the incident information must be provided to nearby residents, General Department of Mineral Resources and

local governments, and measures for preventing the spreading of damages must be taken.

(3) Measurements items, frequency and allowable limits

The items to be measured, the frequency of measurements and allowable limits in regards to mine water and wastewater discharged from the mine into public waters are as according to the effluent standard stipulated in the concerned Law and regulations.

Furthermore, the analysis results of the water quality have kept for three (3) years.

(4) Obedience to the further strict regulation of the effluent standard

When the Minister in charge of mines sector establishes the further strict regulation of the effluent standard depending on the results of measurements and water analysis of mine water or wastewater discharged from the treatment facilities at the mine, the further strict regulation must be obeyed.

(5) Occurrence of mine pollution by mine water or wastewater

When mine pollution occurs or is highly likely to occur by mine water or wastewater, the state of incident, list of emergency measures taken, and plans for restoration work and the list of completed work are immediately reported to the Director General of GDMR or the Minister in charge of mines sector.

6-12 Management of noise generating facility and noise prevention facility

(1) When the noise regulations is applicable to the mine, the noise levels that generated from the noise generating facilities as follows meet the noise control standard stipulated in the "Law on Environmental Protection and Natural Resource Management" and relevant regulations at the boundaries outside mine.

1) A crusher, mill or screen for stones or minerals with a rated motor output of 7.5 kW or more

2) A compressor or fan with a rated motor output of 7.5 kW or more

(2) When mine pollution problems caused by noise occur or is likely to occur that does not conform to the control standard because of an accident, being broken, or other troubles of noise generating facility or noise prevention facility, emergency measures are taken for prompt repair from the incident.

(3) Obedience to the instructions to take appropriate measures

When the Minister in charge of mines sector gives the instructions to take appropriate measures to prevent mine pollution caused by noise, the contents of

instructions must be obeyed.

(4) Technical safety staff for prevention of mine pollution obey following items to prevent mine pollution problems caused by noise.

1) To examine the noise generating and prevention facilities in every working day, and write down the results of examination in the safety diary.

2) To measure noise levels periodically at the boundaries outside mine based on the "Law on Environment Protection and Natural Resource Management" and relevant regulations, and write down the results of measurements in the managements record.

3) To report to the technical safety manager (or safety seniors) immediately when mine pollution problems caused by noise occur or are likely to occur based on the results of examination, and measurements of noise levels.

(5) Occurrence of mine pollution by noise

When mine pollution occurs or is highly likely to occur by noise, the state of incident, list of emergency measures taken, and plans for restoration work and the list of completed work are immediately reported to the Director General of GDMR or the Minister in charge of mines sector.

6-13 Management of vibration generating facility and vibration prevention facility

(1) When the vibration regulations is applicable to the mine, the vibration levels that generated from the vibration generating facilities as follows meet the vibration control standard (undecided) stipulated in the "Law on Environmental Protection and Natural Resource Management" and relevant regulations at the boundaries outside mine.

1) A crusher, mill or screen for stones or minerals with a rated motor output of 7.5 kW or more

2) A compressor with a rated motor output of 7.5 kW or more

(2) When mine pollution problems caused by vibration occur or is likely to occur that don't meet the control standard because of an accident, being broken, or other troubles of vibration generating facility or vibration prevention facility, emergency measures are taken for prompt repair from the incident.

(3) Obedience to the instructions to take appropriate measures

When the Minister in charge of mines sector gives the instructions to take appropriate measures to prevent mine pollution caused by vibration, the contents of instructions must be obeyed.

(4) Safety technical staff for prevention of mine pollution obey following items to prevent

mine pollution problems caused by vibration.

1) To examine the vibration generating facilities and vibration prevention facilities in every working day, and write down the results of examination in the safety diary.

2) To measure vibration levels periodically at the boundaries outside mine based on the "Law on Environment Protection and Natural Resource Management" and relevant regulations, and write down the results of measurements in the managements record.

3) To report to the technical safety manager (or safety seniors) immediately when mine pollution problems caused by vibration occur or are likely to occur based on the results of examination, and measurements of vibration levels.

(5) Occurrence of mine pollution by vibration

When mine pollution occurs or is highly likely to occur caused by vibration, the state of incident, list of emergency measures taken, and plans for restoration work and the list of completed work are immediately reported to the Director General of GDMR or the Minister in charge of mines sector.

6-14 Management of the mine smoke (soot) generating facility and the mine smoke (soot) treatment facility

(1) Obedience to the emission standard

The mine smoke (soot) emitted from the mine into the atmosphere must be thoroughly managed and be met with the emission standard pursuant the "Law on Environmental Protection and Natural Resource Management" and relevant regulations.

(2) When the mine smoke (soot) that does not conform to the emission standard is emitted or is likely to be emitted because of an accident, being broken or other troubles of the mine smoke (soot) generating facility or the mine smoke (soot) treatment facility, emergency measures are taken for prompt repair from the incident.

(3) Obedience to the instructions to take appropriate measures

When the Minister in charge of mines sector gives the instructions to take appropriate measures to prevent mine pollution caused by mine smoke (soot), the contents of instructions must be obeyed.

(4) The technical safety staff for prevention of mine pollution obey the following items to prevent mine pollution problems caused by mine smoke (soot).

1) To examine the mine smoke (soot) generating facility and mine smoke (soot) treatment facility in every working day, and write down the results of

examination in the safety diary.

2) To measure and analyze necessary substances of mine smoke (soot) periodically that emits from the mine smoke (soot) treatment facility, and write down the results of measurements and analysis in the managements record.

c) To report to the technical safety manager (or safety seniors) immediately when mine pollution caused by the mine smoke (soot) is likely to occur on the results of examination, measures and analysis.

(5) When mine pollution occurs or is highly likely to occur caused by mine smoke (soot), the state of incident, list of emergency measures taken, and plans for restoration work and the list of completed work are immediately reported to the Director General of GDMR or the Minister in charge of mines sector.

6-15 Management of dust generating facility and dust treatment facility

(1) If there is a risk of the dust scattering from a mineral ore storage facility, a waste stone dump, a slag dump or a tailings dam, or mining wastes landfill site of 1,000 square meter (m^2) or larger, one of the following matters is conducted.

a) The mine facility is established in a structure that is resistant to the dust scattering.

b) Water is sprinkled using sprinkling equipment.

c) The materials are covered with a dustproof cover to prevent dust scattering.

d) A chemical solution is sprayed or compressing on the surface layer.

e) Other measures equivalent to or more effective than the above are taken.

(2) When a crusher with a rated motor output of seventy-five (75) kW or more (except for wet-type and closed-type), or a mill or screen with a rated motor output of fifteen (15) kW or more (except for wet-type and closed-type) is installed on surface of the mine, one of the following matters conducted.

a) The mine facility is established in a structure that is resistant to the dust scattering.

b) A hood and a dust collector are installed.

c) Water is sprinkled using sprinkling equipment.

d) The mine facility is covered with a dustproof cover to prevent dust scattering.

e) Other measures equivalent to or more effective than the above are taken.

(3) When a belt conveyor (0.75 m or more belt width) or bucket conveyor (0.03 cubic meter (m^3) or more in internal volume of the bucket) is installed on surface of the mine, except for wet-type and closed-type, the following matters are conducted if there is a risk of the dust scattering.

a) The mine facility is established in a structure that is resistant to the dust scattering.

b) A hood and a dust collector are installed at the loading and unloading parts of the conveyor and a water sprinkling device or a dustproof cover is at other parts with a risk of the dust scattering.

c) Other measures equivalent to or more effective than the above are taken.

(4) When a mechanical slaked lime production facility that the dust scattered is installed on surface of the mine (limestone & dolomite), one of the following matters are conducted.

a) A dust collector is installed.

b) Water is sprinkled using sprinkling equipment.

c) Other measures equivalent to or more effective than the above are taken.

(5) When mine pollution occurs or is highly likely to occur caused by dust because of an accident, being broken or other troubles of the dust generating facility or the dust treatment facility, emergency measures are taken for prompt repair from the incident.

(6) Obedience to the instructions to take appropriate measures

When the Minister in charge of mines sector gives the instructions to take appropriate measures to prevent mine pollution caused by dust, the contents of instructions must be obeyed.

(7) The technical safety staff for prevention of mine pollution obey the following items to prevent mine pollution problems caused by dust.

a) To examine the dust generating facility and dust treatment facility in every working day, and write down the results of examination in the safety diary.

b) To report to the technical safety manager (or safety seniors) immediately when mine pollution caused by dust is likely to occur on the results of examination.

(8) When mine pollution occurs or is highly likely to occur caused by dust, the state of incident, list of emergency measures taken, and plans for restoration work and the list of completed work are immediately report to the Director General of GDMR or the Minister in charge of mines sector.

6-16 Management of mining wastes

(1) Necessary measures such as management of storage, preventing mining wastes from scattering, out flowing or infiltrating into underground are taken.

(2) Mining wastes at the mine are transported based on the regulatory disposal standard of the wastes (undecided).

(3) Mining wastes are not dumped and buried in the mining wastes landfill site that does not to meet the technical structure against the regulatory disposal standard of the wastes.

(4) Harmful mining wastes are not dumped and buried in goaf (old mineral working fields) or unused tunnels (galleries) as an underground landfill site.

(5) Transportation or disposal of mining wastes is illegally entrusted against the regulatory disposal standard with a third party.

(6) Obedience to the instructions to take appropriate measures

When the Minister in charge of mines sector gives the instructions to take appropriate measures to prevent mine pollution caused by mining wastes, the contents of instructions must be obeyed.

(7) The technical safety staff for prevention of mine pollution obey the following items to prevent mine pollution problems caused by mining wastes.

1) To examine the incinerator such as the intermediate treatment facility for mining wastes in every working day, and write down the results of examination in safety diary.

2) To examine the mining wastes landfill site on the surface in every working day, and write down the results of examination in the safety diary.

3) To measure and analyze the water quality of underground water nearby mining wastes landfill site on the surface periodically, and write down the results of measurements and analysis in the managements record.

4) To examine water level in the mining wastes landfill site in the underground, water flow into other tunnels (galleries) and other conditions in every working day, and write down the results of examination in safety diary.

5) To measure and analyze the water quality of spilled water out the landfill site once a month or more periodically, and write down the results of measurements and analysis in the managements record.

6) To report to the technical safety manager (or safety seniors) immediately when mine pollution caused by mining wastes is likely to occur on the results of examination of the intermediate treatment facilities and mining wastes landfill sites, measurements and analysis of water quality.

7) All kinds of the generation amount, transportation and method of disposal regarding the harmful mining wastes every a month are written down in the "disposal record of the harmful mining wastes".

8) When mine pollution occurs or is highly likely to occur by mining wastes, the state of incident, list of emergency measures taken, and plans for restoration

work and the list of completed work are immediately reported to the Director General of GDMR or the Minister in charge of mines sector.

6-17 Management of a poisonous or deleterious substance

(1) If a poisonous or deleterious substance has been scattered, or has been leaked, flowed out, leached out or has infiltrated into the ground causing mine pollution, or if there is a risk of pollution problems, emergency measures are taken for prompt restores from the incident.

(2) The technical safety staff for prevention of mine pollution obey the following items to prevent mine pollution problems caused by poisonous & deleterious substances.

1) To examine poisonous & deleterious depots, mine facilities where poisonous or deleterious substances are handled and treatment facilities for wastewater including poisonous or deleterious substances in every day, and write down the results of examination in the safety diary.

2) To report to the technical safety manager (or safety seniors) immediately when mine pollution caused by poisonous or deleterious substance is likely to occur based on the results of the examination.

(3) Obedience to the instructions to take appropriate measures

When the Minister in charge of mines sector gives the instructions to take appropriate measures such as cleaning poisonous or deleterious substances, eliminating the toxic quality of such substances, or taking other measures necessary to prevent mine pollution caused by poisonous or deleterious substances, the contents of instructions must be obeyed.

6-18 Management of land excavation

(1) Appropriate measures are taken concerning the methods of mining, filling and drainage to prevent mine pollution caused by land excavation when there is a risk of the surface subsidence due to mineral-related operations at the underground mining.

(2) Obedience to the instructions to take appropriate measures

When the Minister in charge of mines sector gives the instructions to take appropriate measures such as excavation method, area and frequency of measurement of the surface subsidence to prevent mine pollution caused by land excavation, the contents of instructions must be obeyed .

(3) When the mineral-related operations of underground mining were abolished,

necessary measures such as filling unused tunnels (galleries) with soil or sealing with concrete are taken, and filling the goaf (old mineral working fields) with soil is taken to prevent mine pollution problems after its closure.

(4) When the mineral-related operations of open-pit mining were abolished, necessary measures such as soil covering and vegetation on old surface mineral working fields are taken to prevent mine pollution problems after its closure.

Chapter 7 Implementing system, measures and evaluation methods for securing safety

7-1 Implementing system for securing safety

(1) Execution of the survey on mine safety conditions

The members of survey on mine safety conditions stipulated in Mine Safety Law and its regulations shall be nominated by the safety supervisor of the mine, and form teams of the survey.

The survey teams on mine safety conditions shall find out and evaluate risk factors concerning following items at the mine, and take appropriate measures that need improving as the effect of the survey, and then shall report the results to the safety supervisor and safety committee.

1) When mineral-related operations start at the mine after getting permission by the Minister in charge of mines sector

2) When mineral-related operations suspend for more than one month, and the operations renew

3) When mineral-related operations have significant modification

4) When the right of mineral-related operations at the mine is renounced, or the operations are abolished.

(2) Execution of the survey on prediction of risk factors using “risk management system”

Each department of the mine forms the teams of the survey on prediction of risk factors, and teams must execute the survey using risk assessment methods at mineral working fields and mine facilities as follows every month, and then consider investigation and evaluation of risk factors, and countermeasures of them.

The results of the survey on prediction of risk factors shall be reported to the safety supervisor and safety committee.

1) The conditions of mineral working field and its neighboring

2) The conditions of surrounding at the mine

3) Harmful items that cause mine disaster/accident or mine pollution problem

(3) Execution of safety patrols

1) During safety week and health week that shall be designated by "yearly safety plan", the safety supervisor, technical safety manager and deputy technical safety managers shall patrol and examine the mineral working fields and mine facilities of the mine for securing safety.

2) In addition excepting for the safety week and health week, the deputy technical safety managers shall patrol and examine the mineral working fields and mine facilities, and acquire the actual conditions of the work sites of mineworkers and make effort improving problems.

7-2 Confirmation of the implementation statuses of mine safety activities

(1) Confirmation method concerning statuses of mine safety activities

In order to check the implementation status of mine safety activities at the mine, members of the inspecting team nominated by the safety supervisor shall be formed in order to conduct internal inspection regarding mine safety activities.

Furthermore, the office of internal inspection team is in the Environmental Safety Department.

(2) Confirmation period concerning statuses of mine safety activities

The periods of internal inspection regarding mine safety activities shall be twice a year, in April and October as the periodic inspection, and extra inspection shall be implemented by the instruction of the safety supervisor.

(3) Confirmation details of the internal inspection

For the specific details of the internal inspection regarding mine safety activities, the office staff of the internal inspection shall make a plan before the execution of the inspection, and the plan shall be approved by the safety supervisor and safety committee.

(4) Confirmation report regarding mine safety activities

For the report on the results of the internal inspection regarding mine safety activities, the office staff shall summarize the information as the "report on internal inspection regarding mine safety activities" after implementing the internal inspection, and then shall submit the report to the safety committee after explanation details of the report to the safety supervisor.

7-3 Evaluation of the implementation statuses of mine safety activities

(1) The results of the survey on mine safety conditions shall be deliberated in the safety committee.

However, when, as a result of deliberation, the measures to be taken require additional measures to be added, the department in charge shall reconsider the measures to be taken, then the safety committee shall deliberate on those measures again.

7-4 Recording the confirmation and evaluation results

(1) Records of mine safety activities must be kept for a period of ten (10) years.

(2) The proceedings deliberated by the safety committee must be kept for a period of three (3) years.

Chapter 8 Measures for securing safety and items regarding the review of these measures

The own safety rules shall be revised and modified in the event of followings as necessary.

(1) Important problems discovered and need to improve for securing safety after implementation of the survey on mine safety conditions.

(2) Important problems discovered and need to improve for securing safety after implementation of the survey on prediction of risk factors using risk assessment methods.

(3) When items stipulated in the Mine Safety Law or its regulations amend.

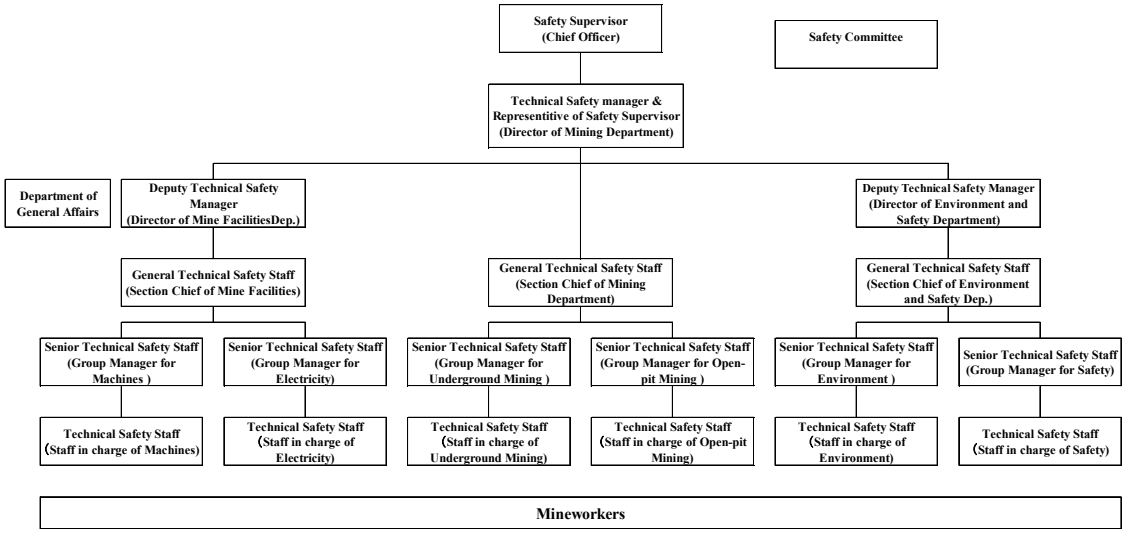
(4) When the result of the deliberation by the safety committee in regards to measures for securing safety, improvements have become necessary.

(5) When the safety supervisor has determined that it is necessary to make revisions to the own safety rules.

(6) When a mine disaster/accident or mine pollution problem occurred and its countermeasures have been established.

Attached)

"Structures of Mine Safety Management at ABE mine"



Attachment-2) "Graphical Symbols for Mines"

This graphical symbols for mines are stipulated in the Japanese Industrial Standards (JIS) in Japan, the principal symbols for mines are as follows for a reference.

JAPANESE INDUSTRIAL STANDARD

Graphical Symbols for Mines

1. Scope

This Japanese Industrial Standard specifies symbols to be used in the drawings of the underground, surface, mining place, offshore, etc. of mines (including all of the mines of metal, non-metal, coal, petroleum, etc.)

2. Symbols

The symbols shall be in accordance with Attached Table.

Furthermore, for the purpose of arrangement, these shall be classified as given in Table 1.

Table 1. Classification of symbols

Classified symbol	Classification	Remarks
A	General	
B	Geology and mineral deposit	
C	Prospecting and mining	
D	Safety facilities	Except those which are included E.
E	Machines, tools and equipment	Those which are operated in underground and surface.
F	Electrical facilities	Except those which are included E.
G	General facilities	Except those which are included E., F
Z	Miscellaneous	Those which do not belong to those given above

3. Sizes for symbols and letters

The sizes for symbols and letters shall be entered adjusting themselves to a drawing, and the letters shall be written clearly and be entered at a legible position of the drawing.

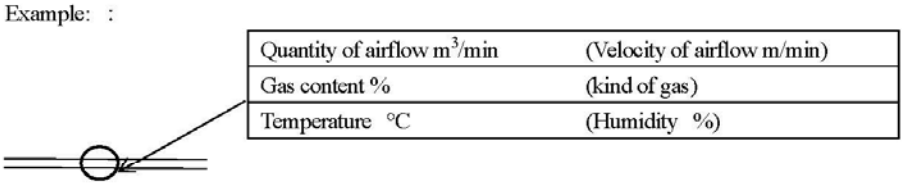
4. Symbols for special applications

As regards the symbols for special applications in this Standard, the methods of application shall be as given in the following:

(1) The order of descriptions for A 1 to A 5 shall be as follows:

Furthermore, in the case of this order of description, the units may be omitted.

Example: :



(2) As regards A 6 and A 7, in tunnels which have been modified into T-shape, the follow-ing applications may also be used.

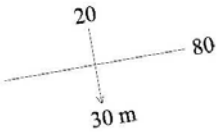
Examples:

(3) Methods of application to symbols relating to geology of B 1 to B 80.

(a) Geological columnar sections: These shall be represented by using the symbols of B 1 to B 61.

(b) Faults and strikes; The symbols B 64 to B 73 relating to faults and strikes shall be used in several combinations. For example, the certain thrust fault of N 80 deg. E in strike, 20 deg. N in dip, 30 m in southward thrust shall be represented as follows:

Example:



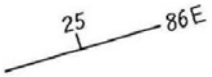
For the strike-wise angle, take N as zero, count in the left or right by 90 deg. system, and fill this numeral at the end of extended line near N.

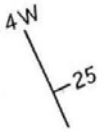
Furthermore, in the case where it is within 5 deg. from the east-west line or south- north line, fill it generally on the extended line near the end of its base line.

(i) When the strike extends nearly in the east to west

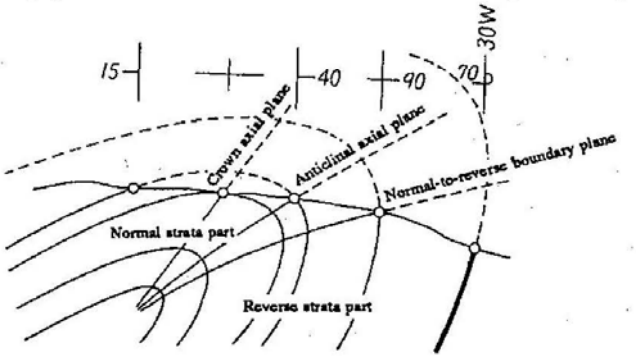
(ii) When the strike extends nearly in the south to north

example



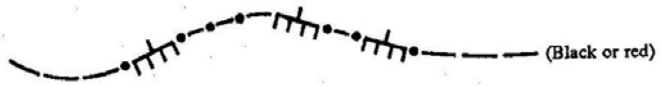


(c) Over-thrust strata; For example, over-thrust strata of N 30° W in strike and 70° in dip shall be represented as follows:



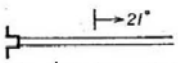
(d) Outcrops; B75 and B76 shall be used for metal deposits and nonmetal deposits (deposits other than coal and petroleum), B 77 to B 80 shall be used for coal deposits, and these may also be used for metal deposits and nonmetal deposits. These symbols shall be used being combined as follows:

Example:



(4) When an angle of inclination is to be entered in an inclined shaft, it shall be entered as follows:

Example:



(6) Where no space is left to state, since two sets or more of equipment are installed at one place, numerals indicating number of sets shall be written below the right of the symbol.

Examples:

Ⓟ4　　Ⓜ3

Attached table

1. For the purpose of making the positions to be attached with symbols intelligible, there are some which have been appended with the symbol of tunnel or the like.

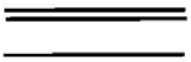
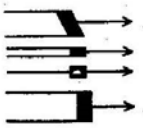
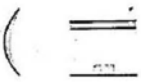
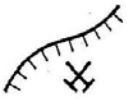
A General

Symbol No.	Title	Symbol	Color	Remarks
A1	Quantity of airflow	Example 300m³/min	Black	Attach a circular mark on a measuring place, and enter this at its side. See 4. (I) of the text of this Standard
A2	Velocity of airflow	Example 30m/min	Black	Attach a circular mark on a measuring place, and enter this at its side. See 4. (I) of the text of this Standard
A3	Gas content	Example 0.2%	Red or Black	Attach a circular mark on a measuring place, enter this at its side, and also enter the type of gas. However, where this is stated separately, mark it in red. See 4. (I) of the text of this Standard
A4	Temperature	Example 20 ℃	Black	Attach a circular mark on a measuring place, and enter this at its side. See 4. (I) of the text of this Standard
A5	Humidity	Example 80 %	Black	Attach a circular mark on a measuring place, and enter this at its side. See 4. (I) of the text of this Standard
A6	Direction of intake air	→	Blue	See 4. (2) of the text of this Standard.
A7	Direction of exhaust air	→	Red	See 4. (2) of the text of this Standard.

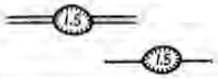
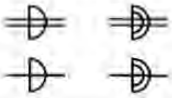
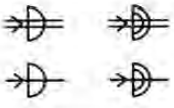
B Geology and mineral deposit

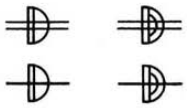
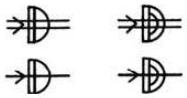
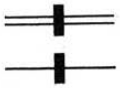
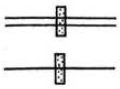
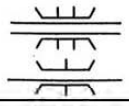
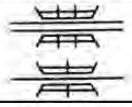
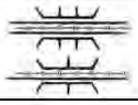
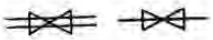
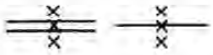
Symbol No.	Title	Symbol	Color	Remarks
B 62	Anticlinal axis		Black or Red	
B 63	Synclinal axis		Black or light blue	
B 64	Proved fault		Black or Red	See 4. (3) (b) of the text of this Standard.
B 65	Probable fault		Black or Red	See 4. (3) (b) of the text of this Standard.
B 66	Possible fault		Black or Red	See 4. (3) (b) of the text of this Standard.
B 67	Normal fault		Black or Red	See 4. (3) (b) of the text of this Standard. The arrow mark indicates the dislocated side
B 68	Reverse fault		Black or Red	See 4. (3) (b) of the text of this Standard. The arrow mark indicates the relatively dislocated side
B 69	Height of dislocation		Black or Red	See 4. (3) (b) of the text of this Standard. Write it in the dislocated side.
B 70	Horizontal slip		Black or Red	See 4. (3) (b) of the text of this Standard. Express the degree of slip in the unit of m, as required
B 71	Strike and dip		Black	See 4. (3) (b) of the text of this Standard. This indicates an example of strike N 60 deg E and dip 30 deg N.
B 75	Vein type outcrop		Black, and gradation of red or light blue towards inside	See 4. (3) (d) of the text of this Standard. The size indicates its range, and where the types of mineral are two types or more, color may also be determined otherwise.
B 76	Massive type outcrop		Black, and gradation of red or light blue towards inside	See 4. (3) (d) of the text of this Standard. The size indicates its range, and where the types of mineral are two types or more, color may also be determined otherwise.
B 77	Proved outcrop		Black or Red	See 4. (3) (d) of the text of this Standard. Attach 4 pieces or more of feathers

C Prospecting and mining

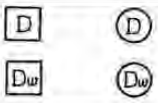
Symbol No.	Title	Symbol	Color	Remarks
C 1	Vertical shaft mouth at surface		Black	The symbol on right shall indicates that of with ladder way
C 2	Vertical shaft mouth at underground		Black	The symbol on right shall indicates that of with ladder way
C 3	Abandoned vertical shaft mouth		Black	The symbol in left side indicates that it is existing at surface, and the symbol in the right side indicates that it is existing at underground
C 4	Inclined shaft mouth or level mouth		Black or sorting by color	See 4. (4) of the text of this Standard Use black in a coal mine, and in a metal mine, sort by color for respective same working level
C 5	Abandoned inclined shaft mouth or abandoned level mouth		Black	
C 7	Tunnel		Black or sorting by color	See 4. (4) of the text of this Standard. For an inclined one, enter its angle of slope. Use the sorting by color for each working level in a metal mine, and a non-metal mine, and black for tunnels in rock and sorting by color or letters for tunnel in coal seam in a coal mine
C 9	Underground working place		Sorting by color for each seam	The arrow mark shall indicate an advancing direction.
C 10	Goaf		Black or sorting by color for each seam	In the case of sorting by color, only edges shall be colored
C 11	Unworked pit		Grey and lines in black	
C 12	Open-cut working place		Black	An edge indicates the range of a working place.
C 13	Mined-out site of open-cut		Black	An edge indicates the range of mined-out site.

D Safety facilities

Symbol No.	Title	Symbol	Color	Remarks
D 3	Fire restricted area		Red	Dimensions shall be so taken that these are representing its range.
D 5	Caving (Cavity)		Black	Express the caved height in unit of m.
D 6	Place of blasting		Black	The square symbol shall indicate the blasting by safety fuse and the circular symbol by electric blasting.
D 8	Preventive palisade or net for scattering stones and falling stones		Black	
D 10	Feed air equipment		Green	
D 12	Underground telephone		Black	
D 13	Fire hydrant		Red	
D 14	Fire extinguisher		Red	
D 15	Emergency center		Black + in red	
D 16	Material storage house for emergency		Black SH in red	
D 17	Wooden air door (Not of an automatic door)		Black	The convex side shall indicate an intake air side. Those in the left shall not be that of splitting door, and in the right be that of splitting door.
D 18	Wooden air door (Automatic door)		Black	The convex side shall indicate an intake air side. Those in the left shall not be that of splitting door, and in the right be that of splitting door.

Symbol No.	Title	Symbol	Color	Remarks
D 19	Brick or concrete air door (Not of an automatic door)		Black	The convex side shall indicate an intake air side. Those in the left shall not be that of splitting door, and in the right be that of splitting door.
D 20	Brick or concrete air door (automatic door)		Black	The convex side shall indicate an intake air side. Those in the left shall not be that of splitting door, and in the right be that of splitting door.
D 23	Board dam		Black	
D 24	Brick or concrete dam		Black	
D 26	Board air crossing		Black	
D 27	Fire proof air crossing		black	
D 28	Air-duct air crossing		Black, air duct part in dark green	
D 33	Spray or watering		Black or blue	
D 34	Sealing		Black	
D 36	Water-proof dam		Black	The convex side shall indicate the pressure side.
D 38	Fence		Black	

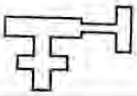
E Machines, tools and equipment

Symbol No.	Title	Symbol	Color	Remarks
E 3	Track		Black	
E 10	Aerial ropeway		Black	
E 12	Rock drills (including auger drill and coal drill)		Black	The symbol in a square shall indicate a compressed air driven one and in a circle electric driven one Dw shall indicate the case of wet type.
E 17	Loader		Black	The symbol in a square shape shall indicate that of driven by compressed air and of circular shape that of driven by electric power, and of triangle an internal combustion engine.
E 21	Belt conveyor		Black	The symbol in a square shape shall indicate that of driven by compressed air and of circular shape that of driven by electric power.
E 23	Winding machine		Black	The symbol in a square shape shall indicate that of driven by compressed air and of circular shape that of driven by electric power.
E 24	Compressed air pipe		Dark green	
E 25	Drainage pipe		Black	
E 26	Watering pipe or water pipe		Blue	
E 29	Pump		Black	The symbol of circular shape shall indicate that of electric driven and the symbol of square shape that of compressed air driven.
E 30	Air duct		Dark green	
E 31	Fan		Black	Main fan and booster fan shall be indicated by large letters and others by small letters. The symbol of circular shape shall indicate that of electric driven, and the symbol of shape that of compressed air driven.
E 37	Air compressor		Black	

F Electric facilities

Symbol No.	Title	Symbol	Color	Remarks
F 1	Power station		Black	
F 2	Generator		Black	
F 3	Substation or transforming equipment		Black	
F 4	Main switch station (Main switching device)		Black	
F 5	Transformer		Black	
F 6	Swich		Black	
F 9	Motor		Black	
F 10	High voltage cable		Red or Black	
F 11	Low voltage cable or cabtire cable		Red or Black	
F 12	High voltage line		Red or Black	
F 13	Insulation line		Red	

G General facilities

Symbol No.	Title	Symbol	Color	Remarks
G 1	Mine building		Black	Draw a shape conforming to the actual circumstances as far as possible
G 2	Other building than mine building		Black	Draw a shape conforming to the actual circumstances as far as possible
G 4	Rest room or smoking room	S	Black	
G 8	Combustible material storing place	SHF	Black SHF in Black or red	
G 9	Storing place of poisonous, violent poison and others	TS	Red	
G 10	Explosive dealing place	EDS	Black EDS in black or red	
G 11	Explosive storing place	ES	Black ES in black or red	
G 12	Oils and grease storing place	OS	Black OS in black or red	
G 13	Water tank		Black inside in blue	
G 19	Surface drainage		Blue	
G 20	Drainage opening of mine water or waste water	EP	Blue or black	
G 21	Fuel storage place	FS	Black	
G 22	Fuel station	FF	Black	
G 23	Mine water and waste water treating installation	WT	Black	

G 24	Ground for accumulation of waste		Black, and gradation of dark brown towards inside	
G 25	Settling pond or filtering pond		Black, and gradation of blue towards inside	
G 26	Reclaimed ground		Black, and gradation of yellow towards inside	

Z Miscellaneous

Symbol No.	Title	Symbol	Color	Remarks
Z 1	Railway track		Black	
Z 2	Mine-lot line		Red	
Z 3	Lines of adjoining mine lots belonging to other persons		Blue	

Attachment-3)

"Structural criteria of vehicle-type mining machines and automobiles"

Chapter 1 Structural criteria of vehicle-type mining machines

(Strength, etc.)

Article 1 The motors, power transmission devices, driving gears, work devices, brakes, and controls of vehicle-type mining machines must conform to the following standards.

1) Must have the strength necessary for the purpose of use.

2) Vehicles must not contain any noticeable damage, wear, deformation, or corrosion.

(Stability of bulldozers, etc.)

Article 2 Bulldozers, rollers, motor graders, scrapers, and scrape dozers must have a left and right stability such that the machine in question does not flip over even when titled up to 35 degrees (30 degrees for vehicle-type mining machines having a maximum running speed of less than 20 kilometers per hour and vehicle-type mining machines having a vehicle-type mining machine gross vehicle weight (the result of multiplying the machine weight, maximum payload, and 55 kg by the riding capacity; heretofore and hereinafter referred to as the "gross weight") that is 1.2 or less that of the machine weight (the weight in the unloaded state) of the vehicle-type mining machine) on a flat and sturdy surface in a state in which the consumables such as fuel for motors and fuel systems and coolant liquid at the maximum amounts and that all necessary equipment, apparatuses, and the like necessary for using the vehicle in question are installed (heretofore and hereinafter referred to the "unloaded state").

(Stability of excavation machines)

Article 3

1. Excavation machines (excluding caterpillar type machines) must have a backward stability conforming to standards established below.

1) When the vertical surface including the center line of the longitudinal direction of a boom, arm, etc. intersects the running direction of the excavation machine in question at a right angle, the total value of the load applied to all overturn fulcrums at the side where the boom, arm, etc. is facing must be a value that is at least 15%

of the gross weight of the excavation machine in question.

2) When the vertical surface including the center line of the longitudinal direction of a boom, arm, etc. is the same as the running direction of the excavation machine in question, the total value of the load applied to all overturn fulcrums at the side where the boom, arm, etc. is facing must be a value equal to or greater than the value obtained by multiplying the value of 15% of the gross machine weight of the excavation machine in question by the value obtained by subtracting the wheel base from the mean wheel track.

2. In caterpillar type excavation machines, the total value of the load applied to all overturn fulcrums at the side where the boom, arm, etc. is facing must have a backward stability that is the value that is at least 15% of the gross weight of the excavation machine in question.

3. The calculation of the backward stability stipulated in paragraph 2 above shall be calculated when the excavation machine in question is in the following states.

1) State in which the backward stability is at its worst,

2) State in which there is no load,

3) State in which the machine is on a level and sturdy surface,

4) State in which the outrigger of an excavation machine having one is not being used,

(Stability of forklifts)

Article 4 Forklifts (excluding side forklifts and reach forklifts), according to the classifications of stability shown in the left column of the following table, must have a front and rear stability and left and right stability such that the forklift does not flip over even when on an inclined slope shown in the right column of the table, when is in the forklift states shown in the middle column of the table.

Stability classification	State of the forklift	Incline (unit; %)
Front and rear stability	In the standard loaded state and the fork is raised to its maximum height	4 (3.5 : in case the maximum weight of the forklift is over 5 ton)
	The standard loaded state during the running of the forklift	18
Left and right stability	State in which the standard loaded state is set, the fork is raised to the maximum height, and the mast is tilted backwards	6

	to the maximum extent	
	The standard unloaded state during the running of the forklift	１５＋1.1 Ｖ

Note)

1. In this table, the standard loaded state is the state in which the maximum load is loaded at the rated load center, the mast is vertical, and the upper surface of the fork is 35 cm above the floor.
2. In this table, the standard loaded state during the running of the forklift is the state after the standard loaded state has been set and the mast is titled backwards to the maximum extent.
3. In this table, the standard unloaded state during the running of the forklift is the state in which the fork is set 30 cm above the floor and then the mast is tilted backwards to the maximum extent.
4. In this table, (V) shall represent a numerical value of the maximum speed of the forklift (unit: kilometers per hour).

(Locking apparatuses)

Article 5　Vehicle-type mining machines must be equipped with locking apparatuses for motors and with apparatuses that prevent these machines from being operated by persons not certified to do so.

Article 6

1. Vehicle-type mining machines (excluding those in which internal combustion engines are not used as motors, and forklifts) must be equipped with brakes in order to brake the running of the machine and to maintain the state in which the machine is not being operated.

2. Among the brakes of the preceding paragraph, brakes used for braking the running of a machine must have the ability to stop the vehicle-type mining machine in question within the stopping distance shown in the right column of the following table, at the initial speed of braking shown in the middle column of the table, according to the maximum running speed of the vehicle-type mining machine on a dry and flat paved roadway surface shown in the following table.

Maximum running speed	Initial speed of Braking	Stopping distance (unit; ｍ)	
		When the gross	When the gross

(unit; km/h)	(unit; km/h)	weight of the machine is less than 20 tons	weight of the machine is over 20 tons
Over 35	35	Less than 14	Less than 20
20 - 35	20	Less than 5	Less than 8
Less than 20	Maximum running speed	Less than 5	Less than 8

3. Among the brakes in item 1, brakes used to maintain the state in which the machine is not in operation must have the able to maintain the unloaded vehicle-type mining machine in that state on a 1/5 inclined surface.

Article 7

1. Forklifts must be equipped with brakes in order to brake the running of the forklift and to maintain the state in which the forklift is not being used.

2. Among the brakes in item 1, brakes used to stop the running of the forklift must have the ability to stop the forklift in question within the stopping distance shown in the right column of the following table, at the initial speed of braking shown in the middle column, according to the state of the forklift shown in the left column.

State of the forklift	Initial speed of braking (unit; km/h)	Stopping distance (unit; m)
The standard unloaded state during the running of the forklift	20 (In case the maximum running speeds of forklifts having less than 20 kilometers per hour)	5
The standard loaded state during the running of the forklift	10 (In case the maximum running speeds of forklifts having less than 10 kilometers per hour)	2.5
Note) In this table, the standard unloaded state during the running of the forklift and the standard loaded state during the running of the forklift each refer to the standard unloaded state during the running of the forklift and the standard loaded state during the running of the forklift shown in the table of article 4. (The same applies to the table of the next item.)		

3. The brakes in item 1 used to maintain the state in which the machine is not in operation must have the ability to maintain the forklift in question in a stopped state on the inclined surface shown in the right column of the table, according to the state of the forklift shown in the left column.

State of the forklift	Incline (unit; %)
The standard unloaded state during the running of the forklift	20
The standard loaded state during the running of the forklift	15

(Brakes of work devices)

Article 8

1. Apparatuses used for raising and lowering the lifting apparatuses, booms, arms, etc. of excavation machines and boring machines (hereinafter referred to as "derricking apparatuses") and apparatuses used for expanding booms, arms, etc. (hereinafter referred to as "expansion apparatuses" must be equipped with brakes used for braking the fall of the load, boom, arm, etc. However, in the case of lifting apparatuses, derricking apparatuses, and expansion apparatuses of excavation machines and boring machines powered by hydraulic pressure and pneumatic pressure, this restriction shall not apply.

2. The brakes of the preceding paragraph must conform to the following established items.

1) The value of the braking torque (when two or more breaks are installed in lifting apparatuses, derricking apparatuses, and expansion apparatuses, the total of the torque values of all the brakes) must be at least 1.5 that of the value of the torque of lifting apparatuses, derricking apparatuses, and expansion apparatuses of the vehicle-type mining machine in question when a load equal to the load from which the load equal to the weight of the weight of loading tools such as hooks and buckets has been deducted from the maximum load that is able to be loaded according to the structure of the vehicle-type mining machine in question, the materials, and the angles of inclination and the lengths of booms, arms, etc.

2) Brakes that require human operation are according to the following established items.

a) The values of the operating force and stroke must be equal to or less than the

values shown in the middle column and right column, according the operation methods shown in the left column.

Operation method	Control force (unit; kg)	Stroke (unit; cm)
Foot-operated type	30	30
Hand-operated type	20	60

b) Must be equipped with holdfasts and clamps.

3) Brakes other than those requiring human operation are automatically activated when power has been cut.

3. The calculations of the torque values of the lifting apparatuses, derricking apparatuses, and expansion apparatuses of item 1 of the preceding paragraph shall be made when there is no resistance applied to the lifting apparatus, derricking apparatus, or expansion apparatus in question. However, in the event that a worm or worm gear mechanism having an efficiency of 75% or less is used in the lifting apparatus, derricking apparatus, or expansion apparatus in question, it is possible to apply resistance equal to 1/2 of the torque value created from the resistance of the gear mechanism in question.

(Operating parts of driving gears, etc.)

Article 9 The operating parts of the driving gears, work devices, and brakes of vehicle-type mining machines must not obstruct the field of vision that is needed by the operator and must be installed in locations that allow them to be easily operated by the operator.

(Display regarding the operation of operating parts)

Article 10

1. For parts that operate driving gears, work devices, and brakes of vehicle-type mining machines, the necessary information in regards to operation of the part in question, such as its functions and operation methods, must be displayed in a location where it can been seen easily by the operator. However, in the case of operating parts that are unlikely to be operated incorrectly by an operator, this restriction shall not apply.

2. In the case of vehicle-type mining machines in which internal combustion engines are not used as motors and machines that have been imported, the stipulations of the preceding paragraph do not apply.

(Required field of vision during operation)

Article 11

1. Vehicle-type mining machines must provide a field of vision that allows the operators to safety operate them.

2. The operator's seats and assistant operator's seats of vehicle-type mining machines must have structures that prevent the operator and assistant operators from easily falling due to vibrations, shock, shaking, etc.

3. Glass used in the front of the operator cabs of vehicle-type mining machines must be safety glass.

(Headlights)

Article 12 Vehicle-type mining machines must have headlights installed. However, in the case of vehicle-type mining machines used in locations where the necessary level of brightness is maintained in order to enable work to be performed safely, this restriction shall not apply.

(Lifting apparatuses)

Article 13 Vehicle-type mining machines having the floor of the operator's seat at a height of more than 1.5 meters must be equipped with an apparatus used for safely raising and lowering the operator. However, in the case of machines having a structure that allows the operator to be safely raised and lowered, this restriction shall not apply.

(Apparatuses for preventing hazards caused by the raising and lowering of arms, etc.)

Article 14 In vehicle-type mining machines, a fence or similar enclosure must be installed within 700 millimeters of the center of the operator's seat when there is a risk that when an arm or other type of apparatus is raised it may enclose the operator between the arm or other apparatus in question and the operator's seat, the body of the machine, etc., in order to prevent risks to the operator.

(Direction indicators)

Article 15 On vehicle-type mining machines, a direction indicator must be installed on the left side and the right side of the machine. However, in the case of vehicle-type mining machines in which an internal combustion engine is not used as the motor, caterpillar type vehicle-type mining machines, vehicle-type mining machines having a

maximum running speed of less than 10 kilometers per hour, and vehicle-type mining machines having a maximum running speed of less than 20 kilometers per hour, for vehicle-type mining machines in which the distance from the operator's seat and the center of the steering wheel to the outermost part of the vehicle-type mining machine in question is less than 650 millimeters, vehicle-type mining machines not having an operator cab, and vehicle-type mining machines used only inside mines, this restriction shall not apply.

(Alarms)

Article 16 Vehicle-type mining machines must be equipped with alarms. However, in the case of machines in which an internal combustion engine is not used as the motor or in the case of boring machines, this restriction shall not apply.

(Safety valves)

Article 17 In hydraulic systems in which the hydraulic pressure of vehicle-type mining machines is used as the driving force, safety valves for preventing the hydraulic pressure in question from reaching an excessive level must be installed.

(Display of important items)

Article 18

1. In vehicle-type mining machines (excluding machines in which an internal combustion engine is not used as the motor, as well as forklifts), the following items must be displayed at a location that is easily visible by the operator.

1) Name of manufacturer
2) Date of manufacture and serial number
3) Gross weight of the machine
4) Stability
5) Rated power output
6) Maximum running speed
7) Mean contact pressure

2. In addition to all items in the previous paragraph, vehicle-type mining machines that include buckets, dippers, etc. must have displayed on the buckets, dippers, etc. in question their volumes and maximum payloads in locations that can be seen easily by the operator.

3. The stability of item 4 of paragraph 1 shall be the direction in the right column, calculated in the states in the middle column, according to the types of vehicle-type mining machines shown in the left column.

The type of vehicle-type mining machine	State	Direction
Bulldozer, scrape dozer	Unloaded state	Front and back, left and right
Motor grader, scraper, roller, and load-haul-dump (LHD) machine	Unloaded state	Left and right
Tractor shovel, loader, crawler drill, drill jumbo, earth auger, down-the-hole drill	The state in which the stability of the vehicle-type mining machine in question is at its worst	Front and back, left and right

Article 19 In forklifts, the following items must be displayed at a location that is easily visible by the operator.

1) Name of manufacturer

2) Date of manufacture and serial number

3) Maximum load

4) Allowable load (This refers to the maximum load that can be loaded according to the structure of the forklift, the materials, and the center of gravity of the load loaded on the fork, etc.)

(Types of internal combustion engines)

Article 20 The types of internal combustion engines of vehicle-type mining machines used in underground mines and at underground facilities must be diesel engines.

(Fuel systems)

Article 21 The fuel systems of the internal combustion engines of vehicle-type mining machines must conform to the following standards.

1) Fuels tanks and the piping thereof must be sturdy and must be installed in a manner that prevents them from being damaged due to vibrations, shock, etc.

2) The inlets and vents of fuel tanks must be structured so that fuel does not leak due to vibration of the vehicle-type mining machine.

3) The inlets and vents of fuel tanks must not be in the same direction as the nozzles of

exhaust pipes and must be separated from the nozzles of exhaust pipes so that there is no danger of catching fire.

4) The inlets and vents of fuel tanks must be separated from exposed electric terminals and electric switches so that there is no risk of fire.

(Air cleaning apparatuses)

Article 22 The inspired air flow paths of internal combustion engines of vehicle-type mining machines used in underground mines and at underground facilities must be equipped with air cleaning apparatuses.

(Exhaust pipes)

Article 23 The exhaust pipes of internal combustion engines of automobiles must be installed in a manner so that the exhaust gas does not harm people nearby.

(Fire extinguishers)

Article 24

1. Vehicle-type mining machines (excluding those is which an internal combustion engine is not used as the motor) used in underground mines and underground facilities must be equipped with fire extinguishers that are appropriate for the extinguishing of fats and oils and that produce a small amount of noxious gas.

2. In addition to the previous paragraph, fire extinguishing apparatuses used for engine departments and intake/exhaust systems must be installed in a location from where they can be easily operated by the operator and where there is no risk of them being damaged.

Chapter 2 Structural criteria of automobiles

(Minimum under clearance)

Article 25 In order to assure safe running of automobiles, the section of the automobile that does not include the contact patches of tires must be spaced an appropriate distance from the ground.

(Stability)

Article 26 The stability of automobiles must conform to the following standards.

1) The sum of the load applied to the contact patches of steering wheels when the

automobile is empty and when the automobile is loaded must be at least 20% of the dead weight and the gross vehicle weight, respectively (in the case of three-wheeled vehicles, at least 18%).

2) Towing vehicles must conform to the standards of the preceding paragraph even when connected to towed vehicles.

3) When empty, automobiles (excluding two-wheeled vehicles or towed vehicles) must not flip over when either the left or right side has been titled up to 35 degrees (30 degrees in the case of automobiles having a maximum running speed of less than 20 kilometers per hour, automobiles having a dead weight of 1.2 times or less of the gross vehicle weight, or automobiles having a gross vehicle weight of more than 20 tons).

4) Towed vehicles must conform to the standards of the preceding paragraph even when connected to empty towing vehicles.

(Motors and power transmission devices)

Article 27

1. The motors and power transmission devices of automobiles must include structures and functions that can sufficiently withstand the running of the automobile.

2. The motors of vehicles (excluding two-wheeled vehicles and light automobiles having a maximum running speed of less than 20 kilometers per hour) must be able to be started from the operator's seat.

(Types of internal combustion engines)

Article 28 The types of internal combustion engines of automobiles used in underground mines and at underground facilities must be diesel engines.

(Air cleaning apparatuses)

Article 29 The inspired air flow paths of internal combustion engines of automobiles used in underground mines and at underground facilities must be equipped with air cleaning apparatuses.

(Exhaust pipes)

Article 30 The exhaust pipes of internal combustion engines of automobiles must be installed in a manner so that the exhaust gas does not harm people nearby.

(Fire extinguishers, etc.)

Article 31

1. Automobiles Vehicles used in underground mines and at underground facilities must be equipped with fire extinguishers appropriate for extinguishing fires according to the structure and load of the automobile and produce small amount of noxious gas.

2. In addition to the previous paragraph, fire extinguishing apparatuses used for engine departments and intake/exhaust systems must be installed in a location from where they can be easily operated by the operator and where there is no danger of them being damaged.

(Driving gears, etc.)

Article 32

1. The driving gears of automobiles must be able to guarantee sturdy and safe running.

2. From among the driving gears of the preceding paragraph, air-filled rubber tires must conform to the following standards.

1) Must be free of noticeable damage, such as cracks and exposure of the code layer.

2) The contact patches of tires must be slip resistant.

3. Tire chains and the like must be able to be installed correctly on driving gears and must be able to assure safe running of the automobile.

(Controls)

Article 33

1. The following devices that need to be operated when operating an automobile must be installed within 600 millimeters from the center of the steering wheel, at the left and right side, and they must be easy to operate from a fixed location by the operator.

1) The manipulators of starting devices, accelerators, clutches, gearboxes, other motors, and power transmission devices,

2) The manipulators of brakes,

3) The manipulators of head lights, alarms, direction indicators, windshield wipers, and washing liquid spraying apparatuses, and the manipulators of defrosters.

(These are devices used for removing the fogging of water droplets and the like from the front glass. The same definition applies hereinafter.)

2. The apparatuses mentioned in item 1 of the preceding paragraph (excluding the manipulators of accelerators, clutches, and gearboxes), the apparatuses mentioned in item 3 of the preceding paragraph (excluding the manipulators of direction indicators), and the areas near any of these must be displayed so that they can be identified easily from the operator's seat by the operator.

3. The manipulators of gearboxes and the areas near them must be displayed so that the current gear can be identified easily from the operator's seat by the operator.

4. The manipulators of direction indicators and the areas near them must be displayed so that the direction currently being indicated by the direction indicators can be identified easily from the operator's seat by the operator.

Article 34 The steering systems of automobiles must conform to the following standards.

1) The steering systems must be able to guarantee sturdy and safe running.

2) Steering systems must be able to be easily and accurately operated from a fixed location by the operator.

3) The steering system must not come into contact with the frame, fenders, or other parts of the automobile during steering.

4) In the relationship between the rotation angle of the steering wheel and the steering angle of the steering axle, there should be no noticeable difference between the left and right side.

5) There must be no noticeable difference in the steering effort of the steering wheel between when steering left and when steering right.

(Locking apparatuses)

Article 35 The motors, power transmission devices, driving gears, gearboxes, and steering systems of automobiles must be equipped with locking apparatuses.

(Brakes)

Article 36 Automobiles (excluding towed vehicles) must be equipped with at least two brake systems that are used independently of each other and that conform to the

following standards. However, in the case of automobiles having a maximum running speed of less than 20 kilometers per hour, a single brake system can be installed.

1) Brakes must be installed so that they are sturdy and are able to sufficiently handle the running of the automobile and in a manner that prevents them from being damaged due to vibrations, shock, contact, etc.

2) Brakes must have a structure and ability that allows them to be used without disrupting the performance of steering.

3) The main brakes (this refers to the brakes normally used to brake the automobile when running it. The same definition applies hereinafter.) must brake at least half of the wheels, including the rear vehicles, of the automobile.

4) Main brakes must have the ability to stop the automobile in question within the stopping distance shown in the right column of the following table, at the initial speed of braking shown in the middle column of the table, according to the maximum running speed of the automobile on a dry and flat paved roadway surface shown in the following table.

Maximum running speed (unit; km/h)	Initial speed of braking (unit; km/h)	Stopping distance (unit; m)
Over 80	50	Less than 22
35 - 80	35	Less than 14
20 - 35	20	Less than 5
Less than 20	Maximum running speed	Less than 5
Note) The operating force of the main brakes operated by the operator shall be no more than 90 kg in case of foot-operated brakes and no more than 30 kg in case of hand-operated brakes.		

5) The brakes of automobiles having a gross vehicle weight exceeding 20 tons must have the ability to stop the automobile in question within the stopping distance shown in the right column of the table, according to the gross vehicle weight of the automobile in the left column, in the state of there being an initial braking speed of 32 kilometers per hour on a dry and flat paved roadway surface.

Gross weight of automobiles (unit; ton)	Stopping distance (unit; m)
Less than 45	Less than 18

45 - 90	**Less than 27**
90 - 180	**Less than 38**
Over 180	**Less than 53**

6) Brakes (in vehicles in which at least two brake systems are installed, only one of the brake systems) must have the ability to maintain via mechanical operation a stopped state on a dry and paved roadway surface having a 1/5 incline, when the operator is not in the operator's seat and the automobile is empty. In such cases, the operating force of foot-operated brakes is 90 kg or less, and the operating force of hand-operated brakes is 50 kg or less.

(Shock absorbers)

Article 37 In automobiles, springs or other types of shock absorbers having a sufficient capacity for withstanding shock from driving surfaces and are able to assure smooth running must be installed.

(Fuel systems)

Article 38 The fuel systems of automobiles that use gasoline, kerosene, diesel fuel, or some other easily ignitable liquid as fuel must conform to the following standards.

1) Fuels tanks and the piping thereof must be sturdy and must be installed in a manner that prevents them from being damaged due to vibrations, shock, etc.

2) The inlets and vents of fuel tanks must be structured so that fuel does not leak due to vibration of the automobile.

3) The inlets and vents of fuel tanks must not be in the same direction as the nozzles of exhaust pipes and must be separated from the nozzles of exhaust pipes by a distance of at least 300 millimeters.

4) The inlets and vents of fuel tanks must be separated by at least 200 millimeters from exposed electric terminals and electric switches.

5) The apertures of inlets and vents of fuel tanks must not be faced toward the inside of vehicle interiors having a cockpit or standing space (excluding automobile cabs that are separated by a partition).

(Electric apparatuses)

Article 39 The electric apparatuses of automobiles must conform to the following standards.

1) Electric apparatuses contained in the interior of an automobile must be coated and

must be fixed within the frame.

2) Electric terminals, electric switches, and other electric apparatuses inside the cab that may generate sparks must be adequately covered.

3) Storage batteries must not move or be damaged due to the vibrations, shock, etc. of the automobile. Storage batteries inside cabs are contained inside wooden boxes or covered with another appropriate insulating material.

(Frames and bodies)

Article 40

1. The frames and bodies of automobiles must conform to the following standards.

1) Frames and bodies must be sturdy and must be able to sufficiently withstand the running of the automobile.

2) Bodies must be correctly installed on frames in order to prevent the frames from loosening due to vibrations, shock, etc.

3) The internal part of the frame and the shape of the automobile in question must not contain any sharp protrusions and the rotating parts of the vehicle must not be protruding.

2. Vehicles that transport people must have sturdy roofs installed.

(Boarding apparatuses)

Article 41 The boarding apparatuses of automobiles must have structures that can assure safe boarding of the automobile in question, so that persons using the automobile do not fall or topple down due to vibrations, shock, etc.

(Operator's seats)

Article 42 The operator's seats of automobiles must be structured in a manner that provides the field of vision necessary for operating the automobile and in a manner that does not allow the persons on-board or the loaded articles to interfere with the running of the automobile.

(Platforms)

Article 43 The platforms of operator cabs and of other interior sections must be equipped with doors that are able to close completely. However, when apparatuses such as chains or ropes have been installed in order to prevent passengers from falling during the running of the automobile, this restriction shall not apply.

(Article loading apparatuses)

Article 44 The cargo beds of automobiles and the article loading apparatuses thereof must have structures that are sturdy and allow the articles to be loaded safely and correctly.

(Window glass)

Article 45

1. The window glass of automobiles (in the case of automobiles having a maximum running speed of less than 20 kilometers per hour, the front glass) must be safety glass. However, in the case of glass installed in locations where there is no danger of passengers being harm by shards of glass in the event that the window glass has been damaged due to collision or the like, this restriction shall not apply.

2. The front windshields of automobiles (excluding towed vehicles) must conform to the following standards.

1) Glass must be transparent and must be free of any distortions that could obstruct the field of vision of the operator.

2) Even when the glass has been damaged, the field of vision directly in front of the operator's seat must be not be obstructed.

(Head lights)

Article 46 Automobiles (excluding towed vehicles) must be equipped with head lights conforming to the following standards. However, in the case of vehicles having a maximum running speed of less than 20 kilometers per hour, this restriction shall not apply.

1) When all of the head lamps are emitting light at the same time, they must be able to spot obstructions to the running of the automobile from a distance of 100 meters during the nighttime.

2) Headlamps must have structures that make it possible to reduce the level of brightness of head lamps or that make it possible to change the direction of the light to a downward direction in order to avoid hindering the running of other automobiles, etc.

(Side lamps)

Article 47 Side lamps must be installed on both sides at the front ends of automobiles (excluding vehicles having a gross vehicle weight of more than 20 tons, two-wheeled

vehicles, and vehicles having a maximum running speed of less than 20 kilometers per hour). However, when the outermost edge of the lighting portion of the side lamp is in a space that is up to 400 millimeters from the outermost part of the automobile, a side lamp need not be installed on that side.

(Tail lights)

Article 48 Vehicles (excluding vehicles having a maximum running speed of less than 20 kilometers per hour) must be equipped with tail lights conforming to the following standards.

1) The light of tail lights must be visible from a distance of 300 meters during the nighttime.

2) The color of tail lights must be red.

(Brake lights)

Article 49 At the rear ends of automobiles (excluding light automobiles having a maximum running speed of less than 20 kilometers per hours), brake lights conforming to the following standards must be installed.

1) Brake lights must be visible from a distance of 100 meters during the daytime.

2) The brake lights must be structured in a manner so that the brake lights turn on only when the main brakes are being operated. (In the case of vehicles having a gross vehicle weight of more than 20 tons, the same applies to the retarder brakes, and in the case of towed vehicles, the same applies to the main brakes of the towing vehicles.)

3) The stipulations of the preceding item notwithstanding, brake lights that also function as tail lights must have a structure in which the brightness of the lights is five times higher only when the main brakes are being operated.

(Backup lamps)

Article 50 Vehicles must be equipped with backup lamps that turn on only when the gearbox has been set to the reverse position (in the case of towed vehicles, the gearbox of the towing vehicle). However, in the case of two-wheeled vehicles and vehicles being towed by two-wheeled vehicles, this restriction shall not apply.

(Direction indicators)

Article 51 Vehicles must be equipped with direction indicators. However, in the case of vehicles having a maximum running speed of less than 20 kilometers per hour, two-

wheeled vehicles, and towed vehicles, this restriction shall not apply.

(Alarms)

Article 52 Automobiles (excluding towed vehicles) must be equipped with alarms conforming to the following standards.

1) The volume of the alarm sounds (in the event of the alarming sounding two times or more, the sum of each of these) must be at least 90 dB at a location two meters in front of the automobile.

2) The alarm sounds produced by the alarm must be consecutive and the volume and timbre of the sound must be consistent.

(Rear view mirrors, etc.)

Article 53

1. Automobiles (excluding towed vehicles) must be equipped with rear view mirrors that make it possible to check the areas surrounding the rear of the automobile (in the case of towed vehicles, the towing vehicle), on the left and right side.

2. In the following automobiles (excluding automobiles having a structure that makes it possible for the operator to directly check from the operator's seat for obstructions directly in front of the automobile and near the front wheels, and towed vehicles), mirrors that make it possible for the operator to check from the operator's seat for obstructions directly in front of the automobile and near the front left wheels (near the front right wheels in automobiles in which the operator's seat is installed on the left side) or equivalent apparatuses must be installed.

1) Automobiles having a gross vehicle weight of 8 tons or more and full-sized automobiles having a maximum loading capacity of 5 tons or more

2) Automobiles having a riding capacity of 11 passengers or more

(Windshield wipers)

Article 54

1. The front glass of automobiles (excluding two-wheeled vehicles and towed vehicles) must be equipped with automatic windshield wipers (when they are installed on both the left and right sides, they must operate simultaneously) that do not obstruct the field of vision directly in front of the front glass.

2. In vehicles in which windshields must be installed (excluding vehicles having a

maximum running speed of less than 20 kilometers per hour), per the stipulations of the preceding paragraph, washing liquid spraying apparatuses and defrosters must be installed. However, in automobiles in which it is not possible to separate the interior and exterior with a partition such as a roof or window glass, it is possible to not install defrosters.

(Speedometers and odometers)

Article 55 In automobiles, speedometers and odometers must be installed in the appropriate locations from where they can be seen easily by the operator. However, the odometer may be replaced with an elapsed time indicator (ETI) for engines in vehicles having a gross vehicle weight of more than 20 tons and are used solely in mines and at surface excavation sites, odometers may be omitted from light automobiles, and speedometers and odometers may be omitted from automobiles have a maximum running speed of less than 20 kilometers per hour and from towed vehicles.

(Internal pressure containers and the attachments thereof)

Article 56 Internal pressure containers and the attachments thereof that are used in vehicles must conform to the following standards.

1) Internal pressure containers that handle compressed air must be equipped with drain cocks.

2) When an internal pressure container is installed in an automobile, the maximum allowable working pressure must be displayed in a location from where it can be seen easily.

3) Internal pressure containers must be installed in locations from where they can be examined easily.

4) Internal pressure containers and the conduits thereof must be installed in automobiles in a manner that prevents them from being damaged due to the vibrations, shock, etc. that occur during the running of the automobile.

5) The pressure gauge of an internal pressure container that indicates the pressure inside the container must be installed in a location where it can be seen easily by the operator.

6) The pressure gauge must display a graduation of the minimum effective operating pressure of the device that runs on compressed gas.

The drafting Mine Safety Inspection Rule

November 10, 2015

(General Provision)

Article 1

Regarding mine safety, supervisory organizations are governed by Article 33 of the Mine Safety Law (hereinafter referred to as "Law"), and inspection, investigation and related duties conducted by mine safety inspectors shall be governed by Article 34 of the Law and regulations related to mine safety (hereinafter referred to as "Regulations"). These activities shall also be governed by the Mine Safety Inspection Rule (hereinafter referred to as "Rule").

(General inspection)

Article 2

1 The Director General or provincial Directors in charge of mines sector shall instruct mine safety inspectors to execute a general inspection of all the mines and accessory mine facilities, including processing plants, coal preparation plants and refineries (hereinafter referred to as "mines") under their jurisdiction.

2 Mine safety inspectors shall execute a general inspection in accordance with the annual inspection plan using the "Mine Safety Inspection Manuals" provided separately, and enter mines to inspect whether to obey the Law and Regulations, conserve mine facilities properly, check books, management records and other documentations related to the mining, investigate other properties, and question the people concerned.

3 Mine safety inspectors shall report the results of a general inspection prescribed in the preceding Paragraph in accordance with the "Mine Safety Inspection Manuals" to the aforesaid Director General (in case mine safety inspectors are staffed in the provincial Departments, by way of provincial Director).

(Special inspection)

Article 3

1 The Director General or provincial Directors in charge of mines sector shall instruct mine safety inspectors to execute a special inspection of the mine when any of the following apply.

1) When any of the mine pollution cases prescribed in the provision of Article 29, Paragraph 1 of the Law is likely to occur or has occurred.

2) When any of the mine disaster prescribed in the provision of Article 29, Paragraph 2 of the Law has occurred.

2 When mine safety inspectors execute a special inspection, the inspectors shall enter the mines to inspect the situation of mine pollution or mine disaster and question the people concerned.

3 Mine safety inspectors shall immediately report the general conditions of the special inspection prescribed in the preceding Paragraph to the aforesaid Director General (in case mine safety inspectors are staffed in the provincial Departments, by way of provincial Director), and submit a special inspection report using Form 1 to the Director General (in case mine safety inspectors are staffed in the provincial Departments, same as above).

(Investigation relevant to the inspection)

Article 4

1 When the Director General or provincial Directors in charge of mines sector consider it necessary based on the results of a general inspection prescribed in the provision of Article 2 of the Rule or a special inspection prescribed in the provision of Article 3 of the Rule, they shall instruct mine safety inspectors to investigate the offices belonging to the concessionaire of the concerned mine, and the offices or working places belonging to the contractors prescribed in the provision of Article 19 of the Law.

2 Mine safety inspectors shall enter the offices belonging to the concessionaire of the concerned mine, and offices or working places belonging to the contractors to check the books, documentations and other properties related to the mining, and question the people concerned.

3 When the Director General or provincial Directors in charge of mines sector consider it necessary for the safety of the mine, they shall issue instructions or give written guidance to the concessionaire regarding appropriate necessary measures, with given reasons.

(Inspection based on a mineworker's report)

Article 5

1 When the Director General or provincial Directors in charge of mines sector receive a report from a mineworker that there is a violation of the Law or ministerial ordinance based on the Law, or damage occurs or there is a risk of such damage occurring at a mine, they shall instruct mine safety inspectors to inspect the concerned mine as prescribed in the provision of Article 37, Paragraph 1 of the Law.

2 The mine safety inspectors shall enter the concerned mine, carefully inspect the facts concerning mineworker's report and question the people concerned.

3 The mine safety inspectors shall report the results of the inspection prescribed in the preceding Paragraph using Form 2 to the aforesaid Director General (in case mine safety inspectors are staffed in the provincial Departments, by way of provincial Director).

4 When the aforesaid Director General or provincial Directors consider it necessary for the safety of the mine, they shall issue instructions or give written guidance to the concessionaire regarding appropriate necessary measures, with given reasons.

(Inspection on the closed mine or suspended mine)

Article 6

1 The Director General or provincial Directors in charge of mines sector consider it necessary to prevent mine pollution or disaster of a third party regarding old mines that have been closed for a set period of up to five (5) years or suspended mines that have stopped mineral-related operations temporarily, they shall instruct mine safety inspectors to inspect the concerned mine.

2 The mine safety inspectors shall report the inspection results of the mine as prescribed in the preceding Paragraph using Form 3 to the aforesaid Director General (in case mine safety inspectors are staffed in the provincial Departments, by way of provincial Director).

3 When the aforesaid Director General or provincial Directors consider it necessary to prevent mine pollution or disaster of a third party based on the inspection as prescribed in the preceding Paragraph, the Director General or provincial Directors shall issue instructions or give written guidance on the necessary measures to the concessionaire or former concessionaire that has renounced the mineral license, with given reasons.

4 The Minister in charge of mines sector has the power to issue orders for a set period of up to five (5) years after the mineral license has been renounced regarding installment of necessary facilities, among other items for preventing mine pollution or disaster of a third party, to the former concessionaire based on the provisions of Article 4, Paragraph 1 and Article 27, Paragraph 1 of the Law, with given reasons.

(Issuance of the improvement instructions for mine safety)

Article 7

1 When mine safety inspectors consider it necessary to secure the safety of the mine based on the results of the inspection as prescribed in the provision of Article 2, 3 or 5 of the Rule, the inspectors should issue the improvement instructions for mine safety using Form 4 to the concessionaire of the concerned mine.

2 When mine safety inspectors issued improvement instructions for mine safety based on the provision of the preceding Paragraph and the Director General or provincial Director in charge of mines sector consider it necessary to further secure the safety of the mine, the aforesaid Director General or provincial Director shall issue improvement instructions for mine safety of additional items, with given reasons.

(Issuance of the orders for warning and directing)

Article 8

1 When mine safety inspectors consider that the use or handling of mine machineries, equipment, buildings, structures or other facilities, or management of explosives, motive powers or fires in mineral-related operations violates the Law and Regulations, and there is an imminent safety risk based on the results of the inspection as prescribed in the provision of Article 2, 3 or 5 of the Rule, the mine safety inspectors should issue the orders for warning and directing using Form 5 to the concessionaire of the concerned mine regarding the clearance of violated items speedily based on the provision of Article 36, Paragraph 1 of

the Law.

2 When mine safety inspectors have issued the orders based on the preceding Paragraph and the aforesaid Director General or provincial Director consider it necessary to further correct the status of the mine safety, the Director General or provincial Director shall issue the written orders to the concessionaire of the concerned mine, with given reasons.

(Measures of supervision and guidance in case of imminent danger or emergency)

Article 9

1 When the Minister or Director General in charge of mines sector considers that fires or wind/flood damage has caused imminent danger at a mine, the aforesaid Minister or Director General shall dispatch mine safety inspectors to the concerned mine to supervise and guide the concessionaire regarding appropriate countermeasures for safety.

2 When the concessionaire has encroached and mined outside the mining areas, and there is an imminent safety risk based on the results of inspection or investigation as prescribed in the provision of Article 2, 3 or 5 of the Rule, the mine safety inspectors should issue the orders for warning and directing to the concessionaire of the concerned mine regarding countermeasures such as the suspension of operations at the involved areas and closure of the areas to correct the status of mine safety speedily based on the provisions of Article 36, Paragraph 2 of the Law and Article 8, Paragraph 1 of the Rule.

3 When there is an urgent need for the rescue of victims at the site of mine pollution or mine disaster at a mine as prescribed in the provision of Article 3 of the Rule, mine safety inspectors should issue the orders for warning and directing to the concessionaire of the concerned mine regarding appropriate measures to secure mine safety speedily based on the provisions of Article 36, Paragraph 3 of the Law and Article 8, Paragraph 1 of the Rule.

4 Mine safety inspectors shall report immediately to the Minister or Director General in charge of mines sector (in case mine safety inspectors are staffed in the provincial Departments, by way of provincial Director) regarding the general conditions of imminent danger or emergency as prescribed in the preceding Paragraph 1 to 3 inclusive as well as the measures of supervision or guidance taken to the concessionaire of the concerned mine.

(Form 1)

The Special Inspection Report

The concerned mine safety inspectors submit the special inspection report as follows regarding (mine pollution /mine disaster) that was occurred at ○○ Mine (○○ Pit) on _____ (dd/mm/yyyy), and execute the inspection during the period from _____ (dd/mm/yyyy) to _____ (dd/mm/yyyy) based on the provision of Article 3, Paragraph 1 of the Mine Safety Inspection Rule.

(Occurrence situation of mine pollution or of mine disaster)

1. Name of mine (name of pit, in case of coal mines)
2. Kinds of minerals, licensed number of the mining area
3. Address of the mine
4. Name of the concessionaires (Representative of corporation)
5. Name of safety supervisor
6. The occurrence date of mine pollution or mine disaster
7. Kinds of mine pollution or mine disaster
8. The occurrence site of mine pollution or mine disaster
9. Fatalities (name, age, kind of occupation, victim degree)
10. Name of technical safety staffs and their duties concerned mine pollution or mine disaster
11. The occurrence situation of mine pollution or mine disaster
    (1) The occurrence situation of mine pollution or mine disaster
    (2) The time and situation when the concerned technical safety staffs patrolled the area before the occurrence of mine pollution or mine disaster
    (3) Alertly warnings or preventative measures taken by the concerned technical safety staffs before the occurrence of mine pollution or mine disaster
12. The situation of mine pollution or mine disaster after its occurrence
13. The cause(s) of mine pollution or mine disaster
14. The contents of the measures taken after the occurrence of mine pollution or mine disaster
    (1) The details of the measures taken by the safety supervisor, technical safety managers and technical safety staffs against mine pollution or mine disaster
    (2) The details of the taken measures and countermeasures to be taken by the concerned concessionaire against mine pollution or mine disaster

(3) The details of measures to the victims by the concerned concessionaire

15. Decreased production, costs due to damage and recovery, and lost time due to mine pollution or mine disaster
16. Violation of Mine Safety Law and its regulations

(1) Provisions of violation of Mine Safety Law and its regulations

(2) Provisions of suspicious violation of Mine Safety Law and its regulations

17. Views by mine safety inspectors who conducted the special inspection
18. Reference items

Date of submission of the report (dd/mm/yyyy)

Name of mine safety inspector(s) who conducted the special inspection

Notice:

1) The mine pollution form or mine disaster form should be selected according to the contents of the special inspection.
2) A sketch of the mine pollution or mine disaster site should be attached.
3) Copies of the documents and property lists should be attached as evidence.
4) In case mine safety inspectors are staffed in the provincial Departments, the repot should be submitted to the General Director by way of provincial Director.

(Form 2)

The Inspection Report based on a Mineworker's Report

The concerned mine safety inspectors submit the inspection based on a mineworker's report as follows that was executed at ○○ Mine (○○ Pit) during the period from _____ (dd/mm/yyyy) to _____ (dd/mm/yyyy) based on the provision of Article 5, Paragraph 1 of the Mine Safety Inspection Rule.

(Items of mentioned)

1. Name of mine (name of pit, in case of coal mines)
2. Kinds of minerals, licensed number of the mining area
3. Address of the mine
4. Name of the concessionaires (Representative of corporation)
5. Name of safety supervisor
6. Contents of a mineworker's report
7. The facts of a mineworker's report
8. Violation of Mine Safety Law and its regulations
   (1) Provisions of violation of Mine Safety Law and its regulations
   (2) Provisions of suspicious violation of Mine Safety Law and its regulations
9. Views by mine safety inspectors who conducted the inspection
10. Reference items

Date of submission of the report (dd/mm/yyyy)

Name of mine safety inspector(s) who conducted the inspection

Notice:

1) In case mine safety inspectors are staffed in the provincial Departments, the repot should be submitted to the General Director by way of provincial Director.

(Form 3)

The Inspection Report on the (Closed Mine or Suspended Mine)

The concerned mine safety inspectors submit the inspection report on the (closed mine or suspended mine) as follows that was executed at (old) ○○ Mine (○○ Pit) during the period from _____ (dd/mm/yyyy) to _____ (dd/mm/yyyy) based on the provision of Article 6, Paragraph 1 of the Mine Safety Inspection Rule.

(Items of mentioned)

1. Name of the closed mine or suspended mine (name of pit, in case of coal mines)
2. Kinds of minerals, (old) licensed number of the mining area
3. Address of the closed mine or suspended mine
4. Name of the (old) concessionaires (Representative of corporation)
5. The present conditions of the mine ((old) mineral working fields, vicinities of mine and attached mine facilities)
6. Name of safety supervisor, in case of suspended mine
7. Mine pollution or disaster of a third party is likely to occur or has occurred.
8. Violation of Mine Safety Law and its regulations, in case of suspended mine
   (1) Provisions of violation of Mine Safety Law and its regulations
   (2) Provisions of suspicious violation of Mine Safety Law and its regulations
9. Views by mine safety inspectors who conducted the inspection
10. Reference items

(Additional items of mentioned, in case of mine pollution or disaster of a third party has occurred)

11. Occurrence date of mine pollution or disaster of a third party
12. Kinds of mine pollution or disaster of a third party
13. The occurrence site of mine pollution or disaster of a third party
14. Fatalities (name, age, kind of occupation, victim degree)
15. Name of technical safety staffs and their duties concerned mine pollution or disaster of a third party, in case of suspended mine
16. The occurrence situation of mine pollution or disaster of a third party
    (1) The occurrence situation of mine pollution or disaster of a third party
    (2) The time and situation when the concerned technical safety staffs patrolled the area

before the occurrence of mine pollution or disaster of a third party, in case of suspended mine

(3) Alertly warnings or preventative measures taken by the concerned technical safety staffs before the occurrence of mine pollution or disaster of a third party, in case of suspended mine

17. The situation of mine pollution or disaster of a third party after its occurrence
18. The cause(s) of mine pollution or disaster of a third party
19. The contents of the measures taken after the occurrence of mine pollution or disaster of a third party

(1) The details of the measures taken by the safety supervisor, technical safety managers and technical safety staffs against mine pollution or disaster of a third party, in case of suspended mine

(2) The details of the taken measures and countermeasures to be taken by the concerned (former) concessionaire against mine pollution or disaster of a third party

(3) The details of measures to the victims by the concerned (former) concessionaire

20. Costs due to damage and recovery

Date of submission of the report (dd/mm/yyyy)

Name of mine safety inspector(s) who conducted the inspection

Notice:

1) The term of closed mine or suspended mine should be selected according to the mine's status.
2) In case mine safety inspectors are staffed in the provincial Departments, the repot should be submitted to the General Director by way of provincial Director.

(Form 4)

The Improvement Instructions for Mine Safety

Representative of concessionaire:
Name of mine:

The results of the ○○inspection conducted during the period from _____ (dd/mm/yyyy) to _____ (dd/mm/yyyy) at ○○Mine (○○ Pit) indicate that the items to be improved for mine safety are as follows. These items should be improved immediately and the improvement protocols should be submitted to the Director General in charge of mines sector not later than _____ (dd/mm/yyyy).
The aforementioned instruction items should be reported to the Safety Committee and should be publicized to all mineworkers at the mine.

Period of the inspection		
Site of the inspection		
NO.	Improvement instruction items based on the inspection	

Issuance Day of the improvement instructions for mine safety: (dd/mm/yyyy)

Name of mine safety inspector(s) who conducted the inspection:

(Form 5)

The Orders for Warning and Directing

Representative of concessionaire:
Name of mine:

The results of the ○○ inspection conducted at ○○Mine (○○ pit) indicate that the items specified below in (1) violate the Mine Safety Law and its regulations, and there is also an imminent safety risk in mining-related operations at the mine.
The necessary measures for the clearance of violated items specified below in (2) should be corrected speedily in accordance with orders provided in the provision of Article 36, Paragraph ○○ of the Mine Safety Law.
The completion of the necessary measures should be reported in writing immediately to the (Minister or General Director) of in charge of mines sector.
The aforementioned orders for warning and directing should be reported to the Safety Committee and the violated items to be corrected should be publicized to all mineworkers at the mine.

(1) The violated items on Mine Safety Law and its regulations

(2) The necessary measures for the clearance of violated items

Issuance Day of the orders for warning or directing: (dd/mm/yyyy)

Name of mine safety inspector(s) who conducted the inspection:

Notice:

1) The term of the Minister or General Director should be selected in accordance with orders prescribed in the provision of the Rule.

The Comparison & Differences of Mining Related Laws in Japan, Cambodia and Other Countries

March 2015

1. Comparison & Differences with previous Mine Safety Law in Japan

The comparison and differences of major items and stipulations of mining related laws between **Mine Safety Law** (previous revision in 2004) (hereinafter referred to as the "previous Mine Safety Law") **of Japan** and **Law on Management and Exploitation of Mineral Resources** (in 2001) (hereinafter referred to as the "Law on Mineral Resources"), and **Law on Environmental Protection and Natural Resource Management** (in 1996) (hereinafter referred to as the "Law on Environmental Protection") **of Cambodia** are described in **Table 1**.

As a reference, the comparison and differences concerned mining related laws in other countries, **Mineral Law** (revised in 2010), **Law on Environmental Protection** (revised in 2001) and **Labor Code** (revised in 2012) **of Vietnam**, and the **Law on Minerals** (revised in 2011), **Labour Act** (in 1990) and **Law on Environmental Protection** (in 1999) **of Laos**, and the **Myanmar Mines Law** (in 1994), **Myanmar Mines Rules** (in 1996) and the **Environmental Conservation Law** (revised in 2012) **of Myanmar** as the criteria for Mine Safety Law of Japan are described in the same table.

Table 1 Comparison and Differences with the previous Mine Safety Law of Japan

Items	The previous Mine Safety Law of Japan	Law on Mineral Resources and Law on Environmental Protection of Cambodia, and mining related laws of other countries
Purpose of the Law	The law aims to prevent injuries to mineworkers, to prevent mine pollution and to promote rational development of mineral resources. (previous Mine Safety Law, article 1)	(The purpose of concerned laws in Cambodia and other countries is mentioned in Table 3)

Obligations of an Owner of Mining Right or the Holder of Mining Lease Right	*The owner of mining right or the holder of mining lease right shall ensure necessary measures as follows. 1) Prevention of rock-falls, collapses, floods, gas outburst, gas or coal dust explosions, spontaneous combustion and fires in mines. 2) Prevention of danger and injuries and mine pollution due to treatment and disposal of gas, dust, waste stones, slag, mine- water, waste-water and mine smoke. 3) Prevention of damage and injuries related to handling of machinery and equipment, as well as handling of explosives, motive power and fires. 4) Establishment of suitable ventilation, and rescue organization. 5) Conservation of mineral resources. 6) Maintenance and management of machinery, equipment, building and structures. 7) Prevention of mine pollution due to land excavation. (previous Mine safety Law, article 4) (Note) Particular contents of the necessary measures to be taken by the owner of mining right or the holder of	*Every concessionaire or sub-contractor shall be responsible for carrying out mineral exploration and exploitation, and shall comply with the following operational requirements: 1 Carry out mineral operations with duly and effective way by following techniques and financial plans which shall be detailed in an exploration work program or in a mining feasibility study; 2 Protect the environment as detailed in the Law on Environmental Protection and Natural Resources Management, such as the study of environmental impact assessment, plan for environmental management, plan for restoration of mining sites, and financial guarantees; 3 Ensure the occupational health and safety of workers, which shall be detailed in a program for mining plans and occupational health and safety in mining sites, including the protection of danger and procedures of reporting the danger; 4 Protect the public safety in and around mining sites, which shall be detailed in the mining plans; 5 Educate, train, and employ Cambodians, which shall be detailed in a program for employment, education and training; 6 Commit the procurement of goods and services obtainable within the Kingdom of Cambodia, where and when it is appropriate. *The Minister in charge of mineral sector can determine the necessities

	mining lease right concerning safety shall be prescribed in ministerial ordinance regulations.	additional to the above operational requirements, subject to the category of mineral licenses and the scale of mineral operations. (Cambodia, Law on Mineral Resources article 21) *Organizations and individuals licensed for mining have the following obligations: d) to exploit to the maximum main and accompanied minerals; to protect mineral resources; to ensure labor safety and sanitation and take measures to protect the environment; g) to compensate for damage caused by mining activities; and i) to close mines, restore the environment and rehabilitate the soil when the mining license expires. (Vietnam, Mineral Law, article 55) *1 Organizations and individuals licensed for mining shall fully abide by labor safety and sanitation rules. 2 Organizations and individuals licensed for mining shall issue labor rules of the mines which comply with technical regulations on labor safety and sanitation. (Vietnam, Mineral Law, paragraphs 1 &2 of article 57) *The employer has the following obligations: b) to ensure the conditions on labor safety and hygiene for machinery, equipment, workshop to reach the national technical regulations on labor safety and hygiene or standards on labor safety and hygiene at the workplace that has been published and applied; c) testing and assessing the dangerous and harmful factors, harmful at workplace

		of the facility to set out the exclusion measures to minimize hazards, harmfulness and improve the working conditions and health care for the employees. (Vietnam, Labor Code, article 138) *In order to ensure the safety and health of labor, investors concerned with mineral business shall implement main measures as follows: 1) establish rules and measures for labor health and safety by providing health check up for labor at least one time per year ; 2) design exploitation operations, construct and install adequate machinery and equipment to meet relevant technical standards; 3) use techniques and technology which is effective to protect against pollution, and to supply equipment and uniforms to provide safety for labor; 4) have a safe place or, warehouse for the storage of explosive and chemical substances; 5) have the alarm system and to deal with an emergency case or accident; and 6) regularly report on safety and health of labor including related statistics regularly. (Laos, Law on Minerals, article 58) *In order to avoid or minimize negative environmental and social impacts, investors in mineral activities must perform measures as follows: 1) create a plan for the management of the environment and a plan of resettlement for people who are impacted from such business related to minerals in

		accordance with regulations; 2) establish a plan for rehabilitation of the mined out area and for mine closure to allow for other uses; 3) be liable to pay compensation for damages incurred from the impact of the business operation related to minerals subject to relevant regulation; 4) to contribute to an Environmental Protection Fund for the project; 5) treat waste water before discharge from the project in order to ensure the health and life of the people, animals and the environment; 6) to regularly summarize and report on assessment of Social and Environmental Impacts to the concerned mineral management / monitoring and inspection organization. (Laos, Law on Minerals, article 60) *Permit holders shall comply with the rules prescribed under the Law with respect to the following matters. 3 Making and implementation of planning documentation for safety and accident prevention countermeasures. 4 Making and implementation of planning documentation relating to the welfare, health, sanitation, and discipline of personnel and workers in a mine. 5 Creation of environmental protection countermeasure documentation to prevent the occurrence of damage due to a mining operation. 6 Reporting of accidents, loss of life and bodily injury received due to such accidents in the mine. 7 Submission to the inspection of the chief inspector and inspectors.

		(Myanmar, Mines Law, article 13)
Obligations of Mineworkers	*The mineworkers must observe items necessary to conserve safety at the mines. (previous Mine Safety Law, article 5) (Note) Particular contents of the necessary items to be observed by mineworkers concerning safety shall be prescribed in ministerial ordinance regulations.	*(There are no provisions regarding the obligations of mineworkers.) Cambodia and Myanmar *Mineworkers shall fully abide by labor safety and sanitation rules. (Vietnam, Mineral Law, section 1 of article 57) *The employee has the following obligations: a) to comply with the regulations, procedures and rules on the labor safety and hygiene related to the work and duties assigned. (Vietnam, Labor Code, section2 of article 138) *Workers shall observe rules of work. Rules of work shall consist of the right and duties of workers as specified under laws and regulations, the internal work rules of the labor unit and employment contract signed between workers and their employer. (Laos, Labour Act, article 31)

Education on Mine Safety	1 The owner of mining right or the holder of mining lease right shall educate and train mineworkers with regard to measures	*Every concessionaire or sub-contractor shall be responsible for carrying out mineral exploration and exploitation, and shall comply with the following

	necessary for mine safety. 2 With regard to particularly dangerous tasks, the level of education the mineworkers should receive, and the restrictions on the tasks that can be performed by mineworkers who have not received this education, shall be prescribed in ministerial ordinance. (previous Mine Safety Law, article 6)	operational requirements: 5) Educate, train, and employ Cambodians, which shall be detailed in a program for employment, education and training. (Cambodia, Law on Mineral Resources, paragraph 5 of article 21) *The employees are entitled to choose their vocation and vocational training at work places consistently with their demands for employment. *The employers shall make the annual plan and prepare budget to provide vocational training or vocational skill and grade improvement courses for their employees; train the employees before they change their jobs to be recruited by the employers. (Vietnam, Labor Code, articles 59 & 60) *All employers must ensure that workers under their authority are trained and acquire qualifications and expertise to enable them to gradually become skilled and specialized workers. (Laos, Labour Act, article 8) *Mineral exploration permit holders employ and train citizens of Myanmar in accordance with the conditions of the permit. *Mineral production permit holders and mine managers provide adequate training and refresher training to ensure the on-the-job safety and health matters of workers. (Myanmar Mine Rules, articles 54 & 100)

Restriction regarding Machinery, Equipment, Explosives and Other Materials	*1 The owner of mining right or the holder of mining lease right shall not use or install in a mine particularly dangerous machinery, equipment, explosives and/or other materials as prescribed in the ministerial ordinances, unless it has passed the examinations. 2 The minister of Economy, Trade and Industry (hereinafter referred to as the "minister of METI") has the power to prohibit the use or installation of especially dangerous machinery, equipment, explosives or other materials in mines if, it is deemed necessary to ensure safety on site. (previous Mine safety Law, sections 1 & 2 of article 7)	(There are no provisions regarding restrictions on use and installation of machines, equipment, explosives, and other materials in a mine.) Cambodia and Myanmar *1 The types of machinery, equipment and materials with strict requirements on labor safety must be inspected before being put into use and periodically inspected during the process of utilization by the organization of technical inspection of labor safety. (Vietnam, Labor Code, section 1 of article 147) *In order to ensure the safety and health of labor, investors concerned with mineral business shall implement main measures as follows: 2) design exploitation operations, construct and install adequate machinery and equipment to meet relevant technical standards. (Laos, Law on Minerals, paragraph 2 of article 58)
Permission regarding Facility Plans	*1 When the owner of mining right or the holder of mining lease right establishes or modifies buildings, structures or other facilities for use in mining, "facility plans" shall be prepared as prescribed in the ministerial ordinance regulations, and submitted to the director of Industrial Safety and Inspection Department (hereinafter referred to as the "director of ISID") for approval.	(There are no provisions regarding permission on facility plans.) Cambodia, Laos and Myanmar *2 The list of machinery, equipment and materials with strict requirements on labor safety is issued by the Ministry of Labour, Invalids and Social Affairs. (Vietnam, Labor Code, section 2 of article 147)

	2 The owner of mining right or the holder of mining lease right shall submit the plans to the director of ISID no later than 14 days before the work is due to begin. 3 The said director has the power to prohibit work on such facilities or order the plans to be modified by the owner or the holder if, it is deemed necessary to ensure safety. 4 When the plans prescribed in section 1 above have been completed, or such buildings, structures or other facilities have been scrapped, the owner or the holder shall notify the said director within 14 days. (previous Mine Safety Law, article 8)	
Safety Rules	*1 The owner of mining right or the holder of mining lease right shall establish their own safety rules to ensure safety at the mine. 2 When the owner or the holder establishes or modifies the safety rules, these rules need to be approved by the safety committee prescribed in Article 19. 3 The director of ISID has the power to order the owner or the holder to modify the rules if, it is deemed necessary to ensure safety. (previous Mine Safety Law, article 10) *The owner of mining right or the holder of mining lease right	*(There are no provisions regarding safety rules) Cambodia *Organizations and individuals licensed for mining shall issue “labor rules of the mines” which comply with technical regulations on labor safety and sanitations. (Vietnam, Mineral Law, paragraph 2 of article 57) *The employer shall be responsible for drawing up “work rules” concerning labor and health protection, including the implementation of such measures as may be required to ensure protection in the use of machinery, and installation of various safety equipment, in consultation with trade unions or workers’

	and mineworkers shall obey the said safety rules. (previous Mine Safety Law, article 12)	representatives in its labor unit. (Laos, Labour Act, article 49) * Mineral production permit holders and mine managers shall prepare and keep an emergency preventive plan specific to each mine, for reasonably foreseeable, work related and natural disasters. (Myanmar Mine Rules, article 98)
Appointment of the Safety Supervisor, Technical Safety Managers, and Technical Safety Staffs	*1 The owner of mining right or the holder of mining lease right shall appoint a safety supervisor at a mine, as prescribed in the ministerial ordinance. 2 The said safety supervisor must be appointed from among those responsible for supervising the mining operations at the mine in question. 3 The owner or the holder shall also appoint technical safety managers (safety technicians), vice-technical safety managers (vice-safety technicians) and some necessary technical safety staffs (operational supervisors) at the mine, as prescribed in the ministerial ordinance. 4 When the owner or the holder has appointed a safety supervisor, technical safety managers (safety technicians), vice-technical safety managers (vice-safety technicians) and some necessary technical safety staffs (operational supervisors)	*(There are no provisions regarding appointment of safety supervisor, safety technical manager and safety technical staffs.) Cambodia and Laos *A mineral exploration practice organization must satisfy the following conditions: b) having employee in charge of technical matters with university degree and work experience; c) having a staff of technical workers specialized in geological exploration. (Vietnam, Mineral Law, article 35) *A mine manager must satisfy the following criteria: a) being knowledgeable about the mineral law and other relevant regulations; b) being knowledgeable about specialized technical regulations, labor safety and sanitation rules and environmental protection regulations in mining activities. (Vietnam, Mineral Law, article 62)

	at a mine, notification must be submitted to the director of ISID. (previous Mine Safety Law, article 12-2) *1 The director of ISID has the power to order the owner or the holder to remove the safety supervisor, the technical safety manager (safety technician), the vice-technical safety manager (vice-safety technician) and the technical safety staff (operational supervisor) from his or her position if, it is deemed necessary to ensure safety. 2 If the said director intends to issue the administrative order as prescribed above, the owner or the holder, the safety supervisor, the technical safety manager (safety technician), the vice-technical safety manager (vice-safety technician) and the technical safety staff (operational supervisor) in question shall be notified of a date and location of a public hearing, in advance. 3 The recipients of such notifications can express their opinions to the said director, at the said hearing. (previous Mine Safety Law, article 13) *1 The safety supervisor shall manage and control matters related to mine safety. 2 The technical safety manager (safety technician), the	* A manager with the prescribed qualifications shall be appointed for the purpose of controlling and managing a mine. (Myanmar Mine Rules, Article 87) * Mineral production permit holders and mine mangers appoint adequate supervisory personnel on each shift in order to secure the safe operation of the mine in accordance with the law. (Myanmar Mine Rules, article 100)

	vice-technical safety managers (vice-safety technicians) shall assist the safety supervisor by managing technical matters related to safety. 3 The technical safety staffs (operational supervisors) shall allocate technical duties related to safety under the direction of the safety supervisor, the technical safety manager (safety technician) and the vice- technical safety manager. 4 The necessary items concerning the duties of the safety supervisor, the technical safety manager (safety technician), the vice-technical safety managers (vice-safety technicians) and technical safety staffs (operational supervisors) shall be prescribed in the ministerial ordinance. (previous Mine Safety Law, article 14) *1 The owner or the holder shall appoint a substitute safety supervisor, technical safety managers (safety technicians) and the vice-technical safety managers (vice-safety technicians) in case of absence due to travel, illnesses or another accidents, and shall notify the director of ISID of the appointment, in advance. 2 When the said substitute undertakes the duties on behalf of the safety supervisor, a technical safety manager (safety technician) and the vice-technical safety managers (vice-safety	

	technicians) at a mine, the application of the law and regulations of the ministerial ordinances based on this law shall consider the substitute to be the safety supervisor, a technical safety manager (safety technician) and the vice-technical safety managers (vice-safety technicians). (previous Mine Safety Law, article 16) The technical safety manager (safety technician), the vice-technical safety managers (vice-safety technicians) and technical safety staffs (operational supervisors) shall be fulfilled the requirements as successful applicants of the national examination, and skills of mining, as prescribed in the ministerial ordinance. (previous Mine Safety Law, article 18)	

Safety Committee	*1 The owner of mining right or the holder of mining lease right shall establish the safety committee to research and deliberate important matters to safety, and to cooperate with the safety Supervisor's duties related to safety, as prescribed in the ministerial ordinance. 2 If the owner or the holder is punished by the minister of METI or the director of ISID, as prescribed in this law or ministerial ordinance regulations based on this law, the safety committee must be informed of the details of the punishment, without delay. 3 The safety committee shall comprise the safety supervisor and committee members, and the safety supervisor shall be the chairperson of the committee. 4 The safety supervisor may appoint a safety technical manager (safety technician) to undertake the duties of the chairperson of the committee. (previous Mine Safety Law, article 19) *1 Members of the safety committee shall be appointed by the owner or the holder, from among mineworkers at the mine. 2 Half of the members of the said committee shall be selected on the recommendation of mineworkers at the mine. (previous Mine Safety Law, article 20)	*(There are no provisions regarding establishment of the safety committee.) Cambodia and Myanmar *"labor protection system" consisted of labor protection council, labor protection section, hygiene organization and system of member of safe hygiene should be issued in the ministry ordinance. (Vietnam, Ministry of Labour, Invalids and Social Affairs) *The investor in mining business shall be required to develop a system to ensure safety and to protect the health of labor by identifying measures and establishing a warning system to prevent, control, eliminate, or minimize the impacts and risks that are dangerous to mining labor in the mines area. *All activity concerning minerals shall institute a mine safety and labor health committee which consists of the participation of employees' representative in accordance with the Labor Law. (Laos, Law on Minerals, article 57)

	*The chairperson shall call the safety committee meetings, and items on the agenda shall be determined by the majority of attendees. When the vote is tied, the chairperson shall cast the deciding vote. (previous Mine Safety Law, article 21)	
Administrative Measures to be Supervised	*1 If the owner of mining right or the holder of mining lease right plans to dig for minerals under the sea, rivers, lakes or any place where there is a risk of mine pollution occurring, a "special mining plan" shall be drafted and submitted to the director of ISID for approval. This shall also apply when plans are modified. 2 The said director has the power to order the owner or the holder to modify the plan if, it is deemed necessary to ensure safety. 3 The owner or the holder must never dig for minerals	*A mineral license issued under this law shall be suspended or revoked if the concessionaire violates the provisions of this law. *The procedures of suspension and revocation of the mineral licenses shall be determined by a sub-decree. (Cambodia, Mineral Resources Law, article 18) *(There are not specific provisions regarding administrative measures to be supervised in mining relater laws) Vietnam

	underground without the permission of the director, as prescribed in paragraph 1. (previous Mine Safety Law, article 23) *1 When the owner or the holder engages a contractor other than a mineworker, as prescribed in the ministerial ordinance, to dig drifts, transport the minerals and do other work for certain period, a “contractual work plan” shall be drafted concerning measures to be taken to ensure the safety of such work, and the plan shall be submitted to the director of ISID. This shall also apply when plans are modified. 2 The said director has the power to order the owner or the holder to modify the plan if, it is deemed necessary to ensure safety. (previous Mine Safety Law, article 23-2) * If a serious disaster or mine pollution occurs, or if mineral resources or mine facilities are damaged, or there is a risk of such damage, the minister of METI has the power to order the owner or the holder to suspend mining operations if, it is deemed necessary. (previous Mine Safety Law, article 24) *1 If the owner or the holder is found to have violated the law or ministerial ordinance regulations based on this law, the director of ISID has the power to order the owner or the holder	*Rights and Duties of the Ministry of Energy and Mines are to propose to the Government for consideration of suspension or cancellation of an agreement on mineral(s) mining which investor violated; (Laos, Law on Minerals, paragraph 11 of article 83) *Persons or organizations violating this law in minor cases or for the first time, such as: failure to submit a mineral business report within the timeframe, working too slowly, not in accordance with the technical plan, carrying out artisanal mining activities without a permit which caused damages with the cost less than one million kips but has been reported in good faith, shall be warned and re-educated. (Laos, Law on Minerals, article 95) * The Ministry of Mines shall notify the permit holder if it is found that the holder of a large-scale mineral production permit, in carrying out mining and mineral processing operations is using methods which may cause wasteful depletion of ore deposits and shall require the holder to show cause within such period as the ministry may specify, why use of such methods should not cease. *The Ministry of Mines may issue a directive to cease the methods within a specified time if the holder of a large scale mineral production permit fails to submit an explanation to the satisfaction of the ministry or if there is sufficient evidence to show that his use and operations are wrong.

	to suspend mining operations for set period of up to one year. (previous Mine Safety Law, article 24-2) *If it is recognized that the use of machinery, equipment, buildings, structures and other facilities, or the management of explosives, motive power and fires in mining operations violate the law or ministerial ordinance regulations based on this law, the director of ISID has the power to order the owner or the holder to take measures to suspend, modify, repair or transfer the facilities, or designate a method of mining operations if, it is deemed necessary to ensure safety. (previous Mine Safety Law, article 25) *If it is recognized that the owner or the holder has compromised safety by encroaching outside the mining area (including prevention of injuries to mineworkers, preservation of mineral resources, maintenance of mine facilities and prevention of mine pollution in the area that was encroached), or there are risks of the safety being compromised, the director of ISID has the power to order the owner or the holder to abandon mining and do the blockage in that area and take necessary measures to ensure safety. (previous Mine Safety Law, article 25-2)	(Myanmar Mine Rules, Article 34)

	*If it is recognized that there is an urgent need to rescue victims of a mine disaster (including places outside the mining area), the director of ISID has the power to order the owner or the holder to take necessary measures. (previous Mine Safety Law, article 25-3) *1 The director of ISID has the power to order former owner to set up necessary facilities for preventing injuries and mine pollution due to mining operations, up to five years after the mining right has been renounced. 2 The recipient of the above ministerial order shall be considered to be the owner within the scope necessary to execute the items ordered. (previous Mine Safety Law, article 26)	*(There are no provisions regarding the issue of administrative order to setting up necessary facilities for preventing injuries or mine pollution problems to the former owner after abandonment of the permit or closed the mine.) Cambodia, Vietnam, Laos and Myanmar
Mine Safety Reports	*1 If the minister of METI or the director of ISID intends to issue the orders prescribed in article 23, 24, 25, 25-2, 25-3 or 26, the owner or the holder or former owner shall be notified of a date and location of a public hearing, in advance. 2 The recipients of such notifications can express their opinions	*The Concessionaire holding a mineral license under this law shall submit the Minister in charge of mineral sector her/his proposals, reports, plans and letters of notification, and shall keep all concerned documents and recording books. (Cambodia, Law on Mineral Resources, article 19) *The Ministry of Environment shall collaborate with concerned ministries to

Mine Safety Maps	to the said minister or director, at the hearing. *The minister of METI or the director of ISID can request the owner of mining right or the holder of mining lease right to submit mine safety reports, as prescribed in ministerial ordinance. (previous Mine Safety Law, article 28) *The owner of mining right or the holder of mining lease right shall draw-up mine safety maps to be kept in the mine offices, and regularly submit copies to the director of ISID. (previous Mine Safety Law, article 29)	require the owners or responsible persons of factories, pollution sources, industrial sites, or sites of natural resources development activity: 1) install or use monitoring equipment; 2) provide samples; 3) prepare or maintain and submit for review records and reports. (Cambodia, Law on Environment Protection, article 14) *4 When a labor accident occurs, mine managers shall take urgent measures to remedy the incident; render first aid for and evacuate people from dangerous areas; promptly report such to competent agencies. (Vietnam, Mineral Law, paragraph 4 of article 57) *3 All occupational accidents and diseases and other serious incidents at the workplace must be declared, investigated, recorded, compile statistics and periodically reported as prescribed by the Government. (Vietnam, Labor Code, paragraph 3 of article 142) *For any accident or other occurrence happening from activity related to mineral business that has or might have unfavorable impact on the environment or health of people or the community, investor must report, within twenty four (24) hours, to local authorities, surrounding people, and other relevant agencies and provide timely protection remedy measures.

		(Laos, Law on Minerals, article 59) *In order to avoid or minimize negative environmental and social impacts, investors in mineral activities must perform measures as follows: 6) to regularly summarize and report on assessment of social and environmental impacts to the concerned mineral management/monitoring and inspection organization. (Laos, Law on Minerals, paragraph 6 of article 60) *Obligations of the mining business operator are: 8) to timely report, to the relevant Energy and Mines sector, on serious accident or events that happened or would happen; to summarize and report on information to the Energy and Mines sector on the results from exploration, mining and processing, including operation performance as well as the accounting records on monthly, quarterly, and annual basis. (Laos, Law on Minerals, paragraph 8 of article 65) * When any accident occurs on or about a mine causing loss of life or serious bodily injury or when an accidental explosion, fire or eruption of water occurs in a mine, the mineral production permit holder or mine manager shall give notice of such occurrence to the Ministry of Mines or related department within 24 hours from such occurrence and shall send a detailed report to the Ministry of Mines or related department within one week. (Myanmar Mine Rules, Article 107)

Delegation to the Ministerial Ordinance regulations	*1 The necessary measures to be taken by the owner of mining right or the holder of mining lease right with regard to the safety, as prescribed in article 4, shall be prescribed in the ministerial ordinance regulations. 2 The necessary items to be observed by mineworkers with regard to the safety, as prescribed in article 5, shall be prescribed in the ministerial ordinance regulations. (previous Mine Safety Law, article 30)	
Jurisdiction of mine safety inspector	*1 Mine safety inspector has the power to enter a mine to inspect safety-related duties, facilities, records, documentation and other safety-related matters, as well as question the people concerned. 2 When a mine safety inspector carries out the aforementioned inspection or questioning, the inspector shall carry identification and be able to produce it if required. (previous Mine Safety Law, paragraphs 1 & 2 of article 35) *1 If a mine safety inspector recognizes that the use or handling	*In [each] necessary case, the Minister in charge of mineral sector shall appoint competent officials to control the implementation of this Law. *The duties of the appointed competent officials are as follows: 1) Be responsible to the Minister in charge of mineral sector for the management [of mineral resources] under the provisions of this Law; 2) Make annual reports on the activities of mineral exploration and exploitation and submit the reports to the Minister in charge of mineral sector; 3) Collect [data and] information and keep the reports on mineral exploration and mining, transport, processing, marketing and export of minerals and mineral products; 4) Control the

	of machinery, equipment, buildings, structures or other facilities, or the management of explosives, motive power or fires in mining operations violate the law or ministerial ordinance regulations based on the law, or that there is an imminent safety risk, the inspector has the authority to carry out the duties of the director of ISID, as prescribed in article 25. 2 If a mine safety inspector recognizes that there is an imminent safety risk due to excavation outside the mining area, the inspector has the authority to carry out the duties of the said director, as prescribed in article 25-2. 3 If there is a need for urgent rescue of a disaster victim, the mine safety inspector has the authority to carry out the duties of the said director, as prescribed article 25-3. 4 The orders issued by the mine safety inspector as prescribed in paragraph 1 to 3 inclusive, shall be regarded as orders issued by the said director in accordance with article 25 to 25-3 inclusive. (previous Mine Safety Law, paragraphs 1 & 4 of article 36)	implementation of the provisions of this Law; 5) Control the implementation of regulations on health and safety of workers and people and environmental protection; 6) Perform other duties assigned by the Minister in charge of mineral sector. *The powers and duties of the appointed competent officials to control, inspect, and report the activities of mineral exploration and exploitation, researches and analysis, related to the management [of mineral resources] under the provisions of this Law, shall be stipulated in a sub-decree. (Cambodia, Law on Mineral Resources, article 23) *The inspector of Ministry of Labour - Invalids and Social Affairs and the inspector of Service of Labour - Invalids and Social Affairs have the following main tasks: 1) inspecting the compliance of provisions of the law on labor; 2) investigating occupational accidents and violations on labor safety and hygiene; 3) making guidance on the application of the system of technical standards and regulations on labor conditions, labor safety and hygiene; 4) settling complaints and denunciation on labor as prescribed by the law; 5) handling under the competence and requesting the competent agencies to handle violations of labor laws. (Vietnam, Labor Code, article 237) 1 The inspector of Ministry of Labour - Invalids and Social Affairs and the

		inspector of Service of Labour - Invalids and Social Affairs shall execute the specialized inspection function on labor. 2 The inspection of labor safety and hygiene in the area of radioactivity, exploration, oil and gas extraction, means of railway, waterway, road and air transportation and other units of the armed forces shall be implemented by the state management agency in that area in cooperation with the specialized inspection on labor. (Vietnam, Labor Code, paragraphs 2 &3 of article 238) *The Inspection Organization has the following rights and duties: 1 Right and duty of mineral prospecting, exploration and mining operations inspection organization: 1) to inspect implementation of laws and regulations related to minerals; 2) to inspect activities and businesses related to prospecting, exploration and mining operations such as: mining, processing and smelting including service businesses related to minerals; 3) propose to concerned organizations to issue an order to suspend or revoke activity related to prospecting, exploration and mining operations activity or sanction staff or prospecting, exploration and mining operations inspection officers who violate the laws and regulations; 4) to compile and inspect reports on the result of the analysis of various mineral samples, the selection of

		technology to design plant and mineral products; 5) to cooperate and coordinate with other concerned sectors for the implementation of other concerned sectors rights and duties; 6) to periodically summarize and report on the implementation of inspection work to the immediate higher level regularly; and 7) to exercise the rights and perform other duties as provided in the laws and regulations. (Laos, Law on Minerals, article 90) *Mineral Activities and Mining Operation Inspection Officers 1 Mineral Prospecting and Exploration Inspection Officers are the government officials of the Natural Resources and Environment sector which has the principal rights and duties as follows. 2 Mining inspection officers [Mining inspector] are the government officials of the Energy and Mines sector which has the principal rights and duties as follows: 1) to conduct patrols and on-site inspections of the following targets such as: site of prospecting, exploration and mining activities for detail feasibility study, construction, mining, mineral transport routes, storage, stockpiles, warehouses for minerals, processing and smelting plants and other places as deemed necessary; 2) to receive and record reported violation cases and to request and check documents related to any violation of minerals related laws and regulations; 3) to contact and coordinate with other organizations concerning local administrative authority regarding the implementation of their

		duties; and 4) to conduct inspections in accordance with Article 89 of the law; and 5) to summarize and report on activities related to mining operation inspection to Energy and Mines sector where inspectors are working for and to local administrative authorities. (Laos, Law on Minerals, article 91) * Chief inspectors, inspectors, and staff specially assigned may enter the mine anytime and carry out surveys or inspections. (Myanmar Mine Rules, article 110) * If it is in the opinion of the Chief Inspector or an Inspector that a matter may affect the environment around the mine or the life or body of any mine worker, the Inspector may request improvement thereof in writing to the mineral production permit holder or mine manager. * If the Chief Inspector is of the opinion that there is an urgent and immediate danger to the lives or safety of mine workers the Inspector may issue to the mineral production permit holder or mine manager a prohibition order that lasts until the danger is removed. (Myanmar Mine Rules, article 112) * When an accident occurs and a collapse, explosion, fire or flood occurs in the mine or surrounding area, the Chief Inspector, Inspector, or staff specially assigned inspects the scene of the accident immediately, and

		then reports the inspection results and their countermeasures to the Ministry of Mines. (Myanmar Mine Rules, Article 113) * In matters of mine restoration, refilling, and tree planting and the guarantee of a safe work environment for mineworkers, the Chief Inspector may make exemptions or orders when a reasonable necessity is recognized. (Myanmar Mine Rules, article 114)
Mine Safety Council	1 Central Mine Safety Council shall be established in the Ministry of Economy, Trade and Industry, Provincial Mine Safety Council shall be established in the Industrial Safety and Inspection Department. 2 When the Minister of METI shall establish, modify or abolish the regulations of the law, or issue the administrative order by article 24, it needs to be approved by Central Mine Safety Council. 3 When the Director of ISID shall proscribe the approval standards concerned the law, it needs to be approved by Provincial Mine Safety Council. 4 Central Mine Safety Council and Provincial Mine Safety Council as an organ shall investigate and deliberate important	(There are no provisions regarding establishment of mine safety council.) Cambodia, Vietnam, Laos and Myanmar

	matters of mine safety and shall suggest to the Minister of METI and the Director of ISID. 5 The members of both Councils are organized by the literates, representatives of the owner of mining right or the holder of mining lease right and mineworkers at mines shall be appointed by the Minister of METI and the Director of ISID. (previous Mine Safety Law, article 45 to 51)	
Penalty Provisions	**(Omission)**	

2. Comparison & Differences with the Law on Special Measures for Mine Damages due to Metal Mining Industry of Japan

The comparison and differences of major items and stipulations of mining related laws between **Law on Special Measures for Mine Damages due to Metal Mining Industry** (hereinafter referred to as the "Law on Mine Pollution Control ") **of Japan** and **Law on Management and Exploitation of Mineral Resources** (in 2001) (hereinafter referred to as the "Law on Mineral Resources"), and **Law on Environmental Protection and Natural Resource Management** (in 1996) (hereinafter referred to as the "Law on Environmental Protection") **of Cambodia** are described in **Table 2**.

As a reference, the comparison and differences of mining related laws in other countries, **Mineral Law** (revised in 2010), **Law on Environmental Protection** (revised in 2001) and **Labor Code** (revised in 2012) **of Vietnam**, and **Law on Minerals** (revised in 2011), **Law on Environmental Protection** (in 1999) **of Laos**, and the **Myanmar Mines Law** (in 1994), **Myanmar Mines Rules** (in 1996) and the **Environmental Conservation Law** (revised in 2012) **of Myanmar** as the criteria for the Law on Mine Pollution Control of Japan are described in the same table.

Table 2 Comparison and Differences with the Law on Special Measures for Mine Damages due to Metal Mining Industry of Japan

Items	The Law on Mine Pollution Control of Japan	Law on Mineral Resources and Law on Environmental Protection of Cambodia, and mining related laws of other countries
Purpose of the law	*1 The Law aims to prevent the metal mine pollution and to contribute the protection of the people's health and preservation of the life environment in consonance with Mine Safety Law. 2 The Law also aims to implement the mine pollution prevention projects certainly and permanently for closed facilities to establish "mine pollution prevention reserve fund", "project fund system regarding treatment of mine drainage in closed facilities for mine pollution prevention" and "the specific organization for mine pollution prevention	*(The purpose of concerned laws in Cambodia and other countries is mentioned in Table 3)

	projects" from facilities such as waste stone dumps, slag dumps, sediment dams and drifts that have used for digging the metallic minerals in mining, and processing, refining and smelting of the minerals. (Law on Mine Pollution Control, article 1)	
Interpretation Terms	*1 "The Specific Facilities" means the facilities such as waste stone dumps, slag dumps, sediment dams and drifts that have used for digging the designated metallic minerals in mining, and processing, refining and smelting of the minerals. 2 "The mine pollution prevention projects" means projects concerning the vegetation and soil cover of waste stone dumps, slag dumps, and sediment dams attached to processing plants and mine-water treatment facilities, as well as projects related to blockage of the drifts, and those related to the treatment of mine-water from facilities. 3 "Designated specific facilities" means the closed specific facilities which have drained mine-water or waste-water that contamination levels and amounts shall be predicted not meet to the effluent standard values after implementation of the mine pollution prevention projects. 4 "The designated metallic minerals" means the minerals that shall probably cause the mine pollution problems to be ionized into	

	mine-water or waste-water not only operating digging the designated metallic minerals in mining operations, and processing, refining and smelting of the minerals for pertaining but also closed those facilities. (Law on Mine Pollution Control, article 2)	
Basic Policy on Implementation of Mine Pollution Prevention Projects	*1 The minister of METI shall decide the basic policy on implementation of mine pollution prevention projects for the specific facilities. (Law on Mine pollution Control, article 4)	*(There are no provisions regarding basic policy on implementation of mine pollution prevention projects for the specific facilities.) Cambodia, Vietnam and Laos * The powers of the Environmental Conservation Committee are as follows: g) laying down and carrying out the Myanmar National Environmental Policies and other environmental policies for conservation and enhancement of the environment with the approval of the Union Government. (Myanmar, Environmental Conservation Law, article 6)
The Mine Pollution Project Plan	*1 The owner of digging right or the holder of mining lease right shall draft a “mine pollution prevention project plan” with regard to the prevention of pollution from facilities such as waste stone dumps, slag dumps, and sediment dams attached to processing plants or mine-water treatment facilities and drifts for when mines are closed in the future,	*(There are no provisions regarding the mine pollution control project plan for the specific facilities.) Cambodia and Myanmar *1 Organizations and individuals licensed for mining shall make mine

	and submit this plan to the director of ISID. 2 The owner of digging right or the holder of mining lease right shall draft a “mine pollution prevention project plan” with regard to the perpetual treatment of contaminated mine- and waste-water that is not expected to meet water quality standards after the mine has closed, and submit this plan to the said director. 3 The said director has the power to order the owner or the holder to modify the plan if, it is deemed necessary to ensure safety. (Law on Mine pollution Control, article 5)	closure plans and submit them to competent licensing state management agencies defined in article 82 of this Law for approval before implementation. (Vietnam, Mineral Law, paragraph 1 of article 74) *In order to avoid or minimize negative environmental and social impacts, investors in mineral activities must perform measures as follows: 1) create a plan for the management of the environment and a plan of resettlement for people who are impacted from such business related to minerals in accordance with regulations; 2) establish a plan for rehabilitation of the mined out area and for mine closure to allow for other uses. (Laos, Law on Minerals, article 60)
Reserve Fund System	1 Every year, the director of ISID shall calculate necessary funds based on the “mine pollution prevention project plan” and notify the owner of digging right or the holder of mining lease right of the amount of money to be paid into the “mine pollution prevention reserve fund” that is managed by Japan Oil, Gas and Metals National Corporation (hereafter referred to as the “JOGMEC”), as prescribed in ministerial ordinance.	*(There are no provisions regarding reserve fund system for mine pollution prevention.) Cambodia *3 Before conducting mineral mining activities, mining organizations and individuals shall pay a deposit for environmental rehabilitation and restoration according to the Government’s regulations.

	2 The reserve fund amount shall be calculated according to calculation standards prescribed in the ministerial ordinance, based on the costs necessary to carry out the mine pollution prevention project and the period of use of the specific facilities, and shall be calculated and indicated by the said director. (Law on Mine pollution Control, article 7) *When the owner of digging right or the holder of mining lease right implements the “mine pollution prevention project plan” prescribed in paragraph 1 & 2, after a facility has been used, the reserved funds relating to the specific facilities can be returned to the owner right or the holder with the permission of the said director, as prescribed in ministerial ordinance. (Law on Mine pollution Control, article 9)	(Vietnam, Mineral Law, paragraph 3 of article 30) *2 In case organizations and individuals licensed for mining dissolve, go bankrupt or are incapable of implementing mine closure plans, competent licensing state management agencies shall select capable organizations or individuals to make and implement these plans. Funds for implementing mine closure plans come from environ mental rehabilitation and restoration deposits of organizations and individuals licensed for mining. (Vietnam, Mineral Law, paragraph 2 of article 74) *Organizations and individuals exploiting natural resources must pay deposits for environmental improvement and rehabilitation according following provisions; a) before exploitation, they must pay deposits at domestic credit institutions or environmental protection funds of localities where natural resources are exploited; the amounts of deposit shall depend on the scale of exploitation, degree of adverse environmental impacts, and costs needed for environmental improvement and rehabilitation after exploitation; b) they shall enjoy interests on their paid deposits and receive back the paid deposits upon completion of environmental improvement and rehabilitation. (Vietnam, Law on Environmental Protection, paragraph1 of article 114)

		*In order to avoid or minimize negative environmental and social impacts, investors in mineral activities must perform measures as follows: 4) to contribute to an Environmental Protection Fund for the project. (Laos, Law on Minerals, paragraph 4 of article 60) *The Government supports the establishment of Environment Protection Fund to support activities in the field of research study, preservation, mitigation and restoration of the environment, including the protection and preservation of natural resources. (Laos, Environment Protection Law, article 30) *The duties and powers relating to the environmental conservation of the Ministry are as follows: o) managing to compel the polluter to compensate for environmental impact, compel to contribute fund by the organizations which obtain benefit from the natural environment service system to contribute a part of the benefit from the business which explore, trade and use the natural resources with regard to environmental conservation activities in the environmental conservation works. (Myanmar, Environmental Conservation Law, Article 7)

		*The Ministry shall establish an Environmental Management Fund in the Union Budget in accordance with the financial regulations and by-laws of the Union for effective implementation of environmental conservation works in addition to the receipt from the Union Consolidated Fund. (Myanmar, Environmental Conservation Law, Article 8)
The Project Fund System regarding Treatment of Mine Drainage for Mine Pollution Prevention	*1 The owner of digging right or the holder of mining lease right shall contribute the amount of money to “the project fund system regarding treatment of mine drainage in closed designated specific facilities for mine pollution prevention” that contaminated conditions and water quality of mine drainage shall be predicted not to meet the effluent standard values and shall treat mine drainage reliably and permanently for mine pollution prevention, which the director of ISID indicates every year for the maximum of six (6) years. 2 The amount of the money to be contributed to the project fund system is the source of revenue for expenditure of treatment of mine drainage for mine pollution control to the designated specific facilities. 3 The management of the project fund system regarding treatment of mine drainage for mine pollution prevention has been assigned by JOGMEC. (Law on Mine pollution Control, article 12)	*(There are no provisions regarding the project fund system on treatment of mine drainage for mine pollution prevention.) Cambodia, Vietnam, Laos and Myanmar

The Specific Organization for implementation of the Project on treatment of mine drainage for mine pollution control	*1 Once the owner of digging right or the holder of mining lease right finished its contribution to the project fund system, the minister of METI shall order the Specific Organization to implement the project on treatment of mine drainage for mine pollution prevention. 2 The Specific Organization shall carry out the project on treatment of mine drainage for mine pollution control in the designated specific facilities instead of the owner of digging right or the holder of mining lease right with revenues from the project fund system. (Law on Mine pollution Control, article 13)	*(There are no provisions regarding the Specific Organization for implementation of the project on treatment of mine drainage in closed designated specific facilities for mine pollution control.) Cambodia, Vietnam, Laos and Myanmar
Environmental Impact Assessment (EIA)	*(There are no provisions regarding Environmental Impact Assessment in the mining related laws, instead the owner of digging right or the holder of mining lease right shall prepare the management plan of mining operations and notify it to the Minister of METI for approval, as prescribed in article 63 of the Mining Law.)	*An environment impact assessment shall be done on every project and activity, private or public, and shall be reviewed by the Ministry of Environment before being submitted to the Royal Government for decision. This assessment shall also be done for existing and in-process activities that have not yet been assessed for environment impact. The procedures of the environmental impact assessment process

		shall be determined by sub-decree following a proposal of the Ministry of Environment. (Cambodia, Law on Environment Protection, article 6) *All Investment Project Applications and all projects proposed by the State shall have an initial Environmental Impact Assessment or an Environmental Impact Assessment as specified in article 6 of this law. The Ministry of Environment shall review and provide recommendations on the initial Environmental Impact Assessment or the Environmental Impact Assessment to the competent organization within the period determined in the Law on Investment of the Kingdom of Cambodia. (Cambodia, Law on Environment Protection, article 7) *Agencies assigned to formulate projects mentioned in article 14 of this law shall have to elaborate Strategic Environmental Assessment Reports. *Contents of Strategic Environmental Assessment Reports: 1) overview of the project's objectives, size and characteristics related to the environment; 3) forecasts for possible bad environmental impacts when the project is executed; 4) citation

		of sources of figures and data, methods of assessment. (Vietnam, Law on Environmental Protection, articles 15 &16) *Owners of projects mentioned in article 18 of this law shall have to elaborate Environmental Impact Assessment Reports and submit them to competent state agencies for approval. (Vietnam, Law on Environmental Protection, article 19) *Environmental Impact Assessment is process of estimating impacts on the environment by development projects and activities. It also identifies methods and standards for mitigating and reducing such anticipated impacts on the social and natural environment. (Laos, Environmental Protection Law, article 8) *The duties and powers relating to the environmental conservation of the Ministry are as follows: (m) causing to lay down and carry out a system of Environmental Impact Assessment and Social Impact Assessment as to whether or not to a project or activity to be undertaken by any Government department, organization or parson may cause a significant impact on the environment. (Myanmar, Environmental Conservation Law, article 7)
Penalty Provisions	**(Omission)**	

3. Comparison & Differences with the Mining Law of Japan

The comparison and differences of major items and stipulations of mining related laws between the revised **Mining Law** (revised in 2011) **of Japan** (hereinafter referred to as the "Mining Law") and the **Law on Management and Exploitation of Mineral Resources** (in 2001) (hereinafter referred to as the "Law on Mineral Resources"), and **Law on Environmental Protection and Natural Resource Management** (in1996) (hereinafter referred to as the "Law on Environmental Protection") **of Cambodia** are described in **Table 3**.

As a reference, the comparison and differences of mining related laws in other countries, **Mineral Law** (revised in 2010), and **Law on Environmental Protection** (revised in 2001) and **Labor Code** (revised in 2012) **of Vietnam**, and the **Law on Minerals** (revised in 2011), and **Labour Act** (in 1990), and **Law on Environmental Protection** (in 1999) **of Laos**, and the **Myanmar Mines Law** (in 1994), **Myanmar Mines Rules** (in 1996) and the **Environmental Conservation Law** (revised in 2012) **of Myanmar** as the criteria for the Mining Law of Japan are described in the same table.

Table 3 Comparison and Differences with the Mining Law of Japan

Items	The Mining Law of Japan	Law on Mineral Resources and Law on Environmental Protection of Cambodia, and mining related laws of other countries
Purpose of the law	The Law aims to provide for the basic system of the mining to contribute to the improvement of public welfare by developing mineral resources in a reasonable manner. (Mining Law, article 1)	*This Law governs the management and exploitation of mineral resources, use of mine sites, and all activities related to mineral operations in the Kingdom of Cambodia, except for oil and natural gas operations that shall be governed by a separate law. (Cambodia, Law on Mineral Resources, article 1) *This Law provides for geological baseline surveys of minerals; protection of unexploited minerals; mineral exploration and mining; state management of minerals in the main land, islands, internal waters, territorial sea, contiguous

		zone, exclusive economic zone and continental shelf of the Social Public of Vietnam. *Oil and gas and natural water other than mineral water and natural thermal water are not governed by this Law. (Vietnam, Mineral Law, article 1) *The Law on Minerals defines the principles, regulations and measures regarding the management, protection, utilization of minerals and mineral resources and the inspection of minerals activities and mining operations, with the aim of ensuring prospecting, exploration, mining and processing of minerals to have high efficiency in conjunction with environmental protection, and consistent with the national socio-economic development plan in order to create conditions for gradual economic growth, industrialization, and progressive modernization, sustainable mineral development, improving the standard of living of all ethnic groups. (Laos, Law on Minerals, article 1) *The objectives of this Law are as follows: a) to implement the Mineral Resources Policy of the Government; b) to fulfill the domestic requirements and to increase export by producing more mineral products; c) to promote development of local and foreign investment in respect of mineral resources; d) to supervise, scrutinize and approve applications submitted by person or organization desirous of conducting mineral prospecting, exploration or

		production; e) to carry out for the development of conservation, utilization and research works of mineral resources; f) to protect the environmental conservation works that may have detrimental effects due to mining operation. (Myanmar, Mines Law, article 3)
The Mining Policy	*As for stable and efficient secure of mineral resources, the promotion of development of mineral exploration at home and abroad, recycling metallic valuables, as middle-long term project, and stockpiling rare-metals as short term project has been promoted into the Mining Policy in Japan.	*(There are no announcements about the Mining Policy.) Cambodia *1 The State adopts mineral strategies and master plans to assure socio-economic sustainable development, national defense and security in each period. 2 The State assures that minerals will be protected, exploited and utilized in a rational, economical and effective manner. 3 The State invests in and conducts geological baseline surveys of minerals under mineral strategies and master plans; carries out human resources training and development in geological baseline surveys of minerals and mineral activities. 4 The State encourages organizations and individuals to invest and cooperate with state-owned geological organizations in conducting geological baseline surveys of minerals.

		5 The State invests in the exploration and mining of some kinds of important minerals to serve socio-economic development, national defense and security. 6 The State promotes investment projects on mineral mining associated with the processing and utilization of minerals to manufacture metal, alloy or other products of high value and socio-economic effectiveness. 7 The State adopts policies on the export of minerals in each period in accordance with sustainable socio-economic development objectives and on the principle of prioritizing raw materials for domestic production. (Vietnam, Mineral Law, article 3) *3 Mineral Strategies shall be elaborated for 10-year periods, with a 20-year vision, corresponding to the period of relevant socio-economic strategies. 4 The Ministry of Natural Resources and Environment shall assume the prime responsibility for, and coordinate with the Ministry of Industry and Trade, the Ministry of Construction, the Ministry of Planning and Investment, other ministries and ministerial-level agencies and concerned localities in, elaborating mineral strategies for submission to the Prime Minister for approval. (Vietnam, Mineral Law, paragraphs 3 & 4 of article 9) *The State has periodically a policy to carefully select domestic and foreign

		enterprises to investment in minerals and mining industry, based on the technical and financial capability, aiming to promote rural development and poverty eradication by establishing strategy, policies, regulations and measures such as: policies on customs and tax in accordance with regulations, providing of information and other facilitation. The State encourages mineral prospecting and exploration in order to have basic geological and mineral data and information that can support scientific study and research regarding minerals and the transformation into capital; The State encourages mining operation that is linked with in country mineral processing by using advanced and modern techniques and technologies for domestic use and as commodities for export; The State reserves and protects some mineral resources areas in accordance with national social – economic development plan for an exploration, planning and mining operation for the national interest and sustainability of natural resources. (Laos, Law on Minerals, article 5) *The Mineral Policy of the Government Myanmar aims to: 1) To boost production to meet growing domestic needs and to increase foreign exchange earnings. 2) To invite participation in terms of technical know-how and investment from sources within the country and abroad.

		3) Emphasis on development of copper, gold, lead, zinc, iron and steel coal, nickel and construction-related industrial such as cement making minerals, dimension stones and aggregates. (Myanmar)
Applicable Minerals	*The minerals to which are covered by the Law includes metal and nonmetal ores, coal, petroleum and flammable natural gas. (Mining Law, article 3)	*Petroleum and flammable natural gas are excluded Cambodia, Vietnam, Laos and Myanmar
Interpretation of Terms	1 “Mining” means prospecting and digging of minerals, and mineral processing, refining, smelting of minerals and other relevant businesses for pertain. (Mining Law, article 4) 2 “Mining right” means the right to dig and obtain the registered minerals and other minerals that exist into the same type of ore deposit in the mining areas. (Mining Law, article5) 3 “Mining lease right” means the right to dig and obtain the minerals as the subject of the mining right in the mining areas of others based on the act of registration. (Mining Law, article 6) 4 The Mining Right shall be the prospecting right and the digging right. (Mining Law, article 11)	

Mining Areas and its Square Measure	*Boundaries of mining areas shall be established by straight lines, and bounds shall be directly below the boundaries on the surface of the Earth. 1) coal, petroleum, asphalt and flammable natural gas 15ha above and below 350ha 2) lime stone, dolomite, silica rock, refractory clay 1ha above and below 350ha 3) Other materials 3ha above and below 350ha (Mining Law, article 14)	*(There are no provisions regarding the mining areas and its square measure for exploration right and exploitation right in the law.) Cambodia *1.A mineral exploration area shall be delimited by lines connecting corner points, drawn on a topographic map using the national coordinating system of an appropriate scale. 2 The size of an exploration area under specific exploration license for a kind or group of minerals is stipulated as follows; a) Not exceeding 50 square kilometers (km2) for gemstone, semi-gemstone, and metallic minerals, except bauxite; b) Not exceeding 100 square kilometers (km2) for coal, bauxite and non-metallic minerals on land; (Vietnam, Mineral Law, paragraphs 1 &2 of article 38) *1 A mining area shall be delimited by lines connecting corner points, drawn on a topographic map using the national coordinating system of an appropriate scale. 2 The area and depth-based boundary of mining area shall be considered on the basis of the mining investment project suitable to mineral deposits permitted for mining design. (Vietnam, Mineral Law, paragraphs 1 &2 of article 52)

		*An Enterprise or a Company may undertake mineral prospecting in one block and the area shall not exceed three hundreds (300) square kilometers and the extension of the area is not permitted. Subsequently an area granted for mineral exploration shall be based on the results of the undertaken mineral prospecting work. For an area where prospecting work already has been done and mineral prospecting work and geological data already exist, an Enterprise or Company may directly apply to undertake mineral exploration, but the area shall not exceed three hundreds (300) square kilometers. Conditions, standards and systems for licensing of mineral prospecting and exploration shall be subject to specific regulations. (Laos, Law on Minerals, article 37) *The Ministry or the Department shall: b) specify the shape, location and size of the land area on issue of mineral prospecting permit and the land area permitted shall not exceed 4,200 km2; the mineral exploration permit shall not exceed 3,150 km2. *The Ministry may, with the approval of the Government grant permit for large scale production of metallic mineral, industrial mineral or stone involving foreign investment, the proposed area is not more than the area required for

		production. (Myanmar, Mines Rules, articles 5, 14& 24)
Restrictions on Mining Areas	*1 In the areas where the Environmental Disputes Coordination Commission recognizes that it inappropriate to dig and obtain minerals in contrast with public interests in general as well as the agriculture, forestry and other industries, and prohibits the registration of a mining right by designated minerals, no mining area can be established for such minerals. 2 More than two (2) mining rights shall not be registered in the same mining area. However, this shall not be apply to the case where the subjects of the mining right are minerals that exist in different types of ore deposits. (Mining Law, articles 15&16)	*The mineral prospecting, exploration and exploitation in State property land, determined as national cultural, historical and patrimonial sites, shall be prohibited. (Cambodia, Law on Mineral Resources, article 8) *1 Areas banned from mineral activities include; a) land areas with historical-cultural relics or scenic places already ranked or delimited for protection under the Law on Cultural Heritages; b) land areas under special-use forests, protection forests or land areas for protection forests and geological conservation zones; c) land areas which are planned for national defense or security tasks; d) Land areas used by religious institutions; and others. (Vietnam, Mineral Law, paragraph 1 of article 28) *Mineral resources divided into four areas as follows: 1) Areas licensed for mineral activities; 2) Reserved areas; 3) Restricted areas; and 4) Toxic areas (Laos, Law on Minerals, article 14)

		*Restricted Areas are areas where no mineral activities are allowed including the following; 1) Dangerous areas such as: areas where unexploded ordinances exists or areas with severe pollution; 2) Areas near or under buildings or public areas that have national importance such as: archeological and historic sites, areas with basic infrastructure, areas that are important for national defense and security and areas that are not appropriate for mineral activities; 3) Forest conservation areas, biodiversity conservation areas, aquatic animal sanctuaries, wildness and upstream forest areas. *A toxic area is a mineral resource area where there is poisonous or toxic contamination in the whole territory of the country such as: areas with arsenic mineral, mercury mineral and other. (Laos, Law on Minerals, articles 17 &18) *Mineral prospecting and exploration shall not be implemented in mineral deposit areas and gemstone tracts specified by the Ministry of Mines. (Myanmar, Mine Rules, articles 4 & 13)

Qualification of the Owner of Mining Right	*The mining right shall be held only by the people of Japan or juridical persons of Japan. However, this shall not apply unless otherwise provided for in the treaty concerned. (Mining Law, article 17)	*The natural person or legal entity can be granted a mineral license under consideration of her/his technical and financial capability and business registration. (Cambodia, Law on Mineral Resources, article 6) *1 Organizations and individuals having registered mineral exploration as their business line may be licensed to conduct mineral exploration. They include: a) enterprises established under the Enterprise Law; b) cooperatives and unions of cooperatives established under the Law on Cooperatives; c) foreign enterprises with Vietnam-based representative offices or branches. (Vietnam, Mineral Law, paragraph 1 of article 34) *1 Organizations and individuals having registered mining as their business line may be licensed for mining. They include: a) enterprises established under the Enterprise Law; b) Cooperatives and unions of cooperatives established under the Law on Cooperatives. (Vietnam, Mineral Law, paragraph 1 of article 51) *This law applies to individuals or legal entities, both domestic and foreign, who are undertaking mineral activities and mineral business, except operations related to oil and natural gas and other construction material such

		as: soil, stone, gravel, sand that are not under the management of this law. (Laos, Law on Minerals, article 10) *Forms of investment in mineral business include Individual enterprise, Partnership and Company as provided in Article 10 of the Enterprise Law. (Laos, Law on Minerals, article 29) * The objectives of this Law are as follows: c) to promote development of local and foreign investment in respect of mineral resources. (Myanmar, Mines Law, article 3)

Duration of the Prospecting Right, Digging Right and Extension	*The duration of a prospecting right shall be two (2) years from the date of registration (in case of prospecting right of which the subject is petroleum or flammable natural gas, four (4) years). The period may be extended twice by the application filed by the holder of the prospecting right. (Mining Law, article 18) (Note) The duration of a digging right is not prescribed in this Law.	(There are no provisions regarding the duration of the prospecting right, mining right and extension) Cambodia *2 A mineral exploration license is valid for 48 months at most and may be extended multiple times for a total maximum duration of 48 months. (Vietnam, Mineral Law, paragraph 2 of article 41) *2 A mining license is valid for 30 years at most and may be extended multiple times for with the total extension period not exceeding 20 years. (Vietnam, Mineral Law, paragraph 2 of article 54)

		*The term for a mineral prospecting license shall not exceed two (2) years from the date the prospecting contract is signed, and it can be extended for additional term of one (1) year. The term for a mineral exploration license shall not exceed three (3) years from the date the exploration contract is signed, and can be extended for additional term not to exceed two (2) years. *The term of the mining license shall not exceed twenty (20) years from the date of obtaining the mining license and can be extended not to exceed five (5) years as agreed by the state on a case by case basis depending on the scale of the mine. (Laos, Law on Minerals, articles 36 & 44) *The Ministry or the Department shall: a) grant a mineral prospecting permit for a period not exceeding 1 year, for an extension within 1year once; b) a mineral exploration permit for a period not exceeding 3 years, for an extension within 1 year twice. The Ministry shall grant a large scale mineral production permit for a period not exceeding 25 years, for an extension of period not exceeding 5 years once with the approval of the Government. (Myanmar, Mines Rules, articles 5, 10, 14, 22, 25, 29, 37, 41, 44, 45 & 54)

Application for Registration of the Mining Right(the Prospecting Right or the Digging Right)	*Those who intend to resister a mining right shall notify the applications, with reference made to the following matters, to the Minister of METI for permission. 1) Location of the area of application 2) Square measure area of application 3) Name of the minerals to be dug 4) Name and address (Mining Law, article 21) *The Minister of METI shall consult with the governor of the prefecture concerned when a mining application is notified. (Mining Law, article 24)	*Mineral licenses are classified as six categories to facilitate applicants to apply for mineral licenses, and to efficiently manage and explore for mineral resources within the Kingdom of Cambodia: 1) Artisanal mining license; 2) Pits and quarries mining license; 3) Gem Mining license; 4) Mineral [Gemstone] cutting license; 5) Mineral exploration license; 6) Industrial mining license. *The Concessionaire holding the mineral exploration license shall submit reports on technical, financial, environmental, social and economic analyses to determine the socio-economic feasibility of mineral operations to the Minister in charge of mineral sector for review and approval. *Procedures and contents of reports, final feasibility studies, references and conditions to issue an industrial mining license shall be stipulated in a sub-decree. (Cambodia, Law on Mineral Resources, article 11)
Application of Registration of Mining Lease right	*1 Those who intend to become the holder of mining lease right and the owner of digging right shall, when they intend to register their mining lease rights, notify the applications, with reference to the documents, to the Minister of METI, and receive authorization from the Minister. 2 The period of duration of the mining lease right shall be ten (10) years or shorter from the date of registration and the period can be extended within five (5) years.	*The natural person or legal entity shall apply for the mineral licenses under this law to the Minister in charge of mineral sector. (Cambodia, Law on Mineral Resources, article 15) *1 Competent state management agencies shall select organization s and individuals to be licensed for exploration of minerals in areas in which the mining right is not subject to auction. (Vietnam, Mineral Law, paragraph 1 of article 36)

	(Mining Law, articles 76 & 77)	2 To obtain a mining license, an organization or individual must satisfy all the following conditions: a) having an investment project to mine minerals in the explored area with the master plans containing on employment of professional human resources, and advanced and appropriate equipment, technologies and mining methods; b) having an environment impact assessment report or an environment protection commitment made under the Environment protection Law; having an equity capital at least equal to 30% of the total investment capital of the mining investment project. (Vietnam, Mineral Law, paragraph 2 of article 53) *The investor intends to undertake mineral prospecting or mineral exploration, the investor shall submit a prospecting or mineral exploration work program, minimum expenditure cost and a preliminary environmental and social impact assessment report in the proposed area to the Ministry of Energy of Mines for a license permit. *After the end of mineral prospecting and exploration, if the investor intends to undertake mining business, the investor shall submit the data related to the results of the prospecting and exploration, mining work program, processing program and efficiency detail feasibility study to the State for a license permit. In case of Large Scale Mining, the National Assembly will consider the project based on the proposal of the government.

		(Laos, Law on Minerals, articles 35 & 40) *A person or organization, desirous of carrying out any of the following operations shall apply to the Ministry in accordance with the stipulations for obtaining a permit: a) prospecting, exploration, large scale production or small scale production of gemstone; (b) prospecting, exploration, large scale production or small scale production or metallic mineral; c) large scale production of industrial minerals; d) large scale production of stones. *A person or organization, desirous of carrying out any of the following operations shall apply to the Department in accordance with the stipulations for a permit: a) prospecting, exploration or small scale production of industrial mineral; b) prospecting, exploration or small scale production of stones. *A person or organization, desirous of carrying out subsistence production of gemstone, metallic mineral, industrial mineral or stone, prescribed in the notification by the Ministry shall apply to the respective Mining Enterprise or to the officer authorized by the Ministry in accordance with the stipulations for obtaining a permit. (Myanmar, Mines Law, article 4 to 6)

Designation of Specified Area	*1 With regard to an area in which an ore deposit of a specified mineral exists or is likely to exist, when the minister of METI recognizes it necessary to select a person most capable of developing the specified mineral appropriately in the area, and to have such developer carry out the prospecting or digging of such specified mineral, for promotion of public interest by the development of the specified mineral, the said minister may designate such area as a “specified area”. 2 When the said minister designates the “specified area” as prescribed in section above, the said minister shall establish an implementation guideline for inviting applicants for the position of a specified developer for each “specified area”. (Mining Law, article 38) *Those who intend to register a mining right for a specified mineral in a specified area as prescribed in section 1 above, shall notify an application, with reference made to the following matters, and obtain permission from the said minister. 1) Location of the application area 2) The business plan with mining method, mining	*In case the Minister in charge of mineral sector determines that the application for a mineral exploration license or an industrial mining license indicates a large scale project and provides special benefits to the nation, the Minister in charge of mineral sector shall negotiate with the applicant to enter into a mineral investment agreement to be supplemented to the mineral exploration license or industrial mining license. (Cambodia, Law on Mineral Resources, article 12) *For any area of land, where mineral potential is known and which has not yet been granted to explore for and exploit minerals, the Minister in charge of mineral sector shall announce the area of land for bids by organizing a session of evaluation and official negotiation to issue an appropriate. A mineral license or by requiring a negotiation to enter into a supplemented mineral investment agreement, as provided in article 12. (Cambodia, Law on Mineral Resources, article 13) *1 Auction of the mining right shall be conducted for mineral activities areas, except areas identified by competent state agencies as not subject to auction of the mining right. (Vietnam, Mineral Law, paragraph 1 of article 78) *1 The Government shall perform the unified state management of minerals.

	maps and others 3) Square measure of the application area (Mining Law, article 39) *1 The minister of METI shall, when the said minister receives a written application as prescribed in paragraph 2 above, examine whether the application satisfies the following requirements and standards. 1) The person who has applied for the registration of mining right in relation to the mining applicant has a sufficient financial basis and technical capability to properly carry out reasonable development of minerals in the specified area. 2) The mining applicant pertaining to the relevant application has sufficient social credibility. 2 The minister of METI shall select the person recognized most capable of developing the specified mineral appropriately in accordance with the evaluation based on the business plan, and grant permission of the mining right to the mining applicant. (Mining Law, article 40)	2 The Ministry of Natural Resources and environment shall take responsibility before the Government for performing the state management of minerals nationwide. (Vietnam, Mineral Law, paragraphs 1 & 2 of article 80) *After the investor has completely implemented and presented the report on the feasibility study (F.S.), Government has the right to undertake the share in such mineral business. *Government shall notify the mining business investor on its intent to participate or not to participate in the equity no later than one hundred and twenty (120) days after the date received of feasibility study report from the investor. (Laos, Law on Minerals, articles 69 & 70) *The Ministry: a) may designate an area where mineral can be produced on commercial scale as Mineral Reserve Area by notification with approval of the Government. (Myanmar, Mines Law, article 21)

Revocation and Other Dispositions	*1 When digging the minerals is recognized to be harmful to health, destroy facilities for public or hinder the protection of cultural properties, parks or hot spring resources, or impair the interests of agriculture, forestry and other industries, and have an extremely adverse effect on public welfare, the minister of METI shall have punishment to decrease such part of mining area or revoke the mining right. 2 If digging minerals significantly interferes with the mining of others, the said minister shall have punishment to decrease such part of mining area as a disposition or revoke the mining right, it is recognized that there is no other way to eliminate such interference. 3 If the owner of mining right conducts the mining without any management plan of mining operations as prescribed in article 63 of the law, or doesn't obey the administrative order by the said minister. 4 If the owner of mining right doesn't obey the administrative order issued as prescribed in paragraph 2 of article 33, article 34 or article 35 of the revised Mine Safety Law. (Mining Law, article 53 to 55)	*A mineral license issued under this law shall be suspended or revoked if the concessionaire violates the provisions of this law. *The procedures of suspension and revocation of the mineral licenses shall be determined by a sub-decree. (Cambodia, Law on Mineral Resources, article 18) *1 Any concessionaire, who violates article 30 of this law, shall be liable to a fine of a double value of minerals transported, or to the revocation of a mineral license, or to the both penalties. *2 Any concessionaire, who does not allow the competent officials, as defined in article 23, to control mineral operations in her/his mining site, shall be liable to a fine from 5,000,000 (five million) to 10,000,000 (ten million) riel and/or to the suspension of a mineral license for a period not exceeded 6 (six) months. In the event of subsequent offense, the mineral license shall be revoked exclusively. (Cambodia, Law on Mineral Resources, articles 37&38) *A mining license will be revoked in the following cases: b) the licensed organization or individual fails to conduct mining within 12 months since the proposed date of commencement of mining, except force major events; c) the licensed organization or individual breaches any of the obligations of this law without taking remedies within 90 days after the date of

		written notice by a competent state management agency in charge of minerals. d) the area permitted for mining is declared to be banned or temporarily banned from mineral activities. (Vietnam, Mineral Law, paragraph 1 of article 58) Additional sanctions may be imposed on the offender such as: suspension of mining business operations, withdrawal of license, and confiscation of offender's vehicles and equipment by the State. (Laos, Law on Minerals, article 100) *The Ministry or the Department may suspend or cancel the permit if any of following circumstances arises: a) failure by the holder of a permit to make payment required under the law or these rules; b) submission of false statement to the Ministry or the Department in respect of the conditions of the permit; c) discovery upon investigation that the permit has been applied for obtained in contravention of the rules; d) after the death of permit holder heirs not being qualified to obtain the permit under the law and the rules; e) the holder of permit not being able to pay in full the taxes and duties payable to the Government becomes insolvent or the company being liquidated. (Myanmar, Mines Rules, article 80)

The Management Plan of Mining Operations	*1 The owner of prospecting right shall prepare the management plan of mining operations before starting the prospect of minerals as prescribed in ministerial ordinance regulations, and notify them to the minister of METI. This shall also apply when the plan is modified. 2 The owner of digging right shall prepare the management plan of mining operations before starting mining operations as prescribed in the ministerial ordinance regulations, and receive authorization from the said minister. This shall also apply when the plan is modified. 3 The owner of mining right as prescribed in paragraph 1 or 2 above never operates prospecting or digging of minerals without the management plan. 4 The owner of digging right has been registered as prescribed in article 41 shall prepare the management plan of mining operations in line with the business plan, and receive authorization from the said minister. This shall also apply when the plan is modified. (Mining Law, article 63)	*Every concessionaire or sub-contractor shall be responsible for carrying out mineral exploration and exploitation, and shall comply with the following operational requirements: 1) Carry out mineral operations with duly and effective way by following techniques and financial plans which shall be detailed in an exploration work program or in a mining feasibility study; 6) Commit the procurement of goods and services obtainable within the Kingdom of Cambodia, where and when it is appropriate. *The Minister in charge of mineral sector can determine the necessities additional to the above operational requirements, subject to the category of mineral licenses and the scale of mineral operations. (Cambodia, Law on Mineral Resources, article 21) *1 Mine design include technical design and working drawing design. 2 Organizations and individuals licensed for mining may build mine infrastructure and mine minerals only when mine designs have been made and approved under law and submitted to state management agencies in charge of minerals. 3 The Ministry of Industry and Trade shall provide details of a mine design. (Vietnam, Mineral Law, paragraphs 1, 2 & 3 of article 61)

		*The investor intends to undertake mineral prospecting or mineral exploration, the investor shall submit a prospecting or mineral exploration work program, minimum expenditure cost and a preliminary environmental and social impact assessment report in the proposed area to the Ministry of Energy of Mines for a license permit. *If the investor intends to undertake mining business, the investor shall submit the data related to the results of the prospecting and exploration, mining work program, processing program and efficiency detail feasibility study to the State for a license permit. For Large Scale Mining, the National Assembly will consider the project based on the proposal of the government. (Laos, Law on Minerals, articles 35 & 40) *When applying for a permit or extension for prospecting of minerals, create a program of mineral prospecting operations, and then submit it to the Ministry of Mines or relevant department. (Myanmar Mine Rules, articles 3 and 9) *When applying for a permit or extension for inspection of minerals, create a program of mineral exploration operations, and then submit it to the Ministry of Mines or relevant department. (Myanmar Mine Rules, articles 12 and 18)

		*When applying for a permit or extension for large-scale production of minerals, create a program of the large scale mineral production that includes the following, and then submit it to the Ministry of Mines. 1) Programs for utilization of mineral resources in the most effective and beneficial way 2) Programs for safety and environmental protection 3) Adequate provisions with respect to the employment and training of Myanmar citizens (Myanmar Mine Rules, articles 23, 24 & 28)
Restrictions regarding Mining	*1 The owner of mining right shall obtain approval of competent agencies or administrators when the owner digs minerals at places located within fifty (50) meters both on the earth's surface and underground from railroads, tracks, roads, waterworks, waterways, ports and harbors, rivers, lakes, swamps, ponds, bridges, banks, dams, irrigation and drainage facilities, parks, cemeteries, schools, hospitals, libraries, and other facilities and buildings for public use. 2 The owner of mining right may prepare an application for	*The mineral prospecting, exploration and exploitation in State property land, determined as national cultural, historical and patrimonial sites, shall be prohibited. (Cambodia, Law on Mineral Resources, article 8) *1 Areas banned from mineral activities include; a) Land areas with historical-cultural relics or scenic places already ranked or delimited for protection under the Law on Cultural Heritages; b) Land areas under special-use forests, protection forests or land areas for protection forests and geological conservation zones; c) Land areas which are planned for

	decision by the minister of METI, if the owner can not obtain approval from administrators as prescribed in paragraph above. (Mining Law, articles 64 & 64-2)	national defense or security tasks; d) Land areas used by religious institutions; and others. (Vietnam, Mineral Law, paragraph 1 of article 28) *Restricted Areas are areas where no mineral activities are allowed including the following; 1) Dangerous areas such as: areas where unexploded ordinances exists or areas with severe pollution; 2) Areas near or under buildings or public areas that have national importance such as: archeological and historic sites, areas with basic infrastructure, areas that are important for national defense and security and areas that are not appropriate for mineral activities; 3) Forest conservation areas, biodiversity conservation areas, aquatic animal sanctuaries, wildness and upstream forest areas. *A toxic area is a mineral resource area where there is poisonous or toxic contamination in the whole territory of the country such as: areas with arsenic mineral, mercury mineral and others. (Laos, Law on Minerals, articles 17 &18) *Mineral prospecting and exploration shall not be implemented in mineral deposit areas and gemstone tracts specified by the Ministry of Mines. (Myanmar, Mine Rules, articles 4 & 13) *The holder of a mineral production permit, in exercising the right under

		the permit shall, if the land relating to the permit: 1) being any land which is within 200 meters of any residence, building or site for construction of residential building; 2) being any land within 50 meters of land which has been cleared or land on which agricultural crops are grown; 3) being any cultivated land from which agricultural crops have been harvested recently; 4) being any land which is the site of or within 100 meters of any irrigation canals, ponds, dams or other land for storage of water. (Myanmar, Mines Rules, article 70)
Mining Office, Prospecting Schedule and Mine Survey Maps	*1 When the owner of mining right has started mining, the owner shall establish the mining office without delay at the location of mining area, and notify the minister of METI of the location and date of beginning of mining. 2 the owner of prospecting right shall prepare the prospecting schedule as prescribed in ministerial ordinance regulations, and keep the schedule at the mining office. 3 the owner of digging right shall prepare the survey maps as prescribed in ministerial ordinance regulations, and keep the maps at the mining office. (Mining Law, article 68 to 70)	*The Concessionaire holding a mineral license under this law shall submit the Minister in charge of mineral sector her/his proposals, reports, plans and letters of notification, and shall keep all concerned documents and recording books. (Cambodia, Law on Mineral Resources, article 19) *2 Organizations and individuals licensed for exploring minerals have the following obligations: c) to collect and store mineral-related information and report exploration results to state management agencies in charge of minerals. (Vietnam, Mineral Law, paragraph 2 of article 42) *2 Organizations and individuals licensed for mining have the following

	*The owner of mining right has been registered in article 40 or article 41 shall report to the said minister on the status of digging of the specified mineral in the mining area, conditions of the ore deposits of specified mineral, and other matters as prescribed in ministerial ordinance regulations. (Mining Law, article 70-2)	obligations: e) to collect and store information on result of further exploration for mineral deposits and on mining results; f) to report mining results to competent state management agencies under regulations of the Ministry of Natural Resources and Environment. (Vietnam, Mineral Law, paragraph 2 of article 55) *1Organizations and individuals licensed for mining shall make, manage and keep status maps, status drawings of cross-section of areas permitted for mining from commencement of mine infrastructure construction to termination of mining activities. 2 Organizations and individuals licensed for mining shall make statistics and inventory of mineral deposits in areas permitted for mining and exploited mineral volumes and take responsibility for statistical and inventoried data. (Vietnam, Mineral Law, paragraphs 1 & 2 of article 63) *Obligations of the mining business operator are: 6) to maintain records on technical data with regards to samples, drawings, maps, as well as data on mining operation, interpretations, accounting system and assets in the field; (Laos, Law on Minerals, paragraph 6 of article 65) *Mineral prospecting permit holders, mineral exploration permit holders, large-scale mineral production permit holders, and small-scale mineral production

		permit holders report before commencing or terminating an operation. *Mineral exploration permit holders issue periodic reports for an operation (once every three months). *During mineral exploration, issue a report of the discovery of a deposit of the mineral to which the mineral expiration permit relates or any other mineral deposit of possible economic value. *Integrated permit holders issue a report in the following situations: when changing over from a mineral prospecting operation to a mineral exploration operation and from a mineral exploration operation to a mineral production operation. (Myanmar Mine Rules, articles 54, 59, 63 & 67)
Entry into Land and Use of Water	*1 When it is necessary for survey and on-the-spot investigation concerning mining, those who intend to register the mining right or those who intend to become the holder of mining lease right, the mining applicant, and the owner of mining right or the holder mining lease right may enter into the land of others or fell hindrance trees with permission of the minister of METI. 2 Those who intend to enter into the land of others or fell	*(There are no provisions regarding entry into land of others and use of water.) Cambodia and Laos *3 Compensation, support and resettlement for land users whose land is recovered for mineral mining projects comply with the land and other relevant regulations. (Vietnam, Mineral Law, paragraph 3 of article 5) *1 Organizations and individuals engaged in mineral activities shall rent land according to the Land Law, unless they do not use the land surface

	hindrance trees as prescribed in section above shall carry the document that proves the permission given by the said minister, and produce it if requested by land owners. 3 Those who entered into the land of others or felled trees as prescribed section 1 above shall compensate the losses by their entrance and cutting trees. (Mining Law, article 101 to 103) *1 When it is necessary and appropriate to use the land of others in the mining area or following purposes, and it is very difficult to substitute the land with another land, the owner of mining right or the holder of mining lease right may use of others. 1) Open a mine entrance or a shaft 2) Construct a waste stone dump or a slag dump 3) Install mine facilities for processing or smelting 2 The owner of mining right or the holder of mining lease right shall, when the owner/holder intends to use or expropriate the land of others as prescribed in section above, notify an application with and receive the permission from the minister of METI. (Mining Law, articles 104 & 106) *The provisions concerning the use and expropriation of land of others shall apply to the right of use of water.	layer or their mineral activities do not affect the use of land surface of organizations and individuals that are lawfully using such land. (Vietnam, Mineral Law, paragraph 1 of article 31) *1 Organizations and individuals engaged in mineral activities may use water according to the Law on Water Resources. 2 Water resources and volume and using methods and wastewater discharge in mineral activities must be specified in exploration projects, mining investment projects and mine designs. (Vietnam, Mineral Law, paragraphs 1& 2 of article 32) *The holder of a mineral production permit; a) shall carry out mineral production operations. only after coordinating and reaching agreement and after payment of the agreed compensation or damages to the individual or organization, which have the right of cultivation, right of possession, right of utilization, and beneficial enjoyment, right of succession or right of transfer of the land included in the permit. If co-ordination cannot be made (is not possible), shall submit the matter to the Ministry for necessary action; b) if agreement can not be reached in accordance with sub-rule in the case of the State-owned Enterprise or a person or organization in joint venture with the Government the matter shall be submitted to the Ministry. If it is found after scrutiny by the Ministry that commercial scale exploitation of mineral could be undertaken in the land included in the permit area, co-ordination shall be made with the relevant Ministry for the acquisition of land in accordance with the existing law. (Myanmar, Mines Rules, article 69) *If the holder of a mineral production permit obtains the right to use public water after co-ordination with the Department in accordance with Section 17 of the Law care shall be taken not to deprive any other person of the water he is accustomed to and shall not impede nor alter any water course without the prior

	(Mining Law, article 108)	permission of the relevant Government Department or Organization. (Myanmar, Mines Rules, article 72)
Obligation for Compensation	*1 If others are damaged by excavation of land to dig minerals, discharge of mine water or waste water, dumps of waste stones, slugs or sediment, or exhaust of mine smoke, such damage shall be compensated by the owner of mining right or the holder of mining lease right in the mining area concerned at the time of occurrence of damage. 2 If the mining right has already renounced at the time of occurrence of damage, such damage shall be compensated by the final owner of mining right (or the holder of mining lease right, if a mining lease right was registered in the mining area concerned at the time of renouncement of the mining right.). (Mining Law, article 109)	*The concessionaire acquiring a mineral license shall compensate the land owner(s) for both within and outside the area of land granted under the mineral license for damage caused by the mineral operations, regardless of whether or not such damage is accidental or anticipated. *In case the damage caused by the mineral operations carried out by two or more concessionaires, the concessionaires shall jointly compensate the land owner(s) for the damage accordingly. (Cambodia, Law on Mineral Resources, article 25) Mining organizations and individuals shall: b) combine mining activities with the building of technical infrastructure and environmental protection and restoration under investment projects on mineral mining, and repair, maintain or build new facilities or pay compensations under law depending on the degree of damage, if causing damage to technical infrastructure facilities or other works and properties. (Vietnam, Mineral Law, paragraph 2 of article 5)

		*In order to avoid or minimize negative environmental and social impacts, investors in mineral activities must perform measures as follows: 3) be liable to pay compensation for damages incurred from the impact of the business operation related to minerals subject to relevant regulation. (Laos, Law on Minerals, paragraph 3 of article 60) *Obligations of the mining business operator are: 5) to compensate for removal, land and agricultural products cost, and to provide an appropriate place for livelihood of the affected people from the mining operation. (Laos, Law on Minerals, paragraph 5 of article 65) *Mineral exploration permit and mineral production permit holders shall backfill or otherwise make safe bore holes, excavations, and surface of land damaged during the course of underground mining operations. *In disposing of liquids, wastes, tailings and fumes which have resulted from mineral production, a mineral production permit holder or a manager shall undertake laboratory tests. When toxic materials are found, degradation shall be made by chemical means. (Myanmar, Mine Rules, articles 105 & 106) *(There are no provisions regarding the obligation of the compensation for damage that shall occur after renouncement of the license or closed the

		mine.) Cambodia, Vietnam, Laos and Myanmar
Deposit on Security	*1 The owner of mining right or the holder of mining lease right who intends to dig and obtain coal or lignite shall deposit a certain amount of money every year in proportion to the quantity of coal or lignite dug in the previous year as prescribed in ministerial ordinance regulations to ensure the compensation for damage to be caused in the mining area concerned. 2 The amount of money as prescribed in ministerial ordinance regulations shall be specified every year by the minister of METI for each mining area to the extent that the amount does not exceed twenty (20) Japanese yen per ton of coal or lignite dug within the previous year. 3 As for the right to seek compensation for damage, the victims shall have the right with higher priority than others the payment of the money deposited to ensure the compensation for damage to be caused in the mining area concerned. (Mining Law, articles 117 & 118)	*(There are no provisions regarding the deposit on security for compensation of the damage concerning digging and obtaining minerals.) Cambodia and Myanmar *2 The State encourages organizations and individuals engaged in production, business and services activities to buy insurance for environmental damage compensation liabilities. (Vietnam, Law on Environmental Protection, article 134) *In order to avoid or minimize negative environmental and social impacts, Investors in mineral activities must perform measures as follows: 2) establish a plan for rehabilitation of mined out area and for mine closure to allow for other uses; 3) be liable to pay compensation for damages incurred from the impact of the business operation related to minerals subject to relevant regulation; 4) to contribute to an Environmental Protection Fund for the project. (Laos, Law on Minerals, article 60)

Reports and Inspection	*The minister of METI shall, to extent necessary to enforce this law, request reports from the owner of mining right or the holder of mining lease right concerning the state of business or have administrative officials enter the places of mining operations or the office and inspect the state of documents. (Mining Law, article 144)	*The Concessionaire holding a mineral license under this law shall submit the Minister in charge of mineral sector her/his proposals, reports, plans and letters of notification, and shall keep all concerned documents and recording books. (Cambodia, Law on Mineral Resources, article 19) *In [each] necessary case, the Minister in charge of mineral sector shall appoint competent officials to control the implementation of this Law. *The powers and duties of the appointed competent officials to control, inspect, and report the activities of mineral exploration and exploitation, researches and analysis, related to the management [of mineral resources] under the provisions of this Law, shall be stipulated in a sub-decree. (Cambodia, Law on Mineral Resources, article 23) *2 Organizations and individuals licensed for exploring minerals have the following obligations: f) to collect and store mineral-related information and report exploration results to state management agencies in charge of minerals; and report other activities to competent state agencies under law. (Vietnam, Mineral Law, paragraph 2 of article 42) *1 State management agencies in charge of minerals shall conduct specialized inspection of minerals. 2 Organization and operation of specialized mineral inspectorates comply with

		this Law and the Inspection Law. (Vietnam, Mineral Law, paragraphs 1 &2 of article 83) *Obligations of the mining business operator are: 8) to summarize and report on information to the Energy and Mines sector on the results from exploration, mining and processing, including operation performance as well as accounting records on monthly, quarterly, and annual basis. (Laos, Law on Minerals, paragraph 8 of article 65) *The Inspection Organizations has the following rights and duties: 1) to inspect implementation of laws and regulations related to minerals; 2) to inspect activities and businesses related to prospecting, exploration including service businesses to minerals. (Laos, Law on Minerals, paragraph A 1 &2 of article 90) *The duties of the Chief Inspector are as follows: a) inspecting in order to as certain as to whether or not the provisions of this law and the rules, orders and directives made there under are observed and conditions contained in the license are compiled with by holders of license. (Myanmar, Mines Law, article 26) *The holder of large scale mineral production permit shall: b) deliver to the Ministry free of charge photo copies of books and records maintained under

		article 60 of this Rule as the Ministry may from time require. (Myanmar, Mines Rule, article 61)
Delegation of Authority	*The authority of the minister of METI prescribed in this law shall be delegated to the director of Regional Bureau of Economy, Trade and Industry as prescribed in ministerial ordinance regulations. (Mining Law, article 145)	
Penal Provisions	**(Omission)**	
Royalties	*The owner of mining right or the holder of mining lease right shall pay the royalties based on the following formula of calculation every year to the provincial governor that a mine is located. Royalties = (the selling price of minerals) x (production of	*All concessionaires, who hold mineral licenses, shall pay the State Royalties of the value of minerals exploited, except for the concessionaire acquiring the mineral exploration license or mineral cutting license. (Cambodia, Law on Mineral Resources, article 28) *The Royalties shall be decide based on the agreement with the

	minerals per year) x (tax rate: 1.0%) (The Law on Regional Taxation, article 519 to 592)	government comparing with the value of mineral production the year. Gemstone 12.5%, semi-Gemstone 10.0% Lime stone 1 %, Precious metal and other minerals 3 – 5 % (Cambodia, Government Ordinance) *The Royalties shall be decided based on the value of mineral production the year and tax rates. (Vietnam,) *The Royalties shall be decided based on the total turnover of minerals, and tax rate, following formula of calculation. Royalties = (the total turnover of minerals) x (tax rate: 2 – 5 %) (Laos) *Apply for a permit to the Ministry of Mines for the following operations: 1) prospecting, exploration, large scale production or small scale production of gemstone; 2) prospecting, exploration, large scale production or small scale production of metallic minerals; 3) large scale production of industrial minerals; 4) large scale production of stones. *Apply for a permit to the relevant department for the following operations. 1) Prospecting, exploration, or small scale production of industrial minerals 2) Prospecting, exploration, or small scale production of stone *A person or organization desirous of carrying out subsistence production of

		gemstone, metallic minerals, industrial minerals or stone prescribed in the notification by the Ministry of Mines shall apply to the respective Mining Enterprise or to the officer authorized by the Ministry to obtain a permit. (Myanmar Mines Law, article 18)

Manual on Measurement and Evaluation of Dust Concentration at Mines

March 2016

Ⅰ. Measurement of Dust Concentration

1. Purposes of measurement of dust concentration

The targets of occupational health management to protect mineworkers from disorders caused by harmful contaminants, noise and vibration and other indoor work environments at mines are as follows:

(1) Work environment management to prevent the occurrence of harmful factors and create desirable work environments for mineworkers

(2) Work management to ensure work safety by removing and improving risk factors

(3) Health management to monitor the health conditions of mineworkers and ensure smooth work performance

Work and health management also include accurate monitoring of the status of harmful contaminants in working places to protect mineworkers from direct damage caused by them.

For example, dust is one of harmful contaminants, the amount of generated dust is usually measured mainly for the prevention of respiratory disorders caused by inhalation and dust explosions.

The main purpose of this manual is the prevention of respiratory disorders and pneumoconiosis (silicosis) due to respirable dust inhalation in mineworkers. The manual includes the design of the measurement protocols as well as preparations necessary to measure respirable dust, information about measuring instruments and their handling, and methods for analysis and evaluation of the measurement results.

2. Dust subject to measurement

Respirable dust is a type of scattered dust that can penetrate deep into the alveoli in the human respiratory system to be deposited there and cause pneumoconiosis.

Measurement of this kind of respirable dust is subject to work environment management.

Criteria for particle size selectors used for the measurement of respirable dust concentration were set by the European Committee for Standardization (CEN) in 1993, and have been approved by 18 countries as European standards. The standard particle size selector for sampling of particulate matter was defined as a device with collection efficiency of 50% for 4 μm (micrometer) particles.

Such criteria for particle size selectors used for the measurement of respirable dust

concentration have been adopted by American Conference of Governmental Industrial Hygienists (ACGIH) in USA since 1993, by Ministry of Health, Labour and Welfare in Japan since 2005.

3. Overview of dust concentration measuring instruments

(1) Mass concentration measuring instruments

Mass concentration measuring instruments consist of a dust collector and a filter to trap the dust. Dust collectors used for measurement of scattered dust concentration in work environments have a particle size selector with a collection efficiency of 50% for 4μm particles.

Size selectors using inertial force are usually employed, but there is also a method using gravity settling of particles.

Dust trapped by a filter is weighed to find the dust mass.

(2) Relative concentration measuring instruments

Relative concentration is a physical quantity that is in 1:1 relation with the dust mass concentration.

Relative concentration measuring instruments have the following characteristics. Care must be taken when handling values measured by this type of instrument because it may be affected by particle-size distribution, specific gravity, optical properties, shape and other properties of the dust.

1) Measurement can be performed within a short time.
2) Handling is extremely easy without requiring special skills, and human handling errors are unlikely.
3) Sensitivity is usually high, allowing measurement of low-concentration dust.
4) Measured values may be affected by other suspended particulate matter than dust (for example: smoke or mist), if such matter exists.

There are light scattering, light absorption and other types of relative concentration measuring instruments.

The principle of the light-scattering laser relative concentration measuring instrument is based on the fact that, when light is emitted from dust, the amount of scattered light is proportional to the mass concentration of dust in the same particle system.

Semiconductor laser measures the mass concentration of dust suspended in the air based on the intensity of the scattered light.

4. Filter for trapping dust

Filters for trapping dust must fulfill the following requirements. Glass- or quartz-fiber filters are usually used.

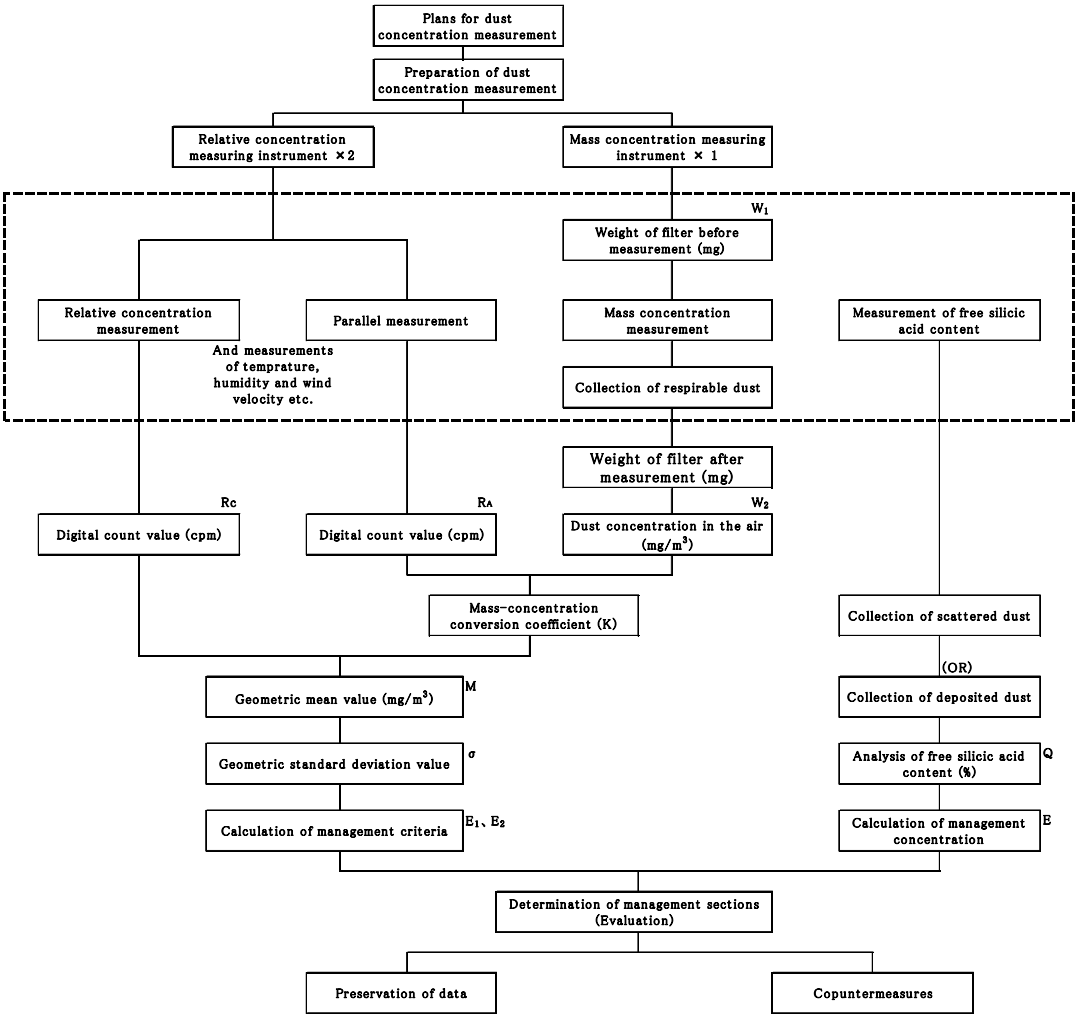
1) The trapping rate must be 95% or higher for particles of 0.3 μm in diameter.
2) Since the pressure loss of filters increase in direct proportion to the filtration velocity, the initial pressure loss must be small and the increase in pressure loss due to dust accumulation must also be small.
3) Filters must be easy to handle and strong enough to withstand sampling.
4) Absorptivity of filters must be low.

5. Preparation for dust concentration measurement

Measurement of scattered dust concentration is important for appropriate work environment management, which involves a correct understanding of the respirable dust concentration status and effective dust prevention measures based on this status. Parallel measurement is performed using a combination of mass and relative concentration measuring instruments.

(1) A flowchart of dust concentration measurement

The following figure shows a flowchart of dust concentration measurement.



Flowchart of dust concentration measurement

(2) Necessary instruments and tools for dust concentration measurement

1) A mass concentration measuring instrument (× 1)
2) Some filters for trapping dust
3) A Relative concentration measuring instrument (× 2)
4) Some plastic bags for collecting samples
5) An anemometer
6) A thermometer
7) A hygrometer
8) Tape measure in five (5) meters or more length
9) Some pieces of chalk
10) A stopwatch or watch
11) Record papers & writing materials

12) Tools (a screwdriver, nipper, some pieces of wire and others)

6. Measurement design

Measurement design must be appropriate to assure accurate evaluation of the work environment where the dust concentration is measured.

(1) Choice of a unit working place and its scope

For a work environment subject to measurement, a unit working place must be chosen within working places where measurement has to be conducted. The unit working place is part of the working places necessary for measurement of dust concentration and other values set based on the scope of activities of mineworkers during operations, dust distribution and other conditions.

When choosing the scope of a unit working place, attention must be paid to the following matters.

1) Work content and area

If dust concentration is expected to vary greatly depending on the time, etc., even in the same area, due to the progress of work processes and other conditions, such a place must be excluded from potential unit working places, and another place must be chosen.

2) Work conditions of mineworkers in a unit working place

If the dust source is known and a series of operations are conducted around it, a unit working place must be chosen based on the range of dust scattering from the source and the usual range of work.

3) Flow diffusion of dust from the source

If the dust concentration in a certain area is expected to be higher or lower than that in other working places at all times due to the position of the dust source or the status of emission into the work environment, such area must also be excluded from potential unit working places, and another place must be chosen.

4) Others

a) In a unit working place, all set measurement points must be within a range where measurement can be completed within one working day (in case of work in underground mining, within eight (8) hours for one-way operation). If this cannot be achieved, the unit working place must be divided.

b) If the data obtained in the unit working place decided first and accumulated subsequently does not match the previous data, the scope of the place and measurement points must be changed.

c) Any place that mineworkers enter for shorter than a total of 30 minutes out of one

unit operation period (8 hours), or that mineworkers are usually prohibited from entering by placement of no-entry fences or other means, must not be decided as a unit working place.

(2) Determination of unit working places

Underground and other indoor working places where an extremely large amount of dust is scattered, as prescribed in Article 239, Paragraph 1, and Article 268, Paragraph 1, of the Mine Safety Regulation, are areas where the following operations are conducted:

1) Drilling of bed rocks or minerals (except for wet conditions, the same applies hereinafter) using drilling machines
2) Excavation of bed rocks or minerals in underground using excavation machines (except for hydraulic excavation)
3) Unloading of rocks or minerals by turning mine cars over using tipplers, etc.
4) Loading of rocks or minerals using vehicle type mine machines in underground
5) Loading of rocks or minerals on a conveyer or unloading from a conveyer in underground
6) Blockage of a tunnel (gallery), etc. (except for blockage by manual loading or hydraulic flow filling) in underground
7) Spreading powder generated from rock crushing in underground
8) Crushing, grinding or sieving of stones, rocks or minerals using power-driven tools (except for power-crushing, -grinding or -sieving in water or oil, or power-sieving while using a water injection facility) in underground or indoors
9) Cutting or finishing of rocks or minerals using power-driven tools (except for flame-cutting or -finishing, or power-cutting or -finishing while using a water or oil injection facility) in underground or indoors
10) Polishing or deburring of rocks, minerals or metals with abrasives, or cutting metals using power-driven tools (except for power-polishing or -deburring of rocks, minerals or metals and using an abrasive agent or cutting of metals while using a water injection facility)
11) Mixing or blending of powdered minerals in underground or indoors
12) Throwing soil and stones or minerals into an open furnace in a melting process (including the calcination process of limestone) and sintering, removing or casting such materials (except for tapping from a converter or casting into molds)
13) Removal, collection or loading of slag or ash adhering to or accumulated in furnaces, flues or chimneys in a smelting process or packing of such materials into containers
14) Construction or repair of furnaces using refractories or disassembly or fracturing of

such furnaces

15) Fusing, arch welding or arch gouging of metals in indoor working places, underground or vehicles (except for indoor automatic fusing or welding)

16) Drying, packing in bags, loading or unloading of powdered minerals, products or fly ash (except for wet ones)

(3) Determination of measurement points

To accurately evaluate the effect of dust on mineworkers, it is necessary to measure the exact amount of respirable dust actually inhaled by such workers. However, it is practically difficult to measure the actual amount inhaled by each of many mineworkers.

Therefore, a unit working place subject to management is usually determined and the dust concentration is measured at several measurement points selected randomly in the area (hereinafter “measurement A”). In a working place where sufficient management may not be possible only by “measurement A”, supplemental evaluation is performed by measuring the mean dust concentration during ten (10) minutes in a part of the working place as well as the time when mineworkers may be exposed most heavily to dust (hereinafter “measurement B”) regardless of the measuring points.

Measurement of the dust concentration should be performed by skillful persons who have sufficient knowledge of the purpose of measurement and the status of the working places to be measured, and the positions of the measurement points should be decided on the concepts of design and sampling.

(4) Determination of measurement points in an indoor work environment

In an indoor unit working place, measurement points should be determined in consideration of the following matters:

1) Five (5) or more measurement points should be chosen at positions suitable for monitoring the concentration distribution in the unit working place.

2) A measurement point shall be the intersecting point of vertical and horizontal lines drawn at equal intervals of three (3) m on the floor of the unit working place (see Fig. 1).

However, in case the intervals of the lines need to be adjusted by looking at the entire floor, the intervals of measurement points at the intersections of vertical or horizontal lines should be equal.

3) If a unit working place not to be divided with straight lines, parallel lines may be curved along the shape of the area (see Fig. 2).

4) The floor space that should be represented by one measurement point is approximately

ten (10) m^2.

5) If a unit working place is small and enclosed, or the type of dust-generating work is completely different, it may be better to limit the range of such an area. Since the number of measurement points may be fewer than five (5) in such a case, it should be increased to five (5) or more by reducing the intervals between vertical and horizontal lines or employing other appropriate means (see Fig. 3).

6) If a unit working place is even smaller than in 5) above, and it is impossible to secure five (5) measurement points, measurement should be performed repeatedly for five (5) or more times at one random point of the unit working place.

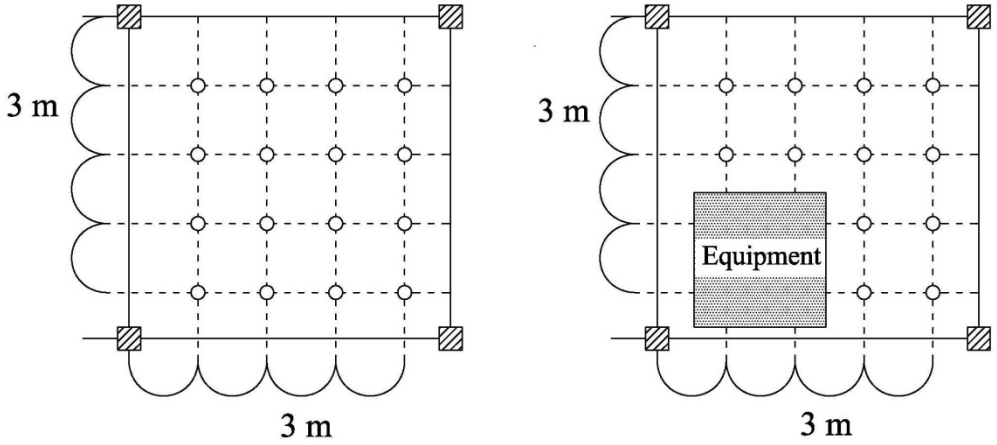


Fig. 1: Determination of a measurement points on the unit working place in an indoor work environment

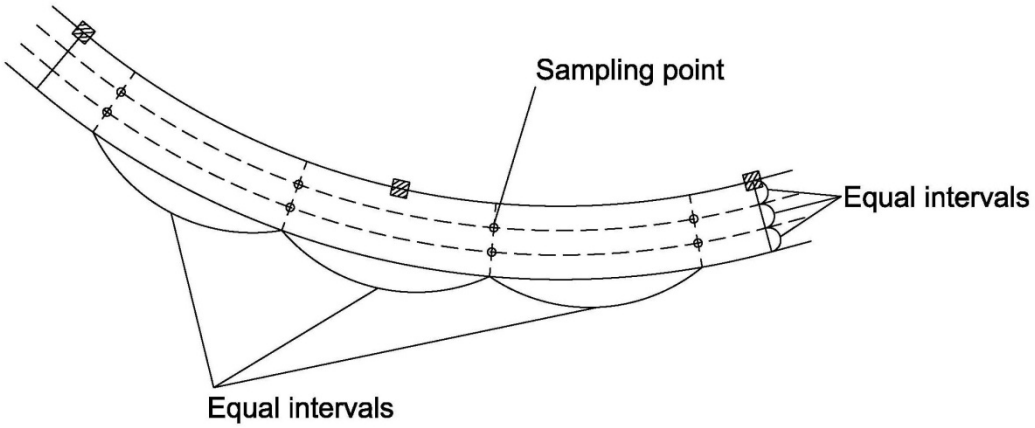


Fig. 2: Determination of measurement points on the unit working place at curved area

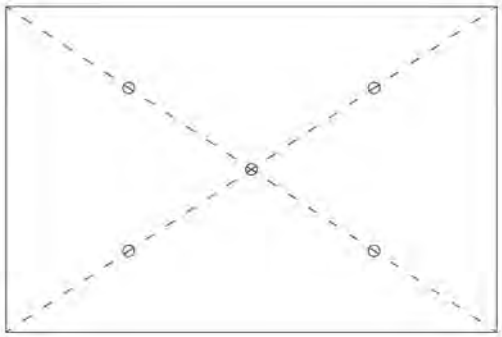


Fig. 3: determination of measurement points on the unit working place if the floor space is small

(5) Determination of measurement points in an underground work environment

In a unit working place in underground at a mine, measurement points should be determined randomly while giving consideration to the following matters:

1) The measurement points should be situated in two (2) lines if the width of tunnel (gallery) floor is two (2) m or more, and in one line if the width of tunnel (gallery) floor is under two (2) m. However, two (2) lines of measurement points may not be necessary, depending on the flow of the dust (see Fig. 4).
2) The intervals between measurement points on the tunnel (gallery) length side should be equal of three (3) m on the floor.
3) The number of measurement points per unit working place should be five (5) or more, but not exceed ten (10).
4) If a unit working place cannot be divided with straight lines, parallel lines may be curved along the shape of the area such as aforementioned (4), 3), Fig. 2.
5) The floor space that should be represented by one measurement points is around ten (10) m^2.
6) If a unit working place is small and enclosed or the type of dust-generating work is completely different, it may be better to limit the range of such an area. Since the number of measurement points may be fewer than five (5) in such a case, it should be increased to five (5) or more by reducing the intervals of vertical and horizontal lines or employing other appropriate means such as aforementioned (4), 5), figure 3.
7) If a unit working place is even smaller than in 6) above, and it is impossible to secure five (5) measurement points, measurement should be performed repeatedly five (5) or more times at one random point of the unit working place.

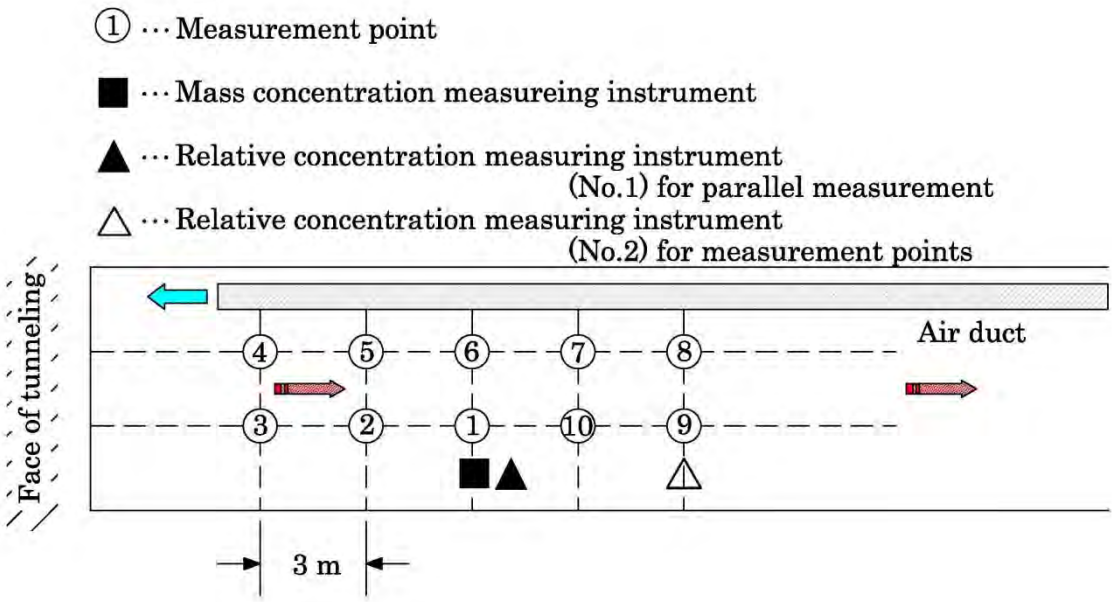


Fig. 4: Determination of measurement points on the unit working place in an underground tunneling

(6) Matters requiring attention concerning measurement design

If the following matters cannot be achieved based on the work environment measurement results, such results are inappropriate for environmental evaluation. Measurement design should therefore be adopted after due consideration.

1) The objectivity of the measured values can be ensured.
2) The presence or absence of possible temporary high-concentration exposure can be assumed.
3) Measured values should be representative for the designated target.

The following matters should also be taken into consideration when designing the measurement draws:

1) If dust concentration is expected to vary depending on the time in the same area due to the progress of work processes or other reasons, such values should be handled as data of different unit working place.
2) If an obvious reason for concentration variations is found by comparing the measurement results with the status of a working place, setting of the unit working place should be reviewed.
3) Since the dust concentration distribution may be greatly affected by air currents in a working place, the effect of such air currents should be taken into consideration when

designating a unit working place.

(7) Method of installing measurement instruments

The technical person in charge of measurement should have sufficient knowledge of the work environment before arriving at the site and installing the measurement instruments.

1) Installation of a mass concentration measuring instrument

i) When installing measurement instruments on site, the mass concentration measuring instrument requires special attention. It should be installed in a position where an almost average dust concentration is expected based on comprehensive judgment of the unit working place and all the measurement points, as well as the status of the dust-generating work and dust flow.

ii) If the dust flow status is unknown, the mass concentration measuring instrument should be placed approximately at the center of the positions of all the measurement points. It may be installed near the central position if the central position as such cannot be selected due to disturbance of the work.

iii) Once the installation position is decided, the measuring instrument should be fixed firmly and horizontally with a tripod or other device to ensure that its air inlet port is at the prescribed height above the floor. A sizing board should also be set horizontally at a height of between 0.5m and 1.5 m from the floor to prevent any effects due to re-scattering of deposited dust. The suction pump and flow meter should be connected securely to avoid air leakage.

iv) When conducting measurement in an underground work environment, the air inlet port of the mass concentration measuring instrument should be facing the direction of the air current.

v) When conducting measurement in an indoor work environment at a mine, there are no special regulations concerning the direction faced by the air inlet port, but care must be taken to avoid measurement in places that may be affected by air currents as far as possible.

2) Installation of mass and relative concentration measuring instruments in case of parallel measurements

When using mass and relative concentration measuring instruments for parallel measurements, the air inlet ports of both devices should be on the same direction, and the two devices should be placed as close as possible to each other in consideration of spatial variations in concentration.

3) Installation of a relative concentration measuring instrument using as mobile measurement

If the device is a portable type, the measurer should place it in front of his/her body, placing back band around his/her neck and ensuring that the air inlet port is facing in the same direction as the mass concentration measuring instrument.

7. Measurement methods (sampling)

To evaluate the work environment of the measured area based on the work environment measurement results, two measurement methods ("measurement A" and "measurement B") are employed.

(1) Measurement A

"Measurement A" is conducted to monitor the average status of dust concentration in a working place, and is not measurement of time-weighted average exposure concentration to the mineworkers in the place.

As the conditions for "Measurement A", the following three principles must be observed.

1) The measurement time should be sixty (60) minutes or longer.
2) The measurement times should be at equal time intervals between measurement points.
3) Measurement points should be positioned at equal distance intervals from each other.

(Basic type of measurement by "measurement A")

The basic type of measurement by "measurement A" uses one mass concentration measuring instrument and two (2) relative concentration measuring instruments.

Simultaneous parallel measurement is conducted during the measurement time using the mass concentration measuring instrument and one of the relative concentration measuring instrument (No. 1) to find the mass-concentration conversion coefficient (hereinafter "K value"). The measurement time (**t**) must be 60 minutes or longer in parallel measurement.

The other relative concentration measuring instrument (No. 2) is used for measurement at each measurement point at equal time intervals during the measurement time to find the geometric mean value.

Figure 5 shows an overview of the basic measurement method by "measurement A", where (**n**) is the number of measurement points, and ①, ② and ③ … (**n**) represent the measurement points. The relative concentration for one minute is measured at each measurement point at equal time intervals.

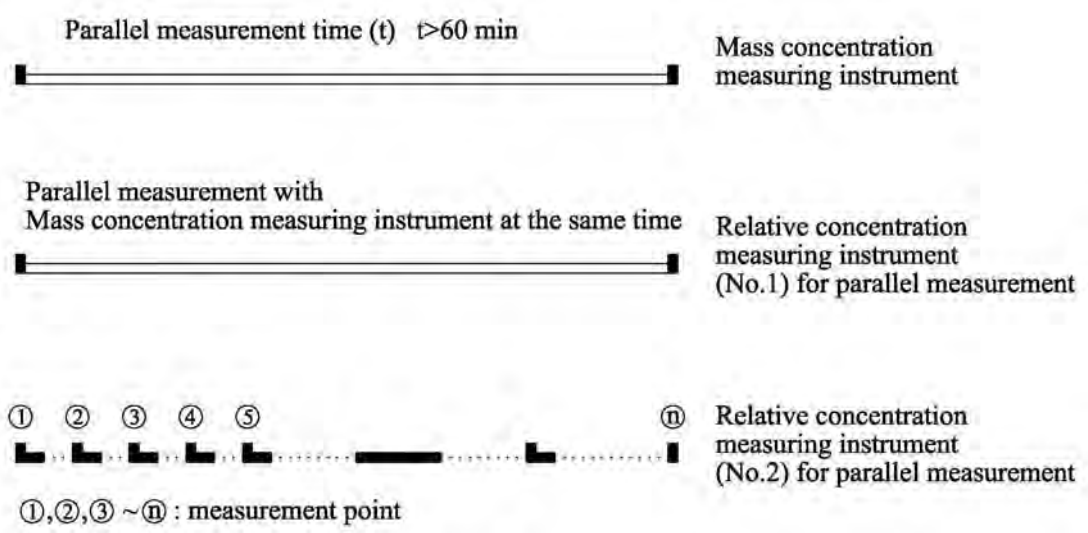


Fig. 5 Basic type of measurement using one mass concentration measuring instrument and two relative concentration measuring instruments by "Measurement A"

(2) Measurement B

"Measurement B" is conducted to supplement "Measurement A" in places where the danger of high exposure concentration is likely to be overlooked.

Therefore, measurement points are decided where the highest dust concentration at work positions adjoining the dust source can be measured. The duration of "Measurement B" is ten (10) minutes. It should be noted that this does not represent measurement of the exposure concentration.

(Basic type of measurement by "measurement B")

1) "Measurement B" should be conducted at a place and time of maximum dust concentration judging from the production process, working mode and dust scattering status in the unit working places where "Measurement A" is conducted.
2) If work involving the maximum dust concentration is not conducted during the time of "Measurement A", the "Measurement B" should be performed separately during the time when such work is conducted.
3) The sampling time of "Measurement B" should be ten (10) minutes.
4) The sampling and analysis methods for "Measurement B" should be the same as those for "Measurement A".
5) When using a relative concentration measuring instrument for "Measurement B", it should be operated for ten (10) consecutive minutes.

6) The mass-concentration conversion coefficient of “Measurement A” conducted in the same unit working place should be used for “Measurement B” using a relative concentration measuring instrument.

(3) Matters that require attention at the time of measurement

Attention must be paid to the following matters when conducting measurement:

1) Mineworkers engaging in dust measurement must wear standard dust respirators.
2) When conducting measurement in an underground work environment, the air inlet port of the mass concentration measuring instrument should be facing the direction of the air current. When conducting measurement in an indoor work environment at a mine, there are no special regulations concerning the orientation of the air inlet port, but care must be taken to avoid measurement in places that may be affected by air currents as far as possible.
3) In case of a mass concentration measuring instrument with a multistage size selector is used, special care must be taken to keep the sizing boards (parallel plates) of the selector horizontal during sampling.
4) The sampling time should be determined to assure collection of an amount of 20 times that of the balance sensitivity (for example, it needs to collect an amount of 0.2 mg or more of dust when a balance with sensitivity of 0.01mg uses) in consideration of the weighing accuracy of the collected dust.
5) Immediately after beginning sampling, it should be confirmed that the prescribed suction flow rate of the mass concentration measuring instrument is achieved using a flow-meter.
6) The flow-meter should be monitored during the sampling time to ensure that the flow of the suctioned amount of sample air prescribed for the particle separator is maintained.
7) When the count of the relative concentration measuring instrument exceeds the maximum indication value (9,999 count), care must be taken to avoid misreading the total count.
8) When conducting measurement at measurement points using a relative concentration measuring instrument, the measurement time intervals at each point should be uniform.
9) When conducting simultaneous parallel measurement using mass and relative concentration measuring instruments, the two devices should be started at the same time to conduct measurement during the sampling time. When sampling is completed, the actual sampling time and the total count of the relative concentration measuring

instrument should be recorded.

10) After collecting dust by mass concentration measuring instrument, the number attached to the filter must be confirmed.

11) When using a high-volume sampler for mass concentration measurement, the following points should be noted:

a) Look out for re-scattering of dust from the collection part, which may occur if the amount of dust collected at the particle separator part becomes large.

b) The flow-meter should be monitored during measurement because the suction amount decreases if the amount of collected dust at the filter part becomes large. However, if the flow rate still decreases, even after flow rate adjustment, sampling should be stopped immediately after recording the measurement time.

12) When using an inertial impaction-type size selector for mass concentration measurement, the following points should be noted:

a) Before conducting dust measurement, the inner wall at the tip of the collection part must be cleaned as dust from the previous measurement may still remain in the part.

b) Care must be taken about re-scattering of dust from the collection part, which may occur when the amount of dust collected at the particle separator part becomes large.

13) If the same value is indicated continuously during measurement using a relative concentration measuring instrument (in case of LD-1E model), care must be taken because the following conditions may occur:

a) In case of mobile measurement, the same value will be continuously indicated on the counter (1,200 to 1,400 **count per a minute (cpm)**) when the dust concentration is high for the range of (× 1) and a scale outside the 1-minute value occurs. Therefore, the range of measurement should be selected based on the dust concentration checked in advance. The indicated value in case of measurement by selecting a range of (× 10) should be ten times larger. Confirm that the pilot lamp is on when the (× 10) switch is pressed.

b) Since functions vary between the ranges (× 1) and (× 10), ranges should not be switched during measurement.

(4) Matters that require attention during parallel measurement

The following matters must be noted when conducting parallel measurement:

1) Positions and height of parallel measurement points

The particle size distribution of dust varies depending on the distance from the source. Since the particle size distribution may affect the mass-concentration

conversion coefficient (**K value**), it is important to perform parallel measurement at positions representative of dust in the unit working place. Therefore, parallel measurement should not be conducted at places near the source directly affected by the inertia of the particles emitted from the source or places far away from the source where almost no dust from the source was suspended in the air.

Mass- and relative- concentration measuring instruments should also be set horizontally at **a height of between 0.5m and 1.5 m from the floor** to prevent any effects due to re-scattering of deposited dust.

2) Layout of measuring instruments

The air inlet ports of the relative concentration measuring instrument and the mass concentration measuring instrument pertained the multistage or inertial impaction-type size selector must be as close as possible to each other to minimize errors caused by spatial variations in the concentration.

8. Post-measurement processing and matters that require attention

(1) Weighing of filters

Filters that collected respirable dust by a mass concentration measuring instrument are usually stored in a desiccator or other containers after measurement and weighed in the same way as pre-measurement weighing. However, filters used in a unit working places where water spraying/sprinkling is conducted for dust-proofing must be compulsorily dried for one hour at approximately 100°C in a constant temperature dryer after measurement, and then stored in a desiccator or other containers and weighed in the same way as the pre-measurement weighing.

(2) Care of measuring instruments

Dust concentration measuring instruments (especially the relative type) should be handled carefully in the same way as other precision equipment. If the dust concentration in the measured area is extremely high, it is also necessary to prevent dust that has entered a measuring instrument from affecting subsequent measurements by taking care of it (e.g., dismantling) as far as possible.

(3) Accurate adjustment of relative concentration measuring instruments

Sufficient care must be taken for the maintenance and management of the relative concentration measuring instruments used for measurement of the trace concentration to ensure its required capacity and accuracy. Since it is necessary to adjust the equipment using a sample with suspended standard particles, which is extremely difficult at mines, it

is desirable to have the manufacturer or a distributer with adjustment capacity perform accurate adjustment at least once a year.

(4) Analysis of measurement data

Analysis of measurement data must be conducted immediately after the completion of measurement. **Table-4 "The Dust Concentration Measurement Records Form"** and **Table- 5 "The Counted Values Form for Relative Concentration Measuring Instrument"** show examples of forms for dust concentration measurement records.

Table-4 shows the items to be included in the record forms and the environmental status of the measured working places can roughly be determined by looking at this form.

If the records on Table-4 are considered insufficient, the status at the time of measurement should be considered based on the counted values by relative concentration measuring instrument and the work status record, and its conformity with the measurement results should be examined.

(5) How to obtain mass concentration conversion coefficient ("K value")

The mass concentration conversion coefficient ("K value") in a unit working place subject to measurement is usually calculated by conducting parallel measurement using mass- and relative- concentration measuring instruments.

The air inlet ports of mass- and relative- concentration measuring instruments are placed in parallel and measurement is performed for (**t**) minutes, which is equivalent to the total measurement time by the two devices.

The "K value" is calculated by substituting mass concentration **Mc** (mg/m^3), parallel measurement concentration **Rc** (cpm) by relative concentration measuring instrument, and dark count **D** (cpm) for following formula.

Dark count **D** (cpm) that is proper numerical value indicated in the test chart of each relative concentration measuring instrument should be checked to use its values.

Mc = W／q × t ÷ 1,000 (mg/m3)

K = Mc／(Rc－D)

W: weight of collected respirable dust (mg)

q: volume of inhaled air (liter/min)

9. Measurement of the free silicic acid content

(1) Free silicic acid

Free silicic acid corresponds to bound silicic acid constituting silicate minerals. Silicon in these minerals (SiO_2) is combined with oxygen three-dimensionally but is not chemically coupled with other elements. Known types of such minerals include quartz (α, β.), tridymite (α, β) and cristobalite (α, β). Free silicic acid contained in dust in the work environment is mostly quartz, and others are extremely small in quantity. If quartz is exposed to high temperature for a prolonged period of time, it is transformed into tridymite or cristobalite. Chalcedony, agate, print, jasper and other rock-forming minerals are aggregated fine quartz crystals, and opal and diatomaceous earth have the composition of $SiO_2 \cdot H_2O$. In terms of occupational safety and health, these are handled collectively as free silicic acid.

In general, chemical compositions are expressed as $K_2O \cdot A\,l_2O_3 \cdot 6SiO_2$ (orthoclase), $Na_2O \cdot A\,l_2O_3 \cdot 6SiO_2$ (albite), $3MgO \cdot 4SiO_2 \cdot H_2O$ (talc), $Al_2O_3 \cdot 2SiO_2 \cdot 2H_2O$ (kaolin), etc. However, since the SiO_2 in these rocks are chemically coupled with other elements, it is not free silicic acid.

(2) Collection of free silicic acid

In principle, free silicic acid content by percentage (hereinafter “Q value”) in dust is measured by the x-ray diffraction method of measurement of the free silicic acid content in inhaled respirable dust trapped by the filter of a low volume air sampler (one of mass concentration measuring instruments) with a particle separator or other device during dust concentration measurement. However, if a sufficient amount of scattered dust cannot be collected, free silicic acid content in dust is measured by means of re-generation of deposited dust or liquid sedimentation.

In many cases of measurement involving collection of deposited dust, the free silicic acid content by percentage is found to be higher than the actual value. Therefore, it is preferable to analyze inhaled respirable dust trapped by the filter of a low volume air sampler using x-ray diffraction or other methods for which the form of dust collection is similar to the actual conditions in working places scattering a free silicic acid content, even if sampling takes more time.

When collecting deposited dust, the dust on top of beams and installed mine machines in the unit working place subject to measurement is collected using a brush and plastic bag, to which a standard 200-mesh (74μm) sieve is attached in advance to collect dust that falls through the sieve. Write the collection date/time, place and other details on the plastic bag.

The collected deposited dust is used as a sample for quantifying free silicic acid after drying in a desiccator.

II. Measurement value calculation method of dust concentration and evaluation of the measurement results

1. Measurement value calculation method of dust concentration

(1) Measurement value calculation method with parallel measurement using mass- and relative- dust concentration measuring instruments

Based on the work environment measurement results by "Measurement A", mass concentration conversion coefficient (**"K value"**), mass concentration value, geometric mean values **M** and geometric standard deviation **σ** are calculated by the following process and methods.

1) How to calculate the mass concentration conversion coefficient

The mass concentration conversion coefficient (**"K value"**) in a unit working place subject to measurement is usually found by conducting parallel measurement result using mass- and relative- concentration measuring instruments and is calculated by the formula shown at Ⅰ - 8 - (5).

2) How to calculate the mass concentration

The mass concentration **Mc** (mg/m^3) is found to multiply in relative concentration $\mathbf{R_A}$ (**count per a minute (cpm)**) at each measurement point measured using relative concentration measuring instrument by the "**K value**".

$$\mathbf{Mc_1 = R_{A1} \times K},\ \mathbf{Mc_2 = R_{A2} \times K}\ \cdots\cdots\ \mathbf{Mc_n = R_{An} \times K}\ (\mathrm{mg/m^3})$$

3) How to calculate the geometric mean values

The geometric mean values **M** (mg/m^3) is calculated by the following formula using the mass concentration $\mathbf{Mc_1, Mc_2}$ ..... $\mathbf{Mc_n}$ (mg/m^3) derived from above 2) at each measurement point in the unit working place.

$$\overline{\mathbf{X}} = \sqrt[\mathbf{n}]{\mathbf{Mc_1 \times Mc_2 \times \cdots\cdots \times Mc_n}}$$

$$\log \overline{\mathbf{X}} = \mathbf{1/n}\ \{ log\ Mc1 + log\ Mc\ 2 + \cdots + logMc\ \mathbf{n}\ \}$$

$$\therefore\ \mathbf{M} = \mathbf{10^{\overline{X}}}\ (\mathrm{mg/m^3})$$

4) How to calculate the geometric standard deviation

The geometric standard deviation **σ** is calculated by the following formula using the mass concentration **Mc** (mg/m^3) at each measurement point.

However, the mathematical sign ΣX^2 in the formula below is sum of square values of the logarithms of mass concentration at each measurement point.

$$\log \sigma = \{ 1/(n-1)(\Sigma X^2 - n \cdot \overline{X^2})\}^{1/2}$$

$$\Sigma X^2 = (\log^2 Mc_1 + \log^2 Mc_2 + \cdots + \log^2 Mc_n)$$

5) In case of two-day measurement

When the measurement has conducted for two days at same unit working place, the measurement value calculation method is in the same way as above.

However, geometric mean values (**M**: geometric mean value for two-day measurement, M_1 and M_2: geometric mean values for Day 1 and Day 2: mg/m^3) and geometric standard deviation (σ: geometric standard deviation for two-day measurement, σ_1 and σ_2: geometric standard deviation for Day 1 and Day 2) are calculated by the following formula.

$$\overline{X} = \sqrt{M_1 \times M_2}$$

$$\log \overline{X} = 1/2 \{\log M_1 + \log M_2\}$$

$$\therefore M = 10^{\overline{X}} \ (mg/m^3)$$

$$\log \sigma = \sqrt{1/2 (\log^2 \sigma_1 + \log^2 \sigma_2)}$$

(2) Simple and easy method using a relative dust concentration measuring instrument

The relative concentration R_A (cpm) at each measurement point is measured using only relative concentration measuring instrument. If the total measurement time is **t** (total measurement time must be sixty (60) minutes or longer at the unit working place by Measurement A) and the number of measurement points is **n** at the unit working place, the suitable time is determined based on **t/n** and measurement is performed at equal time intervals during the time. (For example, in case of total measurement time **t** = 60 and measurement points **n** = 10, calculating **t/n** = 60/10 = 6, the relative concentration in one minute is measured at intervals of six (6) minutes and recorded at the next measurement point).

The mass concentration **Mc** (mg/m^3) at each measurement point can be easily calculated to multiply the relative concentration R_A (cpm) at each measurement point by conversion value regarding mass concentration conversion coefficient that is decided depending on type of relative concentration measuring instruments in the following table figures. After

calculating the mass concentration at each measurement point, the geometric mean and geometric standard deviation can be calculated by the formula same as above (1), 4) and 5).

Type of relative concentration measuring instrument	**Conversion value**
P－5 L	**1 cpm = 0.04 mg/m^3**
P－5 H	**1 cpm = 0.004 mg/m^3**
LD－1 L	**1 cpm = 0.02 mg/m^3**
LD－1 H	**1 cpm = 0.002 mg/m^3**
LD－3 K	**1 cpm = 0.002 mg/m^3**
LD－5 D	**1 cpm = 0.02 mg/m^3**
LD－5	**1 cpm = 0.002 mg/m^3**
3 4 1 1	**1 cpm = 0.02 mg/m^3**
3 4 2 3	**1 cpm = 0.003 mg/m^3**
3 4 4 2	**1 cpm = 0.003 mg/m^3**

Source: The guideline on countermeasures of dust in the tunnel construction in 2000 (by Ministry of Health, Labour and Welfare in Japan)

3. Calculation of management concentration and evaluation method based on measurement results

(1) Calculation of management concentration

When conducting environmental evaluation using the measurement results in a work environment and formulas for management standard, it is necessary to determine the management concentration **E** of respirable dust (harmful substances) in the work environment.

The management concentration is an indicator to determine the management sections when judging the status of the work environment management of a unit working place based on the results of measurements conducted in the area in accordance with the work environment criteria, to evaluate the harmful substances status in the work environment while proceeding with work environment management.

In other words, the management concentration can be interpreted as follows.

1) The management concentration should be specifically compared with statistically processed measured values and cannot be compared directly with individual measured values.

2) The management concentration is different from the exposure limit (permissible concentration) set on the premise of comparison with the exposure concentration for individual workers.
3) The management concentration is set from an administrative viewpoint to serve the purposes of the work environment management in consideration of i) the exposure limit and exposure criteria in different countries, ii) the feasibility of the work environment management technology and iii) other international trends concerning work environment management.

The Law on Industrial Safety and Health in Japan requires business operators to implement work environment measurement of 92 substances that require management measures and manufacturing permission with penalties because they are highly harmful and may cause health disorders in workers due to occupational exposure.

The Law also requires business operators to evaluate the results of work environment measurement in accordance with the work environment evaluation criteria, and it sets the management concentration for each substance in the criteria.

The expert meeting on Management of Dust Concentrations organized by the Ministry of Health, Labour and Welfare in Japan has reviewed 34 substances of which the management concentration values are higher than the permissible concentration recommended by the Japan Society for Occupational Health (including provisional values and evaluation values corresponding to an excessive carcinogenic risk level) or the exposure limits (including provisional values) presented by the American Conference of Governmental Industrial Hygienists (ACGIH), and compiled a report of the review results in March 2004.

Although this report defined permissible dust concentration as the exposure concentration of inhaled respirable dust that may cause Type 2 pneumoconiosis in radiographic findings in five (5) % of mineworkers who had worked in areas involving dust generation for 40 years, it was considered necessary to review the management concentration in reference to the recent literature from the viewpoint of fully enforcing dust exposure prevention measures.

The current review is based on the exposure limits to silicic and non-silicic dust set by ACGIH (1999) and the concept of the current management concentration (= permissible concentration set by the Japan Society for Occupational Health). ACGIH's exposure limits to silicic and non-silicic dust were substituted by the permissible concentrations of silicic dust 0.05 mg/m^3 and non-silicic dust 3 mg/m^3, respectively, and it was decided to use the following formula, which was obtained as a result, as the management concentration **E**.

In response to this report, the Ministry of Health, Labour and Welfare revised the work environment evaluation criteria and the Ministry of Economy, Trade and Industry

incorporated this resolution into the regulation criteria for Mine Safety Law, and revised related ministerial ordinances in March 2005.

$$E = 3.0 / (0.59\,Q + 1)$$

Q：free silicic acid content by percentage in dust (%)

(2) Overview of the evaluation method

Evaluation of the work environment based on the work environment measurement results shall be conducted by dividing the work environment into three (3) management sections by two (2) evaluation values as follows.

(Management Criteria)	**Management section No.1**
First evaluation value (E_{A1})	
	Management section No.2
Second evaluation value (E_{A2})	
	Management section No.3

1) Management Criteria regarding “Measurement A”

a) First evaluation value (**E_{A1}**)

$$\log E_{A1} = \log M + 1.645 \log \sigma$$

b) Second evaluation value (**E_{A2}**)

$$\log E_{A2} = \log M + 1.151 \log^{2} \sigma$$

2) Management Criteria regarding “Measurement B”

a) First evaluation value (**C_{B1}**)

First evaluation value is as same as management concentration **(E).**

$$C_{B1} = E$$

b) Second evaluation value (**C_{B2}**)

Second evaluation value is one and a half (1.5) times of management concentration **(E)**.

$$C_{B2} = 1.5\,E$$

(3) Management sections

These management sections can be summarized as follows.

1) **Management section No.1**

If all values obtained in “Measurement A” are below the management concentration, the management of dust concentration in the work environment is appropriate.

In other words, exposure concentration exceeding the management of dust concentration is considered absolutely impossible in such working places.

However, it is extremely difficult and unrealistic to ensure that the dust concentration will never exceed the management concentration in all areas and at all times in a unit working place. Therefore, the basic idea of the first evaluation value of the results of “Measurement A” is that, although there may be a slight chance that the dust concentration may exceed the management concentration at a certain time or place in a unit working place, management can be considered appropriate if the probability of exceeding is five (5) % or lower.

In other words, management section No.1 represents the status of a unit working place that is evaluated to have a chance that five (5) or fewer mineworkers out of 100 working in the unit working place may be exposed to a higher concentration than the management concentration.

The first evaluation value regarding “Measurement B” is considered to be the management concentration value. “Measurement B” measures the concentration that is considered the highest in a unit working place, and if the value does not exceed the management concentration, it is assumed that the daily average exposure concentration will not be higher than the management concentration in the area.

Therefore, if the measurement results are lower than the management concentration, the unit working place is evaluated as corresponding to management section No.1.

Accordingly, management section No.1 is a section where the results of “Measurement A” and “Measurement B” (if conducted) are better than the first evaluation value. A work environment classified as such is considered appropriate.

2) **Management section No.2**

Concerning the results of “Measurement A”, the second evaluation value represents the state where the management concentration is equal to the hourly average of the value found by dividing the total amount of respirable dust in the work environment of a unit working place at a certain time by the total volume of air.

Such a state where the total average concentration is equal to the management concentration means that approximately half of the mineworkers in the work environment are subject to exposure exceeding the management concentration.

In other words, management section No.2 represents the status of a unit working place that is evaluated to have a chance that fifty (50) or fewer mineworkers out of 100 working in the unit working place may be exposed to a higher concentration than the management concentration.

The second evaluation value regarding “Measurement B” is one and a half (1.5) times the management concentration.

The exposure limit is indicated by both the ceiling value and the weighted mean time for certain substances currently subject to control. Since the ratio of the ceiling value to the weighted mean time is approximately 1.5 to 1 for such substances, the unit working places where the mean concentration of one exposure does not exceed 1.5 times of the management concentration is classified as management section No.2.

Since mineworkers are more likely to be exposed to concentrations higher than the management concentration in management section No.2 than in management section No.1, it is considered that there is still room for improvement of the management of such work environments.

3) **Management section No.3**

A unit working place evaluated as management section No.3 based on the results of “Measurement A” is an area that is evaluated to have a chance that fifty (50) or more mineworkers out of 100 working in the unit working place may be exposed to a higher concentration than the management concentration.

If the results of “Measurement A” or “Measurement B” (if conducted) are worse than the second evaluation value, the measured work environment is evaluated as management section No.3. This classification means that the work environment management is inappropriate.

(4) Procedure to determine management sections

Figure- 6 shows a flowchart used to determine the management sections based on the management concentration, management criteria and other factors.

Figure - 6 : Flowchart for evaluation based on management result of work environment

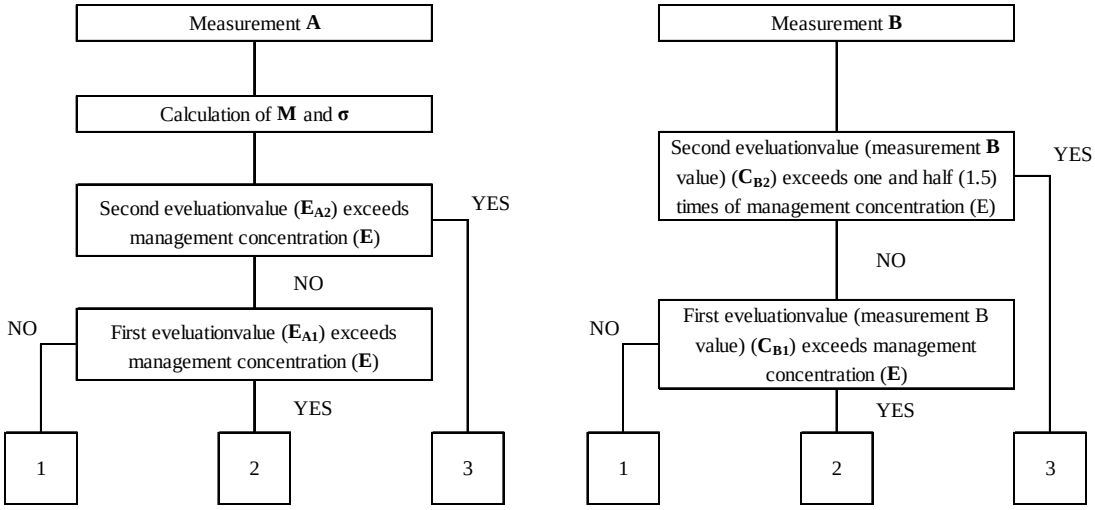
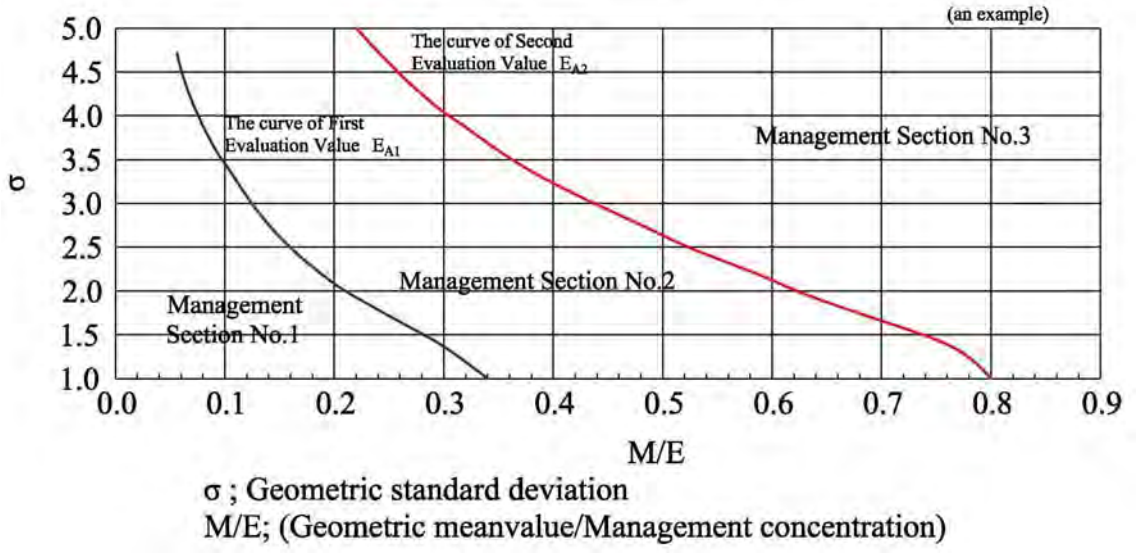


Table- 1: Dividing line between Management Section No.1, No.2 and No.3 by Management Criteria regarding Measurement A



The management sections shall be determined using Flowchart (Figure- 6), Table-1(Dividing line between Management section No.1, No.2 and No.3 by Management Criteria regarding "Measurement A"), Table- 2(Determination of management section based on only "Measurement A ") and Table- 3(Determination of management section based on "Measurement A " and "Measurement B").

If results of the management sections are different between "Measurement A" and "Measurement B", for example management section No.2 in "Measurement A" and management section No.1 in "Measurement B", or management section No.3 in

"Measurement A" and management section No.1 in "Measurement B", there are some problems in measurement design.

It needs to perform the measurement again, some problems recognize after sufficient consideration into the measurement design.

Table- 2: Determination of management section based on only "Measurement A"

Measurement A		
First evaluation value < Measurement concentration	Second evaluation value ≦ Measurement concentration ≦First evaluation value	Second evaluation value > Measurement concentration
Management section No.1	Management section No.2	Management section No.3

Table-3: Determination of management section based on "Measurement A" and "Measurement B"

		Measurement A		
		First evaluation value < Measurement concentration ($E_1 < E$)	Second evaluation value ≦ Measurement concentration ≦First evaluation value ($E_2 \leqq E \leqq E_1$)	Second evaluation value > Measurement concentration ($E_2 > E$)
Measurement B	Measurement B value < Measurement concentration	Management section No.1	Management section No.2	Management section No.3
	Measurement concentration ≦ Measurement B value ≦ Measurement concentration ×1.5	Management section No.2	Management section No.2	Management section No.3
	Measurement B value > Measurement concentration ×1.5	Management section No.3	Management section No.3	Management section No.3

(5) Countermeasures of dust prevention after evaluation

When taking countermeasures of dust prevention, it is necessary to monitor the state of the primary dust generation source, and in case of a working place where contamination from a secondary dust source is likely, the status of such dust should also be monitored correctly. As a result, issues concerning environmental improvement and countermeasures of dust prevention will become self-evident.

Correct work environment measurement should be performed as the first step toward such monitoring. By evaluating the obtained measurement results in accordance with the work environment evaluation criteria, it becomes possible to determine whether the current work environment status is classified as management section No.1 (dust concentration does

not exceed the management concentration at most measurement points), No.2 (geometric mean values of dust concentration for measurement points does not exceed the management concentration) or No.3 (geometric mean values of dust concentration for measurement points exceeds the management concentration).

Even if a unit working place is evaluated as management section No.3 based on the measurement results, the method of proceeding with improvement countermeasures may vary in case such evaluation is based only on “Measurement A” or also includes the results of “Measurement B”.

(6) Measures to be taken by concessionaires at mines

The concessionaires have to take the following measures in addition to those provided by the Mine Safety Law and its Regulations, depending on the management section of the unit working place where the work environment measurements were conducted.

1) Measures in management section No.1

Since the work environment management of the unit working place is considered appropriate, efforts should be made to continue management to maintain the current status.

2) Measures in management section No.2

Further improvement is considered necessary for work environment management of the unit working place. Therefore, efforts should be made to discover the causes of deterioration of the work environment in terms of facilities (including sections where “Measurement B” is performed), work methods and other factors, and to achieve upgrading to management section No.1 by implementing the necessary measures.

If the results of “Measurement B” are worse than the first evaluation value, measures to eliminate the factors causing deterioration of the work environment of the measured sections should be taken. It is also necessary to give consideration to the consolidation of work management.

3) Measures in management section No.3

Work environment management in the unit working place is considered inappropriate. Therefore, efforts should be made in indoor working places on the ground at mines, as well as underground working places, to take the necessary measures to improve dust concentration immediately for upgrading to management section No.1 or No.2.

If the results of “Measurement A” are better than the first evaluation value, measures should be taken to eliminate causes of deterioration of the work environment in terms of facilities, work methods and other factors of the section where

"Measurement B" was conducted. The effect of such measures should be confirmed, work management should be fully enforced and measures should be improved from the health management aspect as necessary.

a) Detailed inspections and surveys should be conducted in terms of raw materials, facilities, work methods, etc. to discover the causes of deterioration factors. Improvement in work methods and more steady implementation of current measures should be promoted, and if possible, comprehensive work environment management measures, including changes of the raw material properties and manufacturing methods, should be taken.

b) After taking the necessary work environment management measures, the effects of such measures should be confirmed by measuring the work environment management in the unit working place.

c) For mineworkers in places where the effect of dust exposure is especially significant, protective devices such as standard dust respirators should be used, other measures should be taken, work management should be fully enforced, and if necessary, surveys of dust exposure should be conducted to ensure the health of mineworkers by consolidating the health management.

(Table 4)

The Dust Concentration Measurement Records Form

1. Name of the Mine (Kinds of ores):
2. Name of the Unit Working Place where Dust Concentration Measurements held:
3. Number of Mineworkers & Kinds of Work at the Unit Working Place:
4. Names/Number of Measuring Instruments Used:
5. Free Silicic Acid Content (%), (Type of sample, Analysis method, Rock type):
6. Balance Used (with sensitivity) & Filters Used:
7. Specifications of the Main Mine Machines Used at the Unit Working Place:
8. Measurement Conditions at the Unit Working Place:
9. Implementation status of Countermeasures for Dust Prevention at the Unit Working Place:
10. Name of Person Who Taking Design and Measurements:
11. Results of Dust Concentration Measurements:
(1) Date of the Measurements:
(2) Time of the Measurements:
(3) Temperature, Humidity and Wind Velocity:

(4) A Mass Concentration Measuring Instrument:

1) Height of inhaled mouth from the floor (m)

2) Volume of inhaled air per a minute (q) (l/min)

3) Inhaling time (t_1) (min)

4) The sum volume of inhaled air ($Q = q \times t_1$) /1000 (m^3)

(5) A Relative Concentration Measuring Instrument for Parallel Measurement:

1) Total Digital Count during parallel measurement (Rn) (count):

2) Measurement time (t_2):

3) Relative Concentration per a minute by Parallel Measurement ($Rc = Rn/ t_2$) (cpm):

(6) Mass concentration Conversion Coefficient

1) Weight of Filter before Measurement (W_1) (mg):

2) Weight of Filter after Measurement (W_2) (mg):

3) Weight of Collecting Respirable Dust ($W = W_2 – W_1$) (mg):

4) Dust Concentration at the Unit Working Place ($Mc = W/ Q$) (mg/m^3):

5) Mass Concentration Conversion Coefficient ($K = Mc/Rc - D$):

12. Drawing a rough sketch at the unit working place including position of each measurement point and number

The Points of Items Mentioned Regarding the Dust Concentration Measurement Records Form

1. Name of the unit working place of dust concentration measurement: a unique name at the mine
2. Mineworkers: total number of mineworkers working directly at the unit working place. If the numbers on the first and second days are different, write the number on the second day in parentheses.
3. Type of work: for example, drilling holes, loading, transportation, boring, crushing, etc.
4. Names/number of measuring instruments used: the numbers assigned to individual instruments and the number of instruments used if there are two or more of the same type of instrument at a mine
5. Free silicic acid content
   (1) Type of sample: scattered dust, deposited dust, collecting raw ore
   (2) Analysis method: phosphoric acid method or x-ray diffraction method
   (3) Rock type: main types of rock generating dust at the unit working place (for example, limestone, shale, sandstone, sandy shale).

6. Balance used: type of balance used for mass measurement of filters and impact plates and its sensitivity (for example, minimum weight of balance sensitivity is 0.0 l mg).
7. Filters used: name of the manufacturer and model number.
8. Specifications of the main mine machines used at the unit working place
   (1) Names, models, output and numbers of mine machines causing dust generation
   (2) When the types and other details of mine machines used on the first and second days are different, write down the details separately for each day.
9. Measurement conditions: mean measurement values of temperature, humidity and wind velocity at the unit working place
10. When writing measurement results in the records form, care must be taken to use the correct units (e.g., Q/m, mg) and calculate the values according to the calculating formulas in parentheses.
11. A rough sketch of the unit working place is drawn including not only position of each measurement point and number but also the distance from dust generated source.

(Table 5)

The Counted Values Form for Relative Concentration Measuring Instrument

1. Name of the Mine (Kinds of ores):
2. Name of the Place Where Dust Concentration Measurements Held:
3. Number of Mineworkers & Kinds of Work in the Working Place:
4. Names/Number of Measuring Instruments Used
5. Specifications of the Main Mine Machines Used:
6. Measurement Conditions at the Unit Working Place:
7. Implementation status of Countermeasures for Dust Prevention at the Unit Working Place:
8. Name of Person Who Taking Design and Measurements:
9. Results of Dust Concentration Measurements Using a Relative Concentration Measuring Instrument:
(1) Date of the Measurements:
(2) Time of the Measurements:
(3) Temperature, Humidity and Wind Velocity:

(4) Measurements Results

(Measurement point) (Measurement time = 1 min.) (Digital Count)

No.1

No.2

No.3

No.4

No.5

No.6

No.7

No.8

No.9

No.10

10. Mass Concentration Conversion Coefficient (K = Mc/Rc - D) or Conversion Value:

11. Free Silicic Acid Content by percentage (%) or Numerical Value for Calculation of Management Concentration:

12. Drawing a rough sketch at the unit working place including position of each measurement point and number

The Points of Items Mentioned Regarding Counted Values Form for Relative Concentration Measuring Instrument

1. Name of the unit working place of dust concentration measurement: a unique name at the mine
2. Mineworkers: total number of mineworkers working directly in the working place. If the numbers on the first and second days are different, write the number on the second day in parentheses.
3. Type of work: for example, drilling holes, loading, transportation, boring, crushing, etc.
4. Specifications of the main mine machines used
   Names, models, output and numbers of mine machines causing dust generation
5. Measurement conditions: mean measurement values of temperature, humidity and wind velocity at the unit working place
6. When calculating mass concentration based on the results of relative concentration at each measurement point using only relative concentration measuring instrument by simple and easy method, the mass concentration **Mc** can be calculated to multiply the relative

concentration $\mathbf{R_A}$ at each measurement point by conversion value in the following table figures.

Type of relative concentration measuring instrument	**Conversion value**
P－5 L	**1 cpm = 0.04 mg/m^3**
P－5 H	**1 cpm = 0.004 mg/m^3**
LD－1 L	**1 cpm = 0.02 mg/m^3**
LD－1 H	**1 cpm = 0.002 mg/m^3**
LD－3 K	**1 cpm = 0.002 mg/m^3**
LD－5 D	**1 cpm = 0.02 mg/m^3**
LD－5	**1 cpm = 0.002 mg/m^3**
3 4 1 1	**1 cpm = 0.02 mg/m^3**
3 4 2 3	**1 cpm = 0.003 mg/m^3**
3 4 4 2	**1 cpm = 0.003 mg/m^3**

Source: The guideline on countermeasures of dust in the tunnel construction in 2000 by Ministry of Health, Labour and Welfare in Japan

7. When calculating management concentration, it needs to get the measurement data of free silicic acid content rate containing in the dust around unit working place.
   Judging from the quality of rocks or minerals (for example, limestone, shale, sandstone, sandy shale etc.) that generated dust around the place, using following numerical value that the data is organized by Department of Resource and Environmental Engineering, Faculty of Science and Engineering. Waseda University shall be applicable to the formula of management concentration **E** instead of analysis data, if the analysis of free silicic acid content is difficult some reasons.
   However, this numerical value shall be paid attention to be used only as a guide to evaluate the propriety of the work environment because free silicic acid content containing scattered dust or deposited dust at a unit working place is actually lower than those of rocks or minerals.

Quality of rocks or minerals	**Numerical value instead of free silicic acid content rate (%)**
Limestone	**0 ～ 8**
Shale	**20 ～ 45**

Sandstone	**25 ～ 65**
Sandy shale	**22 ～ 58**
Tuff	**25 ～ 58**
Clay	**17 ～ 50**
Granite	**29 ～ 38**
Liparite (Rhyolite)	**21 ～ 34**
Dacite	**23 ～ 41**
Peridotite	**0 ～ 1**
Pyroxenite	**0 ～ 1**
Gabbro	**0 ～ 11**
Basalt	**8 ～ 28**
Diabase	**4 ～ 14**

(Sources: Department of Resource and Environmental Engineering, Faculty of Science and Engineering. Waseda University of Japan)

8. **A rough sketch of the unit working place is drawn including not only position of each measurement point and number but also the distance from dust generated source.**

(Reference-1)

Calculation and Evaluation of Measurement Results for Simple and Easy Method Using a Relative Concentration Measuring Instrument

1. Conditions

(1) "Measurement A"

The measurements of dust concentration by "Measurement A" were conducted for simple and easy method using only a relative concentration measuring instrument **(LD-3K type: dark count = 0)** at unit working place of tunneling where ten (10) measurement points at the unit working place were decided in underground Metal mine.

As an alternative to mass concentration conversion coefficient, the conversion value **(1 cpm = 0.002 mg/m^3)** in the view of LD-3K uses in accordance with this manual Ⅰ. 2. (7).

(2) "Measurement B"

The measurement of dust concentration by "Measurement B" was conducted using

only a relative concentration measuring instrument at a certain place and time near the unit working place where dust concentration was considered maximum, the indicator of the relative instrument showed $\mathbf{R_B = 2{,}350}$ count for ten (10) minutes measurement. In addition, deposited dust that was collected near a working place of tunneling and result of analysis for free silicic acid content rate into the dust was **Q = 7.5%**.

2. The results of measurement at a unit working place using only a relative concentration measuring instrument

(1) "Measurement A"

Relative concentration $\mathbf{R_A}$ (cpm) in each measurement point at a unit working place is measured as follows.

$\mathbf{R_{A1} = 55cpm,\ \ R_{A2} = 70cpm,\ \ R_{A3} = 75cpm,\ \ R_{A4} = 60cpm,\ \ R_{A5} = 90cpm,}$
$\mathbf{R_{A6} = 100cpm,\ \ R_{A7} = 75cpm,\ \ R_{A8} = 60cpm,\ \ R_{A9} = 60cpm,\ \ R_{A10} = 70cpm}$

Mass concentration **Mc** (mg/m^3) can be calculated to multiply each relative concentration $\mathbf{R_A}$ by the conversion value **(1 cpm = 0.002 mg/m^3)**.

A geometric mean value **M** and geometric standard deviation value **σ** can be calculated by following formula.

$\mathbf{Mc_1 = R_{A1} \times 0.002 = 0.11mg/m^3,\ Mc_2 = 0.14mg/m^3,\ Mc_3 = 0.15mg/m^3,}$
$\mathbf{Mc_4 = 0.12mg/m^3,\ Mc_5 = 0.18mg/m^3,\ Mc_6 = 0.20mg/m^3,\ Mc_7 = 0.15mg/m^3,}$
$\mathbf{Mc_8 = 0.12mg/m^3,\ Mc_9 = 0.12mg/m^3,\ Mc_{10} = 0.14mg/m^3}$

A geometric mean value M can be calculated as follows.

$$\overline{X} = 1/10\ \{\log 0.11 + \log 0.14 + \log 0.15 + \log 0.12 + \mathrm{Log}0.18 + \log 0.20 + \log 0.15 + \log 0.12 + \log 0.12 + \log 0.14\}$$
$$= 1/10\ \{\blacktriangle 0.958 + \blacktriangle 0.853 + \blacktriangle 0.823 + \blacktriangle 0.920 + \blacktriangle 0.744 + \blacktriangle 0.698 + \blacktriangle 0.823 + \blacktriangle 0.920 + \blacktriangle 0.920 + \blacktriangle 0.853\}$$
$$= 1/10\ \{\blacktriangle 8.512\} = \blacktriangle 0.851$$

$$\therefore\ M = 10^{\overline{X}} = 10^{-0.851} = 0.140\ (mg/m^3)$$

Geometric standard deviation value σ can be calculated as follows.

$$\log \sigma = \{1/(n-1)(\Sigma X^2 - n \cdot \overline{X^2})\}^{1/2}$$

Provided that $\Sigma X^2 = (\log^2 Mc_1 + \log^2 Mc_2 + \log^2 Mc_3 + \log^2 Mc_4 + \log^2 Mc_5 +$

$$\log^2 Mc_6 + \log^2 Mc_7 + \log^2 Mc_8 + \log^2 Mc_9 + \log^2 Mc_{10})$$
$$= (0.917 + 0.727 + 0.677 + 0.846 + 0.553 + 0.487 + 0.677 + 0.846 + 0.846 + 0.727)$$
$$= 7.303$$

$$\log \sigma = \{1/(n-1)(\Sigma X^2 - n \cdot \overline{X^2})\}^{1/2}$$
$$= \{1/9\ (7.303 - 10 \times (\blacktriangle 0.851)^2)\}^{1/2}$$
$$= \{1/9\ (0.063)\}^{1/2}$$
$$= 0.083$$
$$\therefore\ \sigma = 10^{0.083} = 1.210$$

(2) "Measurement B"

Mass concentration (mg / m3) can be calculated to multiply relative concentration R_B that dust concentration is considered maximum at a certain place and time near the unit working place by same conversion value for ten (10) minutes measurement.

$$M_B = R_B \times 0.002 = 2{,}350 / 10 \times 0.002$$
$$= 0.470\ (mg/m^3)$$

(3) Evaluation

1) First evaluation value (E_{A1}) by "Management A"

$$\log E_{A1} = \log M + 1.645 \log \sigma$$
$$= \log 0.140 + 1.645 \log 1.210$$
$$= \blacktriangle 0.853 + 1.645 \times 0.083$$
$$= \blacktriangle 0.717$$

$$\therefore\ E_{A1} = 10^{-0.717} = 0.191\ (mg/m^3)$$

2) Second evaluation value (E_{A2}) by "Management A"

$$\log E_{A2} = \log M + 1.51 \log^2 \sigma$$
$$= \log 0.140 + 1.51 \times \log^2 1.210$$
$$= \blacktriangle 0.853 + 1.51 \times 0.006$$
$$= \blacktriangle 0.844$$
$$\therefore\ E_{A2} = 10^{-0.844} = 0.143\ (mg/m^3)$$

3) Management concentration **E** (mg/m^3)

Management concentration **E** (mg/m^3) can be calculated using the result of analysis for free silicic acid content rate **(Q = 7.5%)** into the dust in the working place of tunneling by following formula.

$$\mathbf{E = 3.0 / (0.59\ Q + 1)}$$
$$\mathbf{= 3.0 / (0.59 \times 7.5 + 1)}$$
$$\mathbf{= 0.552\ (mg/m^3)}$$

4) First evaluation value ($\mathbf{C_{B1}}$) by "Management B"

$$\mathbf{C_{B1} = E = 0.552\ (mg/m^3)}$$

5) Second evaluation value ($\mathbf{C_{B2}}$) by "Management B"

$$\mathbf{C_{B2} = 1.5\ E = 1.5 \times 0.552 = 0.828\ (mg/m^3)}$$

6) Evaluation

In accordance with the procedures to determine the management sections, the management section should be determined by the Management Criteria regarding "Measurement A" ($\mathbf{E_{A1} = 0.191, E_{A2} = 0.143}$) and "Measurement B"($\mathbf{C_{B1} = 0.552, C_{B2} = 0.828}$).

a) "Measurement A"

$\mathbf{E_{A2} = 0.143 < E = 0.552}$

(Second evaluation value by "Measurement A" is less than management concentration)

$\mathbf{E_{A1} = 0.191 < E = 0.552}$

(First evaluation value by "Measurement A" is less than management concentration)

b) "Measurement B"

$\mathbf{C_{B2} = 0.470 < 1.5\ E = 0.828}$

(Measurement value by "Measurement B" is less than Second evaluation value that is an equivalent to one and a half times of

management concentration)

C_{B1} = **0.470** < **E** = **0.552**

(Measurement value by "Measurement B" is less than First evaluation value that is equivalent to management concentration)

c) Conclusion

In accordance with the Management Criteria, both of "Measurement A" and "Measurement B" are applicable to **the management section No.1**, it is considered that the work environment management at the unit working place of tunneling in underground Metal mine is an appropriate.

(Reference-2)

Calculation and Evaluation of Measurement Results for Simple and Easy Method Using a Relative Concentration Measuring Instrument

1. Conditions

(1) "Measurement A"

The measurements of dust concentration by "Measurement A" were conducted for simple and easy method using only a relative concentration measuring instrument **(LD-3K type: dark count = 0)** at the unit working place of indoor working place where ten (10) measurement points were decided in the open-pit mine (limestone).

As an alternative to mass concentration conversion coefficient, the conversion value **(1 cpm = 0.002 mg/m^3)** in the view of LD-3K uses in accordance with this manual Ⅰ. 2. (7).

(2) "Measurement B"

The measurement of dust concentration by "Measurement B" was conducted using only a relative concentration measuring instrument at a certain place and time near the unit working place where dust concentration was considered maximum, the indicator of the relative instrument showed R_B **= 2,780** count for ten (10) minutes measurement. In addition, deposited dust that was collected in the indoor working place and result of analysis for free silicic acid content rate into the dust was **Q = 8.0%**.

2. The results of measurement at a unit working place using only a relative

concentration measuring instrument

(1) "Measurement A"

Relative concentration $\mathbf{R_A}$ (cpm) in each measurement point at a unit working place is measured as follows.

R_{A1} = 235cpm, R_{A2} = 140cpm, R_{A3} = 190cpm, R_{A4} = 255cpm,
R_{A5} =130cpm, R_{A6} = 185cpm, R_{A7} = 210cpm, R_{A8} = 295cpm,
R_{A9} = 280cpm, R_{A10} = 170cpm

(2) Calculation

Mass concentration **Mc** (mg/m^3) can be calculated to multiply each relative concentration $\mathbf{R_A}$ by the conversion value **(1 cpm = 0.002 mg/m^3)**.

A geometric mean value **M** and geometric standard deviation value **σ** can be calculated by following formula.

$Mc_1 = R_{A1} \times 0.002 = 0.47 mg/m^3$, $Mc_2 = 0.28 mg/m^3$, $Mc_3 = 0.38 mg/m^3$,
$Mc_4 = 0.51 mg/m^3$, $Mc_5 = 0.26 mg/m^3$, $Mc_6 = 0.37 mg/m^3$, $Mc_7 = 0.42 mg/m^3$,
$Mc_8 = 0.59 mg/m^3$, $Mc_9 = 0.56 mg/m^3$, $Mc_{10} = 0.34 mg/m^3$

A geometric mean value M can be calculated as follows.

$$\log \overline{X} = 1/10 \{\log 0.47 + \log 0.28 + \log 0.38 + \log 0.51 + \mathrm{Log} 0.26 + \log 0.37 + \log 0.42 + \log 0.59 + \log 0.56 + \log 0.34\}$$
$$= 1/10 \{\blacktriangle 3.931\} = \blacktriangle 0.393$$

$$\therefore\ M = 10^{\overline{X}} = 10^{-0.393} = 0.404\ (mg/m^3)$$

Geometric standard deviation value σ can be calculated as follows.

$$\log \sigma = \{1/(n-1)(\Sigma X^2 - n \cdot \overline{X^2})\}^{1/2}$$

$$\text{Provided that } \Sigma X^2 = (\log^2 Mc_1 + \log^2 Mc_2 + \log^2 Mc_3 + \log^2 Mc_4 + \log^2 Mc_5 + \mathrm{Log}^2 Mc_6 + \log^2 Mc_7 + \log^2 Mc_8 + \log^2 Mc_9 + \log^2 Mc_{10})$$
$$= (0.106 + 0.304 + 0.176 + 0.085 + 0.342 + 0.185 + 0.141 + 0.052 + 0.063 + 0.219)$$
$$= 1.673$$

$$\log \sigma = \{1/(n-1)(\Sigma X^2 - n \cdot \overline{X^2})\}^{1/2}$$
$$= \{1/9\ (1.673 - 10 \times (\blacktriangle 0.393)^2)\}^{1/2}$$

$= \{1/9\ (0.129)\}^{1/2}$

$= 0.119$

$\therefore\ \sigma = 10^{0.119} = 1.317$

(3) "Measurement B"

Mass concentration (**mg / m^3**) can be calculated to multiply relative concentration $\mathbf{R_B}$ that dust concentration is considered maximum at a certain place and time near the unit working place by same conversion value for ten (10) minutes measurement.

$$M_B = R_B \times 0.002 = 2{,}780 / 10 \times 0.002$$
$$= \ 0.556\ (mg/m^3)$$

(4) Evaluation

1) First evaluation value ($\mathbf{E_{A1}}$) by "Management A"

$$\log E_{A1} = \log M + 1.645 \log \sigma$$
$$= \log 0.404 + 1.645 \log 1.317$$
$$= \blacktriangle\ 0.393 + 1.645 \times 0.119$$
$$= \blacktriangle\ 0.198$$

$$\therefore\ E_{A1} = 10^{-0.198} = 0.633\ (mg/m^3)$$

2) Second evaluation value ($\mathbf{E_{A2}}$) by "Management A"

$$\log E_{A2} = \log M + 1.51 \log^2 \sigma$$
$$= \log 0.404 + 1.51 \times \log^2 1.317$$
$$= \blacktriangle\ 0.393 + 1.51 \times 0.014$$
$$= \blacktriangle\ 0.372$$

$$\therefore\ E_{A2} = 10^{-0.372} = 0.424\ (mg/m^3)$$

3) Management concentration **E** (mg/m^3)

Management concentration **E** (mg/m^3) can be calculated using the result of analysis for free silicic acid content rate **(Q = 8.0%)** into the dust in the working place of tunneling by following formula.

$$E = 3.0 / (0.59\,Q + 1)$$
$$= 3.0 / (0.59 \times 8.0 + 1)$$
$$= 0.524 \quad (mg/m^3)$$

4) First evaluation value (C_{B1}) by “Management B”

$$C_{B1} = E = 0.524 \quad (mg/m^3)$$

5) Second evaluation value (C_{B2}) by “Management B”

$$C_{B2} = 1.5\,E = 1.5 \times 0.524 = 0.786 \quad (mg/m^3)$$

6) Evaluation

In accordance with the procedures to determine the management sections, the management section should be determined by the management criteria regarding “Measurement A” ($E_{A1} = 0.633$, $E_{A2} = 0.424$) and “Measurement B”($C_{B1} = 0.524$, $C_{B2} = 0.786$).

a) “Measurement A”

$E_{A2} = 0.424 < E = 0.524$

(Second evaluation value by “Measurement A” is less than management concentration)

$E_{A1} = 0.633 > E = 0.524$

(First evaluation value by “Measurement A” is more than management concentration)

b) “Measurement B”

$M_B = 0.556 < C_{B2} = 1.5\,E = 0.786$

(Measurement value by “Measurement B” is less than Second evaluation value that is an equivalent to one and a half times of management concentration)

$M_B = 0.556 > C_{B1} = E = 0.524$

(Measurement value by “Measurement B” is more than First evaluation value that is equivalent to management concentration)

c) Conclusion

In accordance with the Management Criteria, both of “Measurement A” and “Measurement B” are applicable to **the management section No.2**, it is considered that the work environment management at the unit working place of the indoor working place in the open-pit mine needs to be continuous improvement.

Manual on Risk Management for Mine Safety

March 2016

1. The meaning and necessary of risk management system at mines

Before mine disasters or mine pollution become apparent at mines, identify risks, analyze and evaluate each of them, investigate suitable countermeasures for risks, and then implement appropriate measures due to execution of the survey of mine safety conditions with application of techniques of risk management system.

2. The application of "Risk Management System" to the survey of mine safety conditions

(1) Identification of risks ⟶ (2) Analysis of risks ⟶ (3) Evaluation of risks ⟶ (4) Countermeasure for risks

1) What is the possibility of some kind of mine disaster or mine pollution occurring at a mine?
2) If a mine disaster or mine pollution occurred, what kind of effects would be at a mine?
3) What is the possibility of a mine disaster or mine pollution at a mine?
4) What are the causes of mine disaster or mine pollution at a mine?

(Countermeasure for risks)
1) Avoidance of risks: withdrawal from risks (for example, stopping the use or disuse of mine machines, equipment and other facilities)
2) Reduction of risks: taking measures to reduce the probability of a crisis occurring from risks or reduce the scale of damage
3) Transferring of risks: sharing the load of loss from risks with a third party (for example, preparing for occurrence of a crisis, and preparing insurance)
4) Possession of risks: while being the existence of risks, acknowledge the load of loss related to the identified risks (for example, monitoring risks)

3. Prescribed articles concerning the survey of mine safety conditions in draft of Mine Safety Law and its Regulation in Kingdom of Cambodia

(1) Mine Safety Law (draft)

(The survey of mine safety conditions)

Article 18

1 When concessionaires of mines that employ more than thirty (30) mineworkers at all times shall start, temporarily stop (more than one month) , restart and

expire the mineral-related operations at mines, and when methods of the operations change considerably, as prescribed in the ministerial ordinance, the survey of mine safety conditions shall be carried out before those actions, and appropriate measures taken to deal with items recognized as matters for improvement.

2 The concessionaires shall record and conserve the results of the survey according to the procedures prescribed by the ministerial ordinance.

(2) Mine Safety Regulation (draft)

(Execution of the survey of mine safety conditions)

Article 40

The concessionaires must execute the survey of mine safety conditions as following items in accordance with Article 18, Paragraph 1 of the Law.

1) to start mineral-related operations at a mine after getting permission by the Minister in charge of mines sector;
2) to suspend mineral-related operations for more than one month, and to renew the operations;
3) to have significant modification of mineral-related operations, and;
4) to renounce the right of mineral-related operations at a mine or to abolish the operations.

(Items of the survey of mine safety conditions)

Article 41

The concessionaires must find out and evaluate risk factors at mines, and take appropriate measures that need improving as the effect of the survey of mine safety conditions as following items in accordance with Article 18, Paragraph 1of the Law.

1) the conditions of mineral working field and its neighboring;
2) the conditions of surroundings at a mine;
3) necessary measures for safety that the concessionaire must take, in accordance with Article 5 of the Law;
4) harmful items that cause mine disaster or mine pollution, except each preceding Item above.

(Records of the survey of mine safety conditions)

Article 42

The concessionaire shall record and conserve the results of the survey for five

(5) years from the date of the survey was executed in accordance with Article 18, Paragraph 2 of the Law.

4. A case of practical use of risk management system at mines in Japan

(1) Implementation of safety patrols (frequency: once a month)

1) Composition of safety patrol members: Technical safety staff in each workplace (three (3) people per group x three (3) groups = 9 technical safety staff members)

2) Duties of a safety patrol:

a) Patrol working places and mine facilities, and inspect the observance of the "manuals on work procedure at the mine" and the safety of mine machines and tools.

b) Discover and confirm hazard factors regarding mine disasters and mine pollution. (Identifying of risks)

3) Discuss risk analysis and evaluation, and suitable countermeasures for risks

a) At group conferences in which all safety patrol members participate, discuss the probability that mine disasters or mine pollution will become apparent and their effects in relation to the discovered hazard factors. (Analysis of risks)

b) At group conferences, discuss "Risk Evaluation Levels" and "Risk Evaluation Ranks" for each hazard factor based on the "Risk Evaluation Standard Chart". (Evaluation of risks)

c) At group conferences, discuss suitable countermeasures for each risk, and make a report on the results of analysis, evaluation and suitable countermeasures for risks. (Countermeasures for risks)

(2) Confirmation and determination of risk analysis and evaluation, and suitable countermeasures for risks by Safety Committee at the mine

a) Report the results of analysis, evaluation and suitable countermeasures for risks as confirmed by the implementation of a safety patrol.

b) Confirm and determine the "Risk Evaluation Levels", "Risk Evaluation Ranks", and suitable countermeasures for each risk through the safety committee.

c) Regarding risk reduction measures, plan to review the "manuals on work procedure at the mine", and reflect this review in the "Safety Rules at the mine", if necessary.

(3) Implementation and verification of appropriate measures

a) Carry out appropriate measures at each working place for suitable countermeasures for risks determined by the safety committee.

b) Report and verify the implementation of measures at the safety committee

meeting held the next month.

5. Preparation Risk Evaluation Level & Rank Chart based on the Risk Evaluation Standard Chart

(1) The Constituents of Risk Evaluation Standard concerning Mine Disaster

1) The Constituents of Risk Evaluation Standard concerning Mine Disaster

unit: point

A: Degree of Mine Disaster		B: Possibility of Outbreak of Mine Disaster	
Fatality		Very High Possibility	
Serious Injury or Physical Disability		High Possibility (Frequency: a level of once per month)	
Minor Injury (less than 2 weeks off-work)		Low Possibility (Frequency: a level of once per six months)	
Slight Injury (less than 3 days off-work)		Very Low Possibility or Seldom Occurrence	

2) Risk Evaluation Level & Rank concerning Mine Disaster

A+B	Evaluation Level	Evaluation Rank
	An Unallowable Hazard Factor exists	IV
	A Serious Hazard Factor exists	III
	A Hazard Factor exists	II
	Needless of Countermeasure	I

(2) The Constituents of Risk Evaluation Standard concerning Mine Pollution

1) The Constituents of Risk Evaluation Standard concerning Mine Pollusion

unit: Point

A: Damage degree		B: Possibility of Outbreak of Mine Pollution	
annihilate damage		Very High Possibility (always)	
heavy damage (more than a few months operation suspended)		High Possibility (Frequency: a level of once per year)	
medium−scale damage (around one week oeration suspended)		Low Possibility (Frequency: a level of once per ten odd years)	
small−scale damage (several days operation suspended)		Very Low Possibility or Seldom Occurrence	

C: Influence to the community	
great influence of environmental contamination	
Large−scale of environmental contamination	
medium−scale of environmental contamination	
small−scale of environmental contamination	

(3) Risk Evaluation Level & Rank concerning Mine Disaster or Mine Pollution

A+B+C	Evaluation Level	Evaluation Rank
	An Unallowable Hazard Factor exists	IV
	A Serious Hazard Factor exists	III
	A Hazard Factor exists	II
	Needless of Countermeasure	I

(Risk Evaluation Rank)

Ⅳ : A prompt countermeasure is required.

Ⅲ : A planned countermeasure is required.

Ⅱ : An enlightenment movement or calling people's attention

Ⅰ : Needless of countermeasures especially

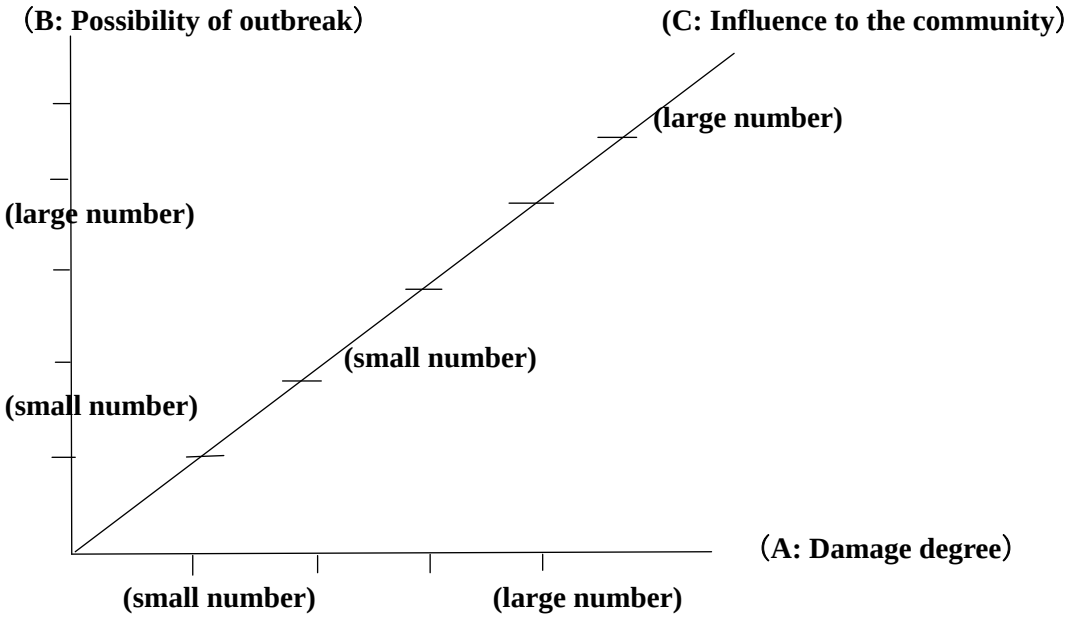
(4) Risk Management Chart concerning Mine Disaster or Mine Pollution

Date: **Group:**

Mine Facility or Working Place	The Hazard Factors concerning Mine Disasters or Mine Pollution	Risk Evaluation Level	
		Sum (A+B+ C)	Rank
(Countermeasures against a hazard factor)			
(Countermeasures against a hazard factor)			

(5) The view point of creation of "Risk Evaluation Level & Rank"

Grouping the sum of constituents that is decided by the "Risk Evaluation Standard" can be specified an extent of level and rank of "Risk Evaluation Level & Rank" using the following table.



(reference)

How to determine an extent of level and rank for “Risk Evaluation Level & Rank” concerning Mine Disaster

1. The constituents of Risk Evaluation Standard concerning Mine Disaster

1) The Constituents of Risk Evaluation Standard concerning Mine Disaster

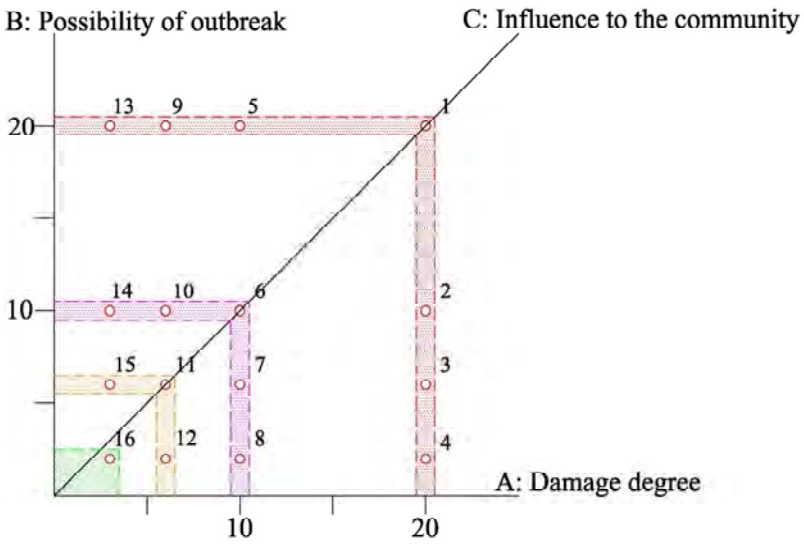
unit: Point

A: Degree of Mine Disaster		B: Possibility of Outbreak of Mine Disaster	
Fatality	20	Very High Possibility	20
Serious Injury or Physical Disabili	10	High Possibility (Frequency: a level of once per month)	10
Minor Injury (less than 2 weeks off-work)	6	Low Possibility (Frequency: a level of once per six months)	6
Slight Injury (less than 3 days off-work)	3	Very Low Possibility or Seldom Occurrence	2

2. The case of sum of constituents of Risk Evaluation Standard

(A+B)

1) a1 + b1 = 20 + 20 = 40
2) a1 + b2 = 20 + 10 = 30
3) a1 + b3 = 20 + 6 = 26
4) a1 + b4 = 20 + 2 = 22
5) a2 + b1 = 10 + 20 = 30
6) a2 + b2 = 10 + 10 = 20
7) a2 + b3 = 10 + 6 = 16
8) a2 + b4 = 10 + 2 = 12
9) a3 + b1 = 6 + 20 = 26
10) a3 + b2 = 6 + 10 = 16
11) a3 + b3 = 6 + 6 = 12
12) a3 + b4 = 6 + 2 = 8
13) a4 + b1 = 3 + 20 = 23
14) a4 + b2 = 3 + 10 = 13
15) a4 + b3 = 3 + 6 = 9
16) a1 + b4 = 3 + 2 = 5



3. Determination of an extent of level and rank of "Risk Evaluation Level & Rank"

Risk Evaluation Level & Rank concerning Mine Disaster

A+B	Evaluation Level	Evaluation Rank
22～40	An Unallowable Hazard Factor exists	IV
12～20	A Serious Hazard Factor exists	III
8～12	A Hazard Factor exists	II
≦5	Needless of Countermeasure	I

Mine Safety Inspection Manual

(General Inspection vol.1:　Prevention of Mine Disaster)

August 2016

Chapter I : Preparation prior to conducting a general inspection (prevention of mine disaster)

1. Matters to be grasped prior to conducting a general inspection (prevention of mine disaster)

Mine safety inspectors and the staff concerned in the authorities in charge of mines sector (hereinafter “the inspectors”) shall investigate/examine the following matters prior to conducting a general inspection (prevention of mine disaster) at a mine and grasp status of mineral-related operations and safety of the concerned mine.

(1) Mining plan

The inspectors shall grasp matters in advance regarding items of “mine safety” contained in the mining plan for conducting mineral-related operations prescribed in the article 21, paragraph 4 of the “Law on Management and exploitation of Mineral Resources”, and to grasp any problems regarding mine safety with neighboring mining areas as necessary.

(2) Safety rules

The inspectors shall grasp matters in advance regarding establishment of own safety rules at the mine and contents of the rules.

(3) Submission items

The inspectors shall grasp matters in advance regarding the submission items prescribed in the Mine Safety Law and its regulations (hereinafter “the Law and its regulations”), and permission of mine buildings and structures to be used for the mineral-related operations.

(4) Safety management system

The inspectors shall grasp matters in advance regarding the appointment of a safety supervisor and a representative safety supervisor, as well as the details of the submission thereof.

(5) Mine safety diagrams

The inspectors shall grasp matters in advance regarding submission of drawing-up mine safety diagrams and contents of them.

(6) Special mineral-related operations plan

The inspectors shall grasp matters in advance regarding submission and permission of “special mineral operations plan”, which is drafted by the mine in which minerals and

tunnels are dug under the sea, rivers, lakes, or any place where there is a risk of mine pollution, impacts or mine disaster by flood occurring.

(7) Pending issues and problems

The inspectors shall take a hearing with the inspectors who conducted the previous general inspection (prevention of mine disaster) regarding pending issues and problems for the concerned mine and to grasp matters in advance the details thereof.

(8) General condition of mineral-related operations at the concerned mine

The inspectors shall grasp matters in advance regarding past inspection results from the reports of general inspection (prevention of mine disaster) as followings: the status of mineral-related operations of the concerned mine, the change of mineral output, the change of the number of mineworkers, the general conditions of mine disasters or mine pollution problems in the past, the general conditions of violations of the Law and its regulations, etc.

2. Preparation prior to conducting a general inspection (prevention of mine disaster)

(1) Pre-meeting regarding a general inspection and drafting the implementation plan for the inspection

In conducting a general inspection (prevention of mine disaster), the inspectors who are to be conducting the inspection shall hold a pre-meeting to extract the inspection points (priority items) for the concerned mine to conduct the inspection more effectively and efficiently based on the following matters: the scale of mineral-related operations of the concerned mine, the improvement instruction items from the previous inspection, pending issues and problems, general conditions of mine disaster and mine pollution problems, the supervision/instruction policies set by government authorities, etc.

Furthermore, an implementation plan for the general inspection (inspection schedule, priority items for the inspection, division of inspection areas by the inspectors, etc.) shall be drafted with instructions regarding the inspection from the supervisors of the authorities as necessary.

(2) Preparation of a general inspection documents and instruments

In conducting a general inspection, the following documents and instruments shall be prepared as necessary.

1) reports of the general inspection (prevention of mine disaster) in the past (copy)
2) documents of “Mine Safety Inspection Rule”
3) mine safety diagrams of the concerned mine (copy)
4) some pieces of improvement instruction form, and orders for warning and directing form

5) a field notebook
6) a work uniform, safety boots, and safety gloves
7) a safety cap (a hard hat) and a standard dust respirator
8) a clinometer and a measuring tape
9) a precision flammable gas detector (for underground coal mines and mines where flammable gas is detected)
10) various gas detectors (CO, CO_2, H_2S, etc.)
11) a camera
12) the certificate of mine safety inspector

Chapter II : Conducting a general inspection (prevention of mine disaster)

1. Conducting a general inspection (prevention of mine disaster) at a mine office

The inspectors shall hold a hearing with the safety supervisor and the technical safety manager (hereinafter “safety seniors”), and the technical safety staff of the concerned mine at a mine office regarding following matters and check the details of the records and items mentioned in the documents (safety diary, maintenance ledger, records management etc.) prescribed in the Law and its regulations, and shall confirm whether there are any hindrances or problems on following matters for ensuring safety of the mine concerned; in case matters deemed inadequate in terms of safety, the inspectors shall provide improvement guidance for the safety seniors.

(1) Hearings, confirmation, and guidance regarding general conditions of mineral-related operations

The inspectors shall hold a hearing with the seniors of the mine, regarding general conditions of mineral-related operations (mineral output, current working places, mineral production status) and the mining plan, and shall confirm whether there are any hindrances
or problems on the contents of the mineral-related operations and the mining plan for ensuring safety of the mine concerned; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

(2) Hearings, confirmation, and guidance regarding the scope of duties of safety supervisor, etc., and the status of labor management

1) The scope of duties of safety supervisor, technical safety manager, and technical safety staff

The inspectors shall hold a hearing with the safety seniors of the mine regarding the concrete scope of duties for the safety supervisor, technical safety manager, and

technical safety staff and check the scope of duties being clear defined through the records and items mentioned, and shall confirm whether there are any hindrances or problems on safety management system for ensuring safety of the mine concerned; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

2) Status of labor management

The inspectors shall hold a hearing with the safety seniors of the mine regarding the change in registered mineworkers and future employment plan, and shall confirm whether there are any hindrances and problems on the status of labor management for ensuring safety of the mine concerned; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

(3) Hearings, confirmation, and guidance regarding the assignment status of the technical safety staff

The inspectors shall hold a hearing with the safety seniors of the mine that suitable number of technical safety staff are secured and assigned based on the scale of the mineral-related operations and the status of mine machineries, and are posted working places of the mine and check them through safety diaries, maintenance ledgers and records management, and shall confirm whether there are any hindrances and problems on suitable number of technical safety staff are secured and assigned for ensuring safety of the mine concerned; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

(4) Hearings, confirmation, and guidance regarding status of safety training to mineworkers

The inspectors shall hold a hearing with the safety seniors of the mine regarding implementation of safety training to new non-skill mineworkers who engage at a underground mine and mineworkers who engage in the hazardous works prescribed in the Law and its regulations and check the implementation and contents of the training through the records, and shall confirm whether there are any hindrances and problems on contents of the training for ensuring safety of the mine concerned; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

(5) Hearings, confirmation, and guidance regarding restriction of caution items on machineries, equipment, etc., which are used or installed at the mine

The inspectors shall hold a hearing with the safety seniors of the mine regarding

particularly dangerous machineries, equipment, explosives, and other materials used or installed in the underground mine meet categorized approval tests or inspection tests and check them through the certifications of the tests, and shall confirm whether there are any hindrances and problems on use or installation of dangerous machineries and other materials for ensuring safety of the mine concerned; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

(6) Hearings, confirmation, and guidance regarding safety committee

The inspectors shall hold a hearing with the safety seniors of the mine regarding the establishment and activities of the safety committee and check the details of research and deliberations of important matters within the activities of the committee through the records, and shall confirm whether there are any hindrances and problems on activities of the committee for ensuring safety of the mine concerned; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

(7) Hearings, confirmation, and guidance regarding surveys of mine safety conditions

The inspectors shall hold a hearing with the safety seniors of the mine regarding implementation of surveys of mine safety conditions prescribed in the Law and its regulations and check the contents of the survey results through the records, and shall confirm whether there are any hindrances and problems on implementation of the surveys for ensuring safety of the mine concerned; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

(8) Hearings, confirmation, and guidance regarding contractual work

The inspectors shall hold a hearing with the safety seniors of the mine and check whether the contractual work plan has already been drafted and submitted to the Minister in charge of mines sector when a contractor other than mineworkers has been engaged more than one month at underground working places, or has been engaged hauling or disposal of mining waste in or outside the mine, and shall confirm whether there are any hindrances and problems on contents and implementation of contractual work for ensuring safety of the mine concerned; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

(9) Hearings, confirmation, and guidance regarding matters for improvement instruction for mine safety

The inspectors shall hold a hearing with the safety seniors of the mine regarding the status of improvement matters that were indicated by the inspectors with the improvement instruction for mine safety in the past and check the propriety of the status of improvement, the state of its progress, the scheduled completion date, etc., and shall confirm whether there are any hindrances and problems on the status of the improvement for ensuring safety of the mine concerned; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

If improvement matters that were indicated by the improvement instruction from the past remain unimplemented, a hearing shall be held regarding the reasons.

(10) Hearings, confirmation, and guidance regarding restoration of closed mineral working place or its utilization plan at an open-pit mine

The inspectors shall hold a hearing with the safety seniors of an open-pit mine regarding the restoration plan for backfilling, soil covering, and planting concerning treatment of closed mineral working place or the reutilization plan of its place when the mineral working place at an open-pit mine is going to be closed or has already been closed, and shall confirm whether there are any hindrances and problems on contents of the restoration plan or the reutilization plan for ensuring safety of the mine concerned; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

(11) Hearings, confirmation, and guidance regarding rescue activities and mechanisms at the time of occurrence of mine disaster or emergency

The inspectors shall hold a hearing with the safety seniors of underground coal mine (Class-A coal pit and Class-B coal pit) regarding the appropriate rescue mechanisms and communication system installed for the time of mine disaster or mine pollution or any other similar emergency occurring and the concrete contents of following trainings being carried out.

The inspectors shall also confirm whether there are any hindrances and problems on contents of rescue mechanisms and communication system for ensuring safety of the mine concerned; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

1) Evacuation training carries out to underground mineworkers once or more in six months regularly.
2) Organizing mine rescue crews, and rescue training carries out once or more in six

months regularly.

(12) Hearings, confirmation, and guidance regarding awareness raising on mine safety

The inspectors shall hold a hearing with the safety seniors of the mine regarding specific engagement of awareness raising on mine safety, current or planned, and shall check the achievements and drafted plans, and shall confirm whether there are any hindrances and problems on awareness raising on ensuring safety of the mine concerned; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

(13) Hearings and confirmation regarding the environmental conditions surrounding the mine and public facilities

The inspectors shall hold a hearing with the safety seniors of the mine regarding environmental conditions of residences, agricultural lands, rivers, etc., surrounding the mine and the presence of public facilities (roads, bridges, multi-purpose dams, parks, hospitals, schools, etc.,), and shall confirm whether there are any hindrances and problems on separating distance between mine working fields and public facilities for ensuring safety of the mine concerned; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

(14) Hearings and confirmation regarding complaints from local residents

The inspectors shall hold a hearing with the safety seniors of the mine regarding complaints concerning mineral-related operations or requests from the local residents surrounding the mine and check its details and measures taken by the mine concerned, and confirm whether there are any hindrances and problems on contents of the measures taken for ensuring safety of the mine concerned; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

(15) Hearings and confirmation regarding the financial condition of the mining company

The inspectors shall hold a hearing with responsible persons in charge of finances of the mine regarding the financial condition of the mining company if necessary, and shall confirm whether there are any hindrances and problems on the financial condition for ensuring safety of the mine concerned; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

2. Confirmation and guidance regarding safety diaries, maintenance ledgers and records management prescribed in the Law and its regulations at a mine office

(1) Confirmation and guidance regarding items mentioned in various safety diaries

The inspectors shall confirm whether various safety diaries containing operation state of safety works in each place, measures taken for safety, etc., prescribed in the Law and its regulations are maintained by technical safety staff, whether format and items mentioned of the diaries are adequate, and whether the diaries are inspected by the safety seniors of the mine; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

1) The diary for surface safety & blasting containing operation state of safety works in each place, implementation of blasting, preservation states of facilities, measures taken for safety and results, etc., as recorded by a technical safety staff for surface safety and blasting

2) The diary for underground safety & blasting containing operation state of safety works in each place, implementation of blasting, preservation states of facilities, measures taken for safety and results, etc., as recorded by a technical safety staff for underground safety and blasting

3) The diary for machinery safety containing operation, maintenance, repair and intermission states of machineries and instruments, and other important matters for safety as recorded by a technical safety staff for machinery

4) The diary for electricity safety containing operation, maintenance, repair and intermission states of electrical machines, appliances, portable safety lamp, wiring, moving cables, grounding (earth) and wire-way, and other important matters for safety as recorded by a technical safety staff for electricity

5) The diary for prevention of mine pollution containing operation states of facilities, measures for mine pollution prevention, results of periodic measurements of necessary items and analysis, and other important matters for safety as recorded by a technical safety staff for prevention of mine pollution

6) The diary for boilers safety containing operation, maintenance, repair and intermission states of boilers or special type boilers, and other important matters for safety as recorded by a technical safety staff for boilers

7) The diary for explosives safety containing management of explosives and its facilities, the situation of dealing and handling in explosives, and other important matters for safety as recorded by a technical safety staff for explosives

8) The diary for poisonous and deleterious substances safety containing management of poisonous and deleterious substances, and its depots, the situation of dealing and

handling in aforesaid substances, and other important matters for safety as recorded by a technical safety staff for poisonous and deleterious substances

(2) Confirmation and guidance regarding items mentioned in various maintenance ledgers And records management containing results of periodic examinations or measurements

The inspectors shall confirm whether various maintenance ledgers, records management containing precise examinations or measurements prescribed in the Law and its regulations are maintained and stored by technical safety staff, whether there are any problems with the results of examinations or measurement, and whether maintenance ledgers and records management are inspected by the safety seniors of the mine; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

1) The maintenance ledger for machineries and instruments containing the results of detailed periodic inspections for machineries and instruments which require especially safety cautions as recorded by a technical safety staff for machinery
2) The maintenance ledger for electrical machines and equipment containing the results of detailed periodic inspections for electrical machines, appliances, wiring, moving cables, grounding (earth) which require especially safety cautions as recorded by a technical safety staff for electricity
3) The record management for results of measurement of dust concentration in the air and content rate of free silicic acid into the dust at underground working places or indoor working places that dust scattering occurs remarkably as recorded by a technical safety staff for underground safety & blasting or a technical safety staff for surface safety & blasting
4) The record management for results of measurement of ventilation quantity in underground containing atmospheric pressure, temperature, velocity and quantity of underground ventilation, concentration of flammable gas as recorded by a technical safety staff for underground safety & blasting of underground coal mine (Class-A coal pit and Class-B coal pit)
5) The maintenance ledger for boilers containing the results of detailed periodic inspections for boilers and special type boilers as recorded by a technical safety staff for boilers
6) The record management for vehicle type mine machines and automobiles containing results of detailed periodic inspections for the parts of vehicle type mine machines and automobiles as recorded by the concessionaire or a person officially qualified for maintenance of vehicle type mine machines and automobiles instead

7) The records of evaluation on environment of underground working places or indoor working places in terms of scattered dust concentration in the air and content rate of free silicic acid into the dust based on the results of measurement conducted by a technical safety staff for underground safety & blasting or a technical safety staff for surface safety & blasting as stored by the concessionaire (prescribed in the Mine Safety Regulation (phase 2))

3. Conducting a general inspection (prevention of mine disaster) to the mine facilities and working places

(1) General items

1) The request asking the safety seniors of the mine to attend a general inspection to the mine facilities and working places

The inspectors shall request the safety seniors of the mine to attend general inspection to the mine facilities and working places, and shall also request the technical safety staff posted at the facility or working place to support the explanation for use of the facility or work conditions if necessary.

2) Confirmation and guidance regarding consistency between conducting status of mineral-related operations and the mining plan and mine safety diagrams

The inspectors shall confirm whether the mineral-related operations are being conducted based on the mining plan and also whether the operations are conformity with the mine safety diagrams prescribed in the Law and its regulations; in case of significant deviations or matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors by mutual consent.

3) Confirmation and guidance regarding establishment or modification of mine buildings, structures or other facilities to be used in mineral-related operations

The inspectors shall confirm whether the “facility plan” for mine buildings, structures or other facilities at the mine has already been submitted to the Minister in charge of mines sector for permission prescribed in the Law and its regulations; in case the matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors by mutual consent.

4) Confirmation and guidance regarding the “proper work procedure” prescribed in the own safety rules at the mine

While conducting a general inspection at mineral working fields and tunneling fields of the mine, the inspectors shall confirm that mineworkers engaged in various tasks confirm with “proper work procedure” prescribed in the own safety rules; in case the matters deemed inadequate in terms of safety, improvement guidance shall be

provided for the safety seniors by mutual consent.

5) Confirmation and guidance regarding wearing protective equipment

While conducting a general inspection at mineral working fields and tunneling fields of the mine, the inspectors shall confirm that mineworkers engaged in the task wearing appropriate protective equipment such as protective helmet, protective boots, and protective gloves; in case the matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors by mutual consent.

6) Confirmation and guidance regarding special mineral operations plan and measurement of surface subsidence

The inspectors shall confirm whether mining methods and advanced drillings of mineral-related operations in underground mine have been carried out according to the “special mineral operations plan” and “special safety diagrams”, and shall confirm measurement results of surface subsidence through the records that the measuring method, area and frequency should be determined by the “special mineral operations plan” when minerals and tunnels have been dug under the sea, rivers, lakes, or any place where there is a risk of mine pollution, impacts or mine disaster by flood occurring; in case the matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors by mutual consent.

7) Confirmation and guidance regarding underground gases

While conducting a general inspection in underground mine that has a risk of flammable gas or harmful gases, the inspectors shall carry a required gas detector, and conduct frequent measurements at the following necessary spots and places, if gas concentration in the air exceeds the limits and there is a risk of danger for safety prescribed in the Law and its regulations, provide immediate guidance for the safety seniors to take safety measures by mutual consent.

a) The places where there is a risk of flammable gas in the air at the mineral working fields and tunneling working fields where mineworkers engaged, nearby sealing tunnels and return air way tunnels in underground coal mine

b) The places where there is a risk of emission of harmful gases exist or are expected, and working places where vehicle type mine machines and automobiles with internal-combustion engines operate in underground metal mines and non-metal mines

(2) Main items for a general inspection regarding roof fall and collapse

The inspectors shall conduct a general inspection with regard to the following main items for prevention of roof fall and collapse at mineral working fields and tunneling

working fields in underground mining, and surface mineral working fields and its neighboring area in open-pit mining; in case the matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors by mutual consent.

1) Working places in underground mining

a) Are suitable supports or other equipment installed depending on the conditions of the roof and side walls of mineral working places immediately when there is a risk of roof fall or collapse?

b) Are head protection and face supports taken at the face of tunneling?

c) Are supports materials provided in the proper working places?

d) Are the broken or decayed timbers for supports promptly exchanged or reinforced?

e) Are appropriate coal pillars or ore pillars remained concerning size and arrangement suited to the bedrock conditions, if it is necessary for ensuring safety?

f) Are appropriate measures such as installation of supports, or filling with soil or other materials taken in sections where the mineral working has been completed and such measures are necessary for ensuring safety?

g) Are items necessary for examining the roof, side walls and face of the tunnels before and during the work? And, are necessary measures such as removal of rocks taken, if there is a risk of danger?

h) Are suitable equipment for removal of loosed rocks for the roof and side walls of the tunnels provided?

2) Working places in open-pit mining

a) Is the surface soil removed with safety method before conducting surface mineral working?

b) Are steps with appropriate height and width installed to secure safety at surface mineral working places? And, are height and slope angle of mineral walls also held safety?

c) Are loosed rocks removed with safety methods in advance? And, are appropriate protection facilities provided to prevent danger caused by falling loosed rocks?

d) Are safe slope angles suited to the bed-rock and other conditions maintained to prevent collapse of residual walls after mineral working?

e) Are appropriate scaffolding installed, when mineworkers have to work with a high risk of falling? And are safety nets, ropes or other appropriate fall-prevention equipment also prepared?

f) Are mineworkers worked simultaneously directly above and below with other

mineworkers at the mineral working field, if there is a risk of danger caused by falling loosed rocks or rolling stones?

g) Are operations stopped and appropriate measures such as prohibition of access to the dangerous section taken, if there is a high risk of danger caused by rainfall in or around the mineral working field?

h) Are appropriate protective equipment installed or off-limit area established, watchmen posted, or warning signs stuck up or other measures to prevent entry of the surrounding area taken, if there is a high risk of danger caused by flying stones or rolling stones out of the mine?

i) Are car-stops installed and other appropriate measures taken to prevent vehicle type mine machines and automobiles from falling over when using them to throw ores into an ore stock bin or crushers?

j) Are residual walls and mineral working walls maintained safe slope angles suited to the bed-rock conditions to prevent collapse when the mineral-related operations shall be intended to close or its operations suspend? And, are necessary measures also taken to prevent falling, rolling stones and other dangers?

k) Do the technical safety staff for surface safety & blasting examine the sections with a high risk of looseness, slide and other types of collapse of bed-rock, and examine sections near the surface soil if stones or rocks are likely to be loosed in the mineral working field once or more every working hours?

l) Do mineworkers who are posted in surface mineral working fields examine the bed-rock conditions before and during the work? And, are necessary measures such as removal of loosed rocks also taken using appropriate equipment if there is a high risk of danger?

(3) Main items for a general inspection regarding explosives and blasting work

The inspectors shall conduct a general inspection with regard to the following main items for handling explosives and blasting work in the mineral-related operations; in case the matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors by mutual consent.

1) Handling explosives

a) Is the structure of explosive service station established in accordance with the Law and its regulations?

b) Is the usage of fire inside the station prohibited? And is there any storage of materials that ignite or burn easily stored nearby?

c) Are explosives kept separately from pyrotechnics such as safety fuse, detonating fuse, industrial detonator and electric detonator?

d) Do the technical safety staff for explosives keep a delivery book for explosives and note the necessary items, and make clear the balance of explosives for delivering explosives at the mine?

e) Do the technical safety staff for underground safety & blasting or for the surface safety & blasting keep a delivery book for explosives and note the necessary items, and make clear the balance of explosives for delivering explosives at the mine that does not establish the explosives service station?

f) Are explosives transported in a safe manner at the mine?

2) Blasting work in open-pit mining

a) Is a container carrying the explosives made of nonconductive materials? And, isn't it exposed iron-kind inside?

b) Are stemming materials for the blasting provided, and is the tamping stick for loading explosives with a safe against friction, impact and static electricity also provided?

c) Are internal materials of the loading machines for ANFO (Ammonium Nitrate Fuel Oil) explosives made of anti-corrosion such as stainless steel, aluminum, and also made of non-promoting solution of the explosives prescribed in the Law and its regulations?

d) If there is a risk of danger caused flying stones and rolling stones outside the mine at the time of blasting work, are measures such as using appropriate amount of explosives, installing appropriate protective equipment or establish an off-limit area, as well as posting watchman and putting up warning signs up taken before firing of the blasting?

e) Do the safety technical staff for surface safety & blasting fix electric detonators or electric safety fuses to explosives at a safe place?

f) Is the end of leading wires on electric detonators or electric safety fuses twisted before connection with the blasting cable?

g) When explosives being loaded into blasting holes at working places, is usage of fire or smoking prohibited?

h) Is the terminal of leading wires of the blasting cable which connects to an exploder always twisted except firing of the blasting? However there is a risk of an accidental explosion due to the generation of induced voltage in the electric blasting circuit caused by a thunderbolt at surface working places, is the terminal of the leading wires of the blasting cable opened?

i) Is the blasting cable with mechanically strong of electric wire, being insulated by cotton or rubber, sufficient length between the place of firing in the evacuation area and the blasting place provided?

j) When the charged explosives do not explode after firing of blasting or the explosion cannot be confirmed, are appropriate measures such as removing the leading wires from an exploder, and twisting the terminal of the cable and prevention of re-firing taken by the safety technical staff for surface safety & blasting?

k) When the blasting is completed, are examining rock conditions and collapse, checking misfired explosives, and measures of off-limits for mineworkers if there is a high risk of danger taken by safety technical staff for surface safety & blasting?

3) Blasting work in underground mining

a) Is a container carrying the explosives made of nonconductive materials? And, isn't it exposed iron-kind inside?

b) Are stemming materials for the blasting provided, and is the tamping pole for loading explosives with a safe against friction, impact and static electricity also provided?

c) When blasting work is carried out in underground Coal mines (Class-A coal pit and Class-B coal pit), is measurement of concentration of flammable gas and existing areas conducted using a precise gas detector before firing of the blasting every time by the safety technical staff for underground safety & blasting?

d) Do the safety technical staff for underground safety & blasting fix electric detonators or electric safety fuses to explosives at a safe place?

e) Is the end of leading wires on electric detonators or electric safety fuses twisted before connection with the blasting cable?

f) Is the blasting cable with mechanically strong of electric wire, being insulated by cotton or rubber, sufficient length between the place of firing in the evacuation area and the blasting place provided?

g) Is an evacuation area at a safe position or with a safe structure secured to prevent the danger of flying stones when conducting blasting work?

h) When the blasting is completed, are examining rock conditions and collapse, checking misfired explosives, and measures of off-limits for mineworkers if there is a high risk of danger taken by safety technical staff for underground safety & blasting?

(4) Main items for a general inspection regarding vehicle type mine machines and automobiles

The inspectors shall conduct a general inspection with regard to the following main items for vehicle type mine machines and automobiles in the mineral-related operations;

in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors by mutual consent.

1) Are vehicles and automobiles' number, limited loading weight, the maximum working load, and other items for operation and management of the vehicle type mine machines and automobiles indicated at a proper position that can be seen easily?
2) When using a vehicle type mine machine or automobile inside the mine, is the vehicle or automobile which meet the construction standard used?
3) When using a vehicle type mine machine or automobile inside the mine, is the vehicle or automobile which emits exhaust gases that meet the criteria used? And, is the fuel that meet the criteria used?
4) Is the robust head guard on each vehicle type mine machine or automobile used in areas with high risk of rock falling, fall hazard itself or other reasons installed?
5) Is a vehicle type mine machine or automobile checked before starting the work?
6) When operating a vehicle type mine machine or automobile, aren't the vehicles or automobiles used to carry loads or passengers that exceed the limits loading weight or number of passengers?
7) When conducting inspection, maintenance, repair or other works under a raised boom, arm or other parts of vehicle type mine machines or automobiles at the mine, are safety pillars and blocks, and other appropriate measures used?
8) Are vehicle type mine machines or automobiles at the mine operated with safety speed and the observance of common traffic rules?
9) When the worker qualified for operating a vehicle or automobile leaves the vehicle or automobile, does the said worker take measures such as; to take down the bucket or dipper to the ground; to stop the engine and brake or take other anchoring measures; and to remove and carry the key to prevent unqualified persons from driving the vehicle or automobile?
10) Are mine road structures in consideration of the topography, geology, weather and other conditions surrounding mine, as well as the driving conditions of vehicle type mine machines or automobiles, installing fences, blocking walls or other appropriate facilities undertaken construction prescribed in the Law and its regulation?
11) Are tunnels (galleries) of the mine where vehicle type mine machines or automobiles run constantly maintained a road surface to be leveled at all time for safety driving; secured a sufficient passage width of the tunnels (galleries) for the vehicles or automobiles; installed road signs, traffic signals and other safety facilities as necessary; and installed lightning facilities as necessary prescribed in the Law and its regulation?

(5) Main items for a general inspection regarding haulage by a belt conveyor, a hoisting device and a locomotive

The inspectors shall conduct a general inspection with regard to the following main items for safety on haulage by a belt conveyor, a hoisting device and a locomotive in the mineral-related operations; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors by mutual consent.

1) Haulage by hoisting devices

a) Are signal devices in tunnels (galleries) where shaft-hosting device, automatic hosting device or endless hoisting device installed?

b) When a connection of mine cars is operated by a hosting device, automatic hoisting device, endless hoisting device at the mine, is a device of anchoring measures fixing in the body of the mine car or necessary places of inclined-shaft to stop the mine cars under runaway, or other necessary devices installed?

c) Are the working place, under repair work or construction work of underground and surface haulage tunnels (galleries) by hoisting devices posted watchmen, fixed red lights, set warning signs up or taken other necessary measures?

d) Is a shaft-hoisting device lifting personnel up and down at the mine installed following equipment?

ⅰ) a depth indicator

ⅱ) a device for preventing over-run winding of rope and over-speed of a hoisting

ⅲ) a device to stop cage during electric power cutting off or abnormality conditions of the power

ⅳ) equipment such as an automatic safety door or manual safety door in the platforms of mine mouth and intermediates to protect personnel from falling down

e) Is an inclined shaft-hoisting device for transportation of personnel at the mine kept the width between the man riding cars and a side wall or obstacle of the tunnel (gallery), kept the space between the head guard of a man riding car and roof or obstacle of the tunnel (gallery) prescribed by the Law and its regulations, and also installed or provided following equipment?

ⅰ) an anchor device or a manual stopping device of a hoisting to stop man riding cars when rope is cut or over-speed of the hoisting;

ⅱ) when the coupling of each mine car, and connecting between a mine car and a rope-socket are connected by metal couplings (chains or a link), spare parts of metal couplings and rope

2) Haulage by belt conveyors

a) Is a belt conveyor for transportation of personnel at the mine kept the space between

the belt and roof or any obstacles of the tunnel (gallery) prescribed by the Law and its regulations, and also installed following equipment?

ⅰ) lighting facilities at the platforms and its vicinity

ⅱ) a device for preventing excess riding on the belt and excess speed of the conveyor

ⅲ) a device for emergency brake of the conveyor

ⅳ) a device for preventing biased running of the belt

b) Is a belt conveyor for transportation of materials that capacity of the motor is twenty (20) kW or more at the mine installed following equipment?

ⅰ) a device for emergency brake to stop the conveyor in case trouble happened

ⅱ) a device for preventing slipping of the belt

ⅲ) a device for preventing biased running of the belt

ⅳ) a device for preventing friction flush and ignition of rolling parts of belt and piled coal at a transshipment place of Coal mines (Class-A coal pit and Class-B coal pit).

3) Haulage by locomotives

a) Are the tools to repair from derailment of a locomotive itself or a mine car, an alarm device, and head lights provided in a locomotive at the mine?

b) Does the worker qualified for operating a locomotive push a train of mine cars backward by operating a locomotive in a haulage tunnel (gallery) except for the switchyard or under the guidance by the designated mineworker at the mine?

c) When the worker qualified for operating a locomotive leaves the locomotive, are the said worker taken following measures prescribed in the Law and its regulations?

ⅰ) stopping the engine (motor) and brake or taking other anchoring measures

ⅱ) removing and carrying the operation lever to prevent unqualified persons from operating the locomotive.

d) When operating a locomotive at night or in the tunnel, is a tail lamp or appropriate sign at the last of a mine car (gallery) fixed?

(6) Main items for a general inspection regarding mine fires and spontaneous combustion

The inspectors shall conduct a general inspection with regard to the following main items for safety on mine fires and spontaneous combustion in the mineral-related operations; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors by mutual consent.

1) Prevention of mine fire

a) Are a hoisting operation site, a pump operation site, a fan room, transformer apparatus site (except main transformer apparatus), a compressor operation room, sites of

driving pulley and main pulley of a belt conveyor, and a charger room for battery type locomotive established using materials of fire-proof construction, and also installed fire fighting devices in each room or site?

b) Are a main oil switch apparatus room, an oil and grease depot, and main transformer apparatus room established using materials of fire-resisting construction, and installed fire-fighting devices in each room or site?

c) Is handling fire prohibited, and is the engine of a vehicle type mine machine or an automobile stopped at the time of refueling?

d) Are fire-hydrants installed in the following places at the underground Coal mines (Class-A coal pit and Class-B coal pit)?

ⅰ) the starting point and terminal of the tunnel (gallery), and within 100m or less in intervals of it, where belt conveyor is installed, internal-combustion engine or electric trolley locomotives is driven, or electric power cables are wired.

ⅱ) the site where the electrical appliances infused oil (except main transformer apparatus and main oil switch apparatus) are installed.

e) Are fire-fighting devices such as ponds, hydrants, extinguishers, extinguishing sand or water tanks provided in accordance with scale of mine buildings in necessary places on surface?

2) Prevention of spontaneous combustion

a) Are fire-fighting devices installed in advance at a site where spontaneous combustion is likely to occur, and provided fire proof materials for sealing smoothly and other appropriate measures in the area at underground Coal mine (Class-A coal pit and Class-B coal pit) and Metal mine?

b) Are filling, sealing of tunnels (galleries) and appropriate measures taken in the goaf (old working field) where spontaneous combustion occurs or is likely to occur at underground Coal mine (Class-A coal pit and Class-B coal pit) and Metal mine?

c) Do the technical safety staff for underground safety & blasting of Coal mine (Class-A coal pit and Class-B coal pit) or Metal mine measure the air temperature, humidity and gas concentration, and check the smells, and pay attention of changes nearby the site of tunnel (gallery) where spontaneous combustion occur or is likely to occur?

d) Do the technical safety staff of Coal mines and Metal mines measure and check the items of same as above, and check abnormalities of the sealing and analyze the gases (concentration, kinds of gases) inside sealing of tunnel (gallery), if it is necessary?

(7) Main items for a general inspection regarding approach to the old pit

The inspectors shall conduct a general inspection with regard to the following main

items for safety on approach to the old pit in underground mineral-related operations; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors by mutual consent.

1) Are advanced drillings or other appropriate measures taken when the heading of tunnel (gallery) approaches to the old pit that submerged or there is a risk of submergence, or filled with flammable gas and other gases or there is a risk of filling with flammable gas or other gases, and to the nearest water vein within fifty (50) meter?
2) Are the bank of water blocking or other water blocking facilities at proper spot of the tunnel (gallery) in case approaching to the old pit that submerged or there is a high risk of flood?
3) Are proper thickness of walls or protection areas kept against the old pit that submerged or there is a risk of submergence for prevention of mine pollution, impacts or mine disaster by flood in underground mine?

(8) Main items for a general inspection regarding electrical equipment

The inspectors shall conduct a general inspection with regard to the following main items for safety on electrical equipment in mineral-related operations; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors by mutual consent.

1) Is electrical equipment installed at the place where the concentration of flammable gas normally exceeds 1.5% at underground Coal mines (Class-A coal pit and Class-B coal pit)? However, a telephone that operates on a weak current doesn't apply.
2) Are terminals of electrical equipment and other exposed live parts appropriately protected to prevent contact with people or outside objects?
3) Are sections with electrical equipment that must not be handled by other mineworkers than the technical safety staff for electricity closed to public access and protected with fences and "Off-limits" signs at underground mine?
4) Are metal bodies used for coating of electric wires, metal electric wire connection boxes, iron beds/outer cases of electrical equipment and transformers taken grounding (earth) works prescribed in the Law and regulations?
5) Do the technical safety staff for electricity inspect and measure the earth resistance value of the major grounding (earth) works of electrical equipment periodically, and write down the results of measurements prescribed in the Law and regulations at underground mine?
6) Are the automatic overloaded protectors installed at a proper spot of electrical motors and transformers for protecting from excess current at underground Coal mines (Class-

A coal pit and Class-B coal pit)?

7) Is separation distance of wirings maintained between insulated wire and other involving insulated wire prescribed in the Law and regulations at underground mine?

8) Are section switches installed at the spot of mine mouth, power receiving ends and main branches in the high-voltage wiring? In case the low-voltage wiring, are the section switches must installed at the spot of mine mouth, the area where there is a risk of danger of gas outburst prescribed in the Law and regulations at underground mine?

9) Are lightning arresters installed near mine mouths to prevent accidents of high-voltage wiring at mines caused by lightning strike or abnormal voltage at underground mine?

10) When the technical safety staff for electricity or workers qualified for electrical equipment repair live parts of electrical equipment of 300 volts or higher voltage or when they conduct inspection or other work involving contact with exposed live parts without cutting the power supply on the surface at mines, are appropriate measures taken such as wearing electrical insulating rubber gloves and other insulating protective equipment or using apparatuses or devices for live line work?

(9) Main items for a general inspection regarding underground passage, underground working places and management of scattered dust in underground mining

The inspectors shall conduct a general inspection with regard to the following main items for safety on underground passage, working places and management of scattered dust in underground mineral-related operations; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors by mutual consent.

1) Underground passages

a) Are two or more passages for access between inner parts of working places and the ground surface at underground mine?

b) Is an emergency ladder path installed for accessing to the ground surface in a vertical shaft or an inclined shaft of forty (40) degrees or more that has a hoisting device to lift mineworkers up and down?

c) Where main belt conveyors or locomotives are regularly operated in the tunnels (galleries), don’t use as passages for mineworkers if there is enough space between conveyors, locomotives or mine cars and side walls or obstacles of the tunnels (galleries) prescribed in the Law and regulations at underground mine?

d) When throwing ores or other materials into a vertical shaft using vehicle type mine machines or automobiles in underground mine, are a car stop or other appropriate measures taken to protect such vehicles or automobiles from falling down?

e) Are blockage, fences and other appropriate fall-prevention equipment installed, and are warning signs indicated at the mouth of disused vertical shaft or inclined shaft with forty (40) degrees or more to protect personnel falling down in underground mine?

f) Are signposts such as name of a tunnel (gallery) and exit direction at a fork of underground passages indicated in underground mine?

2) Underground working places

a) Are the names and work locations of mineworkers identified when they get into underground, and are the records kept at mine office outside mine?

b) Are communication devices such as telephone systems and inductive radio devices installed at major working places and other necessary parts of underground mine?

3) Management of scattered dust in underground mining

a) Are measures such as sprinkling water, collecting dust or other appropriate measures taken to prevent dust scattering for sake of health protection of mineworkers at working places where dust scattering occurs remarkably in underground mining?

b) Do mineworkers wear dust respirators complying with the standards at the working place where dust scattering occurs remarkably and if necessary for safety reasons in underground mining?

c) When mineworkers working at working places where dust scattering occurs remarkably, is a space for a break at a place without dust scattering for sake of health protection of mineworkers?

d) Are the impact rock drills used at working places the wet type? In case, do mineworkers who operate the wet type impact rock drill also wear standard dust respirators?

e) Do the technical safety staffs for underground safety & blasting in underground mining measure the dust concentration in the air and content rate of free silicic acid into the dust periodically at working places that occur remarkable dust scattering?

4) Evaluation on work environment of working places in underground mining

a) Is evaluation on work environment of working places carried out in terms of scattered dust concentration in the air and content rate of the free silicic acid into the dust in underground mining after the measurements of the dust were conducted by the technical safety staff for underground safety & blasting?

Are records of evaluation on work environment of such working places kept for five (5) years?

b) Are efforts made to take the necessary measures for improvement of the scattered dust concentration in underground working places that are classified as management class NO. 2 or 3 of evaluation on environment?

(10) Main items for a general inspection regarding ventilation and mine gases

The inspectors shall conduct a general inspection with regard to the following main items for safety on ventilation and mine gases in underground mineral-related operations; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors by mutual consent.

1) Underground mine air

a) Are underground mine air such as oxygen content and carbon dioxide content where mineworkers are posted or pass through the roadways kept the observance of restriction values prescribed in the Law and its regulations?

b) Is the temperature in underground working places kept the observance of restriction value prescribed in the Law and its regulations?

c) Is the ventilation quantity of underground working places decided based on number of mine workers, outflow of flammable gas or harmful gas, temperature, humidity and possibility of spontaneous combustion in underground Coal mines (Class-A coal pit and Class-B coal pit)?

d) Is ventilation speed in underground kept the observance of restriction value prescribed in the Law and its regulations?

e) Are the intake airway and return airway installed separately?

f) Is a main fan room established using materials of fire-proof construction, and is the main fan installed at a proper place on the ground where a return air from underground not to be supplied into the intake air?

g) Are following items prescribed in the Law and its regulations to provide underground mine air using the auxiliary ventilation kept the observance in underground Coal mines (Class-A coal pit and Class-B coal pit)?

ⅰ) the auxiliary fan must be installed at a proper place where a return air not be supplied into an intake air, and the air volume must be more than the capacity of the fan to prevent from recirculation of air.

ⅱ) the auxiliary fan must be operated in succession except special reasons.

ⅲ) the air duct of the auxiliary ventilation must be maintained in good condition with measures of preventing leakage.

ⅳ) the head of the air duct must be kept setting within 7 m from the face of mineral working field or head of tunneling.

h) When re-supply electricity to the auxiliary fans and other electrical devises in the area that was interrupted in the some reason, do the technical safety staff confirm the safety and check concentration of flammable gas before starting the

power supply to the area?

i) Are the interception walls or air doors installed at the place of a connection tunnel (gallery) between an intake airway and a return airway of vertical shafts, main airway tunnels (galleries)in underground Coal mines (Class-A coal pit and Class-B coal pit)?

2) Mine gases

a) When the concentration of flammable gas in underground working places or return airway exceeds 1.5% or more and there is a risk of danger for safety, do the technical safety staff for underground safety & blasting immediately cut off the power supply to the area, give instructions to mineworkers to take shelter at a safe place and post an alarm sign at the area?

b) When there is a high risk of danger due to increasing the flammable gas remarkably during excavation of tunnel (gallery) or tunneling field in underground Coal mines (Class-A coal pit and Class-B coal pit), are appropriate measures such as advanced drilling or absorption and induction of flammable gas taken?

c) When the goaf (old working field) or disused tunnel (gallery) where a great deal of flammable gas exists in underground Coal mines (Class-A coal pit and Class-B coal pit), are filling, sealing of tunnels (galleries), ventilation and appropriate measures taken?

3) Restriction of using open fire

a) Is using open fire prohibited in underground mining? However practicing electric welding and electric fusing, using open fire for repairing, injecting insulating filler materials into metal connection box for armored cable under the instructions of administrator with safety methods at a safe place by the technical staff for electricity don’t apply at the working.

b) Are mineworkers’ things of ignition tools, smoking implements and tobacco checked at a pit mouth in every time before entering the pit in underground Coal mine (Class-A coal pit and Class-B coal pit)?

c) Don’t mineworkers of underground Coal mine (Class-A coal pit and Class-B coal pit) carry ignition tools, smoking implements and tobacco when they enter the pit?

(11) Main items for a general inspection regarding surface passage, indoor working places and management of scattered dust outside mine

The inspectors shall conduct a general inspection with regard to the following main items for safety on surface passage, indoor working places and management of scattered dust outside mine in mineral-related operations; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors by mutual

consent.

1) Management of scattered dust outside mine

a) Are sprinkling water, collecting dust, sealing machinery or equipment or taking other appropriate measures taken to prevent dust scattering because of health preservation of mineworkers near a crushing plant, a tippler, a processing plant, a smelting & refinery, a coal preparation plant, open pits and other working places outside mine where there is significant dust scattering prescribed in the Law and its regulations?

b) When the above-mentioned measures are taken, and if it is necessary for safety reasons, are mineworkers instructed to wear standard dust respirators?

c) Is a space for a break for sake of health protection of mineworkers provided in the outside place applied to the above-mentioned a) where there is significant dust scattering?

Is equipment prepared for mineworkers to remove dust adhering to their working clothes at a space for a break?

d) Does the technical safety staff for surface safety & blasting measure dust concentration in the air and content rate of free silica acid into the dust periodically indoor working places that dust scattering occurs remarkably, write down the results of measurement and report these results to administrator at a mine?

1-2) Evaluation on work environment of indoor working places outside mine

a) Is evaluation on work environment of indoor working places carried out in terms of scattered dust concentration in the air and content rate of the free silicic acid into the dust after the measurements of the dust were conducted by the technical safety staff for surface safety & blasting?

Are records of evaluation on work environment of such working places kept for five (5) years?

b) Regarding the aforesaid results of evaluation on work environment, are the measures required for the improvement of scattered dust concentration immediately taken in case the indoor working place was classified as management class NO. 3?

Are efforts made to take the necessary measures for improvement of the scattered dust concentration in case the indoor working place was classified as management class NO. 2?

2) Surface passage

a) Are the following requirements prescribed in the Law and its regulations fulfilled when erecting staircases outside mine buildings?

ⅰ) staircases must be of sound structure

ⅱ) riser height and stair tread depth must be constant

ⅲ) there must be landing places at intervals of up to ten (10) m for staircases of

ten (10) m or higher

ⅳ) there must be handrails on the one side

b) Are two or more staircases provided that are positioned appropriately on the respective floors and are connected to safe outdoor locations inside underground structures or structures of two or more stories where thirty (30) or more mineworkers are working at all times?

c) Are handrails provided on the side of staircases, scaffolds or elevated walkways?

d) Are the working place floors kept safe and free from danger of tripping and slipping?

e) Are safe passages installed for mineworkers in sections inside and connected to working places and are such passages kept passable?

f) Are fences, coverings or other safety equipment installed at dangerous sections, including axes at a height of two (2) m or less from the floor or table surfaces, projecting axial ends, and interlocking devices using belts, chains or ropes in the indoor working places outside mine?

g) Are appropriate measures taken to prevent the danger of explosion or leaking of high-temperature substances in blast furnaces or converters in Metal mines and other sections where large amounts of high-temperature substances are handled?

h) Are appropriate protective gloves/boots and other protective equipment provided to be used by qualified workers handling burning and molten materials?

i) Are appropriate protective gloves/boots and other protective equipment provided to be used by qualified workers conducting arc welding?

j) When conducting repair or inspection of mine machineries and equipment by stopping machine operation at mines, does the technical safety staff for machinery or other person designated by the technical safety staff set warning signs of the suspension of machine operation during such repair or inspection, lock starting devices and take sufficient security measures to prevent others from operating such mine machinery or equipment?

(12) Main items for a general inspection regarding management of poisonous and deleterious substances

The inspectors shall conduct a general inspection with regard to the following main items for safety on management of poisonous and deleterious substances in mineral-related operations; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors by mutual consent.

1) Are necessary measures taken to prevent splashing, leakage, outflow or leaching of poisonous and deleterious substances when transporting such substances inside mines?

2) When storing poisonous or deleterious substances at mines, are the following

requirements fulfilled?

a) poisonous and deleterious substances must be stored separately from other substances.

b) tanks, drums and other containers used to store poisonous and deleterious substances must be free from danger of scattering, leakage or leaching of such substances.

3) Are the facilities storing poisonous and deleterious substances locked at mines to prevent theft? If such facilities cannot be locked due to their nature, are robust fences installed around them?

4) Are a processing plant, a smelting and refinery, and other facilities established where poisonous or deleterious substances are used with following constructions and items to be furnished at Metal mine?

a) to be constructed with concrete, wooden or similar structures free from the danger of scattering, leakage, leaching, outflow or infiltrating to the ground of such substances.

b) to have facilities to treat wastewater including poisonous and deleterious substances, and to keep devices or chemicals to eliminate toxic quality of such substances.

5) When producing or handling poisonous or deleterious substances have to suspend such production or handling consecutively for six (6) months or longer due to the suspension of mineral-related operations or have to terminate such production or handling due to the expiration of the mineral-related license, are the remaining amounts of such substances transferred to third parties producing or handling such substances or are they disposed by appropriate methods based on the Law and its regulations within one (1) month from the date of the suspension or termination of the operation at Metal mine?

※ Additional main items for a general inspection prescribed in the Mine Safety Regulation (phase 2)

Chapter II : Conducting a general inspection (prevention of mine disaster)

(additional items)

3. Conducting the scene of a general inspection

The inspectors shall conduct a general inspection with regard to the following main items for safety in addition when mine safety regulation (phase 2) shall be taken effect; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided

for the safety seniors by mutual consent.

(3) Additional main items for a general inspection regarding explosives and blasting work

4) When blasting work is carried out in a working place nominated as the precaution area against gas outburst in underground Coal mine (Class-A coal pit), are following items prescribed in the Law and its regulations observed?

a) firing of blasting by the electric ignition method must be taken after mineworkers evacuated at a safe place against the gas outburst.

b) firing of blasting in the safety facility or intake airway must be taken at a safe place against the gas outburst.

c) anybody of mineworkers must not approach to the blasting place where loaded explosives were blasted and there is risk of gas outburst.

d) explosives with the safety sheath or with quality equivalent in safety must be used.

5) Are following items prescribed in the Law and its regulations observed in working places where concentration of flammable gas increases more remarkable than usual or explosive coal dust occurs scattering significantly in underground Coal mine (Class-A coal pit)?

a) kinds and quantity of using explosives, and kinds of electric detonators and exploders must be designated.

b) safety sheath for explosives must be used.

6) Do the safety technical staff for underground safety & blasting of Coal mines (Class-A coal pit) obey following items prescribed in the Law and its regulations?

a) when the blasting work is carried out at the area where explosive coal dust scatters or there is a risk of the dust scattering, any abnormalities of the explosive coal dust must be checked in the radius of five (5) m distance from the blasting point on every ignition of explosives.

b) when the blasting work perforates other side of tunnel (gallery) through at the area where explosive coal dust scatters or there is a risk of the dust scattering, any abnormalities of the explosive coal dust and flammable gas must be checked in the other side of tunnel (gallery) before ignition of explosives.

c) when there is danger of explosive coal dust scattering, of concentration of flammable gas increasing remarkably or of gas outburst occurring, two (2) or more blasts all at once at the same place must not be carried out except using electric ignition method.

(6) Additional main items for a general inspection regarding mine fires and spontaneous combustion

3) Is a centralized monitoring room established on the ground providing the measurement device for concentration of flammable gas and monitoring devices for specific substances

using sensors continuously in underground?

4) Are following the measurement devices and the measurement devices installed in the centralized monitoring room on the ground prescribed in the Law and its regulations in underground Coal mines (Class-A coal pit)?

a) continuous measurement devices for concentration of flammable gas in the return airways of main exhaust tunnels (galleries), the precaution areas against gas outburst and other necessary sections must be installed in a centralized monitoring room.

b) continuous measurement devices for concentration of the carbon monoxide in the return airways of main exhaust tunnels (galleries), gas pipes in flammable gas induction facilities and other necessary sections of mines must be installed in the room.

c) devices for sensors that detect the outbreak or danger of fires based on the increasing of carbon monoxide concentration, generation of smoke or other changes of environmental conditions at the places of hoisting device rooms, compressor rooms, pump rooms, main fan rooms, sections with transformer facilities, oil and grease depots, main oil-filled switch rooms, tunnels (galleries) where belt conveyors and lifts for transportation of personnel are operated, and other necessary sections of mines must be installed in the room.

5) When a centralized monitoring room is established in underground Coal mines (Class-A coal pit), is a technical safety staff for underground safety & blasting posted to the room?

6) Does a technical safety staff for underground safety & blasting posted to the centralized monitoring room obey following items?

a) any abnormalities of gas or explosive coal dust explosion, spontaneous combustion, fires and others dangers must be checked through the centralized monitoring.

b) the communication with other technical safety staffs and mineworkers worked in underground concerning necessary items for safety must be carried out using radio induction communication system.

c) necessary instructions to mineworkers must be given such as suspending the work, taking the shelter from working place and taking prompt measures, and report to the administrator of the mine must be performed speedily.

d) measures conducted for safety and taking items over to the successor must be written down in the diary for centralized monitoring.

(8) Additional main items for a general inspection regarding electrical equipment

11) When installing trolley wires and contact wires for overhead type electric railway within mines or directly connecting the inside and outside of the mine, are following requirements fulfilled underground Coal mine (Class-B coal pit), Metal mine and Non-metal mine?

a) the voltage of trolley wires must be direct current with a low voltage.

b) the height of trolley wires and contact wires for overhead type electric railway must be 1.8 m or higher above the rail surface.

c) aforesaid trolley wires and contact wires must not have electrical contact with roofs, side walls, air doors or supports of the tunnels (galleries).

d) switches must be provided at main junction of tunnels (galleries) and at appropriate intervals on the circuits.

e) the installation of stretched wire at appropriate intervals and other appropriate measures must be taken to avoid loosening of trolley wires at curved parts of tunnels (galleries).

f) aforesaid stretched wires must be insulated at a position of 0.6 m or less from the trolley wires and be fixed securely.

g) sections where mineworkers cross must have appropriate equipment to avoid danger.

(10) Additional main items for a general inspection regarding ventilation and mine gases

2) Mine gases

d) Are automatic flammable gas alarms installed one or more in the following sections prescribed in the Law and its regulations in underground Coal mines (Class-A coal pit)?

ⅰ) mineral working fields

ⅱ) tunneling fields (except for rock tunneling fields without the danger of flammable gas discharges)

ⅲ) working places where concentration of flammable gas is one (1) % or more at all times and electrical equipment is also installed

ⅵ) sections where flammable gas may stagnate when there is abnormality in ventilation and electrical equipment installed

e) Is the area with a high risk of danger due to gas outburst as the precaution area against gas outburst designated when conducting tunneling and other excavation works in underground Coal mine (Class-A coal pit)?

f) Is aforesaid precaution area against gas outburst notified to mineworkers with posting a notice on the outside wall of mine office or other appropriate means?

g) Is a technical safety staff for underground safety & blasting posted each of tunneling field for excavation designated as the precaution area against gas outburst?

h) Are advanced drillings conducted at the working place of tunneling where it is designated as the precaution area against gas outburst, and is a safe distance maintained between heading of the tunneling field and bottom of borehole at all times in underground Coal mine (Class-A coal pit)?

i) Are the pressure, amount and other matters measured concerning flammable gas spurting

out at the mouth of the borehole of the aforesaid advanced drilling to clarify the status of flammable gas in the hole, and is attention paid to changes in measurement values in underground Coal mine (Class-A coal pit)?

j) When conducting tunneling in the precaution area against gas outburst, isn't the return air from the precaution area passed through the long-wall coal working field in underground Coal mine (Class-A coal pit)?

k) Are air supply devices and safety facilities provided to take shelter for mineworkers appropriate spots in the precaution area against gas outburst in underground Coal mine (Class-A coal pit)?

Are air or oxygen supply devices and communication system such as radio induction also provided in the aforesaid safety facilities to take shelter?

l) Are following requirements fulfilled to prevent danger caused by static electricity prescribed in the Law and regulations in underground Coal mine (Class-A coal pit)?

ⅰ) facilities with a risk of danger caused by static electrification, vinyl pipes, vinyl sheets or other items should be subjected to antistatic treatment, or grounding (earth), sprinkling of water or other appropriate measures must be taken before these are used.

ⅱ) when conducting work with a risk of danger caused by static electrification, grounding (earth), sprinkling of water or other appropriate measures must be taken.

(10-2) Additional main items for a general inspection regarding explosive coal dust

1) Is the coal dust cleaning done periodically on haulage tunnels (galleries) and others due to the dust scattering and accumulation in underground Coal mine (Class-A coal pit)?

2) Are appropriate measures such as water sprinkling or water injection taken to the coal seam to settle down the explosive coal dust scattering in the following sections in underground Coal mine (Class-A coal pit)?

a) coal working fields, tunneling fields and their surroundings where the explosive coal dust is likely to scatter due to the use of mine machinery for coal excavation and coal picks.

b) blasting places and their surroundings before and after coal seam blasting.

c) coal loading and transferring sites

d) underground coal stock pile

e) coal loading to mine-cars

3) Is an adequate amount of powder generated rocks crushing spread at all times in underground sections where explosive coal dust scatters and accumulates in Coal mine (Class-A coal pit)?

4) Are barrier shelves of the powder generated rocks crushing or of barrier shelves of water bags installed to prevent explosion extension caused by explosive coal dust in

main haulage tunnels (galleries), the entrance and exit of working places and other necessary sections prescribed in the Law and its regulations in underground Coal mines (Class-A coal pit)?

Chapter Ⅲ： Measures of supervision and guidance in accordance with a general inspection (prevention of mine disaster)

1. Measures of supervision and guidance for matters required improvement or imminent danger that are in violation of the Law and its regulations are found in the results of a general inspection

1) The inspectors shall indicate the improvement guidance to ensure safety and also issue the improvement instructions for mine safety under the provision of Article 7, Paragraph 1 of "Mine safety Inspection Rule" (hereinafter "the Rule") to the concessionaire of the mine when the matters requiring improvement and in violation of the Law and its regulations are found, and mutual consent with the safety seniors of the mine are confirmed during the inspection. The improvement instructions for mine safety shall be prepared in duplicate including mutual consent of the matters requiring improvement with safety seniors of the mine and their signatures, one is to the concessionaire and the other is to be attached in the inspection report.

2) The inspectors shall order the improvement of violated items speedily and also issue the orders for warning and directing under the provision of Article 8, Paragraph 1 of the Rule to the concessionaire of the mine when the use or handling of mine facilities in the mining violates the Law and its regulations, and there is an imminent safety risk in mineral-related operations are found, and mutual consent with the safety seniors of the mine are confirmed during the general inspection. The orders for warning and directing shall be prepared in duplicate including mutual consent of the imminent safety risks requiring improvement of violated items speedily with safety seniors of the mine and their signatures, one is to the concessionaire and the other is to be attached in the inspection report.

3) For matters requiring the aforementioned improvement and matters requiring immediate clearance, the inspectors shall identify the imminent safety risk in working places and their details, clearly record in a field-book and also the events in violation of the Law and its regulations as well as the events in which imminent risk is recognized, and perform measurements and detailed investigation as necessary; record the results in the field-book and so forth also, make a sketch drawing for the relevant the imminent safety risk in working places and their conditions, and take some pictures as necessary.

2. Comments on the results of a general inspection (prevention of mine disaster)

The inspectors shall take a meeting with the concessionaire, safety supervisor, technical safety manager and technical safety staff of the mine concerning matters requiring immediate clearance and improvement instructions, and overall opinions for the results of a general inspection (prevention of mine disaster) in detail, and shall have a hearing about opinions offered the aforementioned matters from the mine concerned after the inspection is over.

3. Reporting the results of a general inspection (prevention of mine disaster)

The inspectors shall report the results of a general inspection prescribed in the provision of Article 2, Paragraph 3 of the “Mine Safety Inspection Rule” using the format of this manual, and report it to the Director General in charge of mines sector (in case mine inspectors are staffed in the provincial Departments, by way of provincial Director).

The inspection report shall be prepared by following format, including important matters as follows.

1) The inspection results, matters found to be in violation of the Law and its Regulations.
2) Important matters instructed by inspectors based on the “Mine Safety Inspection Rule”.
3) Warned and directed matters ordered by inspectors based on the “Mine Safety Inspection Rule”.
4) Concerned matters and issues to be handed over to the inspectors who will conduct next inspection.
5) Overall opinions of the inspectors.

The General Inspection (prevention of mine disaster) Report (format)

1. Name of mine (Name of pit, in case of coal mines):
2. Kinds of minerals, licensed number of the mining area:
3. Location of the mine:
4. Address of mine office, telephone number and FAX number:
5. Name of the concessionaire (Representative of corporation):
6. Address of the concessionaire (Representative of corporation), telephone number and FAX number:
7. Name of the safety supervisor (Date of appointment):
8. Name of the representative safety supervisor (Date of appointment):
9. Enrollment of technical safety manager and technical safety staff
   1) Number of technical safety manager:
   2) Number of technical safety staff for surface safety & blasting:
   3) Number of technical safety staff for underground safety & blasting:

4) Number of technical safety staff for machinery:

5) Number of technical safety staff for electricity:

6) Number of technical safety staff for prevention of mine pollution:

7) Number of technical safety staff for boilers:

8) Number of technical safety staff for explosives:

9) Number of technical safety staff for poisonous and deleterious substances:

10. Enrollment of mineworkers

1) Number of surface mineworkers:

2) Number of underground mineworkers:

11. Concerning mineral-related operations

1) Date of a beginning and history of mineral-related operations:

2) Method of mining:

3) Production of crude ore and average grade (ton/month, %):

4) Treatment of mineral concentrations and average grade (ton/month, %):

5) Treatment of smelting, refining and average grade (ton/month, %):

6) Production of manufactured products and sales (ton/month):

a) Production of every manufactured product (ton/month):

b) Sales of every manufactured product (ton/month):

7) Total output of electrical equipment (KW):

8) Consumption of every sort of explosives (Kg/month):

12. Concerning mine safety

1) Safety for buildings, structures and other facilities for use in mineral-related operations prescribed in article 9 of Mine Safety Law (writing down the following items concerning the buildings, structures and other facilities individually)

a) Name of building, structure or facility:

b) Notification date of the “Facility Plan”

c) Permission date of “Facility Plan” by the Minister in charge of mines sector

d) A summary of building, structure or facility:

2) Safety for contractual work prescribed in article 19 of the Law

a) Notification date of the “Contractual work Plan”:

b) Contents of contractual work, and number of mineworkers engaged in the work:

c) Period of contractual work:

3) Safety for special mineral operations prescribed in article 20 of the Law

a) Notification date of the “Special Mineral Operations Plan”:

b) Permission date of “Special Mineral Operations Plan” by the Minister in charge of mines sector

c) A summary of special mineral operations plan

4) Notification of “Safety Rules” and “Mine Safety Diagrams”

a) Notification date of “Safety Rules”:

b) Notification date of “Mine Safety Diagrams”:

5) Occurrence situation of own mine disaster

(writing down the following items concerning the own mine disaster that occurred past time by turns)

a) Occurrence date of mine disaster:

b) The sort of mine disaster:

c) Situation of mine disaster after its occurrence:

d) Causes of mine disaster:

e) Number and situation of victims:

13. Overall opinions of the inspectors conducted a general inspection

1) The conducting term of the general inspection:

2) The results of the inspection, matters found to be in violation of the Law and its Regulations:

3) Important matters instructed by inspectors based on the “Mine Safety Inspection Rule”:

4) Warned and directed matters ordered by inspectors based on the “Mine Safety Inspection Rule”:

5) Concerned matters and issues to be handed over to the inspectors who will conduct next Inspection:

6) Overall opinions of the inspectors:

7) Relevant matters:

14. Attached documents and diagrams

1) The improvement instructions for mine safety or the orders for warning and directing if they issued.

2) Sketches and some pictures that are relevant matters requiring the improvement or matters requiring immediate clearance to the results of the inspection.

3) Plane diagrams of the mine

4) Relevant documents

※ Date of submission of the general inspection report (dd/mm/yyyy)

※ Name of mine safety inspectors and the staff concerned who conducted the general inspection

Mine Safety Inspection Manual

(General Inspection vol.2: Prevention of Mine Pollution)

August 2016

Chapter I : Preparation prior to conducting a general inspection (prevention of mine pollution)

1. Matters to be grasped prior to conducting a general inspection (prevention of mine pollution)

Mine safety inspectors and the staff concerned in the authorities in charge of mines sector (hereinafter "the inspectors") shall investigate/examine the following matters prior to conducting a general inspection (prevention of mine pollution) at a mine and grasp status of mineral-related operations and safety of the concerned mine.

(1) Mining plan and Environmental Impact Assessment (EIA)

The inspectors shall grasp matters in advance regarding items of "mine safety" contained in the Mining Plan for conducting mineral-related operations prescribed in the article 21, paragraph 4 of the "Law on Management and exploitation of Mineral Resources", and Environmental Impact Assessment (EIA) and Mine Pollution Prevention prescribed in the article 6 of the "Law on Environmental Protection and Mineral Resource Management" and in the article 8 of "Sub-degree on Environmental Impact Assessment Process.

(2) Safety rules

The inspectors shall grasp matters in advance regarding establishment of own safety rules at the mine and contents of the rules.

(3) Submission items

The inspectors shall grasp matters in advance regarding the submission items prescribed in the Mine Safety Law and its regulations (hereinafter "the Law and its regulations"), and permission of mine buildings and structures to be used for the mineral-related operations.

(4) Safety management system

The inspectors shall grasp matters in advance regarding the appointment of a safety supervisor and a representative safety supervisor, as well as the details of the submission thereof.

(5) Mine safety diagrams

The inspectors shall grasp matters in advance regarding submission of drawing-up mine safety diagrams and contents of them.

(6) Special mineral-related operations plan

The inspectors shall grasp matters in advance regarding submission and permission of “special mineral operations plan”, which is drafted by the mine in which minerals and tunnels are dug under the sea, rivers, lakes, or any place where there is a risk of mine pollution, impacts or mine disaster by flood occurring.

(7) Mine pollution prevention measures

The inspectors shall grasp matters in advance regarding submission of mine pollution prevention measures in regard to the facilities that require the prevention of mine pollution such as waste stones dumps, slag dumps, and tailings dams attached to processing plants or mine water treatment facilities, and tunnels (galleries) (levels, inclined shafts, and vertical shafts) for when mines are closed in the future.

(8) Reserve fund system for mine pollution prevention

The inspectors shall grasp matters in advance regarding depositing amount money certainly to the reserve fund system for mine pollution prevention in each specific facility targeted as mentioned above (7).

(9) Pending issues and problems

The inspectors shall take a hearing with the inspectors who conducted the previous general inspection (prevention of mine pollution) regarding pending issues and problems for the concerned mine and to grasp matters in advance the details thereof.

(10) General condition of mineral-related operations at the concerned mine

The inspectors shall grasp matters in advance regarding past inspection results from the reports of general inspection (prevention of mine pollution) as followings: the status of mineral-related operations of the concerned mine, the change of mineral output, the change of the number of mineworkers, the general conditions of mine pollution problems in the past, the general conditions of violations of the Law and its regulations, etc.

2. Preparation prior to conducting a general inspection (prevention of mine pollution)

(1) Pre-meeting regarding a general inspection and drafting the implementation plan for the inspection

In conducting a general inspection (prevention of mine pollution), the inspectors who are to be conducting the inspection shall hold a pre-meeting to extract the inspection points (priority items) for the concerned mine to conduct the inspection more effectively and efficiently based on the following matters: the scale of mineral-related operations of the concerned mine, the improvement instruction items from the previous inspection, pending issues and problems, general conditions of mine pollution problems, the supervision/instruction policies set by government authorities, etc.

Furthermore, an implementation plan for the general inspection (inspection schedule,

priority items for the inspection, division of inspection areas by the inspectors, etc.) shall be drafted with instructions regarding the inspection from the supervisors of the authorities as necessary.

(2) Preparation of a general inspection documents and instruments

In conducting a general inspection, the following documents and instruments shall be prepared as necessary.

1) reports of the general inspection (prevention of mine pollution) in the past (copy)
2) documents of “Mine Safety Inspection Rule”
3) mine safety diagrams of the concerned mine (copy)
4) some pieces of improvement instruction form, and orders for warning and directing form
5) a field notebook
6) a work uniform, safety boots, and safety gloves
7) a safety cap (a hard hat) and a standard dust respirator
8) a clinometer and a measuring tape
9) a camera
12) the certificate of mine safety inspector

Chapter II : Conducting a general inspection (prevention of mine pollution)

1. Conducting a general inspection (prevention of mine pollution) at a mine office

The inspectors shall hold a hearing with the safety supervisor and the technical safety manager (hereinafter “safety seniors”), and the technical safety staff of the concerned mine at a mine office regarding following matters and check the details of the records and items mentioned in the documents (safety diary, maintenance ledger, records management etc.) prescribed in the Law and its regulations, and shall confirm whether there are any hindrances or problems on following matters for preventing mine pollution problems of the mine concerned; in case matters deemed inadequate in terms of safety, the inspectors shall provide improvement guidance for the safety seniors.

(1) Hearings, confirmation, and guidance regarding general conditions of mineral-related operations

The inspectors shall hold a hearing with the seniors of the mine, regarding general conditions of mineral-related operations (mineral output, current working places, mineral production status) and the mining plan, and shall confirm whether there are any hindrances or problems on the contents of the mineral-related operations and the mining plan for preventing mine pollution problems of the mine concerned; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided

for the safety seniors.

(2) Hearings, confirmation, and guidance regarding the scope of duties of safety supervisor, etc., and the status of labor management

1) The scope of duties of safety supervisor, technical safety manager, and technical safety staff

The inspectors shall hold a hearing with the safety seniors of the mine regarding the concrete scope of duties for the safety supervisor, technical safety manager, and technical safety staff and check the scope of duties being clear defined through the records and items mentioned, and shall confirm whether there are any hindrances or problems on safety management system for preventing mine pollution problems of the mine concerned; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

2) Status of labor management

The inspectors shall hold a hearing with the safety seniors of the mine regarding the change in registered mineworkers and future employment plan, and shall confirm whether there are any hindrances and problems on the status of labor management for preventing mine pollution problems of the mine concerned; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

(3) Hearings, confirmation, and guidance regarding the assignment status of the technical safety staff

The inspectors shall hold a hearing with the safety seniors of the mine that suitable number of technical safety staff are secured and assigned based on the scale of the mineral-related operations and the status of mine machineries, and are posted working places of the mine and check them through safety diaries, maintenance ledgers and records management, and shall confirm whether there are any hindrances and problems on suitable number of technical safety staff are secured and assigned for preventing mine pollution problems of the mine concerned; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

(4) Hearings, confirmation, and guidance regarding status of safety training to mineworkers

The inspectors shall hold a hearing with the safety seniors of the mine regarding implementation of safety training to new non-skill mineworkers who engage at a underground mine and mineworkers who engage in the hazardous works prescribed in

the Law and its regulations and check the implementation and contents of the training through the records, and shall confirm whether there are any hindrances and problems on contents of the training for preventing mine pollution problems of the mine concerned; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

(5) Hearings, confirmation, and guidance regarding safety committee

The inspectors shall hold a hearing with the safety seniors of the mine regarding the establishment and activities of the safety committee and check the details of research and deliberations of important matters within the activities of the committee through the records, and shall confirm whether there are any hindrances and problems on activities of the committee for preventing mine pollution problems of the mine concerned; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

(6) Hearings, confirmation, and guidance regarding surveys of mine safety conditions

The inspectors shall hold a hearing with the safety seniors of the mine regarding implementation of surveys of mine safety conditions prescribed in the Law and its regulations and check the contents of the survey results through the records, and shall confirm whether there are any hindrances and problems on implementation of the surveys for preventing mine pollution problems of the mine concerned; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

(7) Hearings, confirmation, and guidance regarding contractual work

The inspectors shall hold a hearing with the safety seniors of the mine and check whether the contractual work plan has already been drafted and submitted to the Minister in charge of mines sector when a contractor other than mineworkers has been engaged more than one month at underground working places, or has been engaged hauling or disposal of mining waste in or outside the mine, and shall confirm whether there are any hindrances and problems on contents and implementation of contractual work for preventing pollution problems of the mine concerned; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

(8) Hearings, confirmation, and guidance regarding matters for improvement instruction for mine safety

The inspectors shall hold a hearing with the safety seniors of the mine regarding the status of improvement matters that were indicated by the inspectors with the improvement instruction for mine safety in the past and check the propriety of the status of improvement, the state of its progress, the scheduled completion date, etc., and shall confirm whether there are any hindrances and problems on the status of the improvement for preventing mine pollution problems of the mine concerned; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

If improvement matters that were indicated by the improvement instruction from the past remain unimplemented, a hearing shall be held regarding the reasons.

(9) Hearings, confirmation, and guidance regarding restoration of closed mineral working place or its utilization plan at an open-pit mine

The inspectors shall hold a hearing with the safety seniors of an open-pit mine regarding the restoration plan for backfilling, soil covering, and planting concerning treatment of closed mineral working place or the reutilization plan of its place when the mineral working place at an open-pit mine is going to be closed or has already been closed, and shall confirm whether there are any hindrances and problems on contents of the restoration plan or the reutilization plan for preventing mine pollution problems of the mine concerned; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

(10) Hearings, confirmation, and guidance regarding communication system and rescue mechanisms at the time of occurrence of mine pollution problems or emergency

The inspectors shall hold a hearing with the safety seniors of the mine regarding the appropriate communication system and rescue mechanisms installed for the time of mine pollution problems or any other similar emergency occurring.

The inspectors shall also confirm whether there are any hindrances and problems on contents of communication system and rescue mechanisms for preventing mine pollution problems of the mine concerned; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

(11) Hearings, confirmation, and guidance regarding awareness raising on mine safety

The inspectors shall hold a hearing with the safety seniors of the mine regarding specific engagement of awareness raising on mine safety, current or planned, and shall check the achievements and drafted plans, and shall confirm whether there are any

hindrances and problems on awareness raising for preventing mine pollution problems of the mine concerned; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

(12) Hearings and confirmation regarding the environmental conditions and public facilities surrounding the mine concerned

The inspectors shall hold a hearing with the safety seniors of the mine regarding environmental conditions of residences, agricultural lands etc., and the presence of public facilities (roads, rivers, bridges, multi-purpose dams, parks, hospitals, schools, etc.,) surrounding the mine, and shall confirm whether there are any hindrances and problems on separating distance between mine working fields and residences, agricultural lands and public facilities for preventing mine pollution problems of the mine concerned; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

(13) Hearings and confirmation regarding complaints from local residents

The inspectors shall hold a hearing with the safety seniors of the mine regarding complaints or requests concerning mineral-related operations from the local residents surrounding the mine concerned, and check its details and measures taken by the mine concerned, and confirm whether there are any hindrances and problems on contents of the measures taken for preventing mine pollution problems of the mine concerned; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

(14) Hearings and confirmation regarding the financial condition of the mining company

The inspectors shall hold a hearing with responsible persons in charge of finances of the mine regarding the financial condition of the mining company if necessary, and shall confirm whether there are any hindrances and problems on the financial condition for preventing mine pollution problems of the mine concerned; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

2. Confirmation and guidance regarding safety diaries, maintenance ledgers and records management prescribed in the Law and its regulations at a mine office

(1) Confirmation and guidance regarding items mentioned in various safety diaries

The inspectors shall confirm whether various safety diaries containing operation state of safety works in each place, measures taken for preventing mine pollution problems prescribed in the Law and its regulations are maintained by technical safety staff for mine pollution prevention and related technical safety staff, whether format and items mentioned of the diaries are adequate, and whether the diaries are inspected by the safety seniors of the mine; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

1) The diary for machinery safety containing operation, maintenance, repair and intermission states of machineries and instruments regarding mine pollution prevention, and other important matters for safety as recorded by a technical safety staff for machinery
2) The diary for electricity safety containing operation, maintenance, repair and intermission states of electrical machines, appliances and wiring regarding mine pollution prevention, and other important matters for safety as recorded by a technical safety staff for electricity
3) The diary for prevention of mine pollution containing operation states of facilities, measures for mine pollution prevention, results of periodic measurements of necessary items and analysis, and other important matters for safety as recorded by a technical safety staff for prevention of mine pollution
4) The diary for poisonous and deleterious substances safety containing management of poisonous and deleterious substances, and its depots, the situation of dealing and handling in aforesaid substances, and other important matters for safety as recorded by a technical safety staff for poisonous and deleterious substances

(2) Confirmation and guidance regarding items mentioned in various maintenance ledgers and records management containing results of periodic examinations or measurements

The inspectors shall confirm whether various maintenance ledgers, records management containing precise examinations or measurements prescribed in the Law and its regulations are maintained and stored by technical safety staff for mine pollution prevention and related technical safety staff, whether there are any problems with the results of examinations or measurement, and whether maintenance ledgers and records management are inspected by the safety seniors of the mine; in case matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors.

1) The maintenance ledger containing the results of precise examinations and measurements for machineries and instruments which require especially safety

cautions regarding mine pollution prevention as recorded by a technical safety staff for machinery.

2) The maintenance ledger containing the results of precise examinations and measurements for electrical machines, appliances, wiring and grounding (earth) which require especially safety cautions regarding mine pollution prevention as recorded by a technical safety staff for electricity

3) The maintenance ledger and records management containing the results of precise examinations and measurements for the mine smoke generating facility and mine smoke treatment facility, the dust generating facility such as a crusher with a rated motor output of seventy-five (75) kW or more and a mill or screen with a rated motor output of fifteen (15) kW or more etc., and the dust collector, the treatment facilities on contaminated mine water or wastewater, the dioxin-kinds incinerator, the mining wastes treatment facility, the noise generating facility and noise prevention facility at the mine subject to noise regulations, the vibration generating facility and vibration prevention facility at the mine subject to vibration regulations, the waste stones dump, slag dump and tailings dam which require especially safety cautions regarding mine pollution prevention as recorded by a technical safety staff for mine pollution prevention

3. Conducting a general inspection (prevention of mine pollution) to the mine facilities and working places

(1) General items

1) The request of attendance a general inspection to the safety seniors of the mine

The inspectors shall request the safety seniors of the mine to attend a general inspection to the mine facilities and working places, and shall also request the technical safety staff posted at the facility or working place to support the explanation for use of the facility or work conditions if necessary.

2) Confirmation and guidance regarding establishment or modification of mine buildings, structures or other facilities to be used in mineral-related operations

The inspectors shall confirm whether the “facility plan” for mine buildings, structures or other facilities at the mine has already been submitted to the Minister in charge of mines sector for permission prescribed in the Law and its regulations, and shall confirm whether there are any hindrances and problems on the contents of the plan for preventing mine pollution problems of the mine concerned; in case the matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors by mutual consent.

3) Confirmation and guidance regarding the “proper work procedure” prescribed in the own safety rules at the mine

While conducting the general inspection at working places of the mine, the inspectors shall confirm that mineworkers engaged in various tasks confirm with “proper work procedure” prescribed in the own safety rules, and shall confirm whether there are any hindrances and problems on the contents of “proper work procedure” for preventing mine pollution problems of the mine concerned; in case the matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors by mutual consent.

4) Confirmation and guidance regarding special mineral operations plan and measurement of surface subsidence

The inspectors shall confirm whether mining methods and advanced drillings of mineral-related operations in underground mine have been carried out according to the “special mineral operations plan” and “special safety diagrams” when minerals and tunnels have been dug under the sea, rivers, lakes, or any place where there is a risk of mine pollution, impacts or mine disaster by flood occurring, and also shall confirm whether there are any hindrances and problems on the contents of advanced drillings and measurement results of surface subsidence through the records for preventing mine pollution problems of the mine concerned; in case the matters deemed inadequate in terms of safety, improvement guidance shall be provided for the safety seniors by mutual consent.

Chapter Ⅲ : Conducting a General Inspection (Prevention of Mine Pollution) on a Waste Stones Dump, a Slag Dump and a Tailings Dam

(Referring to the attached document No.1 for details)

Chapter Ⅳ : Conducting a General Inspection (Prevention of Mine Pollution) on Mine Water and Wastewater

(Referring to the attached document No.2 for details)

Chapter Ⅴ : Conducting a General Inspection (Prevention of Mine Pollution) on Noise

(Referring to the attached document No.3 for details)

Chapter Ⅵ : Conducting a General Inspection (Prevention of Mine Pollution) on Vibration

(Referring to the attached document No.4 for details)

Chapter Ⅶ : Conducting a General Inspection (Prevention of Mine Pollution) on Mine Smoke (Soot) and Dust

(Referring to the attached document No.5 for details)

Chapter Ⅷ : Conducting a General Inspection (Prevention of Mine Pollution) on Mining Waste, Poisonous & Deleterious Substances, Dioxin-kinds and Land Excavation

(Referring to the attached document No.6 for details)

Chapter Ⅸ : Measures of supervision and guidance in accordance with a general inspection (prevention of mine pollution)

1. Measures of supervision and guidance for matters required improvement or imminent danger that are in violation of the Law and its regulations are found in the results of a general inspection

1) The inspectors shall indicate the improvement guidance to ensure safety and also issue the improvement instructions for mine safety under the provision of article 7, paragraph 1 of "Mine safety Inspection Rule" (hereinafter "the Rule") to the concessionaire of the mine when the matters requiring improvement and in violation of the Law and its regulations are found, and mutual consent with the safety seniors of the mine are confirmed during the inspection. The improvement instructions for mine safety shall be prepared in duplicate including mutual consent of the matters requiring improvement with safety seniors of the mine and their signatures, one is to the concessionaire and the other is to be attached in the general inspection report.

2) The inspectors shall order the improvement of violated items speedily and also issue the orders for warning and directing under the provision of article 8, paragraph 1 of the Rule to the concessionaire of the mine when the use or handling of mine facilities in the mining violates the Law and its regulations, and there is an imminent safety risk in mineral-related operations are found, and mutual consent with the safety seniors of the mine are confirmed

during the general inspection. The orders for warning and directing shall be prepared in duplicate, including mutual consent of the imminent safety risks requiring improvement of violated items speedily with safety seniors of the mine and their signatures, one is to the concessionaire and the other is to be attached in the general inspection report.

3) For matters requiring the aforementioned improvement and matters requiring immediate clearance, the inspectors shall identify the imminent safety risk in working places and their details, clearly record in a field-book and also the events in violation of the Law and its regulations as well as the events in which imminent risk is recognized, and perform measurements and detailed investigation as necessary; record the results in the field-book and so forth also, make a sketch drawing for the relevant the imminent safety risk in working places and their conditions, and take some pictures as necessary.

2. Comments on the results of a general inspection (prevention of mine pollution)

The inspectors shall take a meeting with the concessionaire, safety supervisor, technical safety manager and technical safety staff of the mine concerning matters requiring immediate clearance and improvement instructions, and overall opinions for the results of a general inspection (prevention of mine pollution) in detail, and shall have a hearing about opinions offered the aforementioned matters from the mine concerned after the inspection is over.

3. Reporting the results of a general inspection (prevention of mine pollution)

The inspectors shall report the results of a general inspection prescribed in the provision of article 2, paragraph 3 of the “Mine Safety Inspection Rule” using the format of this manual, and report it to the Director General in charge of mines sector (in case mine inspectors are staffed in the provincial Departments, by way of provincial Director).

The inspection report shall be prepared by following format, including important matters as follows.

1) The inspection results, matters found to be in violation of the Law and its regulations.
2) Important matters instructed by inspectors based on the “Mine Safety Inspection Rule”.
3) Warned and directed matters ordered by inspectors based on the “Mine Safety Inspection Rule”.
4) Concerned matters and issues to be handed over to the inspectors who will conduct next inspection.
5) Overall opinions of the inspectors.

The General Inspection (prevention of mine pollution) Report (format)

1. Name of mine (Name of pit, in case of coal mines):

2. Kinds of minerals, licensed number of the mining area:

3. Location of the mine:

4. Address of mine office, telephone number and FAX number:

5. Name of the concessionaire (Representative of corporation):

6. Address of the concessionaire (Representative of corporation), telephone number and FAX number:

7. Name of the safety supervisor (Date of appointment):

8. Name of the representative safety supervisor (Date of appointment):

9. Enrollment of technical safety manager and technical safety staff

1) Number of technical safety manager:

2) Number of technical safety staff for machinery:

3) Number of technical safety staff for electricity:

4) Number of technical safety staff for prevention of mine pollution:

5) Number of technical safety staff for poisonous and deleterious substances:

10. Enrollment of mineworkers

1) Number of surface mineworkers:

2) Number of underground mineworkers:

11. Concerning mineral-related operations

1) Date of a beginning and history of mineral-related operations:

2) Method of mining:

3) Production of crude ore and average grade (ton/month, %):

4) Mineral concentration process and average grade (ton/month, %):

5) Smelting and refining process, and average grade (ton/month, %):

6) Production of manufactured products and sales (ton/month):

a) Production of every manufactured product (ton/month):

b) Sales of every manufactured product (ton/month):

7) Total output of electrical equipment (KW):

12. Concerning mine safety

1) The buildings, structures and other facilities for use in mineral-related operations prescribed in article 9 of Mine Safety Law (writing down the following items concerning buildings, structures and other facilities individually)

a) Name of building, structure or facility:

b) Notification date of the "Facility Plan"

c) Permission date of "Facility Plan" by the Minister in charge of mines sector

d) A summary of building, structure or facility:

2) The contractual work prescribed in article 19 of the Law

a) Notification date of the "Contractual work Plan":

b) Contents of contractual work, and number of mineworkers engaged in the work:

c) Period of contractual work:

3) The special mineral operations prescribed in article 20 of the Law

a) Notification date of the "Special Mineral Operations Plan":

b) Permission date of "Special Mineral Operations Plan" by the Minister in charge of mines sector

c) A summary of special mineral operations plan

4) Notification of "Safety Rules" and "Mine Safety Diagrams"

a) Notification date of "Safety Rules":

b) Notification date of "Mine Safety Diagrams":

5) Occurrence situation of own mine pollution problems

(writing down the following items concerning the own mine pollution problems that occurred past time by turns)

a) Occurrence date of mine pollution problems:

b) The sort of mine pollution problems:

c) Situation of mine pollution problems after its occurrence:

d) Causes of mine pollution problems:

e) Number and situation of victims:

13. Overall opinions of the inspectors conducted a general inspection

1) The conducting term of the general inspection:

2) The results of the inspection, matters found to be in violation of the Law and its Regulations:

3) Important matters instructed by inspectors based on the "Mine Safety Inspection Rule":

4) Warned and directed matters ordered by inspectors based on the "Mine Safety Inspection Rule":

5) Concerned matters and issues to be handed over to the inspectors who will conduct next Inspection:

6) Overall opinions of the inspectors:

7) Relevant matters:

14. Attached documents and diagrams

1) The improvement instructions for mine safety or the orders for warning and directing if they issued.

2) Sketches and some pictures that are relevant matters requiring the improvement or matters requiring immediate clearance to the results of the inspection.

3) Plane diagrams of the mine

4) Relevant documents

※ Date of submission of the general inspection report (dd/mm/yyyy)

※ Name of mine safety inspectors and the staff concerned who conducted the general inspection

(attached document No.1)

Chapter Ⅲ: General Inspection (Prevention of Mine Pollution) on a Waste Stones Dump, a Slag Dump and a Tailings Dam

August 2016

1. Preparation of a general inspection (prevention of mine pollution) documents and instruments

In conducting a general inspection (prevention of mine pollution) on a waste stones dump, a slag dump and a tailings dam, the inspectors shall prepare following instruments in addition to Chapter Ⅰ. 2. (2) "Preparation of a general inspection documents and instruments" as necessary.

1) Instruments for water quality measurement (a portable pH meter, some Pack-tests)

2) Some of 1000-ml polyethylene bottles

3) Some of Filters

4) a Funnel

5) Chemicals (Nitric acid (HNO_3), Sodium hydroxide (NaOH) etc.,)

6) a Thermometer

2. Conducting a general inspection (prevention of mine pollution) on a waste stones dump, a slag dump or a tailings dam

(1) Conducting a general inspection (prevention of mine pollution) on a waste stones dump, a slag dump or a tailings dam at a mine office

The inspectors shall hold a hearing with the safety seniors regarding following matters concerning a waste stones dump, a slag dump or a tailings dam of the mine, and shall confirm whether there are any hindrances or problems for preventing mine pollution problems processing the mineral-related operations; in case matters deemed inadequate in terms of safety, the inspectors shall provide improvement guidance for the safety seniors.

1) Are following items regulated in the own mine safety rules at the mine?

a) Items concerning management of a waste stones dump, a slag dump or a tailings dam

b) Items concerning measures at the time of heavy rainfall, rainy season

c) Items concerning preparing and storing the emergency tools and materials properly

d) Items concerning protection woods on a waste stones dump, a slag dump or a tailings dam

2) Does a safety technical staff for prevention of mine pollution obey following items to prevent mine pollution problems caused by collapsing the accumulations of waste stones or slag, or flowing out the sediments concerning a waste stones dump, a slag dump and a

tailings dam?

a) To check and examine for a blocking wall or an embankment of a waste stones dump or a slag dump, whether or not collapsing of accumulated materials, land slide in every working day, and write down the results of examination in the safety diary.

b) To check and examine for a blocking wall, an embankment, a mountain stream drainage, hillside channels, an emergency drainage and inside water drainage in every working day, and write down the results of examination in the safety diary.

c) To take prompt measures, and report to the administrator (safety seniors) of the mine speedily when there is found effects such as cracks on the surface of the embankment, subsidence of the embankment, collapse or landslide around sites of the dump or dam.

3) When there is a heavy rain around sites of a waste stones dump, a slag dump or a tailings dam, does a safety technical staff for prevention of mine pollution increase frequency of the examination for confirming the abnormality or not at the embankment, or a blocking wall, outbreak of collapse of accumulated materials, and outbreak of land slide regarding to the waste stones dump or slag dump, and confirming the abnormality or not at the embankment, a mountain stream drainage, hillside channels, inside water drainage and an emergency drainage regarding to the tailings dam?

Does the safety staff write down results of the examination the maintenance ledgers, too?

4) When mine pollution problem occurs or is highly likely to occur in a waste stone dump, a slag dump or a tailings dam, does the concessionaire report the state of incident, list of emergency measures taken, and plans for restoration work and the list of completed work to the Director General in charge of mines sector in accordance with the Law and its regulations ?

5) Hearing and confirmation regarding present conditions of a waste stones dump, a slag dump or a tailings dam as follows

a) present conditions of an embankment or a blocking wall of the dump or dam

b) storage capacity per month

c) gross volume of storage capacity at present and the plan of storage capacity

(2) Conducting a general inspection (prevention of mine pollution) on a waste stones dump, a slag dump and a tailings dam and facilities concerned

In addition to "Chapter Ⅱ. 2. Conducting mine facilities and working places", inspectors shall confirm following matters whether there are any hindrances or problems for preventing of mine pollution problems concerning a waste stones dump, a slag dump or a tailings dam in the process of the mineral-related operations; in case matters deemed inadequate in terms of safety, the inspectors shall provide improvement guidance for the safety seniors.

1) Whether has the "facility plan" for a waste stones dump, a slag dump or a tailings dam at

the mine already been submitted to the Minister in charge of mines sector for permission prescribed in the Law and its regulations, and also whether are the dump or dam facilities conformity with the "facility plan"?

2) Are an embankment, blocking wall or other appropriate facilities established in a waste stones dump, a slag dump or a tailings dam to prevent mine pollution problems caused by collapsing the accumulations of waste stones or slag, or flowing out the sediments such as slime?

3) Is a waste stones dump or a slag dump, a tailings dam established at the sites where there is a high risk of danger or occurrence of mine pollution problems due to collapse and landslide?

4) Is a waste stones dump, slag dump and tailings dam established to keep a minimum distance of thirty (30) m from residences, agricultural lands, mine offices and public facilities such as a public roads, rivers, bridges, multipurpose dams, parks, hospitals, schools, etc.,?

5) When a waste stones dump, a slag dump or a tailings dam is disused, are necessary measures such as soil covering and vegetation inside dam site and the slope of the embankment taken to prevent mine pollution problems caused by outflow of wastewater or sediments?

6) In a tailings dam, are an inside water drainage, a mountain stream drainage, hillside channels and other appropriate facilities installed to prevent off-site water such as mountain streams, hillside water and other water from flowing into inside the dam site?

7) Is an emergency drainage installed at proper positions of outside dam site to prepare inflowing large amounts of off-site water into the tailings dam of which the embankment is established by soil materials?

8) Management status of a waste stones dump, a slag dump, a tailings dam and facilities concerned

- **a) Is an emergency system complete? Have the safety technical staff trained periodically that emergency case assumed?**
- **b) Are the emergency tools prepared and stored properly?**
- **c) Are the seepage level and rise of the water level inside the embankment of a tailings dam measured? Is the measuring equipment appropriate, and are the maintenance and management of the equipment adequate?**
- **d) Are drainage facilities of a tailings dam checked and examined regularly?**

9) The structure of the embankment concerning a waste stones dump, a slag dump and a tailings dam

- **a) Are the banking materials of the embankment proper? Is the compaction method proper?**
- **b) Is top of the embankment wide enough?**

c) Are the berm and angle of the slope face undertaken construction in accordance with the facility plan?

d) Are the top and the slope face of the embankment any abnormality phenomena such as uneven surfaces, cracks and sinking?

e) Is the slope covered with soil and vegetation after formation of an embankment without delay? Is it free of scouring by rainfall?

10) Dumping method of slime in a tailings dam

a) Is there any damage or crack on the pipe-line carrying slime to a tailing dam, and is it found the slime or wastewater flowed out from the damaged part?

b) Is the slime that carried by a pipe-line discharged from an embankment toward the upstream of a tailing dam?

c) Is slime sediments carried out evenly throughout a tailings dam, and is slime level raised equality inside the dam?

d) Is the water level inside a tailings dam kept lower than top of the embankment by one (1) m or more?

e) Is surface of slime sediments inside a tailings dam kept lower than top of the embankment by 0.5 m or more?

f) Is spring water spurted out through the hole-piercing due to seepage water on the slope of an embankment?

g) Are there depressed holes, cracks or other abnormality phenomena observed on the surface of slime sediments surrounding the embankment?

h) Is the gushing (spring) water occurred near by embankment? Are sliding-out, collapse or like phenomena occurred surrounding end of the embankment?

i) Is the seepage level inside the embankment raised abnormally than usual?

11) Drainage facilities in a tailings dam

(inside water drainage)

a) Are drainage facilities to eliminate inside water of the dam working sufficiently?

b) Is an emergency drainage kept in the adequate condition?

c) Is sufficient surplus height between the entrance gate of an emergency drainage and the top of the embankment?

(mountain stream drainage)

d) Is a mountain stream drainage established with sufficient discharge potential?

e) When culverts used as a mountain stream drainage are established in the bottom of the tailing dam by cutting the foundation ground, is the structure of the culverts robust, and is there any crack, damage, closed or like abnormality the inside?

f) Are a driftwood stopper, soil-stopping facilities and other appropriate facilities established upstream of mountain stream drainage to prevent the blockage of channels caused by driftwood, soil, stones?

g) Does a function of a driftwood stopper and soil-stopping facilities work sufficiently? (hillside channels)

h) Are hillside channels buried by sands, fallen leaves inside?

i) Are hillside channels collected hillside water securely and worked effectively?

j) Are hillside channels not damaged?

(3) Sampling for wastewater or gushing (spring) water occurred near by embankment in a waste stones dump, a slag dump and a tailings dam sampling of wastewater

1) Concerning the wastewater (inside water) from the drainage facility of the dump or dam, the measurement of pH, water temperature and amount of discharge of wastewater, and quickly check of the water quality using Pack Tests are conducted at the location of the drainage facility of the dump or dam, and write down the results of measurement data to the field book. In case the water quality analysis of the wastewater from the dump or dam is necessary, the sampling of wastewater is conducted at the same spot together with the mine concerned.

Concerning the wastewater from the treatment facility that is neutralized after discharging from the drainage facility of the dump or dam, the measurement of pH, water temperature and amount of discharge of wastewater, and quickly check of the water quality using Pack Tests, and sampling of wastewater from the treatment facility are conducted as well as above together with the mine concerned if necessary.

2) Concerning spring water from slope of the embankment of dump or dam, the measurement of pH, water temperature and amount of spring water, and quickly check of the water quality using Pack Tests for spring water as well as above 1), and write down the results of measurement data to the field book, and take sampling of the spring water together with the mine concerned if necessary, and make sketches regarding the spot of spring water from the slope of the embankment in details and also take some pictures.

3) Concerning gushing (spring) water near by the embankment of the dump or dam, the measurement of pH, water temperature and amount of gushing (spring) water, and quickly check of the water quality using Pack Tests for gushing (spring) water as well as above 2), and write down the results of measurement data to the field book, and take sampling of the gushing (spring) water together with the mine concerned if necessary, and make sketches regarding the spot of gushing (spring) water near by the embankment in details and also take some pictures.

4) Concrete methods of collecting water samples for wastewater and gushing (spring) water are referred to seeing "3. Conducting collecting water samples for water quality survey of mine water and wastewater" of "Chapter Ⅳ: Conducting a General Inspection (mine pollution prevention) for Mine Water and Wastewater".

3. Drafting and reporting of a general inspection on a waste stones dump, a slag dump and a tailing dam

Report of a general inspection (prevention of mine pollution) on a waste stones dump, a slag dump and a tailings dam (Format)

（Writing down the following items concerning a waste stones dump, a slag dump and a tailings dam individually)

1. Name of the dump or dam, and Location of the dump or dam	
2. Beginning date of dumping	
3. Classification	**In use, Suspend, Closed**
4. An embankment or a blocking wall **1) Length** **2) Width** **3) Inclination in case of the embankment** **(the upper stream)** **(the down stream)** **4) Height** **(base ground ~ top of the embankment or blocking wall)** **5) Embankment materials** **6) Classification of the embankment or blocking wall**	
5. Storage capacity **1) Gross volume of storage capacity (plan)** **2) Effective storage capacity (present)**	
6. Management of drainage facilities **1) The status of inside drainage** **2) The status of emergency drainage**	

3) The status of mountain stream drainage **4) The status of hillside channels**	

7. Slope surface of the embankment **1) The status of slope surface** **2) gushing (spring) water**	
8. Quantity of inside drainage (m^3/min)	
9. Management of upper stream of the dam **1) The status of driftwood stopper** **2) The status of the sand stopping facilities**	
10. Circumference of the dump or dam **1) The status of hillside (ex. forest, rocky place)**	
11. Downstream of the dump or dam **1) Existence of the river, lake (the name of river, or lake) (Quantity of river)** **2) Quantity of irrigation, a water supply from the river or lake** **3) Existence of damaged objects if collapse or outflow of the dump or slime occurred**	
12. Particular things	

13. Results of analysis on inside water (wastewater) or gushing (spring) water

Location of Sampling	Quantity of water (m3/min)	Water temperature (℃)	pH	Color, muddy	Copper Cu (ppm)	Lead Pb (ppm)	Zinc Zn (ppm)	

14. The mine pollution problems caused by a waste stones dump, a slag dump and a tailings dam that occurred past time by turns

Occurrence date of the problems	Location	Outline of mine pollution problems, and damage

15. Evaluation and problems of the inspection on a waste stones dump, a slag dump and a tailings, and inspectors' opinion

16. Attached documents and diagrams

1) Plane diagrams of the waste stones dump, slag dump and tailings dam (write down the location of drainage facilities, gushing (spring) water, places of sampling water)

2) Plane diagrams for under stream of the waste stones dump, slag dump and tailings dam (write down the residences, agricultural lands, mine offices and public facilities such as public roads, rivers, bridges, multipurpose dams, parks, hospitals, schools, etc.,)

3) Computation of Slope Stability analysis of the embankment of a tailings dam if possible

4) Documents concerning hearings with the safety seniors of the mine regarding the contents of the complaints and requests from the residents living around the mine, and status of how the mine is working to address to those complaints and measures.

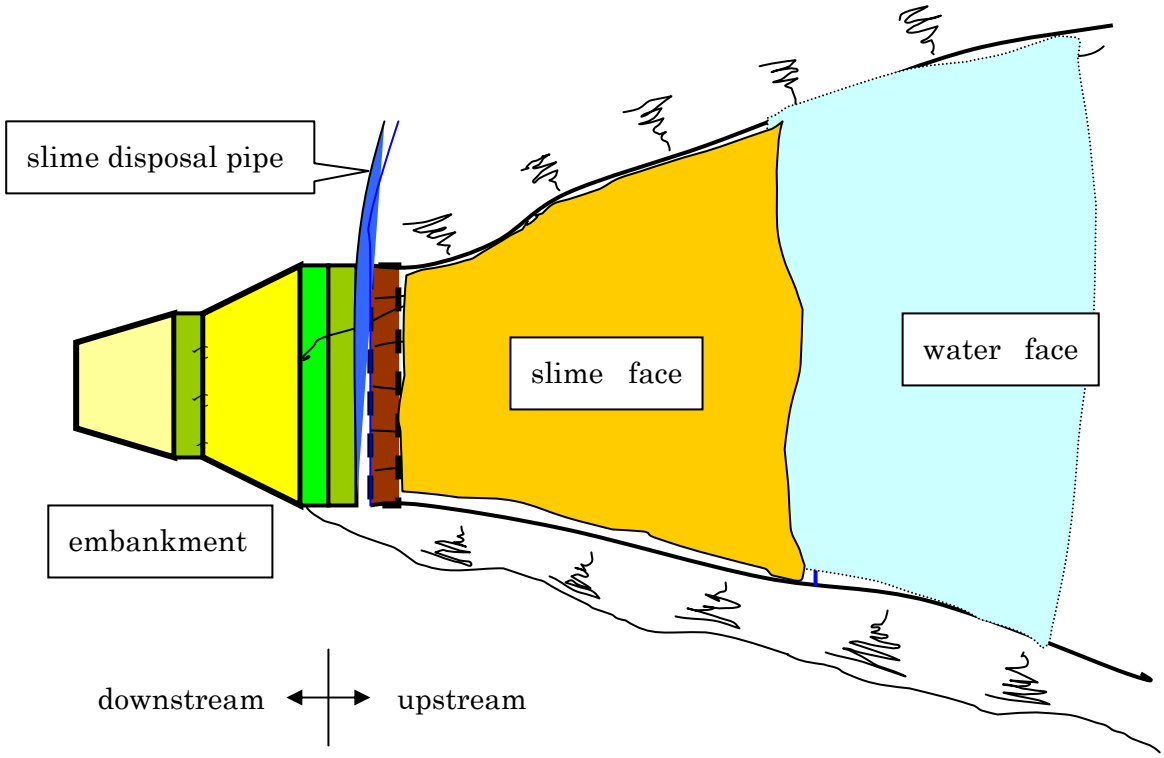
5) Photos concerning the waste stones dump, slag dump and tailings dam

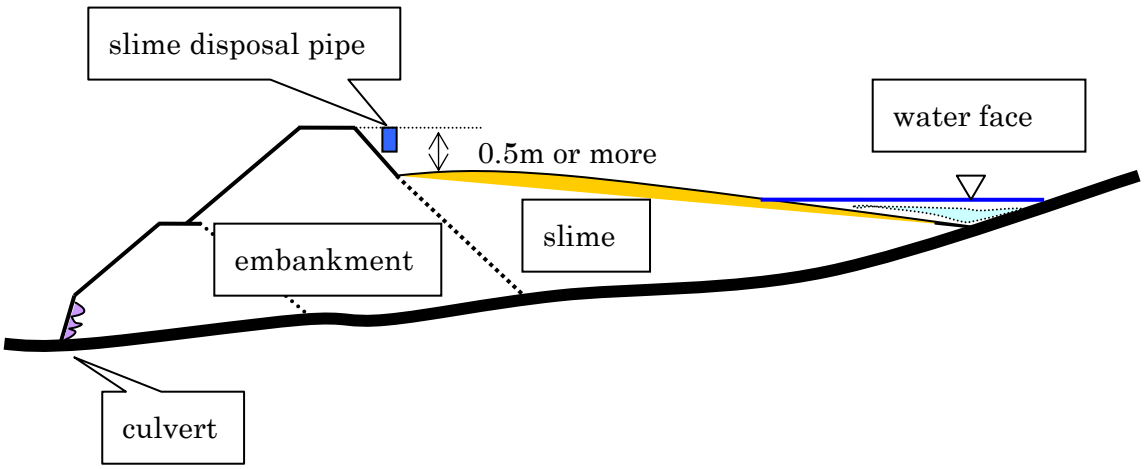
(Commentary)

<Checking Points for a Tailings Dam>

1. Dumping method of slime to a tailings dam

1) The aim is to drive away water face as far as possible from an embankment and, at the same time, to improve the stability of the tailings dam, by making the rises of surface of the sediments equality. An example is shown below.

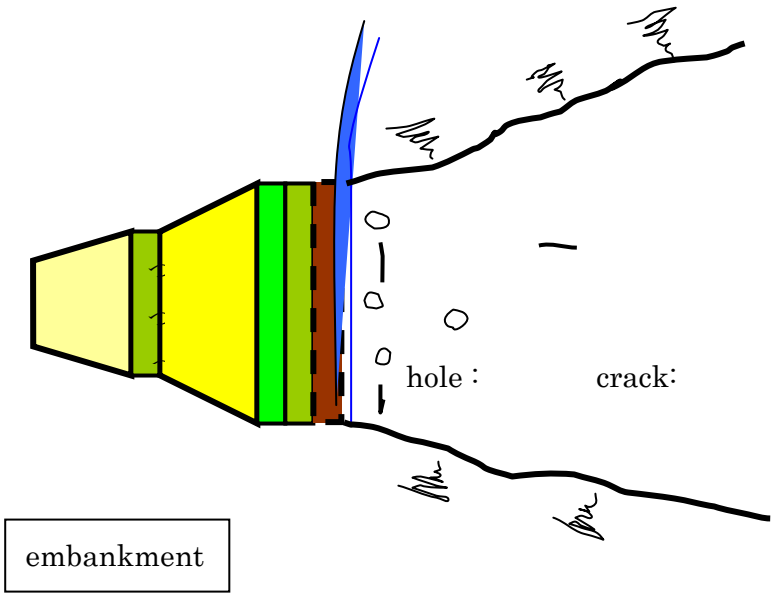


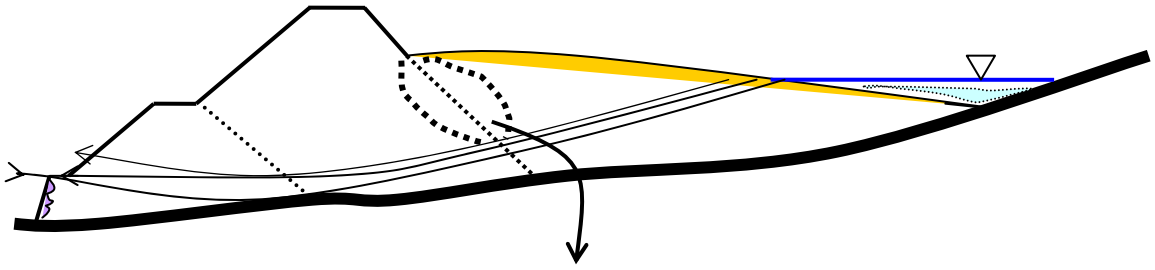


2) In such cases as shown above in the figure, it is said that the difference of height is 0.5 m or more between the surface of slime sediments and the top of an embankment. The purpose of this difference is to leave a margin so as to discharge on-site water without flowing over the top of the embankment even if the water face level rises during heavy rains.

3) It is the worst case from the viewpoint of the stability of the tailings dam if the water face contacts the embankment. This is not only because tailings dams are not originally designed for the purpose of storage of water but also (because they are designed and constructed) rather to hasten slime sediment to solid state.

4) If depressed holes or cracks are observed on the surface of slime sediments surrounding the tailings dam, it is considered that hole-piercing action due to seepage water inside slime sediments is taking place. This means that, with the dam slope on the upstream side as a boundary, the tailings dam and banking materials play the role of a filter layer. If the hole-piercing action advances, seepage water will spurt out from the slope face on the downstream. This might cause collapse of the embankment of the dam.





(This place do not play the role of a filter layer)

2. The embankment of a tailings dam

1) Stability of a tailings dam is closely related to conditions of making embankment. Especially, inside of structures is important.

2) When gushing (spring) water or seepage water is observed on slope face of the embankment, it is the state in which an optimistic view cannot be allowed in terms of stability of the embankment.

In this case, it is necessary to investigate the cause and take measures.

3) When an uneven surface or a crack is found on the slope face of the embankment, it is proper to consider that water is saturated inside the embankment, or that seepage water causes hole-piercing action. In this case, it is also necessary to investigate the cause and take measures.

4) If the slope face of the embankment is scoured by rainwater, this action alone will lower stability of the embankment. (In addition, it will result in muddy rivers, because the flowing water which scoured the slope will carry earth and sand.) It is necessary to take measures to protect the slope face and measures for discharge in order to prevent scouring.

5) If there is slippage around the end of the slope of the embankment, it should be considered that water is saturated inside the embankment. It is necessary to take measures.

3. Drainage facilities of a tailings dam

1) The emergency drainage does not become serviceable until an emergency due to a natural disaster, such as a heavy rain, occurs. Therefore, the emergency drainage must be prepared for effective functioning at any time and on any occasion.

2) As stream water is usually clear (and harmless), it must be completely introduced into mountain stream drainage. If the stream water is allowed to flow into a tailings dam, the level of water face will be raised in the dam.

3) In many cases, a culvert on the bottom is installed on foundation rock of a tailings dam, and the role of this conduit is to discharge both inside water and stream water. Although both inside water and stream water is clear, if the discharged water is muddy at an outlet of the covered conduit, it is proper to consider that this has resulted from some inside abnormality. For example, deposited mud may have entered through cracks of the covered conduit, or seepage water may have been introduced.

4) If the volume of water at an outlet of the covered conduit is excessive, it is considered from the volume of stream or inside water taken in that a large quantity of spring water, subsoil water or like may be flowing in from some part(s) of the covered conduit. Accordingly, caution is required.

5) The driftwood stopper and soil-stopping facilities are placed on the upstream portion of mountain stream drainage to remove trees, soil carried from upstream by stream water during a heavy rain, in order to prevent blockage or damage of the inlet of stream water.

Therefore, these facilities must be maintained so that they can remove drifting logs, soil and rocks at any time. If the driftwood stopper and soil-stopping facilities are interrupted by drifting logs, soil and rocks, stream water flows out and carries them which then may block the inlet of stream water or the inside of mountain stream drainages.

6) Hillside channels are facilities to prevent mountainside water from entering a tailings dam. If these are damaged or blocked up, water will overflow into the dam.

When flowing water is not observed from hillside channels that worked effectively in the beginning of installation, in spite of a heavy rain, it should be considered that rainwater enters the dam as subsoil water. Therefore, it is necessary to pay attention to the rise of the water level of the dam.

4. Construction standard of a soil type embankment of a tailings dam

(1) Conditions for selecting the site of a soil type embankment

1) In the vicinity of the downstream side of the location for which design is planned, there are no houses and public facilities such as a school, a multipurpose dam, rivers, railways, public roads and important buildings.

2) The danger of landslides is low.

3) The location does not close off a valley having a large catchment area.

4) The foundation ground is appropriate.

(2) Implementing the surveys of the foundation ground

In order to select the site of the tailings dam, the following surveys in regard to the local foundation ground and the nearby foundation grounds thereof shall be conducted in advance.

1) The types, attributes, and presence of rocks and soil that make up the foundation ground

2) The state of the groundwater

3) The locations and states of spring water

(3) Drainage capacity of the drainage facilities

The amount of precipitation and the amount of inflow from a mountain stream and hillside during rainfall in order to determine the drainage capacity that outside water drainage facilities and inside water drainage facilities shall be determined based on the following items.

1) In calculating the drainage capacity shall be used the maximum amount of precipitation that is considered to occur once in a period of 100 years.

However, in calculating the drainage capacity of an emergency drainage, the maximum amount of precipitation that is considered to occur once in a period of 200 years is used.

2) The amount of precipitation is calculated based on the observational data over a long period of time at the precipitation observatory station considered to be representative of the catchment. However, in the event that observational data concerning precipitation is

not available, it is permissible to substitute this with the amount of precipitation estimated from long-term observational from a nearby precipitation observatory station.

3) In calculating the influent quantity, the factors that are the runoff coefficient from the catchment area, the average rainfall intensity during the time of concentration, and the catchment area are used.

4) Flow of sand and rocks must be considered according to the state of the catchment area.

(4) General matters concerning design of a soil type embankment of a tailings dam

1) The embankment of the dam must not create a load equal to or greater than the allowable bearing power on the foundation ground.

2) The embankment of the dam must be stable to dead weight and external force.

3) The embankment of the dam must have an appropriate structure for draining water contained in the sediments.

4) Seepage water lines must not appear on the slope face of the downstream side of the embankment.

5) Piping phenomena must not have occurred in the foundation ground and in the body of the embankment.

6) The slope surface of the embankment must be constructed for preventing corrosion caused by rainwater.

7) The structure of the embankment must be established for preventing outflow of embankment materials and the slime sediments inside the dam.

8) The embankment materials must not be easily scattered.

(5) The physical properties concerning the foundation ground and sediments necessary for the confirmation of the design of the tailings dam and of the management and stability of execution shall be judged to be appropriate or not based on the results of the soil tests.

The types of soil tests that are performed in regard to the foundation group and the sediments are explained below, and the collection points and methods shall of testing requirements and samples shall be decided so that it is possible to obtain a sufficient level of precision necessary for performing a stability analysis of the embankment of the tailings dam.

For collecting samples, there are collection methods with which a position from which a sample representative of the entire area is collected, such as by using boring, a test well, or trenching.

1) Particle Size Test

Purpose and Application

The purpose of this test is to know the different sizes of particles that compose soil.

It will also be shown that the distribution of various sizes of soil particle is proportional to its weight. The nature of soil materials can be differentiated into gravel, sand, silt and clay through the range of its particle sizes.

Sieving process determines the distribution of particle sizes whose sizes are larger than 75 μm (No.200 sieve), while a sedimentation process determines the distribution of particle sizes whose are smaller than 75 μm.

Use of Test Result

Testing of particle size indicates not only the type of soils but also its physical characteristics.

2) Test for Water Content of Soil

Purpose and Application

The water content in the soil can be described as water-contained ratio that is the mass ratio between mass of water and dry soil of specimen.

Water-contained ratio is the basic value in finding out the soil condition because physical characteristics of soil become different with the influence of water.

Use of Test Result

It is commonly considered that the stress of sandy soil is higher than that of clay. But the strength of the same soil can differ depending on its water-contained ratio. Water content of the soil is an important indicator of soil quality both in its physical and the dynamic aspect.

It is therefore important to quantify the water content in the different soil types as it varies differently before doing any civil engineering works.

3) Test of Soil Particles Density

Purpose and Application

To find the density of soil particles, it's mass and volume should be calculated. Though the mass measurement of soil particle is easy to calculate, it is necessary to remove the pore influence in volume measurement as soil is composed of water, air and particles.

Use of Test Result

This test method can be used to determine the in-place density and unit weight of natural inorganic soil.

The test result is used generally to look for the fundamental quality of soil such as its water-contained ratio, saturated density of soil particles, pore ratio of soil and saturated degree of soil.

The saturated density of soil or its unit weight is used to compute the slope stability analysis.

4) Tests for Soil's Liquid Limit, Plastic Limit and Plasticity Index

Purpose and Application

The consistency of soil means the relative ease with which it can be deformed. This capability depends on the soil's water content and it can be categorized into hard, soft and fragile. As the water content of soil decreases, its condition changes from liquid state to plastic state, from plastic state to half-solid state, from half-solid state to solid state. We call the boundary of each water contents condition as Liquid Limit, Plastic Limit and Plasticity Limit.

a) Liquid Limit (LL)

The boundary of water-contained ratio of soil in Liquid Limit is reached when the soil is in its minimum shear strength as plastic state.

b) Plastic Limit (PL)

The boundary of water-contained ratio of soil in Plastic Limit is reached when it easily cracks by the addition of strength and hardly deforms itself.

c) Plasticity Index (PI)

The Plasticity Index shows the degree of the plasticity of soil, it can be calculated by finding the difference between Liquid Limit and Plastic Limit.

$$PI = LL - PL$$

Use of Test Result

The Liquid Limit, Plastic Limit, and Plasticity Index of soils are also used extensively, either individually or together, with other soil properties to correlate with engineering behavior such as compressibility, permeability and shear strength.

The Liquid Limit and Plastic Limit of soils can be used with the natural water content of the soil to know its relative consistency. This method is sometimes used to evaluate the weathering characteristics of clay-shale materials.

When subjected to repeated wetting and drying cycles, the Liquid Limit of these materials tend to increase. The amount of increase is considered to be a measure of a shale's susceptibility to weathering.

In case of civil engineering works, there's need for careful planning in selecting machines and finding suitable methods of construction when water content in the soil is bigger than the Liquid Limit, because it is likely to become mud-shaped during construction.

5) Tests for Sand's Maximum and Minimum Density

Purpose and Application

The relative density is the condition between looseness and tightness of particles in the sand. We can compare the different kinds of sand using relative density by their

compression, deformation character and liquidity phenomenon, applying the same condition on each sample.

Use of Test Result

The relative density of sand together with other testing can be used in judging the possibility of underground water sand-flowing phenomenon that can cause trouble during an earthquake.

6) Unconfined compression test, tri-axial compression test, and shear test

The shear strength of the soil can be calculated by applying extreme pressure on both ends of soil sample until it is destroyed. At the same time, examine the change of volume and deformation. There are some tests such as unconfined compression test, tri-axial compression test, shear test, etc. to determine shear strength of soil.

The data from shearing examination can be used to determine the stability and support power of piling soil, slope of cutting, ground foundation, etc.

The shear stress (τ) can be calculated using the formula of Kuroon.

$$\tau = c + \sigma \tan\varphi \qquad (kN / m^2)$$

The data of cohesive strength (c), principal axial stress (σ) and the angle of internal friction(φ) vary in values according to density, water-contained ratio and effective power of soil.

Moreover, the value varies when using a different method of examination and depending on the drainage condition even if it is the same type and condition of soil.

It is therefore important to select an examination method that is suitable on the existing condition of soil.

7) Unconfined Compression Test

Purpose and Application

This test method provides an approximate value of the compressive strength of cohesive soil in terms of total stress.

The cohesive strength (c) and angle of internal friction(φ) in case of saturated cohesive soil can be calculated by the formula of Kuroon.

It is suitable for examining a massive amount of samples, as its operation is easy.

Use of Test Result

The data of $c = qu/2$ and $\varphi = 0$, which we get from unconfined compression test, are used for examination of the stability of saturated cohesive soil piling.

8) Tri-axial Compression Test

Purpose and Application

It is suitable to use tri-axial test to find enough accurate shear strength not only for cohesive soil but also for sandy soil and all kinds of soils.

There are four types of the tri-axial test to choose the purpose.

How to draw the Mohr stress circle and destruction line of Kuroon.

First we draw a graph that the vertical axis as the shear strength and the horizontal axis as the normal stress.

Then we draw a Mohr stress circle that changes the value of lateral pressure at least three (3) times with a diameter ($\delta_3 - \delta_1$) on the graph.

Next we make the tangent line that is common in all Mohr stress circle, that is called as destruction line of Kuroon.

We can find the value of cohesive strength c which shows at the point of contact with the vertical axis and the angle of internal frictionφ which shows the angle of intersection with the horizontal axis by drawing the line according to the Mohr stress circle that changes the value of lateral pressure in case of tri-axial compression test.

Generally the lateral pressure in case of tri-axial compression test is decided in following method: Different optional value of the lateral pressure in case of piling soil materials that is as less than 0.5 times of maximum load of piling soil, in case of cutting soil slope that is less than 0.5 times of maximum load of original ground level.

Maximum of lateral pressure

Piling soil materials < (the height of piling soil) × (the unit weight of piling soil) × 0.5

Cutting soil slope < (the depth of cutting soil) × (the unit weight of cutting soil) × 0.5

a) Unconsolidated Un-drained Compressive Strength (U U)

It tries not to discharge the water contained in the pore of soil with keeping lateral pressure and the principal axial stress is increased in the up-down direction, that is the way of finding shear strength of soil.

Use of Test Result

The data of cu and φu, which we get from the Unconsolidated and Un-drained test (UU), are used in examining the stability of piling soil and

earth's foundation in case of saturated cohesive soil.

b) Consolidated Un-drained Compressive Strength (C U)

After pressing a certain lateral pressure, it tries not to discharge the water in the soil, the principal axial stress is increased in the up-down direction, this is the way to determine the shear strength of soil.

There are two types of test, to measure the pore water pressure that occurs in specimen or not. Using pore water pressure measured during test, the shear strength determined from this test can be expressed in terms of effective stress.

This shear strength may be applied to field conditions where full drainage can occur, drained conditions or when pore water pressure is induced by loading the field stress conditions can be estimated are similar those in the test.

When the pore water pressure is measured, the Mohr stress circle is drawn with effective stress that deducted the amount of pore water pressure from the principal axial stress, thus, a strength fixed number(ccu') and (φcu') are found.

Use of Test Result

The data of (ccu) and (φcu) or (ccu') and (φcu') which we get from the Consolidated and Un-drained test (CU), are used in the examination of the stability of piling soil, cutting soil slope and structure that is affected by pore water pressure such as permeation water.

The shear strength determined from the test expressed in terms of total stress (un-drained condition) or effective stress (drained condition) is commonly used in stability analysis of an embankment, earth pressure calculations, and foundation design.

c) Consolidated Drained Compressive Strength (C D)

The test presses the soil sample with a certain lateral pressure. This test discharges the water in the soil. Principal axial stress is increased slowly in the up-down direction so that pore water pressure may not occur, this is the way of shearing the soil and we can find the value of (cd) and (φd) by drawing the line according to the circle of Mohr based on result of tests.

Use of Test Result

The data of (cd) and (φd), which we get from the Consolidated and Drained test (CD), are used on the examination of the stability of piling soil, cutting soil slope that strata condition is permeable like sandy soil and sand.

9) Standard Penetration Test (SPT)

Purpose se and Application

The standard penetration test provides a soil sample for identification purposes and for laboratory tests to find out among the soil samples are the biggest shear strain disturbance.

This test is used extensively in a great variety of geo-technical exploration projects.

Many local correlation and widely published correlation relate SPT blow count or (N value) with engineering behavior of earth foundations.

This is how to find the (N value) to know the relation of solid-loose soil, and the relative value of solid.

(N value) means the blow count of hammer weighing 63.5kg that falls freely from the height of 75cm to drive a test sampler to 30cm depth.

The application of SPT to nature soil examination is very extensive, though an accurate calculation is difficult in conglomerate layer of about one (1) cm diameter or more.

A fixed number estimated as N value

(1) The relationship between N value and angle of internal friction φ in sandy soil

1) Proposal of Dunham

a) Grain soil with almost the same a round particle.

$$\varphi = \sqrt{12N} + 15$$

b) The square particle whose grain distribution is good.

$$\varphi = \sqrt{12N} + 25$$

c) The round particle whose grain distribution is good.

$$\varphi = \sqrt{12N} + 25$$

d) Grain soil is almost the same with a square particle.

$$\varphi = \sqrt{12N} + 20$$

2) Proposal of Dr. Osaki

$$\varphi = \sqrt{20N} + 15$$

(2) The relationship between N value and shear strength of Unconfined Compression test in cohesive soil

(Proposal of Terzaghi-Peck)

$$qu = N/8 \quad (kN/m2)$$

(Proposal of Dr. Osaki)

$$qu = 0.4 + N/20 \quad (kN/m2)$$

ANNEX

1. Analysis of Soil Particles

5 μm	75 μm	0.42mm	2mm	19mm	75mm	
Clay	Silt	fine	coarse	fine	coarse	cobble
		Sand		Grave		Rock
Fine grained		Grained		Coarse		Rock

Particle size of geo-materials and group names by JGS in Japan

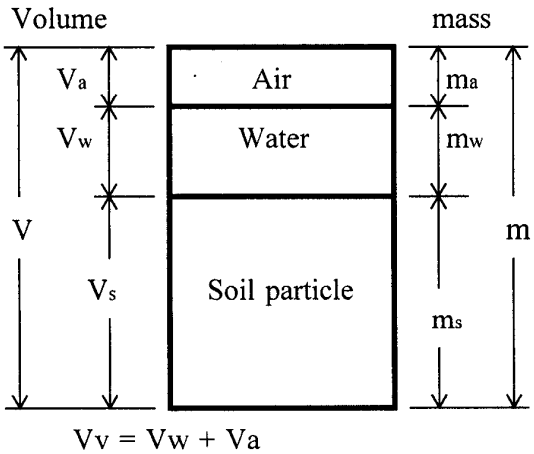
0.002mm	0.074mm	0.42mm	2.0mm	4.75mm	19mm	75mm
Clay	Silt	fine	medium	coarse	fine	Coarse	cobble
		Sand			Gravel		Rock

Particle size of geo-materials and group names by ASTM in USA

2. Test for Water Content of Soil and Test for Soil Particles Density

The composition of soil

(1) Unsaturated condition



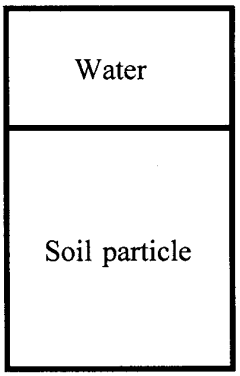
$Vv = Vw + Va$

$mw = Vw \cdot \delta w$

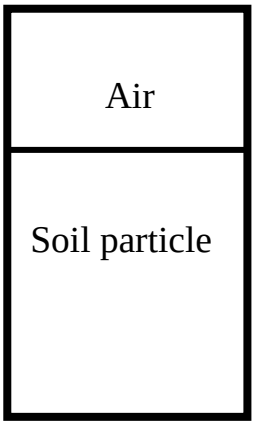
$ms = Vs \cdot \delta s$

$m = V \cdot \delta t$

(2) Saturated condition



3. Absolute dryness condition



where,

Water contained ratio $\omega = \frac{m_w}{m_s} \times 100 \ (\%)$

Density of Soil particles $\delta s = \frac{m_s}{\gamma_w \cdot V_s} \ (kN/m3)$

γ w : density of water = 9.8kN / m3, at 4 ^{o}C of water

Saturated density of soil particles or unit weight of soil

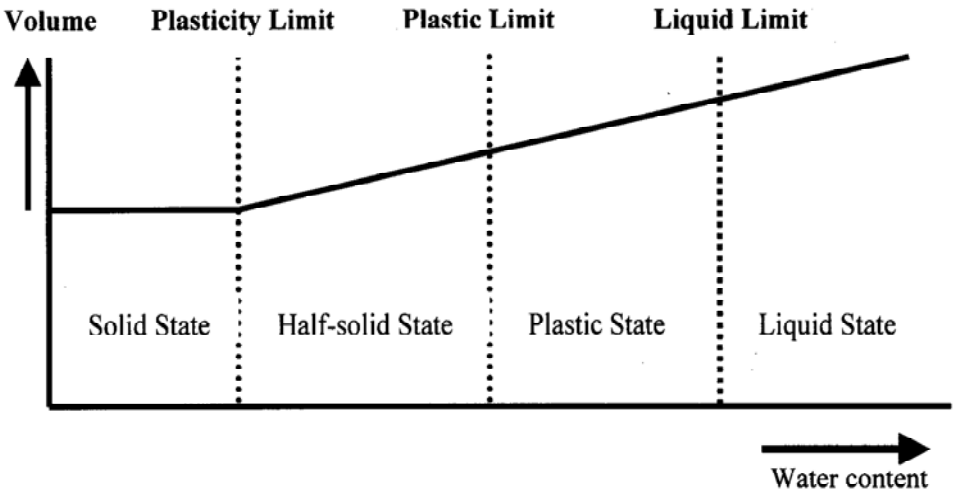
$$\delta_t = \gamma_t = \frac{m}{V} \ (kN/m3)$$

Pore ratio of soil $\varepsilon = \frac{V_v}{V_s} = (1 + \frac{\omega}{100}) \times \frac{\delta_s}{\delta_t} - 1$

Saturated degree $Sr = \frac{V_w}{V} \times 100 = \frac{\omega}{\varepsilon} \times \frac{\delta_s}{\delta_w} \ (\%)$

(δ_w is density of water : $\delta_w = \gamma_w$)

IV. Testing Method for Soil's Liquid Limit, Plastic Limit and Plasticity Index



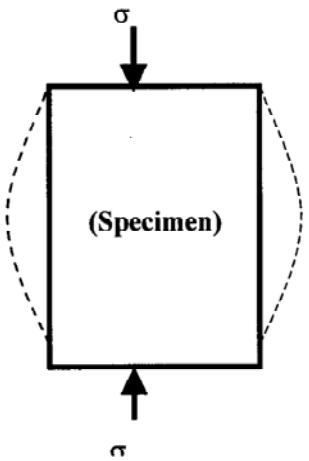
Consistency of the Soil

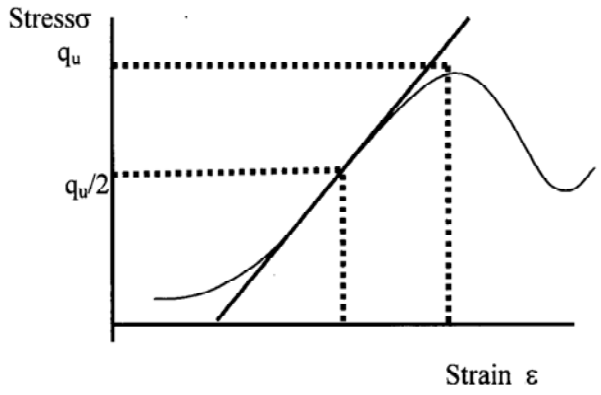
V. Testing for Sand's Maximum and Minimum Density

$$\mathbf{Dr} = \frac{\rho_{dmax}\ (\rho_d - \rho_{dmin})}{\rho_d\ (\rho_{dmax} - \rho_{dmin})} \quad (\%)$$

where, Dr : relative density of soil (%)
ρ_d : dryness density of a specimen (g/cm^3)
ρ_{dmax} : dryness density of a specimen in case of testing of maximum density (g/cm^3)
ρ_{dmin} : dryness density of a specimen in case of testing of minimum density (g/cm^3)

VI. – A Unconfirmed Compression Test





$$qu = \frac{P}{Ao} \times \frac{\varepsilon f}{(1 - 100)} \times 98.07 \quad (kN/m^2)$$

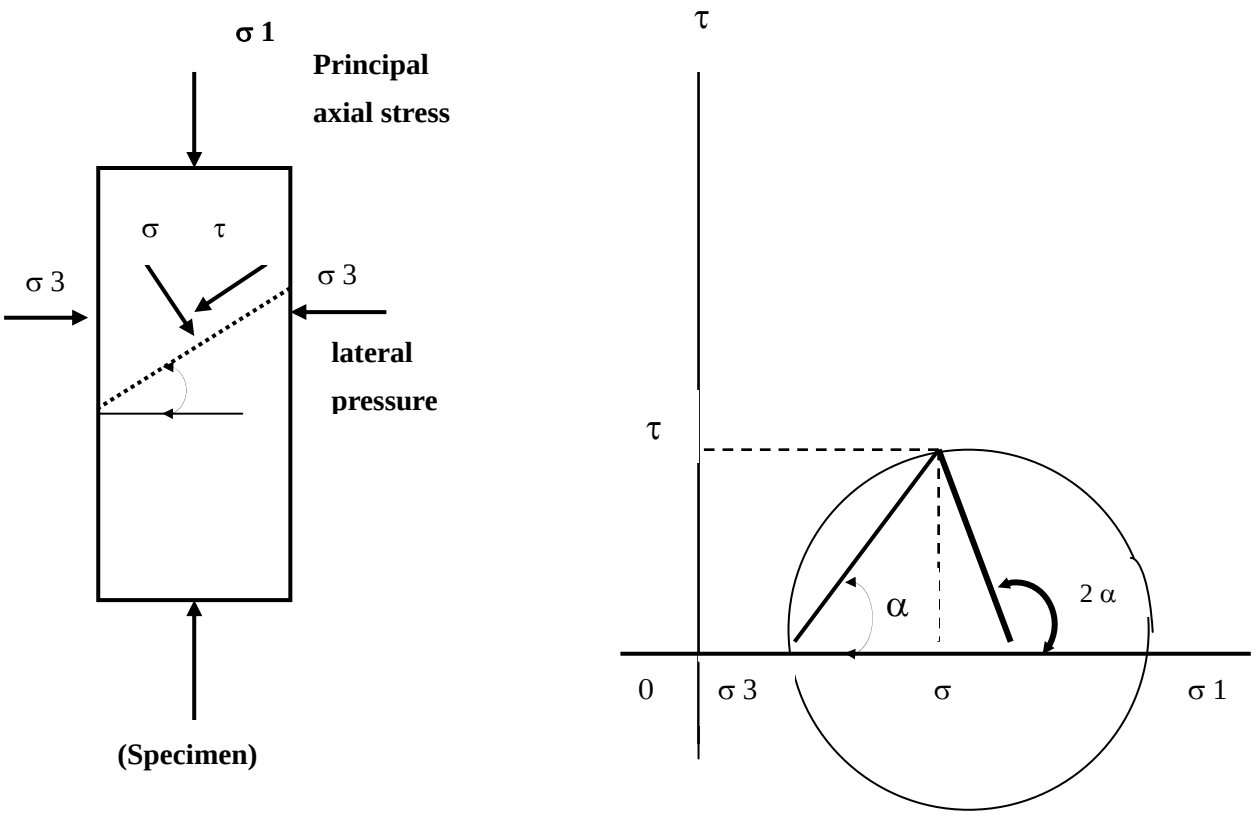
Where, **qu : compression stress (kN /m^2)**

P : compression strength that compression strain shows the point of ε f (kgf)

Ao : cross section of the specimen (cm^2) Ao = π D^2/4

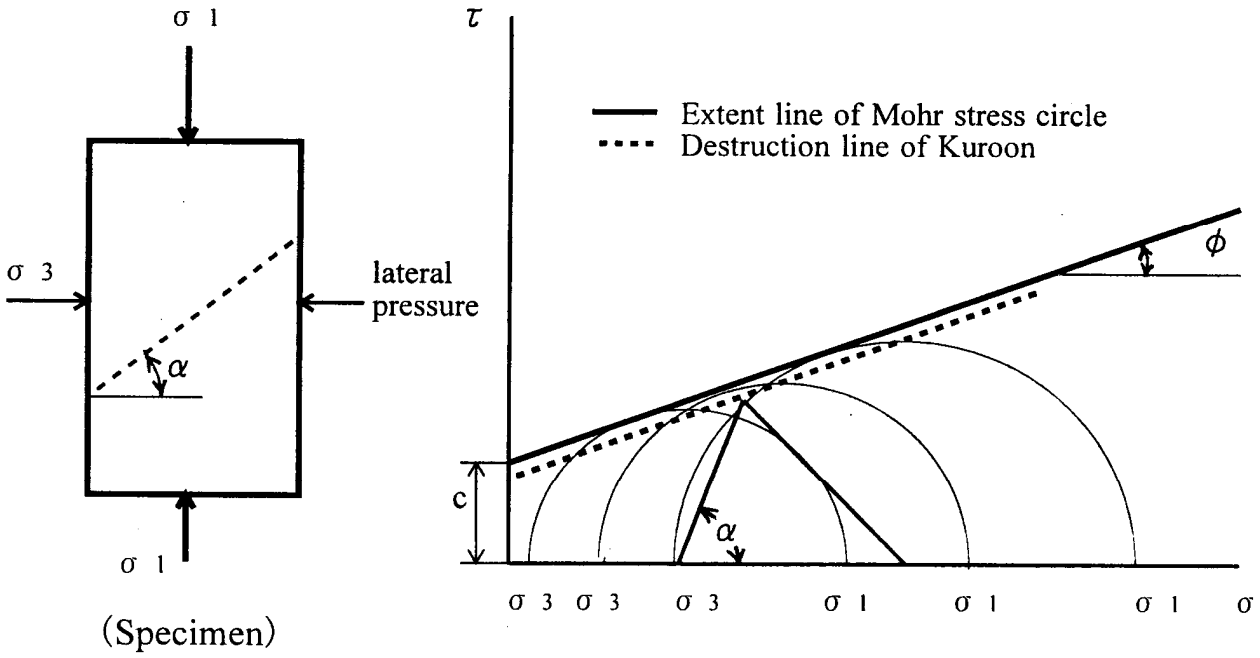
ε f : compression strain (%)

6 - B Tri-axial Compression Test



$$\sigma = \frac{\sigma 1 + \sigma 3}{2} - \frac{\sigma 1 - \sigma 3}{2} \cos 2\alpha \quad (kN/m2)$$

$$\tau = \frac{\sigma 1 - \sigma 3}{2} \sin 2\alpha \quad (kN/m2)$$



The Drainage Condition of each Tri-axial Compression Test

Method of Examination	Condition of Drainage	
	First point of pressurization of specimen	The shear point of specimen
1) Unconsolidated Un-drained (UU)	[close the drainage valve]	[close the drainage valve]
	Pore water in the soil doesn't drain during the examination.	
2) Consolidated Un-drained (CU, $\overline{\text{CU}}$)	[open the drainage valve] Pore water in the soil should drain during consolidation	[close the drainage valve] Pore water in the soil doesn't drain until shearing specimen In another case, measurement drainage pressure: u
3) Consolidated Drained (CD)	[open the drainage valve] Pore water in the soil should drain during the consolidation	[open the drainage valve] Pore water in the soil should drain until shearing specimen

(6) Construction standards and stability analysis of a soil type tailings dam

1) As embankment materials of the dam, soil having a high sheering strength, soil not having a large amount of organic content, and soil not having a large amount of clay.

2) The slope gradients have the following values as a standard.

Upstream side 1:1.8 (total slope 29°)

Downstream side 1:2.5 (total slope 21°)

3) The width of top embankment is calculated as a standard with the following formula.

$$W = 1.3\sqrt{H} \quad (m)$$

W: Width of top embankment (m)

H: Effective height of the embankment (m)

4) In order to prevent the permeation of water contained in the sediments into the body of the embankment, a water shielding layer is installed in the upstream side slope of the embankment.

5) In the slope of the downstream side of embankment, berms are installed per space having a height no greater than 10 meters.

6) In the slope surface of the downstream of the embankment, rainwater drainages are installed if necessary in order to eliminate the catchment of rainwater.

7) Rainwater drainages are installed on both sides of the embankment if necessary.

8) In order to prevent scattering of the embankment materials, necessary measures such as planting of grasses and covering with stones and rocks are taken in the slope surface of the downstream of the embankment.

9) The stability analysis of the embankment is conducted according to a circular arc analysis.

As for the slope stability analysis, there are many kinds of methods such as Fellenius method, Bishop Simplified method, Janbu Simplified method, Generalized Limit Equilibrium method, Finite Element Stress method, etc.

Fellenius (Revised) method and Bishop Simplified method uses a circular arc as a slide because a circle is easier to draw and faster to compute the slope stability analysis of an embankment in a tailings dam. The use of circle instead of oval shape doesn't make much difference, as there is no substantially difference in the result of the analysis.

Outline of slope stability analysis based on Fellenius (Revised) Method

Fellenius Revised method which assumes a circular arc in a slope that tries to cause a slide, finds the ratio between the force of movement that causes a slide in the soil inside the circular arc and the force of resistance against slide.

There are innumerably assumed circular arc inside a slope, it is necessary to find out the lowest ratio as the slope stability analysis of an embankment in a tailings dam is measured with the minimum factor of safety.

a) Let us assume a circular arc inside a section cross of an embankment in a tailings dam, and then divide the range inside the circular arc into some section.

b) And then we compute and draw the center of gravity G1, G2, G3 ------ of each section.

c) We can get each weight of W1, W2, W3 ----------: the area of each section multiplied by the unit weight of it. The weight of W1, W2, W3 -------- forces in vertical direction at the point of intersection between a product of each center of gravity G1, G2, G3 ---------- and a circular arc.

- **In this case, R is the radius of a circular arc, (α) is the angle of intersection between the perpendicular line from the center of the radius and a product of the center of gravity.**

d) We divide each weight of W1, W2, W3 --------- into T1, T2, T3 -------- that is the moment in the direction of tangent line of the circular arc, and N1, N2, N3 ------- that is the moment in the direction of a product of the radius of it.

e) The total of (Tn) gives *the force of slide* that happens inside range of a circular arc of an embankment.

$$\Sigma Tn = T1 + T2 + T3 \quad \text{----------}$$

But, the moment of slide, which is divided by the perpendicular line from the center of radius of a circular arc, makes a different signs i.e. a plus and a minus.

For example, the center of radius of a circular is divided by the perpendicular line, a part of a slide of the perpendicular line in the slope makes a plus sign that means positive slide of slope while the other part makes a minus sign that means resistance against the slide of the slope.

f) Summation of $\Sigma Nn = N1 + N2 + N3$ ---------- multiplied by ($\tan\varphi$) plus length of the circular arc (L) that multiplied by the cohesive strength (c) equals *the force of resistance against the slide*.

g) The geo-technical drilling in the field of tailings dam gives the data of *internal friction angle(*φ) and *cohesive strength(*c**) that can be acquired through tri-axial compression test and unconfined compression test of samples in laboratory.**

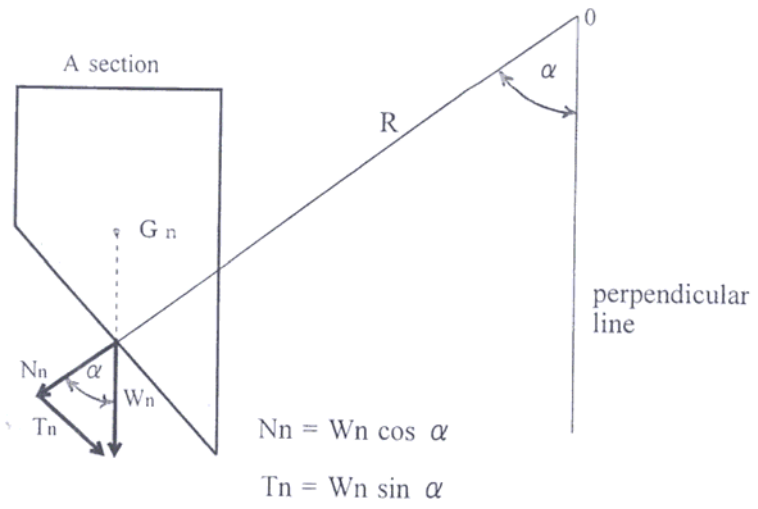
h) The next formula is commonly used to compute the safety rate Fs of the embankment.

- **When the result of the slope stability analysis is over one (1.0), it is considered almost a stable condition.**
  However if the result is less than one (1.0), the safety rate is considered an unstable condition.

According to " The construction standard of tailings dam" that was established by Ministry of International Trade and Industry (MITI) in Japan in 1980 (the present administrative organ is "Ministry of Economy, Trade and Industry" (METI)), the safety rate of slope stability analysis to earth-fill dam, rock-fill dam, sand dam and combined zone type dam needs over 1.2 as a stable condition.

However, the result of safety rate is less than 1.2 considers an unstable condition and it needs some countermeasures to an embankment of a tailings dam in mines.

$$Fs = \frac{\Sigma c \times L + \Sigma Nn \times \tan\varphi}{\Sigma Tn} \quad \begin{matrix} \geqq 1.2 & \text{a stable condition} \\ < 1.2 & \text{an unstable condition} \end{matrix}$$



$$Fs = \frac{\Sigma c \times L + \Sigma Nn \times \tan Ø}{\Sigma Tn} = \frac{\Sigma c \times L + \Sigma Wn \cos \alpha \times \tan Ø}{\Sigma \quad Wn \sin \alpha}$$

10) The stability analysis of the embankment is performed at the design stage of the dam, at the time of completion of deposition and in the event that an abnormality has been confirmed in the embankment.

(attached document No.2)

Chapter Ⅳ : Conducting a General Inspection (Prevention of Mine Pollution) on Mine Water and Wastewater

August 2016

1. Preparation of a general inspection (prevention of mine pollution) documents and instruments

In conducting a general inspection (prevention of mine pollution) on mine water and wastewater, the inspectors shall prepare following instruments in addition to Chapter Ⅰ. 2. (2) "Preparation of a general inspection documents and instruments" as necessary.

1) Instruments for water quality measurement (a portable pH meter, some Pack-tests)

2) Some of 1000-ml polyethylene bottles

3) Some of Filters

4) a Funnel

5) Chemicals (Nitric acid (HNO_3), Sodium hydroxide (Na(OH)) etc.,)

6) a Thermometer

2. Conducting a general inspection (prevention of mine pollution) on mine water and wastewater

(1) Conducting a general inspection (prevention of mine pollution) at a mine office

The inspectors shall hold a hearing with the safety seniors regarding following matters concerning mine water and wastewater of the mine, and shall confirm whether there are any hindrances or problems for preventing mine pollution problems processing the mineral-related operations; in case matters deemed inadequate in terms of safety, the inspectors shall provide improvement guidance for the safety seniors.

1) Are following items regulated in the own mine safety rules at the mine?

a) Items concerning management of treatment facilities on mine water or wastewater

b) Items concerning measurement of pH level, amount of water flow and water quality analysis

c) Items concerning emergency measures when mine pollution problems occur caused by mine water or wastewater or is likely to occur because of causing troubles of the water treatment facility such as an accident, being broken, electric power cutting

off ,or heavy rain or other special reasons.

2) When the contaminated mine water or wastewater that does not conform to the effluent standard is discharged from the tunnel (gallery) or the waste stones dump, slag dump or tailings dam used for mineral-related operations at the mine, does the concessionaire report the contaminated status and water flow of mine water or wastewater?

3) Does the concessionaire discharge contaminated mine water or wastewater that does not conform to the effluent standard pursuant the " Law on Environmental Protection and Natural Resource Management" and relevant regulations from into public rivers?

4) Does the concessionaire penetrate contaminated mine water or wastewater that does not conform to the effluent standard into the underground?

5) When the contaminated mine water or wastewater that does not conform to the effluent standard is discharged or penetrated, or is likely to be discharged or to be penetrated because of an accident, being broken, electric power cutting off or other troubles of the water treatment facility, does the concessionaire take emergency measures for prompt repair from the incident.

6) When the oil is leaked outside of the mine because of an accident, being broken or other troubles of the facility in the mineral-related operations, and mine pollution occurs or is highly likely to be occurred, does the concessionaire take emergency measures for prompt repair from the incident?

7) When the mine water that does not conform to the effluent standard is discharged from a tunnel (gallery) that was used in the mineral-related operations, does the concessionaire block or seal the tunnel (gallery), or establish treatment facilities for contaminated mine water or take appropriate measures?

8) When the Minister in charge of mines sector establishes the further strict regulation of the effluent standard depending on the results of measurements and water analysis of mine water or wastewater discharged from the treatment facilities at the mine based on the Law and its regulations, does the concessionaire follow further strict regulation of the effluent standard set by the Minister?

9) Does a safety technical staff for prevention of mine pollution obey following items to prevent mine pollution problems caused by mine water or wastewater?

a) To examine the treatment facilities on mine water or wastewater in every working day, and write down the results of examination in the safety diary.

b) To measure and analyze necessary substances periodically to define contaminated status and amount of water flow of the mine water or wastewater, and write down

the results of measurements and analysis in the managements record.

c) In case mine pollution problems caused by mine water or wastewater is occurred or likely to occur based on the results of examination, measurements and analysis, or there is a risk of danger to the treatment facilities on mine water or wastewater caused by rainstorm, electric power cutting off and other reason, the technical safety staff must immediately report to the administrator (safety seniors).

10) When mine pollution occurs or is highly likely to occur by mine water or wastewater, does the concessionaire immediately report the state of incident, list of emergency measures taken, and plans for restoration work and the list of completed work to the Director General in charge of mines sector?

(2) Conducting a general inspection (prevention of mine pollution) on mine water and wastewater to mine facilities and working places

In addition to "ChapterⅡ. 2. Conducting mine facilities and working places", inspectors shall confirm following matters whether there are any hindrances or problems for preventing of mine pollution problems concerning mine water and wastewater in the mine facilities and working places in the process of mineral-related operations; in case matters deemed inadequate in terms of safety, the inspectors shall provide improvement guidance for the safety seniors.

1) Is the performance of treatment facilities on mine water and wastewater sufficient?

2) Is the maintenance state of the facilities for treating the mine water or wastewater satisfactory?

To examine the thickener, collecting and sending pipe-line of sediments in the facilities, and to confirm the leakage of wastewater or sediments and abnormalities.

3) Does mine water from the tunnel (gallery) that has discharged into the public rivers conform to the effluent standard?

4) Does the wastewater from mine facilities such as processing plant and refinery that has discharged into the public rivers conform to the effluent standard?

5) To confirm the kinds of chemicals, the monthly usage and storage amounts in the treatment facilities on mine water and wastewater

6) Does the concessionaire penetrate contaminated mine water or wastewater that does not conform to the effluent standard into the underground?

7) Does the concessionaire provide the emergency tools and materials and store them properly?

3. Conducting collecting water samples for water quality survey of mine water and wastewater

(1) Drafting a work plan on collecting water samples for water quality survey of mine water and wastewater

The inspectors shall draft a work plan on collecting water samples for water quality survey of mine water and wastewater based on the "Treatment flowchart of mine water and wastewater" at the mine.

In the plan, sampling methods, process of water quality survey, communication system for emergency, and countermeasures against prevention of accidents and troubles during the survey shall be provided in details.

(2) Preparation for collecting water samples for water quality survey of mine water and wastewater

The inspectors shall request the safety seniors or the safety technical staff for prevention of mine pollution not only to attend collecting water samples of mine water and wastewater at the mine but also to collect water samples for the same conditions as the inspectors conduct at same spot.

(3) Water quality survey of mine water and wastewater

1) The inspectors shall examine the pipe-line for collecting and sending of sediments in the treatment facilities, and confirm the leakage of wastewater or sediments and abnormalities.

2) Water quality survey of mine water and wastewater shall be conducted in the following procedures.

a) The source of mine water and wastewater shall be surely collected, and the pH level, water temperature, state of murkiness, and quantity of flow shall be measured, then results of data shall be recorded. Furthermore, dissolved oxygen shall be measured if necessary, and when a foul odor has detected in the mine water or wastewater, the results of data shall be recorded as a special mention.

b) When collecting water samples at metal mines, 1000-ml polyethylene bottles shall be prepared and used generally.

c) When a water sample is murky, the sample shall be filtered by a filtering device, then added 10 ml of nitric acid (HNO_3) to the sample so that the pH level of the water becomes around pH1 (adding 10 ml of HNO_3 to 1000ml of the sample). Because the polyethylene bottle has a high absorptivity of metal ions, it is necessary to add the nitric acid as primary measures in order to prevent absorption.

(4) Water quality survey of the treatment facilities on mine water and wastewater

1) At the treatment facilities on mine water and wastewater, the treatment capacity, state of chemicals consumption, operation and management of the facilities, and abnormalities shall be examined.

2) Water quality survey of wastewater discharged in the treatment facilities shall be performed in the following procedures.

a) In case mine water or/and wastewater is neutralized in the treatment facilities, wastewater that is discharged by the facilities shall be surely collected, and the pH level, water temperature, state of murkiness, and quantity of flow shall be measured, then results of data shall be recorded.

b) When collecting samples at metal mines, 1000-ml polyethylene bottles shall be prepared and used generally as well as above.

c) When the water quality of a sample is murky, the sample shall be filtered by a filtering device, then added 10 ml of nitric acid (HNO_3) to the sample so that the pH level of the water becomes pH1.

(5) Water quality survey of the river, lake or reservoir

1) Water quality survey of the river, lake or reservoir that mine water and wastewater of the mine and wastewater from the treatment facilities discharged and flowed shall be conducted in the following procedures.

a) In case the river which mine water and wastewater of the mine and wastewater from the treatment facilities discharged and flowed, collecting water samples for water quality of the river water both of an upstream point and a downstream point as the starting point of discharged water of the mine shall be surely collected, and the pH level, water temperature, state of murkiness, and quantity of flow shall be measured, then results of data shall be recorded.

b) When collecting water samples of the river water both of an upstream point and a downstream point, 1000-ml polyethylene bottles shall be prepared and used generally as well as above.

c) When water quality is murky, collecting a water sample shall be filtered by a filtering device, then added 10 ml of nitric acid (HNO_3) to the sample so that the pH level of the water becomes around pH1.

When collecting a water sample at the downstream point of the river, it can be considered that discharged mine water and wastewater of the mine has mixed enough with the river water is good suitable location for collecting a water sample.

d) When the river water at the downstream point from the discharged mine water and wastewater that is irrigated for use as irrigation water or as potable water, the river

water at the irrigation point shall be surely collected, and the pH level, water temperature, state of murkiness, and quantity of flow shall be measured, then results of data shall be recorded, too.

e) When collecting water samples at the irrigation point of the river water, 1000-ml polyethylene bottles shall be prepared and used generally as well as above.

f) When water quality is murky, collecting a water sample shall be filtered by a filtering device, then added 10 ml of nitric acid (HNO_3) to the sample so that the pH level of the water becomes around pH1.

g) When collecting water samples of the lake or reservoir that mine water or/and wastewater of the mine and wastewater from the treatment facilities discharged and flowed into directly, the location where mine water or/and wastewater discharged from the mine has mixed enough with water of the lake or reservoir shall be selected, and the pH level, water temperature, and state of murkiness shall be measured. When the water of the lake or reservoir to which mine water or/and wastewater discharged is irrigated for use as irrigation water or as potable water, water quality survey not only the water of the lake or reservoir but also the water at the irrigation point shall be conducted as same as above d), e) and f).

(6) The volume of collected samples and primary measures

In the water quality survey, the lowest-ever volume of samples and primary measures are important matters to collecting samples contained ions in the targeting water using a polyethylene bottle or a solid glass bottle as follows.

Targeting component	The lowest-ever volume	primary measures
Cu, Pb, Zn, Cd, As, Fe, Mn, Cr, Ni, Co	1,000 ml	1) Add nitric acid so that the pH of the water is around 1. 2) The amount to be added is 10 ml of nitric acid (HNO_3) per 1000 ml of water sample.
Hg	1,000 ml	1) Collect the sample in a solid glass bottle. 2) Add 10 ml of nitric acid so that the pH of the water is around 1. 3) The amount to be added is 10 ml

		of nitric acid per 1000 ml of water sample.
Cyanide (CN^-)	**500 ml**	**1) Add sodium hydroxide (NaOH) solution (20%) or tablets so that the pH of the water is around 12. 2) The amount to be added is 10 ml of sodium hydroxide solution (20%) per 500 ml of water sample.**
Cr^{6+}	**500 ml**	**Store the water in a neutral state in a cool and dark place.**

(7) Selection points and drafting a map of collecting water samples

When conducting a water quality survey of mine water and waste water, as long as there are no changes in the mineral-related operation of the mine, the state of discharge of mine water and wastewater, the treatment methods of mine water and wastewater and like, the points for collecting water samples shall be decided and collecting water samples shall continue to be taken from that same point.

Also, in the event that water samples for a water quality survey of mine water and wastewater has been conducted, a location map of collecting water samples shall be drawn every inspection.

The map of collecting water samples shall include points of the source of mine water and wastewater, points of discharged wastewater from treatment facilities of mine water and wastewater, points of an upstream and downstream of the river to which mine water and wastewater from the mine and wastewater from the treatment facilities thereof flow, points of collecting water samples at the lake and reservoir, and the location of irrigation points in the river, lake, or reservoir to which discharged mine water and wastewater from the mine flows is irrigated for use as irrigation water or as potable water.

4. Effluent Standard

Effluent Standard in Cambodia **(Items are extracted)**

parameters	**Allowable limits for pollutant substance discharging to protected**	**Allowable limits for pollutant substance discharging to public**

	public water area	water area and sewer
Temperature	**＜ 45℃**	**＜ 45℃**
pH	**6 ～ 9**	**5 ～ 9**
COD	**＜ 50 mg/l**	**＜ 100 mg/l**
Total suspended solids	**＜ 50 mg/l**	**＜ 80 mg/l**
Grease and oil	**＜ 5.0 mg/l**	**＜ 15 mg/l**
Cyanide (CN^-)	**＜ 0.2 mg/l**	**＜ 1.5 mg/l**
Arsenic (As)	**＜ 0.1 mg/l**	**＜ 1.0 mg/l**
Tin (Sn)	**＜ 2.0 mg/l**	**＜ 8.0 mg/l**
Iron (Fe)	**＜ 1.0 mg/l**	**＜ 20 mg/l**
Manganese (Mn)	**＜ 1.0 mg/l**	**＜ 5.0 mg/l**
Cadmium (Cd)	**＜ 0.1 mg/l**	**＜ 0.5 mg/l**
Chromium (Cr^{+6})	**＜ 0.05 mg/l**	**＜ 0.5 mg/l**
Copper (Cu)	**＜ 0.2 mg/l**	**＜ 1.0 mg/l**
Lead (Pb)	**＜ 0.1 mg/l**	**＜ 1.0 mg/l**
Mercury (Hg)	**＜ 0.002 mg/l**	**＜ 0.05 mg/l**
Nickel (Ni)	**＜ 0.2 mg/l**	**＜ 1.0 mg/l**
Selenium (Se)	**＜ 0.05 mg/l**	**＜ 0.5 mg/l**
Zinc (Zn)	**＜ 1.0 mg/l**	**＜ 3.0 mg/l**

5. drafting and reporting of a general inspection on mine water and wastewater

Report of a general inspection (prevention of mine pollution) on mine water and wastewater (Format)

1. Treatment facilities on mine water and wastewater

1) Treatment facilities on mine water and wastewater

Name of the Facility	Date of Notification and Permission	Type, Structure and Capacity of Main Machinery	Treatment Methods	Others

2) The status of operation management of treatment facilities and its problems

Name of the Facility	The Status of Operation Management, and Problems

2. The treatment achievements of mine water and wastewater

Date	Treatment Facilities	Quantity of Treatment Water (m^3/min)	Kinds of Chemicals	Consumption of Chemicals (ton/Month)	Amount of Created Sediments (ton/Month)	Others

3. The results of water quality survey of mine water and wastewater

1) Date of collecting water samples **2) Weather condition in the survey**

3) The results of water quality analysis as follows.

No.	Points of Collecting Samples	Quantity of water flow (m^3/min)	pH	Water temperature, state of murkiness	Analysis Data (mg/ℓ)					
					Cu	Pb	Zn	Cd		

4. The mine pollution problems caused by mine water and wastewater that occurred past time by turns

Occurrence Date of the problems	Location	Outline of Mine Pollution Problems, Caused Damages

5. Evaluation on the results of water quality survey of mine water and wastewater, and inspectors' opinion

6. Attached documents and diagrams

1) A location map of collecting water samples for water quality survey shall be drawn every inspection.

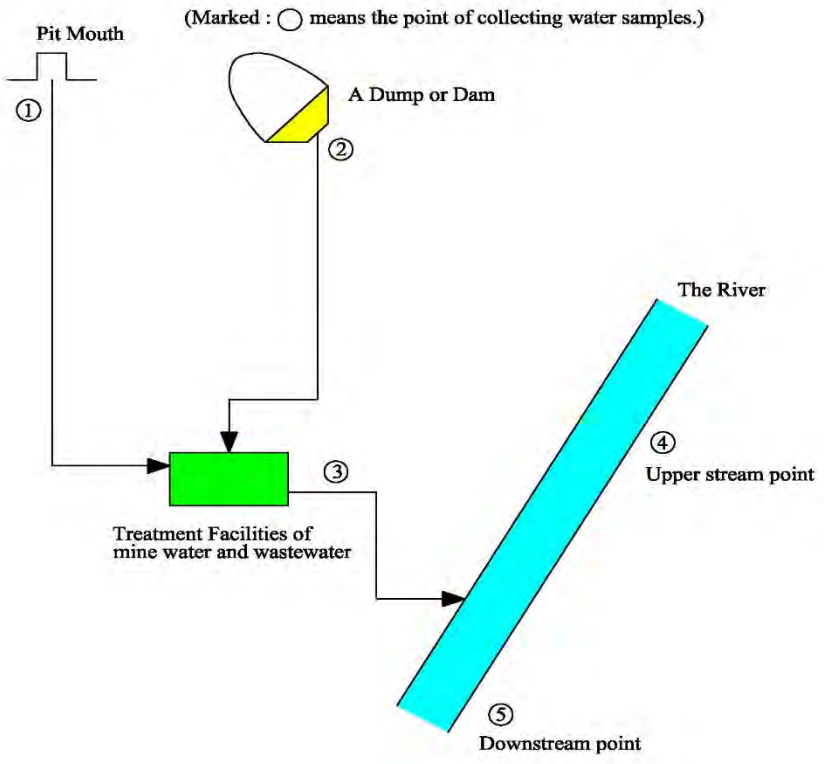
2) The diagram on treatment flowchart of mine water and wastewater at the mine

3) Documents concerning hearings with the safety seniors of the mine regarding the contents of the complaints and requests from the residents living around the mine about mine water and wastewater, and status of how the mine is working to address to those complaints and measures.

4) Photos concerning discharged mine water and wastewater and their treatment facilities, points of collecting water samples at the river, lake or reservoir, and residences and farmlands.

(Commentary)

1. A case of a location map of collecting water samples for water quality survey



2. Selection of collecting water samples in the rivers and measurement methods of water flow for water quality survey

(1) Collecting water samples of the river for water quality survey

1) Upper stream point of the river where mine water or/and wastewater discharged from the mine.

2) Downstream point of the river where mine water or/and wastewater discharged and flowed into from the mine has mixed enough with river water.

3) The point where the river water is irrigated for use as irrigation water or as potable water.

(2) Methods of collecting water samples

1) The position of collecting water samples in the river is around 20% of the depth in principle from the surface of the water.

2) Using a water sampler (collector) is desirable, but utilizing a bucket is considerable choice depending on the flow rate of the river and environmental conditions.

(3) Water flow measurement methods

1) Selecting a point of a gently flowing river water, measuring and calculating the following required velocity and cross section of appropriate part (divided 0.3 to 0.5 m equally in width) of the river, and summed them up.

$$Q = \Sigma An \times Vn = A_1 V_1 + A_2 V_2 + \cdots\cdots + A_n V_n \quad (m^3/min)$$

An : cross section of each part of the river (m^2)

Vn : velocity of each part of the river (m/min)

(Cross section of the river)

2) Velocity measurement methods

a) In case water depth of the river is one (1) meter or more, measuring velocity at the position of 20 % and 80% of the depth from the surface of the water on each part by the two (2) point method using a flow meter, and adopting the average velocity of two points.

b) The other case water depth is less than one (1) meter, measuring and adopting velocity at the position of 60 % of the depth from the surface of the water on each part by the one (1) point method using a flow meter.

3) In case water depth is extremely shallow, selecting two (2) points of a gently flowing river water, measuring and calculating the following required cross section of the two (2) points of the river.

Next, driving a float down a stream of the river from upper stream to downstream of between selected two (2) points and measuring the time taken, and then calculating the water flow using following expression.

As velocity value is different between water surface and the position of 60 % of the depth of the river, it needs to correct the velocity value using the adjustment coefficient of 1.2 (Velocity measurement using a flow meter is difficult).

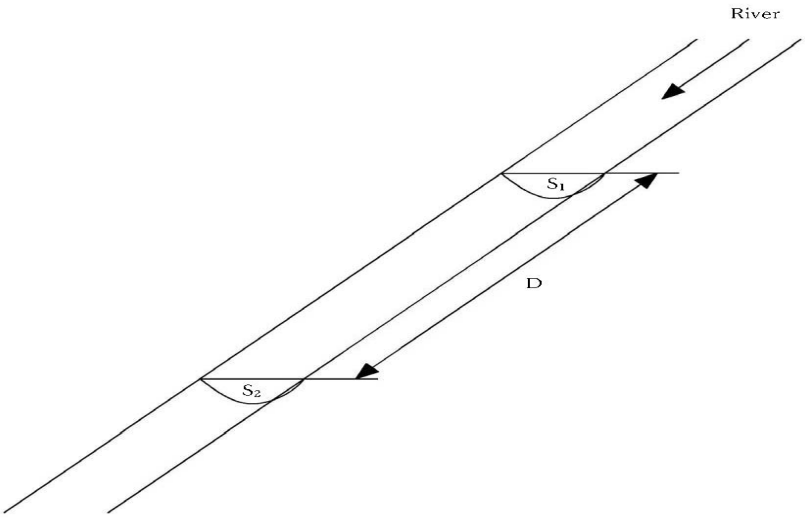
$$Q = 1/2\ (S_1 + S_2) \times D \times 1.2 \times 60/T \quad (m^3/min)$$

S_1: Cross section of upper stream of the river (m^2)

S_2: Cross section of under stream of the river (m^2)

D: Distance between S_1 andS_2 (m)

T : Measuring time using a float (sec)



(attached document No.3)

Chapter Ⅴ： Conducting a General Inspection (Prevention of Mine Pollution) on Noise

September 2016

1. Preparation of a general inspection (prevention of mine pollution) documents and instruments

In conducting a general inspection (prevention of mine pollution) on noise, the inspectors shall prepare following instruments in addition to Chapter Ⅰ. 2. (2) "Preparation of a general inspection documents and instruments" as necessary.

1) a Sound level meter

2) a Level recorder or a Data recorder (if necessary)

3) a Thermometer

4) an Anemometer

2. Conducting a general inspection (prevention of mine pollution) on noise

(1) Conducting a general inspection (prevention of mine pollution) at a mine office

The inspectors shall hold a hearing with the safety seniors regarding following matters concerning noise of the mine, and shall confirm whether there are any hindrances or problems for preventing mine pollution problems processing the mineral-related operations; in case matters deemed inadequate in terms of safety, the inspectors shall provide improvement guidance for the safety seniors.

1) Are following items regulated in the own mine safety rules at the mine?

a) Items concerning management of noise generating facility and noise prevention facility

b) Items concerning measurement of noise levels

c) Items concerning emergency measures when mine pollution problems occur caused by noise or is likely to occur because of causing accident, being broken or other troubles of noise generating facility or noise prevention facility, or heavy rain or other special reasons.

2) Does the concessionaire (subject to noise regulations) generate noise that does not meet the noise control standard regulated in the "Law on Environmental Protection and Natural Resource Management" and relevant regulations at the boundaries outside mines?

3) When mine pollution problems caused by noise occur or is likely to occur that does not conform to the control standard because of an accident, being broken, or other troubles of noise generating facility or noise prevention facility, does the concessionaire take emergency measures for prompt repair from the incident?

4) Does the concessionaire (subject to noise regulations) obey the instructions given by the Minister in charge of mines sector to take appropriate measures to prevent mine pollution caused by noise?

5) Does a safety technical staff for prevention of mine pollution obey following items to prevent mine pollution problems caused by noise?

a) To examine the noise generating and prevention facilities in every working day, and write down the results of examination in the safety diary.

b) To measure noise levels periodically at the boundaries outside mine based on the "Law on Environment Protection and Natural Resource Management" and relevant regulations, and write down the results of measurements in the managements record.

c) To report to the administrator (safety seniors) immediately when mine pollution problems caused by noise occur or are likely to occur based on the results of examination, and measurements of noise levels.

6) When mine pollution occurs or is highly likely to occur by noise, does the concessionaire immediately report the state of incident, list of emergency measures taken, and plans for restoration work and the list of completed work to the Director General in charge of mines sector?

(2) Conducting a general inspection (prevention of mine pollution) on noise to mine facilities and working places

In addition to "ChapterⅡ. 2. Conducting mine facilities and working places", inspectors shall confirm following matters whether there are any hindrances or problems for preventing of mine pollution problems caused by noise in the mine facilities and working places in the process of the mineral-related operations; in case matters deemed inadequate in terms of safety, the inspectors shall provide improvement guidance for the safety seniors.

1) Is the maintenance state of the noise generating facilities and noise prevention facilities at the mine (subject to noise regulations) for controlling noise satisfactory?

2) Do the noise levels generated from following noise generating facilities meet the noise control standard regulated in the "Law on Environmental Protection and Natural Resource Management" and relevant regulations at the boundaries

outside mines?

a) A crusher, mill or screen for stones or minerals with a rated motor output of 7.5 kW or more

b) A compressor or fan with a rated motor output of 7.5 kW or more

3) Do the residents living around the mine have any complaints against generating noise?

If there are any complaints against generating noise, the inspectors shall hold a hearing with the safety seniors regarding the contents of the complaints and the status of how the mine is working to address to those complaints, and measure the noise levels around the regions from which the complaints have been raised, if necessary.

3. Measurement and evaluation methods of noise levels

(1) The definition and interpretation of the relevant technical terminology concerning noise

1) Sound pressure level (Lp)

In the field of noise, a physical scale of the loudness (pressure) of sound waves are used so that if the effective value P (Pa: pascal) of the moment sound pressure of a certain sound and base sound pressure P_0 (Pa) are assumed, the sound pressure level L_P (dB) shall be obtained as follows. The unit is decibels (dB).

Furthermore, for base sound pressure in air, the smallest pressure level of (20 μPa) that human beings can hear is used.

$$L_P = 10 \log_{10} P^2 / P_0^2 = 20 \log_{10} P / P_0 = 20 \log_{10} P / 2\times10^{-5}$$

Regarding the method of calculation of the combined sound pressure level from multiple sound sources, when each sound pressure level of the sources indicated like as L_1, L_2, ... L_n (dB), the combined sound pressure level can be obtained by converting the aforementioned formula into the exponential function that leads the following formula (1).

$$P_1^2 / P_0^2 = 10^{L1/10},\ P_2^2 / P_0^2 = 10^{L2/10} \ldots\ldots P_n^2 / P_0^2 = 10^{Ln/10}$$

$$L_P = 10 \log_{10}\{ (P_1^2 + P_2^2 + \ldots P_n^2) / P_0^2\} = 10\log_{10}\{ 10^{L1/10} + 10^{L2/10} + \ldots + 10^{Ln/10}\} \quad \ldots\ldots (1)$$

Also, regarding the method of obtaining the averaged power of multiple sound pressure levels, when the sound pressure levels of the sources indicated like as L_1, L_2, ... L_n (dB), the following formula (2) is the averaged power: $Lp_{(av)}$ of the sum of numerical (n).

$$Lp_{(av)} = 10 \log_{10}\{1/n \cdot (P_1^2 + P_2^2 + \ldots P_n^2) / P_0^2\}$$
$$= Lp - 10 \log_{10} n \quad \ldots\ldots (2)$$

For example, when calculating the combined sound pressure level, using the aforementioned formula (1) or (2) as follows.

a) If the sound pressure levels are, for example, 60dB and 70dB, the combined sound pressure level is 70.4dB.

$$L_P = 10 \log_{10}\{10^{L1/10} + 10^{L2/10}\} = 10 \log_{10}(10^{60/10} + 10^{70/10})$$
$$= 10 \log_{10} 10^6 (1 + 10) = 10 \log_{10} 10^6 + 10 \log_{10} 11 = 60 + 10.4 = 70.4 \text{ dB}$$

b) If the sound pressure is, for example, 90dB and is used for the revision of background noise. And, the background noise is 85dB, the sound pressure level is calculated in 88dB using the table for revision value of background noise.

$L_P = 90 - 2 = 88$ dB **(when the difference of the value is 5 dB, the revision value of background noise is ▲2 according to the table.**

c) When the sound pressure levels are, for example, L1=70dB and L2=80dB, L3=90dB and L4=100dB, the averaged power of those sound pressure levels is 58.4dB, using the formula (2).

$$Lp_{(av)} = 10 \log_{10}\{1/n \cdot (10^{L1/10} + 10^{L2/10} + 10^{L3/10} + 10^{L4/10})\}$$
$$= 10 \log_{10}\{1/4 \cdot (10^{70/10} + 10^{80/10} + 10^{90/10} + 10^{100/10})\}$$
$$= 10 \log_{10}\{10^7 + 10^8 + 10^9 + 10^{10}\} - 10 \log_{10} 4$$
$$= 10 \log_{10} 10^{80}(10^{-1} + 1 + 10 + 10^2) - 10 \log_{10} 4$$
$$= 10 \log_{10} 10^{80} + \log_{10} 101 - 10 \log_{10} 4 = 94.4 \text{ dB}$$

2) A-weighted sound pressure level (L_A)

A-weighted sound pressure level is indicated by revising A-weighted to the sound pressure level as a physical scale of the loudness (pressure) of sound waves.

The revision value of A-weighted is relative to numerical value (1 kHz, 40 dB) of sound pressure level as a standard (0 dB).

A-weighted sound pressure level is calculated by 10 times the common logarithm of the value that the square of the A-weighted sound pressure is divided by the square of base sound pressure as follows. The unit is decibels (dB).

The numerical value of base sound pressure uses the smallest sound pressure (20μPa) that can be heard by human beings.

$$L_A = 10 \log_{10} P^2 / P_0^2 = 20 \log_{10} P / P_0 = 20 \log_{10} P / 2\times10^{-5}$$

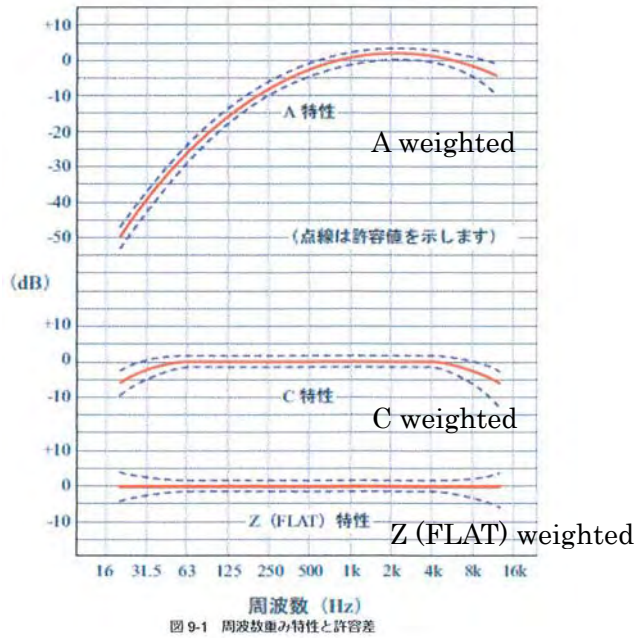


図 9-1 周波数重み特性と許容差

Source: Document concerning noise by Onosokki Corporation in Japan

3) Equivalent continuous A-weighted sound pressure level (L_{Aeq})

The "Equivalent continuous A-weighted sound pressure level" is indicated as an averaged power of the fluctuating sound level within a certain time range. The unit is decibels (dB).

The "Equivalent continuous A-weighted sound pressure level" is used in the evaluation of noise value in a common environment and working environment, etc., so the method of calculating the "Equivalent continuous A-weighted sound

pressure level" is found by using the measured noise levels in the following formula.

$$L_{Aeq,T} = 10 \log_{10} \{ 1 / t_2 - t_1 \cdot \int P_A^2 (t) / P_0^2 \, dt \}$$
$$= 10 \log_{10} \{ 1 / n [10^{LA1}/_{10} + 10^{LA2}/_{10} + \cdots 10^{LAn}/_{10}] \}$$
$$= 10 \log_{10} \{ [10^{LA1}/_{10} + 10^{LA2}/_{10} + \cdots 10^{LAn}/_{10}] \} - 10 \log_{10} n$$

P_A (t) : A-weighted sound pressure

P_0 : Standard sound pressure (20μPa)

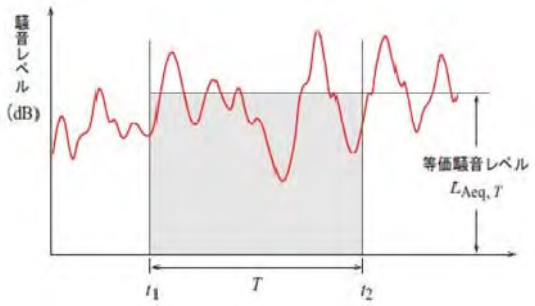
t_1 : Starting time for measurement

t_2 : Ending time for measurement

T : Effective measurement time ($t_2 - t_1$)

n : Total number of measurement

L_{A1}, L_{A2}, … L_{An} : measurement value



The diagram for relationship between A-weighted sound pressure level and Equivalent continuous A-weighted sound pressure level (L_{Aeq})

Source: Document concerning noise by Onosokki Corporation in Japan

4) Percentile sound pressure level ($L_{AN,T}$)

This value had traditionally been used as an evaluation value of fluctuating noise in Japan, but now the equivalent continuous A-weighted sound pressure level is used instead, so it is effective for evaluating the distribution condition of the fluctuating A-weighted sound pressure level.

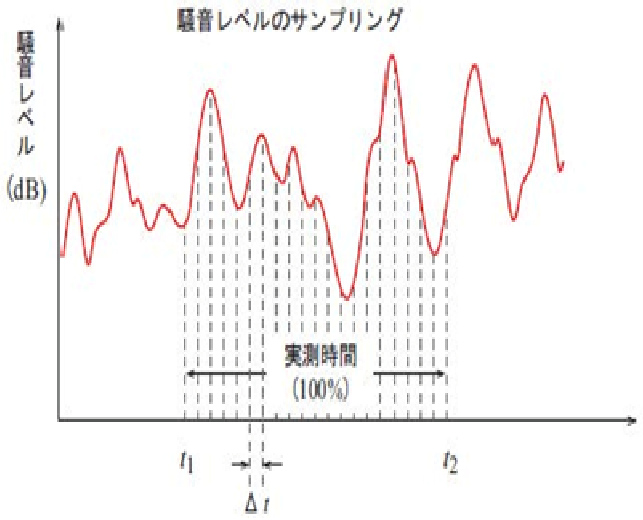
A-weighted sound pressure level is called "N percent (%) of the percentile sound pressure level" in the event that a certain noise level has been exceeded over a period of N% of the measurement time: T. For example, "50% of the percentile sound pressure level" is called the median (L_{A50}), "5% of the percentile sound pressure level" is called the upper end value of the 90% range (L_{A5}), and "95% of

the percentile sound pressure level" is called the lower end value of the 90% range(L_{A95}). The unit is decibels (dB).

The percentile sound pressure level is actually conducted by sampling the noise levels at regular intervals of Δt. As a method of statistical processing, it is common that a curve of the "cumulative frequency distribution" is drawn by the value of the noise levels, and then (100-x)% of sound pressure level is treated with "x % of the percentile sound pressure level".

In case common method of measuring noise levels is applicable as the method of measuring 50 times at regular intervals of 5 seconds (equal to Δt).

Sampling of noise levels



Measurement time ($t_2 - t_1$)

Source: Document concerning noise by Onosokki Corporation in Japan

5) Maximum A-weighted sound pressure level ($L_{A, Fmax}$)

Maximum A-weighted sound pressure level means maximum value of generating the noise level during measurement of noise. The unit is decibels (dB).

This is useful for a reference index to confirm the variation factor of the equivalent continuous A-weighted sound pressure level caused by getting into noise levels not subject to measurement.

6) Minimum A-weighted sound pressure level ($L_{A,Fmin}$)

Minimum A-weighted sound pressure level means minimum value of generating the noise during measurement of noise. The unit is decibels (dB). This is useful for a reference index to confirm the background noise levels.

7) Background noise

Background noise means the noise that generated from sound resources excepting for noise generating facility.

Measurement of sound pressure level during operating noise generating facility is composed with the actual measurement noise levels and background noise, and calculating noise measurement value need to deduct the effects of background noise.

8) Conventional time periods

This is the time period during which the value of equivalent continuous A-weighted sound pressure level shall be applied as a representative value, and the conventional time periods are divided daytime (6:00-22:00) and evening (22:00-6:00) in the "Environmental Quality Standards for Noise in Japan".

9) Observation time

The observation time is the fundamentals and units used when measuring the noise levels, and is set as the lengths of time during which the state of generating noise is considered to be constant. In this manual, the length of an observation time is one (1) hour.

10) Effective measurement time

The measurement of noise levels is conducted during the observation time. In this manual, the length of effective measurement time is ten (10) minutes.

11) Characteristic of a frequency

This is the characteristic of frequency correction in which a sound level meter is preinstalled, and because this is determined by giving consideration to factors such as changes in the sensitivity of human hearing due to the frequency, "A-weighted" is adopted when measuring the noise levels.

12) Characteristic of time range

This is a characteristic of time range for finding the actual value of the sound pressure by using a sound level meter or level recorder, and it is also referred to as the "dynamic characteristic" because the speed of the deflection of the needle changes. Two types are adopted: F characteristic (Fast), which is a fast dynamic characteristic, and S characteristic (Slow), which is a slow dynamic characteristic.

(2) Method of measuring noise levels

1) Determining the location of measurements and the points of measurement

The location where noise levels are to be measured shall be on the boundaries of the mine, at the shortest distance between the border and residential areas which are considered to be affected by noise-generating facilities and around the regions from

which the complaints regarding mine pollution problems caused by noise have been raised into the residents.

2) Measurement height

Regarding the height of the microphone of a sound level meter, the height of the microphone for measurement of noise levels was 1.2 meters from the ground, but now it is considered adequate to use the height of the living floor of a building or residence that is used for residential purpose and is considered to be affected by mine pollution caused by noise.

3) Measurement instruments

From among ordinary sound level meters, precision sound level meters, and measuring instruments of equal or superior performance, a specified measuring instrument that has satisfied the conditions of the Measurement Act shall be regulated to use in Japan.

4) The observation time and effective measurement time

The observation time of noise levels, in principle, is 1 hour, while effective measurement time of noise levels, in principle, is ten (10) minutes or more, and the equivalent continuous A-weighted sound pressure level (L_{Aeq}) shall be conducted during a conventional time period.

Specifically, in the beginning, the observation time is divided into appropriate times of effective measurement of noise levels, and then the (L_{Aeq}) of each division is conducted. During statistical processing of the effective data following measurement, the abnormal measurement values which are judged by "Maximum A-weighted sound pressure level" (L_{AFmax}) and "5% of the percentile sound pressure level" (L_{A5}), are omitted, and then the "Equivalent continuous A-weighted sound pressure level (L_{Aeq})" shall be calculated by using averaged power of remained data.

Generating noise levels are quite different responding to the status of mineral-related operations of the mine, the measurement time of noise levels shall be selected and conducted in order to the actual situation of the operations.

In reference to selection of the observation time and measurement time of noise

levels, the conventional time periods are divided daytime (6:00-22:00) and evening (22:00-6:00) regulated in the "Environmental Quality Standards for Noise in Japan", frame of measurement time shall be selected by consideration to the operating state of noise generating facilities of the mine, such as: a 5-hour period from 7:00 AM to 12:00 during the daytime, during which a period of effective measurement being ten (10) minutes or more is conducted once an hour of the observation time during each of the five (5) hours of this frame; and for a 5-hour period from 22:00 PM to 3:00 AM during the nighttime, during which a period of effective measurement being ten (10) minutes or more is conducted once an hour of the observation time during each of the five (5) hours of this frame.

5) Treatment of sounds to be omitted

a) In the event of continuous monitoring

In the event that the person performing the measurements is using continuous monitoring to conduct the measurements of noise levels, there is a method of quickly pressing the (Pause) button when a sound to be omitted has been detected in order to pause the measurement, and then restarting the measurement by pressing the (Start) button after the sound to be omitted is no longer heard.

b) Person-less measurements or events in which there is no monitor

During the statistical processing of the actual data following measurement, the abnormal measurement values which are judged by "Maximum A-weighted sound pressure level" (L_{AFmax}) and "5% of the percentile sound pressure level" (L_{A5}),re omitted, and then the "Equivalent continuous A-weighted sound pressure level (L_{Aeq})" shall be calculated by using averaged energy of remained data.

6) Environmental conditions for measurement of noise levels

A weather condition in rainfall for conducting measurement of noise levels is to be suspended.

when the wind velocity is 1m/sec or faster, a wind screen is attached to the microphone of a sound level meter. But wind noises are affecting the measurement values of noise levels even if the wind screen is attached, the measurement is suspended.

Currently, attaching the wind screen to the microphone of a sound level meter can reduce the effect of wind noises up to wind velocity level of five (5) m/sec.

(3) Evaluation method of noise levels using percentile sound pressure level ($L_{AN,T}$)

Concerning evaluation of measurement of noise levels using a sound level meter, the scale of noise levels shall be decided as follows.

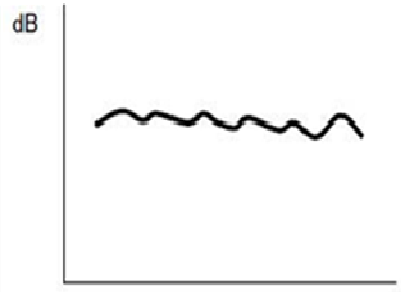
1) When the indicated values of a sound level meter are move-less or a little fluctuation, the indicated values of meter shall be applied as following a diagram of case 1).

2) When the indicated values of a sound level meter fluctuate periodically or intermittently, and also the maximum of the indicated values generally has kept constant, the average of the maximum of the indicated values during each fluctuation shall be applied as following a diagram of case 2).

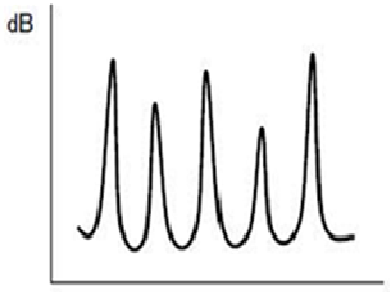
3) When the indicated values of a sound level meter are irregular and the values also fluctuate over a large range, the value of "5% of the percentile sound pressure level" that equals the upper end value of the 90% range shall be applied as following a diagram of case 3).

4) When the indicated values of a sound level meter fluctuate periodically or intermittently, and the maximum of the indicated value has not kept constant during each fluctuation, the value of the upper end value of the 90% range shall be applied as following a diagram of case 4).

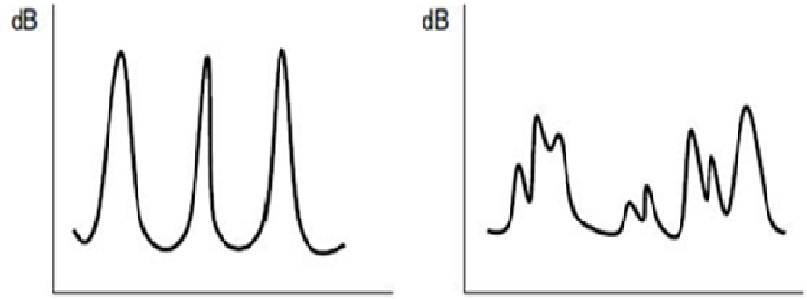
Case 1) The indicated values are move-less or a little fluctuation



Case 2) The indicated values fluctuate periodically or intermittently



Case 4) the indicated values fluctuate periodically or intermittently, and the maximum of the value has not kept constant



Case 3) The indicated values are irregular and the values fluctuate over a large range

(4) Standard Values for Noise

1) Standard Values for Regulating Noise described in the Law on Environmental Protection and Natural Resource Management, and relevant regulations in Cambodia

	6:00 ～ 18:00	18:00 ～ 22:00	22:00 ～ 6:00
Areas where quietness required	45dB	40dB	35dB
Areas used for residences	60dB	50dB	45dB
Areas used for commerce	70dB	65dB	50dB
Areas used for small scale industries including residences	75dB	70dB	50dB

2) Standard Values for Regulating Noise Generated by the Operation of Specified Factories including Mines in Japan

Type of Areas	Daytime	Morning / Evening	Nighttime
Area No.1	45dB ～ 50dB	40dB ～ 45dB	40dB ～ 45dB
Area No.2	50dB ～ 60dB	45dB ～ 50dB	40dB ～ 50dB
Area No.3	60dB ～ 65dB	55dB ～ 65dB	50dB ～ 55dB
Area No.4	65dB ～ 70dB	60dB ～ 70dB	55dB ～ 60dB

Remarks)

(1) Time range

1) Daytime is from 7:00am or 8:00am until 6:00pm, 7:00pm, or 8:00pm in the evening.

2) Morning is from 5:00am or 6:00am until 7:00am or 8:00am. Evening is from 6:00pm, 7:00pm, or 8:00pm until 9:00pm, 10:00pm, or 11:00pm.

3) Nighttime is from 9:00pm, 10:00pm, or 11:00pm until 5:00am or 6:00am of the following morning.

(2) The measurement of noise levels shall be conducted using a sound level meter that has passed the conditions regulated in the Measurement Act of Japan. In this case, "A-weighted" shall be adopted in the characteristic of frequency correction and "F characteristic (Fast)" that is a fast dynamic characteristic shall be adopted in the characteristic of time range in Japan.

(3) "Type of Areas" listed in the table above are as follows.

1) Area category No.1 shall be applied to areas where quietness is specially required.

2) Area category No.2 shall be applied to areas used exclusively residences where quietness is required.

3) Area category No.3 shall be applied to areas used for not only residences but also commerce and industry and shall be required prevention of public (mine) pollution caused by noise in order to preserve the living environment of residents.

4) Area category No.4 shall be applied to areas used for primarily industrial purposes and shall be required prevention of remarkable public (mine) pollution caused by noise in order to preserve the living environment of residents.

(4) The revision value of background noise

Measurement of sound pressure level during operating noise generating facility is composed with the actual measurement noise levels and background noise, and calculating noise measurement value need to deduct the effects of background noise is called the revision of background noise.

In case the difference of the indicated value of a sound level meter has less than three (3) dB or more than ten (10) dB between operating and suspension of the noise generating facility, it does not consider the effects of background noise.

But, when the difference of the value is less than 10 dB, the revision of background noise shall be conducted as following value.

Unit: dB

Difference of indicated value	4 ～ 5	6 ～ 9
Revision of background noise value	▲ 2	▲1

4. drafting and reporting of a general inspection (prevention of mine pollution) on noise

Report of a general inspection (prevention of mine pollution) on noise (Format)

1. Noise generating facility and noise prevention facility

(1) **Noise generating facilities**

Name of the facility	Date of installation of the facility	Structure and Capacity of Machinery	State of management

(2) Noise prevention facilities

Name of the facility	Date of installation of the facility	Structure and Capacity of Machinery	State of Management

2. The results of measurement of noise levels

(1) Conditions at the measurements

1) Date of measurement

2) Type of the sound level meter

3) Weather, temperature (degree) and wind velocity (m/sec)

4) Status of operation of noise generating facilities at the time of the measurements

5) Name of measurement spot

(2) The results of measurement of noise levels

unit : dB

Measurement time	L_{Aeq}	L_{Amax}	L_{Amin}	L_{A5}	L_{A50}	L_{A95}	
~							
~							

~							
Average value							

(3) The mine pollution problems caused by noise that occurred past time by turns

Occurrence Date of the problems	Location or Areas	Outline of Mine Pollution Problems, and Caused Damages

(4) Evaluation on the results of measurement of noise levels, and inspectors' opinion

(5) Attached documents and diagrams

1) The plane diagram that noise generating facilities, measurement points of noise levels, buildings and residences are written. (writing down the distance between noise generating facilities, measurement points of noise levels and residences on the diagram)

2) Documents concerning hearings with the safety seniors of the mine regarding the contents of the complaints and requests from the residents living around the mine against generating noise, and status of how the mine is working to address to those complaints and measures.

3) Photos concerning measurement points of noise levels and residences

(Commentary)

1. What is noise?

1) Noise that is unpleasant and undesired (difficult to define)

2) An individual sensitivity

3) A social or cultural background

4) Time frame (early morning, daytime, evening, late at night)

5) Length (a short duration, a few minutes, continuous)

6) Timbre (regardless of level)

2. The effects of noise to human body

1) Effects on physiological functions

Fatigue, central nervous system, autonomous nervous system, internal secretion, high blood pressure, heart disease, etc.

2) Effects on sleep

Insomnia due to sleep disturbance, increases in the risk of ischemic heart disease, etc.

3) Effects on hearing

Noise-induced deafness, sudden noise-induced deafness

3. Relationship between sound strength, sound pressure level and sound pressure

Conditions) Density of air: 1.2 kg/m3, the speed of sound: 340m/sec

Sound Intensity (W/m^2)	Sound Pressure Level (dB)	Sound Pressure (Pa)
10	130	10^2
10^{-2}	100	2
10^{-4}	80	2×10^{-1}
10^{-6}	60	2×10^{-2}
10^{-8}	40	2×10^{-3}
10^{-10}	20	2×10^{-4}
10^{-12}	0	2×10^{-5}

4. Method of calculating the percentile sound pressure level ($L_{AN,T}$)

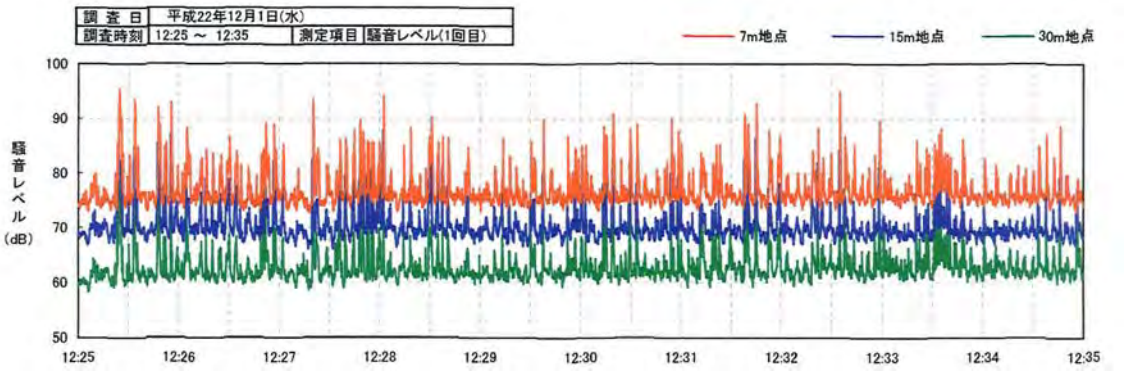
"Percentile sound pressure level" has been used for evaluating fluctuating noise in Japan, however the "Equivalent continuous A-weighted sound pressure level" is used for evaluation of fluctuating noise rather than the "Percentile sound pressure level" in recent years.

But the results of calculating the "Percentile sound pressure level" are clear to understand statistical characteristics of certain generating noise.

In the beginning, collecting fifty (50) samples of noise levels by measuring at a certain point, then write down noise level data except abnormal measurement values in table-A below in chronological order, then transferring data of Table-A to Table-B with a number per measuring noise levels in each of one (1)dB and getting cumulative total value. Next, using the data of Table-B to plot the measurement noise value on the X-axis and the cumulative frequency on the Y-axis of the diagram. In the final, drawing a curve of the "Cumulative frequency distribution".

A curve of the "Cumulative frequency distribution" that contacts 95% point of

cumulative frequency means “upper end value of the 90% range (L_{A5})”, and contacts 5% point of cumulative frequency means “lower end value in the 90% range (L_{A95})”, and contacts 50% point of cumulative frequency means “the median (L_{A50})”.



Source: The report of measurement of noise levels in Hokkaido by HRS Corporation in 2010

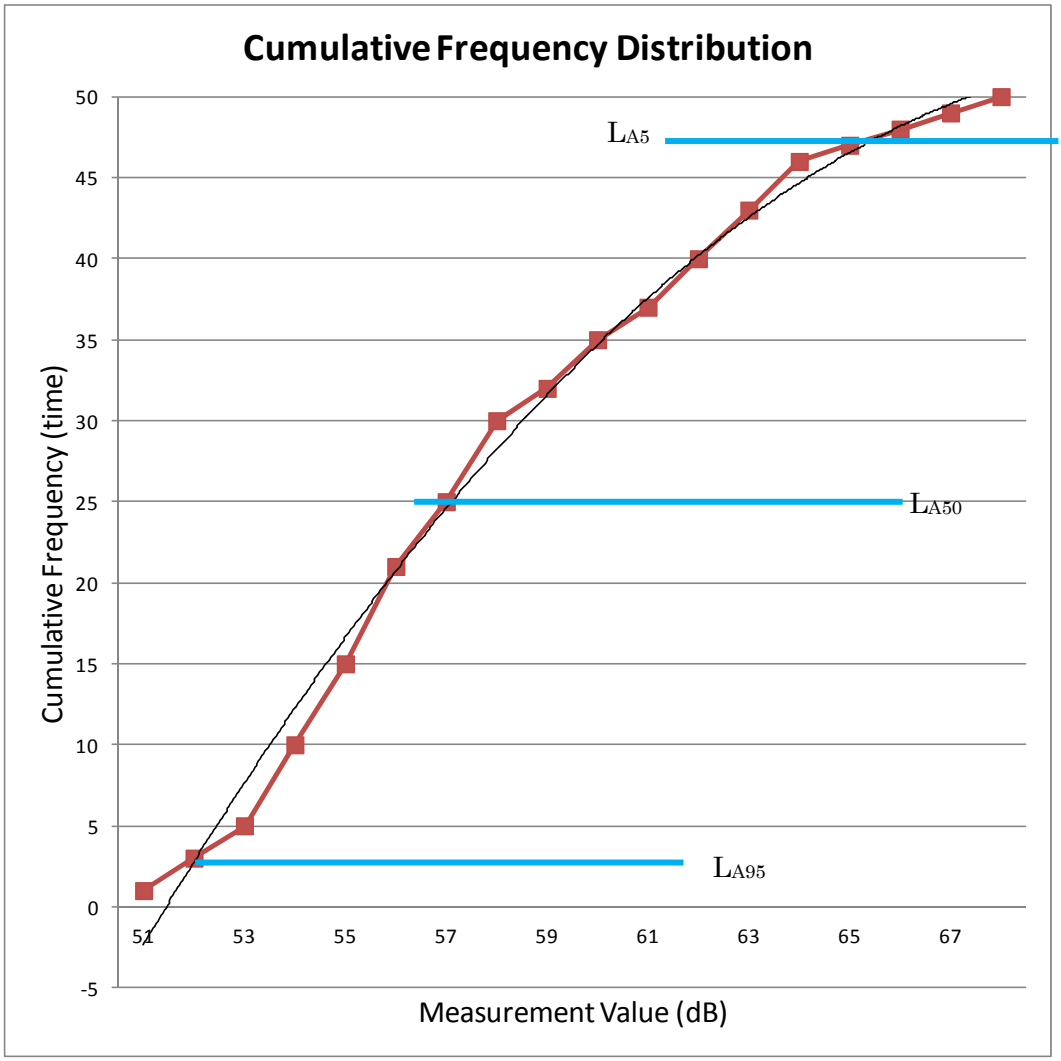
Table-A：50 samples of measurement of noise levels

列	列1	列2	列3	列4	列5	列6	列7	列8	列9	列10
No.	1	2	3	4	5	6	7	8	9	10
dB	53	52	51	55	55	55	56	57	58	58
No.	11	12	13	14	15	16	17	18	19	20
dB	58	58	59	57	57	55	63	56	62	64
No.	21	22	23	24	25	26	27	28	29	30
dB	62	61	68	58	60	61	55	56	60	52
No.	31	32	33	34	35	36	37	38	39	40
dB	54	56	57	58	56	54	54	54	62	64
No.	41	42	43	44	45	46	47	48	49	50
dB	59	60	54	53	58	56	66	67	65	64

Table-B：A number per measuring noise levels and cumulative total value

	列1	列2	列3	列4	列5	列6	
MV	51dB	52dB	53dB	54dB	55dB	56dB	
N	1	2	2	5	5	6	
CT		1	3	5	10	15	21
MV	57dB	58dB	59dB	60dB	61dB	62dB	
N	4	5	2	3	2	3	
CT		25	30	32	35	37	40
MV	63dB	64dB	65dB	66dB	67dB	68dB	
N	3	3	1	1	1	1	
CT		43	46	47	48	49	50

MV : Measured Vaalue, N : Number, CT : Cumulative Total


Cumulative Frequency Distribution
Cumulative Frequency (time)
Measurement Value (dB)
LA5
LA50
LA95
50
45
40
35
30
25
20
15
10
5
0
-5
51
53
55
57
59
61
63
65
67

(attached document No.4)

Chapter Ⅵ : Conducting a General Inspection (Prevention of Mine Pollution) on Vibration

September 2016

1. Preparation of a general inspection (prevention of mine pollution) documents and instruments

In conducting a general inspection (prevention of mine pollution) on vibration, the inspectors shall prepare following instruments in addition to Chapter Ⅰ. 2. (2) "Preparation of a general inspection documents and instruments" as necessary.

1) a Vibration level meter

2) a Level recorder or a Data recorder (if necessary)

3) a Thermometer

2. Conducting a general inspection (prevention of mine pollution) on vibration

(1) Conducting a general inspection (prevention of mine pollution) at a mine office

The inspectors shall hold a hearing with the safety seniors regarding following matters concerning vibration of the mine, and shall confirm whether there are any hindrances or problems for preventing mine pollution problems processing the mineral-related operations; in case matters deemed inadequate in terms of safety, the inspectors shall provide improvement guidance for the safety seniors.

1) Are following items regulated in the own mine safety rules at the mine?

a) Items concerning management of vibration generating facility and vibration prevention facility

b) Items concerning measurement of vibration levels

c) Items concerning emergency measures when mine pollution problems occur caused by vibration or is likely to occur because of causing accident, being broken or other troubles of vibration generating facility or vibration prevention facility, or heavy rain or other special reasons.

2) Does the concessionaire (subject to vibration regulations) generate vibration that does not meet the vibration control standard regulated in the "Law on Environmental Protection and Natural Resource Management" and relevant regulations at the boundaries outside mines?

3) When mine pollution problems caused by vibration occur or is likely to occur that

don't meet the control standard because of an accident, being broken, or other troubles of vibration generating facility or vibration prevention facility, does the concessionaire take emergency measures for prompt repair from the incident?

4) Does the concessionaire (subject to vibration regulations) obey the instructions given by the Minister in charge of mines sector to take appropriate measures to prevent mine pollution caused by vibration?

5) Does a safety technical staff for prevention of mine pollution obey following items to prevent mine pollution problems caused by vibration?

a) To examine the vibration generating facilities and vibration prevention facilities in every working day, and write down the results of examination in the safety diary.

b) To measure vibration levels periodically at the boundaries outside mine based on the "Law on Environment Protection and Natural Resource Management" and relevant regulations, and write down the results of measurements in the managements record.

c) To report to the administrator (safety seniors) immediately when mine pollution problems caused by vibration occur or are likely to occur based on the results of examination, and measurements of vibration levels.

6) When mine pollution occurs or is highly likely to occur caused by vibration, does the concessionaire immediately report the state of incident, list of emergency measures taken, and plans for restoration work and the list of completed work to the Director General in charge of mines sector?

(2) Conducting a general inspection (prevention of mine pollution) on vibration to mine facilities and working places

In addition to "ChapterⅡ. 2. Conducting mine facilities and working places", inspectors shall confirm following matters whether there are any hindrances or problems for preventing of mine pollution problems caused by vibration in the mine facilities and working places in the process of the mineral-related operations; in case matters deemed inadequate in terms of safety, the inspectors shall provide improvement guidance for the safety seniors.

1) Is the maintenance state of vibration generating facilities and vibration prevention facilities at the mine (subject to vibration regulations) for controlling vibration satisfactory?

2) Do the vibration levels generated from following vibration generating facilities meet the vibration control standard regulated in the "Law on Environmental Protection and Natural Resource Management" and relevant regulations at the

boundaries outside mines?

a) A crusher, mill or screen for stones or minerals with a rated motor output of 7.5 kW or more

b) A compressor with a rated motor output of 7.5 kW or more

3) Do the residents living around the mine have any complaints against generating vibration?

If there are any complaints against generating vibration, the inspectors shall hold a hearing with the safety seniors regarding the contents of the complaints and the status of how the mine is working to address to those complaints, and measure the vibration levels around the regions from which the complaints have been raised, if necessary.

3. Measurement and evaluation of vibration levels

(1) The definition and interpretation of the relevant technical terminology concerning vibration

1) Vibration acceleration level (L_{Va})

Vibration magnitude is expressed in Acceleration (Gal) or (m / sec2), Speed (m/sec) and Displacement (m).

The effective of vibration acceleration that human's whole body can be detected in the frequency range of (1-80 Hz), converted into the common logarithm is called "Vibration acceleration level".

"Vibration acceleration level" is concretely obtained by twenty (20) times the common logarithm of the value that measurement of effective vibration acceleration is divided by base vibration acceleration(10^{-5} m/sec^2). The unit is decibels (dB).

$$L_{Va} = 20 \log_{10} a/a_0$$

a : Effective value of the vibration acceleration (m/sec^2)

a_0 : The value of base vibration acceleration (10^{-5} m/sec^2)

2) Vibration level (L_V)

The effects of vibration on the human body depend on the amplitude and frequency, and the human body feels different between vertical direction and horizontal direction of vibrations.

The value of "Vibration level" is obtained by making revision of the sensitivity characteristics of the human body (horizontal and vertical characteristics), and this

value can be obtained by twenty (20) times the common logarithm of the value that the effective value of the vibration acceleration revised the sensitivity characteristics of the human body is divided by the value of base vibration acceleration.

$$L_V = 20 \log_{10} a_V/a_0$$

a_v : Effective value of the vibration acceleration which has revised the sensitivity characteristics of the human body (m/sec^2)

a_0 : Value of base vibration acceleration (10^{-5} m/sec^2)

3) Averaged power level (L_{Veq})

The averaged power level means same energy of the vibration level or the vibration acceleration level in case the indicating vibration values fluctuate great deal during measurement of vibration levels.

The averaged power level has same meaning of A-weighted sound pressure level of noise, and is evaluated to be equivalent of the "Equivalent continuous A-weighted sound pressure level" of noise. The unit is decibels (dB).

$$L_{Veq} = 20 \log_{10} \{ 1 / t_2 - t_1 \cdot \int a(t)/a_0 \, dt \}$$
$$= 20 \log_{10} \{ 1 / n [10^{LV1/10} + 10^{LV2/10} + \cdots 10^{LVn/10}] \}$$
$$= 20 \log_{10} \{ [10^{LV1/10} + 10^{LV2/10} + \cdots 10^{LVn/10}] \} - 10 \log_{10} n$$

a_v : Effective value of the vibration acceleration which has revised the sensitivity characteristics of the human body Vibration level

a_0 : Value of base vibration acceleration (10^{-5} m/sec^2)

t_1 : Starting time for measurement

t_2 : Ending time for measurement

T : Effective measurement time ($t_2 - t_1$)

n : Total number of measurement

$L_{V1}, L_{V2}, \cdots L_{Vn}$: measurement of vibration value

4) Maximum vibration level (L_{Vmax})

Maximum vibration level means maximum value of generating vibration level or vibration acceleration level during measurement of vibration. The unit is decibels (dB).

This is useful for a reference index to confirm the variation factor of the equivalent continuous A-weighted sound pressure level caused by getting into vibration levels not subject to measurement.

5) Minimum Vibration level (L_{Vmin})

Minimum vibration level means minimum value of generating the vibration level or vibration acceleration level during measurement of vibration. The unit is decibels (dB).

6) Percentile vibration level ($L_{VN,T}$)

Vibration level is called "N percent (%) of the percentile vibration level" in the event that a certain vibration level has been exceeded over a period of N% of the measurement time: T. For example, "50% of the percentile vibration level" is called the median (L_{V50}), "10% of the percentile vibration level" is called the upper end value of the 80% range (L_{V10}), and "90% of the percentile vibration level" is called the lower end value of the 80% range(L_{V90}). The unit is decibels (dB).

The percentile vibration level is actually conducted by sampling the vibration levels at regular intervals of Δt. As a method of statistical processing, it is common that a curve of the "cumulative frequency distribution" is drawn by the value of the vibration levels, and then (100-x)% of the percentile vibration level is treated with "x % of the percentile vibration level".

In case common method of measuring vibration levels is applicable as "the method of measuring 100 times at regular intervals of 5 seconds (equal to Δt).

7) Background vibration

Background vibration means the vibration that generated from the resources excepting for vibration generating facilities.

Measurement of vibration level during operating vibration generating facility is composed with the effective measurement vibration levels and background vibration, and calculating measurement of vibration value needs to deduct the effects of background vibration. The revision value of background vibration is shown in the "Commentary".

(2) Method of measuring vibration levels

1) Determining the location and points of measurement of vibration levels

The location where vibration levels are to be measured shall be on the boundaries of the mine, at the shortest distance between the border and residential

areas which are considered to be affected by vibration generating facilities and around the regions from which the complaints regarding mine pollution problems caused by vibration have been raised into the residents.

2) Measurement instruments

For vibration meters, specified measuring instruments that have satisfied the conditions of the Measurement Act shall be regulated to use in Japan.

3) Method of measurement of vibration levels

a) Selection of direction of vibration levels

With a vibration meter, it is now possible to measure vibration levels of three directions: the vertical direction and two horizontal directions at the same time. However, when conducting measurement of vibration levels based on Vibration Control Law of Japan, the vibration level which making revision of the sensitivity characteristics of vibration acceleration of the vertical direction has been applied to be measured.

b) Selection of installation locations of the vibration pickup

During measurement of vibration levels, in principle, only the Z direction (vertical direction) shall be measured, and the vibration pickup of a vibration level meter shall be installed on the boundary of the mine where the X direction (one of horizontal direction) of the vibration pickup sets on the cross direction against the border of the mine, and the Y direction (another horizontal direction) of the vibration pickup sets on the parallel direction toward the border of the mine as follows.

Appropriate installation locations of the vibration pickup of a vibration level meter are following.

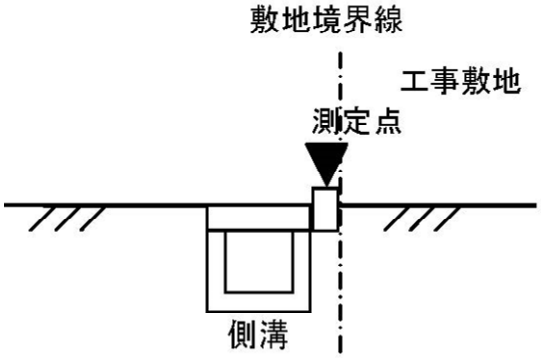
i) Solid ground without buffers, and it is adequately treaded down.

ii) The ground has maintained a horizontal surface without slopes and bumps

iii) Places unaffected by external conditions such as temperature, electricity, and magnetism

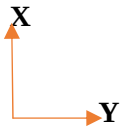
iv) When measurement of vibration levels shall be conducted in a situation in which appropriate locations can't be found, burry an object such as a concrete block into the ground and install the vibration pickup on top of it.

A vibration pickup



敷地境界線上に無理に設置しないで、道路や縁石などに設置してください。
側溝の蓋の上など、地盤と異なる部分に設置することは避けてください。

Setting a vibration pickup on the suitable measurement point along the boundary line



Source: Measurement and evaluation on vibration by Ministry of Environment of Japan

4) Decision of the observation time and effective measurement time

The observation time of vibration levels, in principle, is one (1) hour, while effective measurement time of vibration levels, in principle, is ten (10) minutes or more, and the averaged power level (L_{Veq}) shall be conducted during a conventional time period.

Specifically, in the beginning, the observation time is divided into appropriate times of effective measurement of vibration levels, and then the averaged power levels (L_{Veq}) of each division is conducted. During statistical processing of the effective data following measurement, the abnormal measurement values which are judged by "Maximum vibration level" (L_{Vmax}) and "80% of the percentile vibration level" (L_{V10}), are omitted, and then the averaged power level (L_{Veq}) shall be calculated by using remained data.

Generating vibration levels are quite different responding to the status of mineral-related operations of the mine, the measurement time of vibration levels shall be selected and conducted in order to the actual situation of the operations.

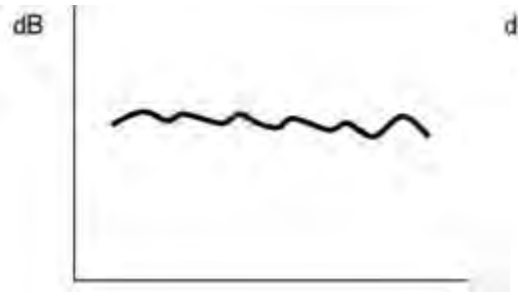
As a method of decision of measurement of vibration level, the values are decided as shown below, based on the fluctuation waves measured.

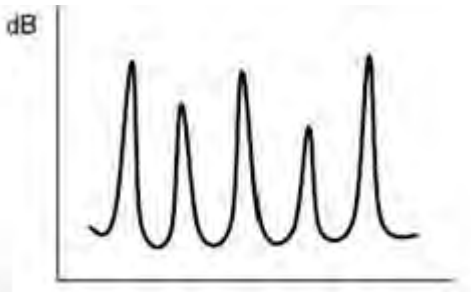
Decision of vibration levels based on indication of fluctuation waves

Fluctuation waves	Decision of vibration level
a) The indicated values are move-less or a little fluctuation	The indicated value shall be applied as a vibration level

b) The indicated values fluctuate periodically or intermittently	**The average of the maximum of the indicated values shall be applied**
c) The indicated values are irregular and the values fluctuate over a large range	**80% of the percentile vibration level (L_{A10}) shall be applied**

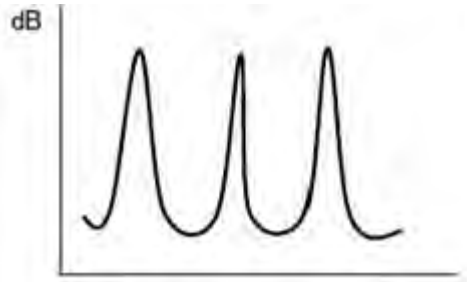
a) The indicated values are move-less or a little fluctuation

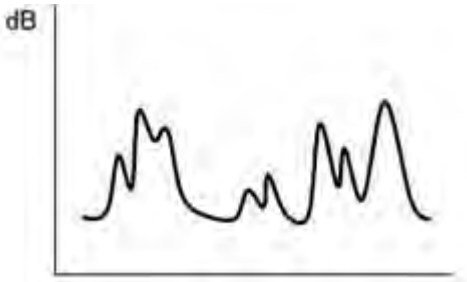




b) The indicated values fluctuate periodically or intermittently

b) The indicated values fluctuate periodically or intermittently





c) The indicated values are irregular and the values fluctuate over a large range

(3) Standard Values for Regulating Vibration Generated by the Operation of Specified Factories including Mines in Japan

Type of Areas	Daytime	Nighttime
Area category No.1	60dB ～ 65dB	55dB ～ 60dB
Area category No.2	65dB ～ 70dB	60dB ～ 65dB

Remarks)

(1) Time range

1) Daytime is from 5:00am, 6:00am or 7:00am until 7:00pm, 8:00pm, 9:00pm, or 10:00pm in the evening.

2) Nighttime is from 7:00pm, 8:00pm, 9:00pm, or 10:00pm until 5:00am, 6:00am, 7:00am, or 8:00am of the following morning.

(2) "Type of Areas" listed in the table above are as follows.

1) Area category No.1 shall be applied to areas where quietness is specially required.

2) Area category No.2 shall be applied to areas used for not only residences but also commerce and industry and shall be required prevention of public (mine) pollution caused by noise in order to preserve the living environment of residents.

(3) The revision value of background vibration

Measurement of vibration level during operating vibration generating facility is composed with the effective measurement vibration levels and background vibration, and calculating measurement of vibration value needs to deduct the effects of background vibration that is called the revision of background vibration.

In case the difference of the indicated value of a vibration level meter has less than two (2) dB or more than ten (10) dB between operating and suspension of the vibration generating facility, it does not consider the effects of background]vibration.

When the difference of the value is less than 10 dB, the revision of background vibration shall be conducted as following value.

Unit: dB

Difference of indicated value	Revision value
3 dB	3 dB
4 dB ～ 5 dB	2 dB
6 dB ～ 9 dB	1 dB

4. drafting and reporting of a general inspection (prevention of mine pollution) on vibration

Report of a general inspection (prevention of mine pollution) on vibration (Format)

1. Vibration generating facility and vibration prevention facility

(1) Vibration generating facilities

Name of facility	Date of installation	Structure and Capacity of Machinery	State of management

(2) Vibration prevention facilities

Name of facility	Date of installation	Structure and Capacity of Machinery	State of management

2. The results of measurement of vibration levels

(1) Conditions at the measurements

1) Date of measurement

2) Type of the vibration level meter

3) Weather, temperature (degree) and others

4) Status of operation of vibration generating facilities at the time of the measurements

5) Name of measurement spot

(2) The results of measurement of vibration levels **unit: dB**

Measurement time	L_{Veq}	L_{Vmax}	L_{Vmin}	L_{V10}	L_{V50}	L_{V90}	
～							
～							
～							
Average value							

(3) The mine pollution problems caused by vibration that occurred past time by turns

Occurrence Date of the problems	Location or Areas	Outline of Mine Pollution Problems, and Caused Damages

(4) Evaluation on the results of measurement of vibration levels, and inspectors' opinion

(5) Attached documents and diagrams

1) The plane diagram that vibration generating facilities, measurement points of vibration levels, buildings and residences are written. (writing down the distance between vibration generating facilities, measurement points of vibration levels and residences on the diagram)

2) Documents concerning hearings with the safety seniors of the mine regarding the contents of the complaints and requests from the residents living around the mine against generating vibration, and status of how the mine is working to address to those complaints and measures.

3) Photos concerning measurement points of vibration levels and residences

(Commentary)

1. What is vibration?

1) Vibration doesn't exit in daily life, phenomena of shaking, rolling, tossing and trembling etc., are abnormal.

2) Vibration of waves affected by things that acts as an intermediary

3) People feel the different feel from the vibration due to frequency and directions because their sense of scale are different.

4) People have own sense of scale and unpleasant on vibration

2. Effects of vibration on the human body

1) Health hazards

If the human body were exposed by vibration for long term, health damage such as influence of sleep, mental reactions, and physiological reactions can occur.

3. Method of calculating the percentile vibration level ($L_{VN,T}$)

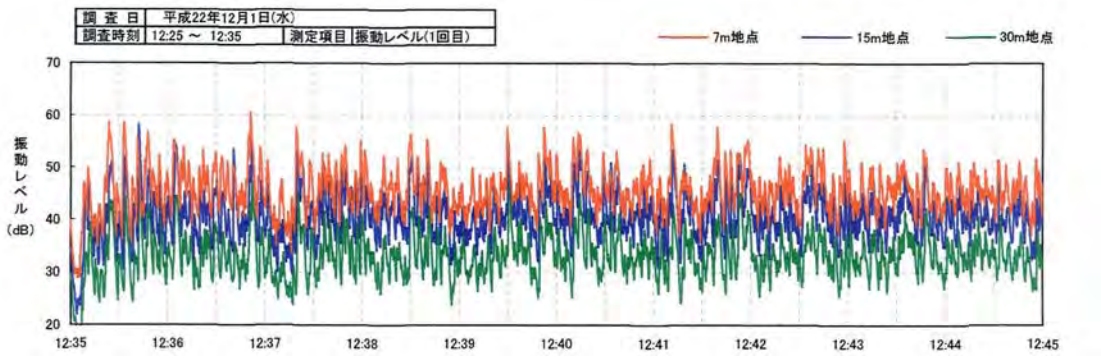
"Percentile vibration level" has been used for evaluating fluctuating vibration in Japan, however the averaged power level" is used for evaluation of fluctuating vibration rather than the "Percentile vibration level" in recent years.

But the results of calculating the "Percentile vibration level" are clear to

understand statistical characteristics of certain generating vibration.

In the beginning, collecting hundred (100) samples of vibration levels by measuring at a certain point, then write down vibration levels excepting abnormal values in table-A below in chronological order, then transferring the data of Table-A to Table-B with a number per measuring vibration levels in each of one (1)dB and getting cumulative total value. Next, using the data of Table-B to plot the measurement of vibration value on the X-axis and the cumulative frequency on the Y-axis of the diagram. In the final, drawing a curve of the "Cumulative frequency distribution".

A curve of the "Cumulative frequency distribution" that contacts 90% point of cumulative frequency means "upper end value of the 80% range (L_{V10})", and contacts 10% point of cumulative frequency means "lower end value in the 80% range (L_{V90})", and contacts 50% point of cumulative frequency means "the median (L_{V50})".



Source: The report of measurement of vibration levels in Hokkaido by HRS Corporation in 2010

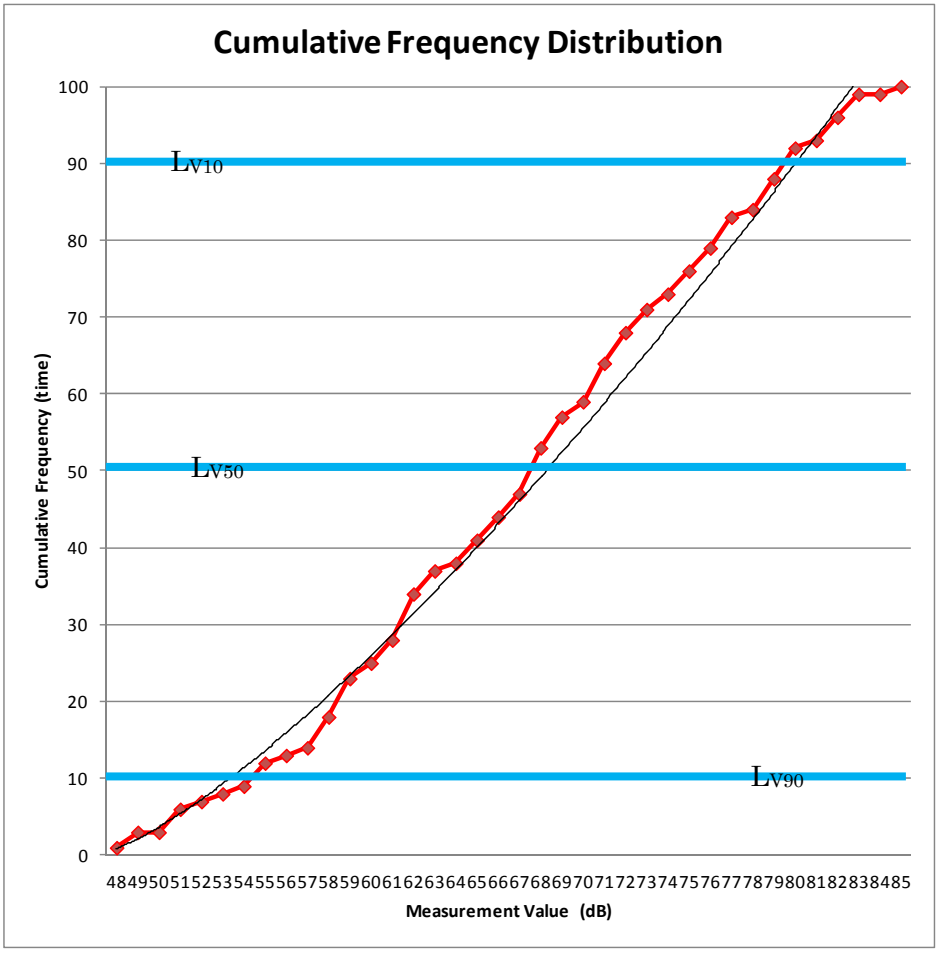
Table-A：100 samples of measurement of vibration levels unit: dB

No.	1	2	3	4	5	6	7	8	9	10
dB	65	71	75	77	80	85	83	78	72	70
No.	11	12	13	14	15	16	17	18	19	20
dB	68	61	59	55	59	60	59	54	51	58
No.	21	22	23	24	25	26	27	28	29	30
dB	62	67	70	74	77	79	82	80	83	82
No.	31	32	33	34	35	36	37	38	39	40
dB	79	73	71	69	68	63	59	55	51	49
No.	41	42	43	44	45	46	47	48	49	50
dB	48	49	51	58	66	67	62	69	72	71
No.	51	52	53	54	55	56	57	58	59	60
dB	74	77	81	80	79	77	73	72	68	69
No.	61	62	63	64	65	66	67	68	69	70
dB	75	76	71	72	76	71	68	66	64	62
No.	71	72	73	74	75	76	77	78	79	80
dB	68	61	58	55	58	57	53	52	56	59
No.	81	82	83	84	85	86	87	88	89	90
dB	60	63	62	63	67	62	68	66	61	65
No.	91	92	93	94	95	96	97	98	99	100
dB	62	65	69	73	76	75	79	80	82	83

Table-B：A number per measuring vibration levels and cumulative total value

MV	48dB	49dB	50dB	51dB	52dB	53dB	54dB	55dB	
N	1	2	0	3	1	1	1	3	
CT		1	3	3	6	7	8	9	12
MV	56dB	57dB	58dB	59dB	60dB	61dB	62dB	63dB	
N	1	1	4	5	2	3	6	3	
CT		13	14	18	23	25	28	34	37
MV	64dB	65dB	66dB	67dB	68dB	69dB	70dB	71dB	
N	1	3	3	3	6	4	2	5	
CT		38	41	44	47	53	57	59	64
MV	72dB	73dB	74dB	75dB	76dB	77dB	78dB	79dB	
N	4	3	2	3	3	4	1	4	
CT		68	71	73	76	79	83	84	88
MV	80dB	81dB	82dB	83dB	84dB	85dB			
N	4	1	3	3	0	1			
CT		92	93	96	99	99	100		

MV : Measured Vaalue, N : Number, CT : Cumulative Total


Cumulative Frequency Distribution
100
90
80
70
60
50
40
30
20
10
0
Cumulative Frequency (time)
LV10
LV50
LV90
484950515253545556575859606162636465666768697071727374757677787980818283848 5
Measurement Value (dB)

(attached document No.5)

Chapter Ⅶ : Conducting a general inspection (Prevention of Mine Pollution) on Mine Smoke (Soot) and Dust

October 2016

1. Preparation of a general inspection (prevention of mine pollution) documents and instruments

In conducting a general inspection (prevention of mine pollution) on mine smoke (soot) and dust, the inspectors shall prepare following instruments in addition to Chapter Ⅰ. 2. (2) "Preparation of a general inspection documents and instruments" as necessary.

1) a Deposit gauge or a Dust jar
2) a Relative concentration measuring instrument
3) Some plastic bags for collecting samples
4) an Anemometer
5) a Thermometer

2. Conducting a general inspection (prevention of mine pollution) on mine smoke (soot) and dust

(1) Conducting a general inspection (prevention of mine pollution) on mine smoke (soot) and dust at a mine office

The inspectors shall hold a hearing with the safety seniors regarding following matters concerning mine smoke (soot) and dust of the mine, and shall confirm whether there are any hindrances or problems for preventing mine pollution problems processing the mineral-related operations; in case matters deemed inadequate in terms of safety, the inspectors shall provide improvement guidance for the safety seniors.

(Items related to mine smoke (soot))

1) Are following items regulated in the own mine safety rules at the mine?

a) Items concerning management of mine smoke (soot) generating facility and mine smoke (soot) treatment facility

b) Items concerning the confirmation of the sulfur content of fuel used in the mine smoke (soot) generating facilities.

c) Items concerning the measurement of the amount of exhaust gas and measurement of the amount of sulfur oxide and harmful substances contained therein, and items concerning the observation of the wind direction and wind velocity.

d) Items concerning emergency measures when mine pollution problems occur or is likely to occur caused by mine smoke (soot) because of causing accident, being broken or other troubles of mine smoke (soot) generating facility or mine smoke (soot) treatment facility, or heavy rain or other special reasons.

2) Has the concessionaire emitted the mine smoke (soot) that does not conform to the emission standard of the " Law on Environmental Protection and Natural Resource Management" at an emitting point of mine smoke (soot) generating facility?

3) When the mine smoke (soot) that does not conform to the emission standard is emitted or is likely to be emitted because of an accident, being broken or other troubles of the mine smoke (soot) generating facility or the mine smoke (soot) treatment facility, does the concessionaire take emergency measures for prompt repair from the incident?

4) Does the concessionaire obey the instructions given by the Minister in charge of mines sector to take appropriate measures to prevent mine pollution caused by mine smoke (soot)?

5) Does the technical safety staff for prevention of mine pollution obey the following items to prevent mine pollution problems caused by mine smoke (soot)?

a) To examine the mine smoke (soot) generating facility and mine smoke (soot) treatment facility in every working day, and write down the results of examination in the safety diary.

b) To measure and analyze necessary substances of mine smoke (soot) periodically that emits from the mine smoke (soot) generating facility, and write down the results of measurements and analysis in the managements record.

c) To report to the administrator (safety seniors) immediately when mine pollution caused by dust is likely to occur on the results of examination, measures and analysis.

6) When mine pollution occurs or is highly likely to occur caused by mine smoke (soot), does the concessionaire immediately report the state of incident, list of emergency measures taken, and plans for restoration work and the list of completed work to the Director General in charge of mines sector?

(Items related to Dust)

7) Are following items regulated in the own mine safety rules at the mine?

a) Items concerning management of dust generating facility and dust treatment facility.

b) Items concerning prevention of dust generating and scattering.

c) Items concerning emergency measures when mine pollution problems occur or is likely to occur caused by dust because of causing accident, being broken or other troubles of dust generating facility or dust treatment facility, or heavy rain or other special reasons.

8) If there is a risk of the dust scattering from a mineral ore storage facility, a waste stone dump, a slag dump or a tailings dam, or mining wastes landfill site of 1,000 square meter (m^2) or larger, does the concessionaire conduct one of the following requirements?

a) The facility is established in a structure that is resistant to the dust scattering.

b) Water is sprinkled using sprinkling equipment.

c) The material is covered with a dustproof cover to prevent dust scattering.

d) A chemical solution is sprayed or compressing on the surface layer.

e) Other measures equivalent to or more effective than the above are taken.

9) When a crusher with a rated motor output of seventy-five (75) kW or more (except for wet-type and closed-type), or a mill or screen with a rated motor output of fifteen (15) kW or more (except for wet-type and closed-type) is installed on surface of a mine, does the concessionaire conduct one of the following requirements?

a) The facility is established in a structure that is resistant to the dust scattering.

b) A hood and a dust collector are installed.

c) Water is sprinkled using sprinkling equipment.

d) The facility is covered with a dustproof cover to prevent dust scattering.

e) Other measures equivalent to or more effective than the above are taken.

10) When belt conveyor (0.75 m or more belt width) or bucket conveyor (0.03 cubic meter (m^3) or more in internal volume of the bucket) is installed on surface of a mine, except for wet-type and closed-type, does the concessionaire conduct the following requirements if there is a risk of the dust scattering?

a) The facility is established in a structure that is resistant to the dust scattering.

b) A hood and a dust collector are installed at the loading and unloading parts of the conveyor and a water sprinkling device or a dustproof cover is at other parts with a risk of the dust scattering.

c) Other measures equivalent to or more effective than the above are taken.

d) The facility is covered with a dustproof cover to prevent dust scattering.

11) When a mechanical slaked lime production facility that the dust scattered is installed on surface of limestone mine (including dolomite mine), does the concessionaire conduct one of the following requirements?

a) A dust collector is installed.

b) Water is sprinkled using sprinkling equipment.

c) Other measures equivalent to or more effective than the above are taken.

12) When mine pollution occurs or is highly likely to occur caused by dust because of an accident, being broken or other troubles of the dust generating facility or the dust treatment facility, does the concessionaire take emergency measures for prompt repair from the incident?

13) Does the concessionaire obey the instructions given by the Minister in charge of mines sector to take appropriate measures to prevent mine pollution caused by dust?

14) Does the technical safety staff for prevention of mine pollution obey the following items to prevent mine pollution problems caused by dust?

a) To examine the dust generating facility and dust treatment facility in every working day, and write down the results of examination in the safety diary.

b) To report to the administrator (safety seniors) immediately when mine pollution caused by dust is likely to occur on the results of examination.

15) When mine pollution occurs or is highly likely to occur caused by dust, does the concessionaire immediately report the state of incident, list of emergency measures taken, and plans for restoration work and the list of completed work to the Director General in charge of mines sector?

(2) Conducting a general inspection (prevention of mine pollution) on mine smoke (soot) and dust to mine facilities and working places

In addition to "ChapterⅡ. 2. Conducting mine facilities and working places", inspectors shall confirm following matters whether there are any hindrances or problems for preventing of mine pollution problems caused by mine smoke (soot) and dust to mine facilities and working places in the process of the mineral-related operations; in case matters deemed inadequate in terms of safety, the inspectors shall provide improvement guidance for the safety seniors.

(Items related to Mine Smoke (soot))

1) Are the maintenance state of mine smoke (soot) generating facility and mine smoke

(soot) treatment facility satisfactory?

2) Are cracks, damage, leaks or abnormal sounds confirmed in mine smoke (soot) generating facility, mine smoke treatment facility, chimneys and ducts?

3) Are functions and capacity of mine smoke (soot) treatment facilities adequate?

4) Are the soot, sulfur oxide, nitrogen oxide and other harmful substances that collected from mine smoke (soot) treatment facilities, appropriately treated and disposed of?

5) Are mine pollution problems acknowledged that the sulfur dioxide emitting from the mine contaminated the atmosphere in the area around the mine?

6) Has the fall dust been found prominently in the area around the mine?

7) Has the suspended particulate matter found remarkably in the area around the mine?

(Items related to Dust)

8) Are the maintenance state of dust generating facility and dust treatment facility satisfactory?

9) Has there been occurred dust leakage from dust treatment facilities?

10) Are functions and capacity of sprinkling equipment adequate for prevention of scattered dust ?

11) Are the collected dust from dust treatment facilities, appropriately treated and disposed of?

12) Has the fall dust been found prominently in the area around the mine?

13) Are mine pollution problems acknowledged that the suspended particulate matter emitting from the mine contaminated the atmosphere in the area around the mine?

3. Measurement of fall dust, generated dust and suspended particulate matter

(1) Measuring fall dust and generated dust in the area around the mine

When a remarkable amount of fall dust or generated dust has been confirmed in the area around the mine, the inspectors take measurement of the amounts using the method of the deposit gauge or the dust jar, in case matters deemed inadequate in terms of safety and prevention of mine pollution caused by dust, the inspectors shall provide guidance and supervision in regard to countermeasures against generated dust to the safety seniors.

The measurement performed with the method of deposit gauge is a collection device for fall dust and scattered dust that is composed by a large funnel

(ϕ150mm-600mm) and a tank connecting together with a pipe collects fall dust, scattered dust and rain water that has fallen to the ground.

The structure of the measuring device is very simple and this measuring method does not require an electrical sources or the like in order to perform measurement.

The inspectors set up a deposit gauge measuring device in a location for one month where a remarkable amount of fall dust or scattered dust has been confirmed in the area around the mine. The matter collected inside the tank is classified as being either a soluble component or as being an insoluble component, and then the weight of them are measured after one month. In the last, the amount collected per unit area in a period of one month at the location where the measuring device has been set up shall be calculated (unit: ton/km^2/month).

In Japan, there are no regulations for environmental standards concerning the amount of fall dust and scattered dust in the atmosphere.

Furthermore, the measuring method of the dust jar is as same as the method of deposit gauge.

（A deposit gauge measuring device）

(2) Measuring suspended particulate matter in the area around the mine

Particulate matter that is suspended in the atmosphere is matter having a particle diameter of 10μm or less. This matter remains in the atmosphere for a relatively long period of time because the velocity of sedimentation rate is really small, so it can penetrate deep into the alveoli in the human respiratory system to be deposited there and resulting harmful effects to human health.

Methods of measuring the amount of suspended particulate matter in the area around a mine are by using a high volume air sampler or by using a low volume air

sampler. The suspended particulate matter is collected on the filter of these devices.

Then, after measuring the weight of the matter on the filter that has been taken, and it is analyzed for heavy metals if necessary.

1) Measuring suspended particulate matter with a high volume air sampler

a) Structure of a high volume air sampler and the filter thereof

A high value air sampler is a measuring device for dust composed by a filter holder, a suction pump, and a flow rate meter. The filters that collect suspended particulate matter with the efficiency of at least 99% or more of a particle diameter of 0.3μm are made of quartz fiber or of fluorocarbon resin.

The conditions of the suction pump have a capacity of suction power as 0.7-1.5m^3/min, having a flow equalization function, and it can be operated continuously for a period of 24 hours or longer.

Types of a flow meter are a float type, a heat wave method, and a detection of differential pressure type etc.

b) Collection conditions and measurement values

When setting up a high volume air sampler on the ground, the location shall be selected not to be affected by fluttering suspended particulate matter coming from near the ground. Then, a measuring device has operated consecutive measurement for a period of 24 hours, and then the average value is calculated from the hourly values.

c) Measuring the weight of the filter before collecting the suspended particulate matter

The filters collecting suspended particulate matter are prepared to be set a constant temperature of 20℃ and a relative humidity of 50% in the a desiccator , and then to be accurately weighed up to 0.1mg.

d) Collecting the suspended particulate matter

After setting the filter to the filter holder of a high volume air sampler, a flow meter of the device is adjusted right after starting collection of the particulate matter, and the indicated value of the meter is recorded. Right before the completion of measuring for a continuous period of 24 hours, the indicated value of the meter is checked again and recorded, then the amount of suction in the atmosphere is calculated with the following formula.

$$V_{20} = St \times (Fs + Fe) / 2 \times (273 + 20) / (273 + T) \times P / 101.3$$

V20 : The amount of suction in the atmosphere under conditions of

20℃, 101.3 kPa (m^3)

St : Suction time (min)

Fs : Amount of air flow at the start of measurement (m^3/min)

Fe : Amount of air flow at the end of measurement (m^3/min)

T : Average temperature during measurement (℃)

P : Average air pressure during measurement (Pa)

e) Measuring the weight of the filter after collecting the suspended particulate matter

The filter collected the suspended particulate matter is dried in a desiccator as same conditions as before collection (temperature 20℃, relative humidity 50%), and is accurately measured up to 0.1mg.

f) Calculating the concentration of the suspended particulate matter with the following formula

$$C = (We - Ws) / V_{20}$$

C : Concentration of the suspended particulate matter (mg/m^3)

We : Weight of the filter after collection (mg)

Ws : Weight of the filter before collection (mg)

g) Pretreatment for analysis of heavy metals

In case the heavy metals contained within the collected particulate matter need to analyze, a solution of the particulate matter is created by the acid decomposition in advance if necessary.

High-purity chemical substances for the acid, alkali, and solvents need to be prepared and used at the time of the acid decomposition.

h) Analysis of heavy metals

(The rest is omitted.)

2) Measuring suspended particulate matter with a low volume air sampler

a) Structure of a low volume air sampler and the filter thereof

A low value air sampler is a measuring device for dust (soot) composed by a filter holder, a suction pump, and a flow rate meter. The filters that collect suspended particulate matter with the efficiency of at least 99% or more of a particle diameter of 0.3μm are made of quartz fiber or of fluorocarbon resin.

The conditions of the suction pump have a capacity of suction power as 10

– 30 liter/min, having a flow equalization function, and it can be operated continuously for a period of 24 hours or longer.

b) Collection conditions and measurement values

When setting up a low volume air sampler on the ground, the location shall be selected not to be affected by fluttering suspended particulate matter coming from near the ground. Then, a measuring device has operated consecutive measurement for a period of 24 hours, and then the average value is calculated from the hourly values.

c) Conducting simultaneous parallel measurement using a low volume air sampler (a mass concentration measuring instrument) and a relative concentration measuring instrument, and obtaining mass concentration conversion coefficient (K value)

In simple and easy method, the mass concentration transformation coefficient (K value) subject to measurement is calculated by conducting parallel measurement using a low volume air sampler (a mass concentration measuring instrument) and a relative concentration measuring instrument, and it can be possible to measure the concentration of suspended particulate matter in the area around a mine.

Referring to the documents of [how to obtain the mass concentration transformation coefficient (K value)] of "Manual on measurement and evaluation of dust concentration at mines" as follows.

(Extracted sentences from the "Manual on measurement and evaluation of dust concentration at mines")

1. How to obtain mass concentration conversion coefficient ("K value")

The mass concentration conversion coefficient ("K value") in a unit working place subject to measurement is usually calculated by conducting parallel measurement using mass- and relative- concentration measuring instruments. (a mass concentration measuring instrument means a low volume air sampler.)

The air inlet ports of mass- and relative- concentration measuring instruments are placed in parallel and measurement is performed for (t) minutes, which is equivalent to the total measurement time by the two devices.

The "K value" is calculated by substituting mass concentration Mc

(mg/m^3), parallel measurement concentration Rc (cpm) by relative concentration measuring instrument, and dark count D (cpm) for following formula.

Dark count D (cpm) that is proper numerical value indicated in the test chart of each relative concentration measuring instrument should be checked to use its values.

Mc = W／q × t ÷ 1,000 (mg/m3)

K = Mc／(R_A－D)

Mc : Concentration of suspended particulate matter (mg/m3)

W : Weight of collected suspended particulate matter (mg)

q : Volume of inhaled air (liter/min)

t : Measurement time (min)

R_A : Counts of relative concentration (counts per minute)

D : Dark count

2. Measurement value calculation method of dust concentration

(1) Measurement value calculation method with parallel measurement using mass- and relative- dust concentration measuring instruments

Based on the work environment measurement results by "Measurement A", mass concentration conversion coefficient ("K value"), mass concentration value, geometric mean values M and geometric standard deviation σ are calculated by the following process and methods.

1) How to calculate the mass concentration conversion coefficient

The mass concentration conversion coefficient ("K value") in a unit working place subject to measurement is usually found by conducting parallel measurement result using mass- and relative- concentration measuring instruments and is calculated by the formula shown at Ⅰ - 8 - (5).

2) How to calculate the mass concentration

The mass concentration Mc (mg/m^3) is found to multiply in relative concentration R_A (count per a minute (cpm)) at each measurement point measured using relative concentration measuring instrument by the "K value".

$$Mc_1 = R_{A1} \times K,\ Mc_2 = R_{A2} \times K \cdots\cdots Mc_n = R_{An} \times K\ (mg/m^3)$$

3) How to calculate the geometric mean values

The geometric mean values M (mg/m^3) is calculated by the following formula using the mass concentration $Mc_1, Mc_2 \ldots\ldots\ldots Mc_n$ (mg/m^3) derived from above 2) at each measurement point in the unit working place.

$$\overline{X} = \sqrt[n]{Mc_1 \times Mc_2 \times \cdots \times Mc_n}$$

$$\log \overline{X} = 1/n \left\{ log\ Mc1 + log\ Mc\ 2 + \cdots + logMc\ n \right\}$$

$$\therefore M = 10^{\overline{X}} \ (mg/m^3)$$

(2) Simple and easy method using a relative dust concentration measuring instrument

The relative concentration R_A (cpm) at each measurement point is measured using only relative concentration measuring instrument. If the total measurement time is (t)(total measurement time must be sixty (60) minutes or longer at the unit working place by Measurement A) and the number of measurement points is (n) at the unit working place, the suitable time is determined based on (t/n) and measurement is performed at equal time intervals during the time. (For example, in case of total measurement time t = 60 and measurement points n = 10, calculating t/n = 60/10 = 6, the relative concentration in one minute is measured at intervals of six (6) minutes and recorded at the next measurement point).

The mass concentration Mc (mg/m^3) at each measurement point can be easily calculated to multiply the relative concentration R_A (cpm) at each measurement point by conversion value regarding mass concentration conversion coefficient that is decided depending on type of relative concentration measuring instruments in the following table figures. After calculating the mass concentration at each measurement point, the geometric mean and geometric standard deviation can be calculated by the formula same as above (1), 4) and 5).

Type of a relative concentration measuring instrument	Conversion value
LD – 3K2	1 cpm = 0.001 mg/m^3

4. Emission standards and environmental quality standards concerning mine smoke (soot) and suspended particulate matter

(1) Environmental quality standards concerning suspended particulate matter

The environmental quality standards concerning suspended particulate matter shall be observed both of the following values.

1) The daily average for hourly value during a 24-hour period of continuous measurement	**0.1 mg/m3**
2) hourly value	**0.2 mg/m3**

(2) Emission standards for harmful substances in the smoke (Substances related to mines)

Harmful substances	**Targeted facilities**	**Standard value**
1) Cadmium and its compounds	**a) Roasting furnaces, sintering furnaces, melting furnaces, converters, and dry furnaces used for refining copper, lead, and zinc**	**1.0 mg/m^3N**
2) Lead and its compounds	**a) Roasting furnaces, melting furnaces, converters, and dry furnaces used for refining copper, lead, and zinc**	**10 mg/m^3N**
	b) Sintering furnaces and Blast furnaces used for refining copper, lead, and zinc	**30 mg/m^3N**

(3) Emission standards for sulfur oxide and nitrogen oxide in the smoke

(The rest is omitted.)

5. drafting and reporting of a general inspection (prevention of mine pollution) on mine smoke (soot) and dust

Report of a general inspection (prevention of mine pollution) on mine smoke (soot) (Format)

1. Mine smoke (soot) generating facility and mine smoke (soot) treatment facility

(1) mine smoke (soot) generating facilities

1) The kinds of raw fuel, amount of content of sulfur, nitrogen and ashes, and amount of consumption of fuel (writing down the following items concerning mine smoke (soot) generating facility individually)

Name of mine smoke (soot) generating facility	The kinds of raw fuel used for mine smoke (soot) generating facility					
	Kinds	Amount of content (%)			Amount of consumption of fuel (t/h, m^3N/h)	
		Sulfur	Nitrogen	Ashes		

2) Mine smoke (soot) generating facility

Name of mine smoke (soot) generating facility	
1. Date of installation of the facility	
2. Structure and capacity of the facility	
3. Conditions of emission of mine smoke	
1) Quantity of emission of mine smoke (wet)	(m^3N/h)
2) Quantity of emission of mine smoke (dry)	(m^3N/h)
3) Temperature of emission of mine smoke	(℃)
4) Velocity of emission of mine smoke	(m/sec)
5) Actual height of chimney	(m)

6) Effective height of chimney	**(m)**
7) Concentration of O2 in the emission of mine smoke	**(% of capacity)**

(2) mine smoke (soot) treatment facilities

Name of the facility		
1. Date of installation of the facility		
2. Structure and capacity of the facility		
3. Conditions of treatment of mine smoke	**Before treatment**	**After treatment**
1) Quantity of mine smoke treatment (maximum)	**（m^3N/h）**	**（m^3N/h）**
2) Quantity of mine smoke treatment (continuous operation)	**(m^3N/h）**	**（m^3N/h）**
3) Temperature of emission gas	**（℃）**	**（℃）**
4) Quantity of emission gas of sulfur oxide	**（m^3N/h）**	**（m^3N/h）**
5) Quantity of emission gas of nitrogen oxide	**(cm^3/m^3N)**	**(cm^3/m^3N)**
6) Quantity of generating dust	**(mg/m^3N）**	**(mg/m^3N）**

2. Results of measurement of fall dust

Date of measurement	**Location**	**Measuring data ($t/km^2/M$)**	**Study and consideration**

3. Results of measurement of suspended particulate matter

Date of measurement	**Location**	**Measuring data (mg/m^3)**	**Study and consideration**

4. The mine pollution problems caused by mine smoke (soot) that occurred past time by turns

Occurrence Date of the problems	Location or Areas	Outline of Mine Pollution Problems, and Caused Damages

5. Evaluation on the results of measurement of mine smoke (soot), and inspectors' opinion

6. Attached documents and diagrams

1) The plane diagram that mine smoke (soot) generating facilities, mine smoke (soot) treatment facilities, measurement points of fall dust, measurement points of suspended particulate matter, buildings and residences are written. (writing down the distance between mine smoke generating facilities and measurement points of fall dust, measurement points of suspended particulate matter and residences on the diagram)

2) Documents concerning hearings with the safety seniors of the mine regarding the contents of the complaints and requests from the residents living around the mine against generating mine smoke (soot), and status of how the mine is working to address to those complaints and measures.

3) a Flowchart of mine smoke (soot) treatment

4) Photos concerning measurement points of fall dust, measurement points of suspended particulate matter, and residences.

Report of a general inspection (prevention of mine pollution) on dust (Format)

1. Dust generating facility and dust treatment facility

(1) Dust generating facilities

(writing down the following items concerning dust generating facility and dust treatment facility individually)

Name of facility	Date of installation of the facility	Structure and capacity of the facility	State of management

(2) Dust treatment facilities

Name of the facility	Date of installation of the facility	Structure and capacity of the facility	State of management

2. Results of measurement of fall dust

Date of measurement	Location	Measuring data ($t/km^2/M$)	Study and consideration

3. Results of measurement of suspended particulate matter

Date of measurement	Location	Measuring data (mg/m^3)	Study and consideration

4. The mine pollution problems caused by dust that occurred past time by turns

Occurrence Date of the problems	Location or Areas	Outline of mine pollution problems, and caused damages

5. Evaluation on the results of measurement of fall dust or/and, measurement of suspended particulate matter and inspectors' opinion

6. Attached documents and diagrams

1) The plane diagram that dust generating facilities, dust treatment facilities, measurement points of fall dust, measurement points of suspended particulate matter, buildings and residences are written. (writing down the distance between dust generating facilities and measurement points of fall dust, measurement points of suspended particulate matter and residences on the diagram)

2) Documents concerning hearings with the safety seniors of the mine regarding the contents of the complaints and requests from the residents living around the mine against generating dust, and status of how the mine is working to address to those complaints and measures.

3) a Flowchart of dust treatment

4) Photos concerning measurement points of fall dust, measurement points of suspended particulate matter, and residences.

(Commentary)

1. Definition of mine smoke (soot)

(1) Sulfur oxide produced from the burning of fuel or some other substances

(2) Soot produced from the burning of fuel or some other substance or from the use of electricity as a heat source

(3) Among the substances produced in conjunction with the combustion, synthesis, decomposition, or other treatment of matter, the following substances are those which may cause harm to the human health and living environments.

1) Cadmium and its compounds, as well as lead and its compounds

2) Chlorine and hydrogen chloride

3) Fluorine, hydrogen fluoride, silicon fluoride

4) Nitrogen oxides

2. Targeted structure and capacity of mine smoke (soot) generating facilities

Generating facilities	Structure and capacity of the facility
1) Boilers	The area of heating is 10 m^2 or more, or combustion capacity of burner fuel is 50 L/h or more converted into fuel oil

2) Roasting furnaces, Sintering furnaces, Calcination furnaces used for refining metals	**The throughput of raw materials is 1.0 t/h or more**
3) Blast furnaces used for refining metals	**The throughput of raw materials is 1.0 t/h or more**
4) Melting furnaces used for refining or casting of metals	**The area of grate is 1.0 m^2 or more, or combustion capacity of burner fuel is 50 L/h or more converted into fuel oil**
5) Heating furnaces used for forging or rolling of metals, or for heat treatments of metals or metal products	**The area of grate is 1.0 m^2 or more, or combustion capacity of burner fuel is 50 L/h or more converted into fuel oil**
6) Dry furnaces	**The area of grate is 1.0 m^2 or more, or combustion capacity of burner fuel is 50 L/h or more converted into fuel oil**
7) Wastes incinerators	**The area of grate is 2.0 m^2 or more, or combustion capacity is 200kg/h or more**
8) Roasting furnaces, sintering furnaces, Melting furnaces, Converters, and Dry furnaces used for refining copper, lead, and zinc	**The throughput of raw materials is 0.5 t/h or more, the area of grate is 0.5 m^2 or more, or combustion capacity of burner fuel is 20 L/h or more converted into fuel oil**
9) Gas turbines	**Combustion capacity of fuel is 50 L/h or more converted into fuel oil**

3. Calculation of amount of mine smoke (soot)

1) Prerequisites

a) The sulfur content of the fuel, in case of the fuel being petroleum, is calculated as the entire amount of the fuel being SO_2. In case of the fuel being coal, only accurate values of the rate of absorption of sulfur in the content of ash found by experimentation, shall be used.

b) In calculating the amount of exhaust gas, the rate of leakage from the air preheater into the air shall be according to the designed value in the event that there is a definite designed value. If there isn't a definite designed value, the rate of leakage shall be zero (0).

2) The amount of exhaust gas

a) Theoretical amount of air

$$Ao = 8.89\,(C) + 26.7\,(H) + 3.33\,(S) \quad (m^3N/kg\text{ –fuel})$$

C, H and S : The content of carbon, hydrogen, and sulfur per 1 kg of fuel (kg/kg)

b) Theoretical quantity of combustion gas

$$Qo = 8.89\,(C) + 32.3\,(H) + 3.33\,(S) \quad (m^3N/kg\text{ –fuel})$$

c) Actual quantity of combustion gas

$$Q' = Qo + (\lambda - 1)Ao \quad (m^3N/kg\text{ –fuel})$$

λ : percentage of excess air and percentage of leaked air (%)

d) The amount of exhaust gas

$$Q = Q' \times F \times (273 + 15) / 273 \times 1/3{,}600 \quad (m^3/sec)$$

F : Consumption of fuel (kg/h)

e) Temperature of exhaust gas

$$T = 273 + t \quad (°K)$$

f) Velocity of exhaust gas

$$V = (T/273 \times Q' \times F \times 1/3{,}600) / A \quad (m/sec)$$

A: the size of the corrected outlet of the chimney (m^2)

g) Calculation of revised height of outlet of the chimney

$$He = Ho + 0.65\,(Hm + Ht) \quad (m)$$

$$Hm = 0.75\,\sqrt{(Q \times V)} / (1 + 2.58/V)$$

$$Ht = 2.01 \times 10^{-3} \times Q \times (T - 288) \times (2.301 \log J + 1/J - 1)$$

$$J = 1 / \sqrt{(Q \times V)} \times (1460 - 296 \times V / (T-288) + 1$$

h) Calculation of the allowable amount of emission of sulfur oxides

$$q = K \times 10^{-3} \times He^2 \quad (m^3N/h)$$

q : The allowable amount of emission of sulfur oxides

K : A value determined according to the region

He : Height of the revised outlet of the chimney

i) Calculation of amount of emission of sulfur oxides

$$q' = 0.7 \times S/100 \times F \quad (m^3N/h)$$

j) Calculation of concentration of smoke (soot) at the outlet of the chimney

$$d = D / Q' \quad (g/m^3N)$$

D : Ash content per 1 kg of fuel (g)

Q' : Actual quantity of combustion gas per 1 kg of fuel (m^3N/kg –fuel)

k) Maximum terrestrial concentration of sulfur oxides, and the terrestrial site where the sulfur oxides are found

$$Cmax = 1.72 \times q' / He^2 \quad (ppm)$$

$$Xmax = 20.8 \times He^{1.143} \quad (m)$$

4. Outline of mine smoke (soot) generating facilities

(1) Boilers

Boilers are used for supplying steam, hot water, and the like in smelting processing, such as drying, heating, etc. Types of boilers include water-tube types, once-through types, fire-tube types, and forced-circulation types, and the materials used as fuel in boilers include coal, heavy oil, and gas.

(2) Dry furnaces

Dry furnaces are used for drying etc., of residues created as a result of removing moisture from ores and the like, from wet type smelting processing, from operating equipment used for cleaning waste gas, and other activities. The types of dry furnaces include rotary types, flush types, and vaporization types, and the materials used as fuel in these furnaces include coal, heavy oil, and gas.

(3) Calcination furnaces

Calcination furnaces are used in order to remove carbon dioxide and moisture by burning minerals such as limestone. The materials used as fuel in these furnaces include coal, heavy oil, non-gas combustible wastes (rubber products and waste oil),

etc.

(4) Roasting furnaces

Roasting furnaces are used in order to create metallic compounds and metallic compounds containing oxygen, by heating sulfide ores and the like to an extent at which they do not melt. Different types of roasting furnaces with specific uses include oxidized roasting, sulfurized roasting, and chlorinated roasting, and the types of these furnaces include multi-hearth types, rotary types, flash types, and fluidized bed roasting furnaces. In the case of sulfide ores, exothermic reactions are utilized in order to allow for self combustion (self-sustained combustion); however, in the event that a heat source is necessary, a heat source such as heavy oil or gas is used.

(5) Sintering furnaces

Sintering furnaces, in the event that fine ore is to be processed using a blast furnace and other equipment, are used to heat and harden ore into fine ore.

Because the ore must be hardened into fine ore before it is cast into a blast furnace, coke breeze fuel is mixed in if the ore is an oxide, and the heat combustion of sulfur and iron are utilized if the ore is a sulfide ore. The types of sintering urnaces include pot types, Greenwald types, Dwight Lloyd types, etc.

(6) Blast furnaces

Blast furnaces are a type of furnace necessary for use in the smelting of iron, copper, lead, zinc, nickel, etc. The shapes of the cross sections of blast furnaces include round types, oval types, and rectangular types. For example, in the case of ferrous metal smelting, ores, cokes, fluxes, etc. are sequentially cast into the furnace from the top part, and preheated air is blown with air blowers from the bottom part of the furnace.

(7) Reverberation furnaces

Reverberation furnaces are a wide and shallow hearth and an arch-shaped ceiling. These furnaces have a burner on one side, and they are heated from the burning of heavy oil, gas, etc. These are called “reverberation furnaces” because charges are heated with the radiation of flames and with radiant heat from the roof of the furnace, which has been heated to a high temperature.

(8) Converters

Converters are furnaces used in the refining and smelting of metals, and the two primary types of these furnaces are converters for steelmaking and converters for the smelting of nonferrous metals. The inner parts of both converters for steelmaking and converters for the smelting of nonferrous metals are lined with

firebricks.

(9) Rotary furnaces

Rotary furnaces are furnaces having a structure in which a furnace body having a steel-plate cylinder inner part that is lined with firebricks is supported and rotated with a roller. Rotary furnaces are used for a variety of purposes, mainly for the drying, roasting, slag processing, etc. of ores.

(10) Melting furnaces

Melting furnaces are furnaces used in the refining and casting of metals and the types of these furnaces include cupola furnaces, reverberation furnaces, and electric furnaces.

(11) Heating furnaces

Heating furnaces are used in heat treatments such as the forging, rolling, and tempering of metals, and the types of heating furnaces include reverberation furnaces and electric furnaces.

5. Measurement of monthly changes of the amount of fall dust in Tokyo area in Japan

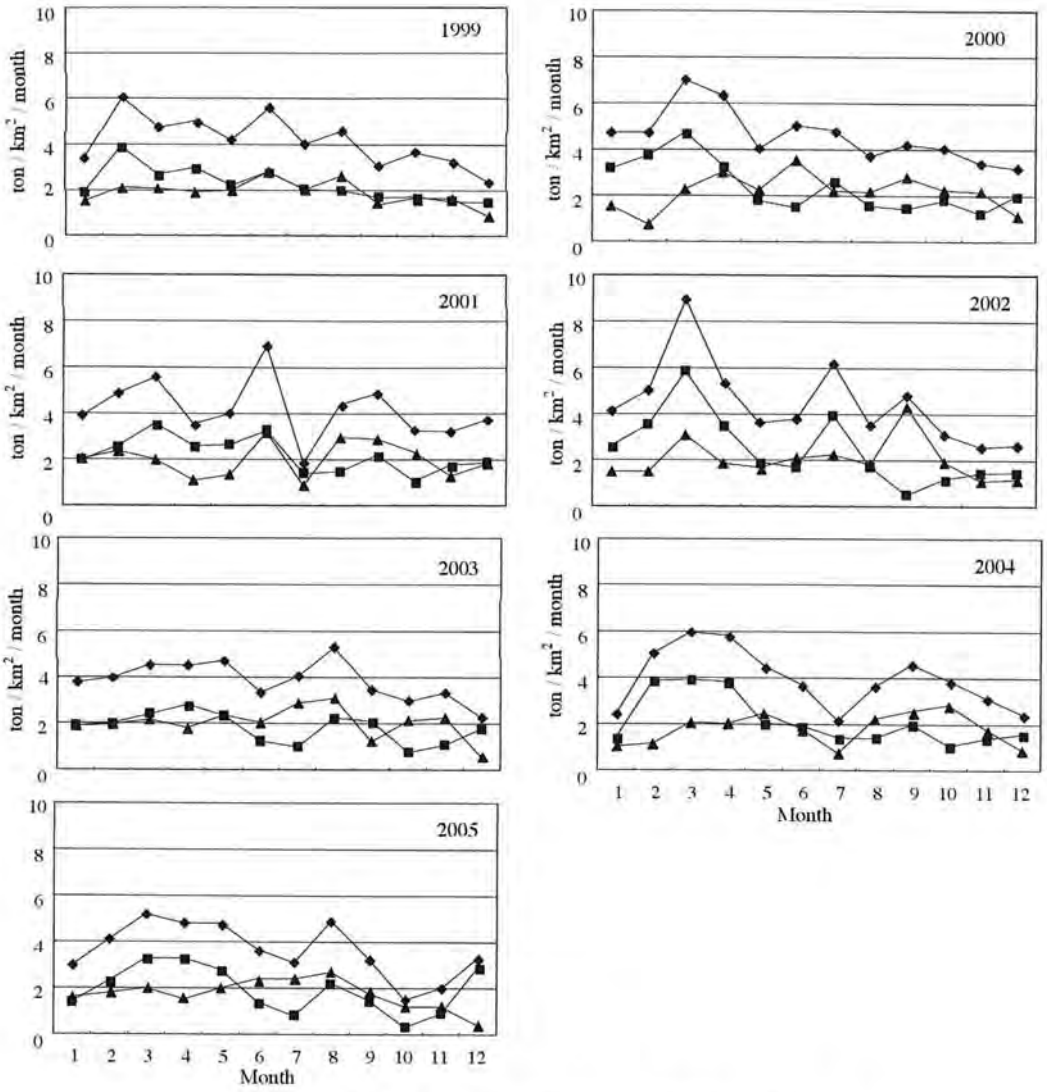


Fig. 1 Monthly Changes of the Amount of Fall Dust in Tokyo Area
◆, Total Amount; ■, Insoluble Fraction; ●, Soluble

Sources: Metropolitan Tokyo in Japan

(attached document No.6)

Chapter Ⅷ： Conducting a General Inspection (Prevention of Mine Pollution) on Mining Wastes, Poisonous & Deleterious Substances, Dioxin-kinds and Land Excavation

October 2016

1. Preparation of a general inspection (prevention of mine pollution) documents and instruments

In conducting a general inspection (prevention of mine pollution) on mining wastes, poisonous & deleterious substances, dioxin-kinds and land excavation, the inspectors shall prepare following instruments in addition to Chapter Ⅰ. 2. (2) "Preparation of a general inspection documents and instruments" as necessary.

1) Instruments for water quality measurement (a portable pH meter, some of Pack-tests)

2) Some of 1000-ml polyethylene bottle

3) Some of Filter

4) a Funnel

5) Chemicals (Nitric acid (HNO_3), Sodium hydroxide (NaOH) etc.,)

6) a Thermometer

2. Conducting a general inspection (prevention of mine pollution) on mining wastes, poisonous & deleterious substances, dioxin-kinds and land excavation

(1) Conducting a general inspection (prevention of mine pollution) on mining wastes, poisonous & deleterious substances, dioxin-kinds and land excavation at a mine office

The inspectors shall hold a hearing with the safety seniors regarding following matters concerning mining wastes, poisonous & deleterious substances, dioxin-kinds and land excavation of the mine, and shall confirm whether there are any hindrances or problems for preventing mine pollution problems processing the mineral-related operations; in case matters deemed inadequate in terms of safety, the inspectors shall provide improvement guidance for the safety seniors.

(Items related to mining wastes)

1) Are following items regulated in the own mine safety rules at the mine?

a) Items concerning storage and transportation of mining wastes

b) Items concerning disposal of mining wastes

c) Items concerning measurement and analysis on harmful substances in the mining wastes contained

d) Items concerning measurement and analysis on the water quality of ground water nearby mining wastes landfill site

e) Management of the incinerator such as the intermediate treatment facility for mining wastes

f) Management of a mining wastes landfill site

2) Does the concessionaire dump mining wastes illegally generated by mineral-related operations at the mine?

3) Does the concessionaire take necessary measures, such as management of storage, preventing mining wastes from scattering, out flowing or infiltrating into underground?

4) Does the concessionaire transport mining wastes at the mine by a wrong method against the regulatory disposal standard of the wastes?

5) Does the concessionaire dispose mining wastes by burying not to meet the technical standard against the regulatory disposal standard of the wastes?

6) Does the concessionaire dispose harmful mining wastes by burying in goaf (old mineral working fields) or unused tunnels (galleries) as underground landfill site?

7) Does the concessionaire entrusts a third party with transport or disposal of mining wastes illegally against the regulatory disposal standard?

8) Does the concessionaire obey the instructions given by the Minister in charge of mines sector to take appropriate measures to prevent mine pollution caused by mining wastes?

9) Does the technical safety staff for prevention of mine pollution obey the following items to prevent mine pollution problems caused by mining wastes?

a) To examine the incinerator such as the intermediate treatment facility for mining wastes in every working day, and write down the results of examination in safety diary.

b) To examine the mining wastes landfill site on the surface in every working day, and write down the results of examination in the safety diary.

c) To measure and analyze the water quality of underground water nearby mining wastes landfill site on the surface periodically, and write down the results of measurements and analysis in the managements record.

d) To examine water level in the mining wastes landfill site in the underground, water flow into other tunnels (galleries) and other conditions in every working

day, and write down the results of examination in safety diary.

e) To measure and analyze the water quality of spilled water out the landfill site once a month or more periodically, and write down the results of measurements and analysis in the managements record.

f) To report to the administrators (safety seniors) immediately when mine pollution caused by mining wastes is likely to occur on the results of examination of the intermediate treatment facilities and mining wastes landfill sites, measurements and analysis of water quality.

10) Does the concessionaire record all kinds of the generation amount, transport and method of disposal regarding the harmful mining wastes every a month in the "disposal record of the harmful mining wastes"?

11) When mine pollution occurs or is highly likely to occur by mining wastes, does the concessionaire immediately report the state of incident, list of emergency measures taken, and plans for restoration work and the list of completed work to the Director General in charge of mines sector?

(Items related to poisonous & deleterious substances)

12) Are following items regulated in the own mine safety rules at the mine?

a) Items concerning storage and management of poisonous & deleterious substances

b) Items concerning measures at the time of incident by poisonous & deleterious substances

13) If a poisonous or deleterious substance has been scattered, or has been leaked, flowed out, leached out or has infiltrated into the ground causing mine pollution, or if there is a risk of pollution problems, does the concessionaire at the mine take emergency measures for prompt restores from the incident?

14) Does the technical safety staff for prevention of mine pollution obey the following items to prevent mine pollution problems caused by poisonous & deleterious substances?

a) To examine poisonous & deleterious depots, mining facilities where poisonous or deleterious substances are used and treatment facilities for wastewater including poisonous or deleterious substances in every day, and write down the results of examination in the safety diary.

b) To report to the administrator (safety seniors) immediately when mine pollution caused by poisonous or deleterious substance is likely to occur based on the results of the examination.

15) Does the concessionaire obey the instructions given by the Minister in charge of mines sector for cleaning poisonous or deleterious substances, eliminating the toxic quality of such substances, or taking other measures necessary to prevent mine pollution when the Minister specially deems it necessary?

(Items related to the dioxin-kinds)

16) Does the concessionaire emit or discharge the dioxin-kinds that do not conform to the emission standard or effluent standard at an emitting exit of dioxin-kinds incinerator or the discharging exit of the water treatment facility?

17) Does the concessionaire take emergency measures for prompt repair from the incident when the dioxin-kinds that do not conform to the emission standard or effluent standard are emitted or discharged or are likely to be emitted or to be discharged, because of an accident, being broken, electric power cutting off or other troubles of the dioxin-kinds incinerator or the water treatment facility?

18) Does the concessionaire obey the instructions given by the Minister in charge of mines sector to take appropriate measures such as restriction of emitting the gas emission including dioxin-kinds or discharging the drainage including of dioxin-kinds to prevent mine pollution caused by dioxin-kinds, if necessary?

19) Does the technical safety staff for prevention of mine pollution obey the following items to prevent mine pollution problems caused by dioxin-kinds?

a) To examine the dioxin-kinds incinerator in every working day, and write down the results of examination in the safety diary.

b) To report to the administrator (safety seniors) immediately when mine pollution caused by dioxin-kinds is likely to occur based on the results of examination of the incinerator.

(Items related to land excavation)

20) Does the concessionaires of underground mining take appropriate measures concerning the methods of mining, filling and drainage to prevent mine pollution caused by land excavation when there is a risk of the surface subsidence due to mineral-related operations at mines?

21) Does the concessionaire obey the instructions given by the Minister in charge of mines sector to indicate the method, area and frequency of measurement of the surface subsidence to prevent mine pollution caused by land excavation when the Minister specially deems it necessary?

22) When the concessionaire of underground mining abolishes mineral-related

operations, does the concessionaire take necessary measures, such as filling unused tunnels (galleries) with soil or sealing with concrete, and filling the goaf (old mineral working fields) with soil to prevent mine pollution problems after its closure?

23) When the concessionaire of open-pit mining abolishes mineral-related operations, does the concessionaire take necessary measures, such as soil covering and vegetation on old surface mineral working fields to prevent mine pollution problems after its closure?

(2) Conducting a general inspection (prevention of mine pollution) on mining wastes, poisonous & deleterious substances, dioxin-kinds and land excavation to mine facilities and working places

In addition to "Chapter Ⅱ. 2. Conducting mine facilities and working places", inspectors shall confirm following matters whether there are any hindrances or problems for preventing of mine pollution problems caused by mining wastes, poisonous & deleterious substances, dioxin-kinds and land excavation in the mine facilities and working places in the process of the mineral-related operations; in case matters deemed inadequate in terms of safety, the inspectors shall provide improvement guidance for the safety seniors.

(Items related to mining wastes)

1) Is the maintenance state of the incinerator such as the intermediate treatment facility for mining wastes satisfactory at the mine?

2) Is the transportation of mining wastes conducted to meet the regulatory disposal standard of the wastes?

3) Do the landfill sites for mining wastes at the mine conform to the technological standards?

4) Are harmful mining wastes disposed in an appropriate methods?

5) The inspectors shall conduct collecting samples for a water quality survey of the groundwater nearby the landfill site which mining wastes are disposed by burying if necessary, and shall measure the pH level, water temperature, and state of murkiness and a foul odor in accordance with the "3. Conducting collecting water samples for water quality survey of mine water and wastewater" of "Chapter Ⅳ: Conducting a general inspection (prevention of mine pollution) on mine water and wastewater".

6) The inspectors shall conduct collecting samples for a water quality survey of the

wastewater inside the landfill site and spilled water that are discharged and flowed into public river, lake or reservoir if necessary, and shall measure the pH level, water temperature, and state of murkiness and a foul odor in accordance with the "3. Conducting collecting water samples for water quality survey of mine water and wastewater" of "Chapter Ⅳ: Conducting a general inspection (prevention of mine pollution) on mine water and wastewater".

(Items related to poisonous & deleterious)

7) Is the maintenance state of poisonous and deleterious depots, mining facilities where poisonous and deleterious substances are used, and treatment facilities for wastewater containing poisonous or deleterious substances satisfactory?

8) Are instruments and stock of chemicals for cleaning of poisonous or deleterious substance, and elimination of the toxic quality of such substances prepared enough for in case of incident or troubles?

9) The inspectors shall conduct collecting samples for a water quality survey of wastewater contained poisonous and deleterious substances in the treatment facilities that is discharged and flowed into public river, lake or reservoir if necessary, and shall measure the pH level, water temperature, and state of murkiness and a foul odor in accordance with the "water quality survey of mine water and wastewater" and "water quality survey of the river, lake or reservoir" of Chapter Ⅳ: Conducting a general inspection (prevention of mine pollution) on mine water and wastewater.

(Items related to dioxin-kinds)

10) Is the maintenance state of the dioxin-kinds incinerator satisfactory?

11) Is the soot and incinerated ash produced by the dioxin-kinds incinerator disposed appropriately?

12) The inspectors shall conduct collecting samples for a water quality survey of wastewater contained dioxin-kinds in the treatment facilities that is discharged and flowed into public river, lake or reservoir if necessary, and shall measure the pH level, water temperature, and state of murkiness and a foul odor in accordance with the "3. Conducting collecting water samples for water quality survey of mine water and wastewater" of "Chapter Ⅳ: Conducting a general inspection (prevention of mine pollution) on mine water and wastewater".

(Items related to land excavation)

13) Are appropriate measures concerning the methods of mining, filling and drainage taken when there is a risk of the surface subsidence due to mineral-related operations at underground mine?

14) Are necessary measures, such as filling unused tunnels (galleries) with soil or sealing with concrete, and filling the goaf (old mineral working fields) with soil taken at underground mine?

15) Are necessary measures, such as soil covering and vegetation taken on old surface mineral working fields at open-pit mine?

3. drafting and reporting of a general inspection (prevention of mine pollution) on mining wastes

Report of a general inspection (prevention of mine pollution) on mining wastes (Format)

1. Intermediate treatment facilities on mining wastes

Name of the facility	Date of notification	Type, structure and capacity of the main machinery	Status of management

2. Actual results of disposal of mining wastes

Date	Name of disposal	Kinds of mining wastes	Amount of disposal of mining wastes (m^3/M)	

3. Landfill site of mining wastes (surface or underground)

(1) The name of the landfill site:

(2) Date of notification of the landfill site:

(3) Beginning date of the landfill site:

(4) Kinds of mining wastes:

(5) Structure of landfill site:

(6) Countermeasures against scattering, outflow, seepage of mining wastes:

(7) The amount of landfill per month (m^3/M), the effective storage capacity, and the gross volume of storage capacity (plan):

(8) The maximum height from the base ground to the top of landfill (m):

(9) Whether or not there is groundwater contamination nearby the landfill site of mining waste:

(10) Whether or not there is wastewater, and spilled water from the landfill site:

(11) The special items:

4. The results of a water quality survey of the groundwater nearby the landfill site, wastewater inside the landfill site, spilled water from the landfill site, public river, lake or reservoir

1) Date of collecting water samples **2) Weather condition in the survey**

3) The results of water quality analysis as follows.

No.	Location of Sampling	Quantity of water (m3/min)	Water temperature (℃)	pH	Color, muddy	Copper Cu (ppm)	Lead Pb (ppm)	Zinc Zn (ppm)

5. The mine pollution problems caused by mining wastes that occurred past time by turns

Occurrence date of the problems	Location	Outline of mine pollution problems, and damage

6. Evaluation and problems of the inspection concerning mining wastes, and inspectors' opinion

7. Attached documents and diagrams

1) The plane diagram that the places of intermediate treatment facilities on mining wastes, landfill site of mining wastes, buildings, residences and farm lands are written. (writing down the distance between the facilities, landfill site and residences, and farm lands on the diagram)

2) The plane diagram that the spots collecting samples for a water quality survey of the groundwater nearby the landfill site, wastewater inside the landfill site, spilled water from the landfill site, public river, lake or reservoir are written.

3) A flowchart of treatment of mining wastes

4) Documents concerning hearings with the safety seniors of the mine regarding the contents of the complaints and requests from the residents living around the mine about intermediate treatment facilities on mining wastes or landfill site of mining wastes, and status of how the mine is working to address to those complaints and measures.

5) Photos concerning intermediate treatment facilities on mining wastes and landfill site of mining wastes, residences and farm lands.

4. drafting and reporting of a general inspection (prevention of mine pollution) on poisonous & deleterious substances

Report of a general inspection (prevention of mine pollution) on poisonous & deleterious substances (Format)

1. Poisonous & deleterious depots

Name of the depot	Date of installation of the depot	Type, structure and capacity of the depot, amount of storage	Status of management

2. Actual results of use of poisonous & deleterious substances

Date	Name of the facility	Kinds of poisonous & deleterious substances	Actual results of use of poisonous & deleterious	

			substances	

3. The results of a water quality survey of wastewater of treatment facilities on poisonous & deleterious substances, public river, lake or reservoir

1) Date of collecting water samples **2) Weather condition in the survey**

3) The results of water quality analysis as follows.

No.	**Location of Sampling**	**Quantity of water (m3/min)**	**Water temperature (℃)**	**pH**	**Color, muddy**	**Copper Cu (ppm)**	**Lead Pb (ppm)**	**Cyanide CN^- (ppm)**

4. The mine pollution problems caused by poisonous & deleterious substances that occurred past time by turns

Occurrence date of the problems	**Location**	**Outline of mine pollution problems, and damage**

5. Evaluation and problems of the inspection concerning poisonous & deleterious substances, and inspectors' opinion

6. Attached documents and diagrams

1) The plane diagram that the place of poisonous & deleterious depots, mining facilities

where poisonous and deleterious substances are used, and treatment facilities for wastewater contained poisonous or deleterious substances, buildings, residences and farm lands are written.

2) The plane diagram that that the spots of collecting samples for a water quality survey of wastewater of treatment facilities, public river, lake or reservoir are written.

3) Documents concerning hearings with the safety seniors of the mine regarding the contents of the complaints and requests from the residents living around the mine about treatment facilities of poisonous and deleterious substances, and status of how the mine is working to address to those complaints and measures.

4) Photos concerning treatment facilities of poisonous and deleterious substances, residences and farm lands.

5. drafting and reporting of a general inspection (prevention of mine pollution) on dioxin-kinds

Report of a general inspection (prevention of mine pollution) on dioxin-kinds (Format)

1. Treatment facilities on dioxin-kinds (individually)

Name of the facility	Date of installation	Type, structure and capacity of the main machinery	Status of management

2. Actual results of use of dioxin-kinds

Date	Name of the facility	Produced the Soot and incinerated ash per month (kg/M)	Disposed location of the soot and incinerated ash produced by the dioxin-kinds incinerator	

3. The results of a water quality survey of wastewater of treatment facilities on dioxin-kinds, and public river, lake or reservoir

1) Date of collecting water samples **2) Weather condition in the survey**

3) The results of water quality analysis as follows.

No.	Location of Sampling	Quantity of water (m3/min)	Water temperature (℃)	pH	Color, muddy	Copper Cu (ppm)	Lead Pb (ppm)	Cadmium Cd (ppm)

4. The mine pollution problems caused by dioxin-kinds that occurred past time by turns

Occurrence date of the problems	Location	Outline of mine pollution problems, and damage

5. Evaluation and problems of the inspection concerning dioxin-kinds, and inspectors' opinion

6. Attached documents and diagrams

1) The plane diagram that the place of dioxin-kinds incinerator, treatment facilities where the soot and incinerated ash produced by the dioxin-kinds incinerator are disposed, buildings, residences and farm lands are written.

2) The plane diagram that the spots collecting samples for a water quality survey of wastewater discharged in the treatment facilities contained dioxin-kinds, public river, lake or reservoir are written.

3) A flowchart of treatment of dioxin-kinds

4) Documents concerning hearings with the safety seniors of the mine regarding the contents of the complaints and requests from the residents living around the mine against treatment facilities of dioxin-kinds, and status of how the mine is working to address to those complaints and measures.

5) Photos concerning treatment facilities of dioxin-kinds, residences and farm lands.

6. drafting and reporting of a general inspection (prevention of mine pollution) on land excavation

Report of a general inspection (prevention of mine pollution) on land excavation (Format)

1. Countermeasure of surface subsidence due to underground mining in mineral-related operations

Items	Contents of countermeasure of surface subsidence	Date of introduction	Study and consideration
1) Methods of mining			
2) Filling and sealing method to the goaf (old mineral working fields)			
3) Drainage system			

2. The status of filling and sealing to unused tunnels (galleries) and the goaf (old mineral working fields)

Items	Number of filling and sealing	Study and consideration
1) Unused tunnels (galleries)	1) Number of filling, Total number of filling 2) Number of sealing, Total number of sealing	
2) Goaf (old mineral working fields)	1) Number of filling	

3. The status of restoration to old surface mineral working fields

Name of old surface mineral working field	Contents of soil Covering (implementation and plan)	Contents of vegetation (implementation and plan)	Study and Consideration

4. The mine pollution problems caused by land excavation that occurred past time by turns

Occurrence date of the problems	Location	Outline of mine pollution problems, and damage

5. Evaluation and problems of the inspection concerning land excavation, and inspectors' opinion

6. Attached documents and diagrams

1) The plane diagram that the area of surface subsidence occurred, old surface mineral working fields at open-pit mining, buildings, residents and farmlands are written.

2) Documents concerning hearings with the safety seniors of the mine regarding the contents of the complaints and requests from the residents living around the mine about surface subsidence, and status of how the mine is working to address to those complaints and measures.

3) Photos concerning the area of surface subsidence occurred, old surface mineral

working fields at open-pit mining, buildings, residents and farmlands around the mine.

Designing a policy for an annual inspection plan on the mines under the authorities of MME/GDMR

July 4, 2016

Ⅰ. Factors on classification of mines for a general inspection

1. Number of mineworkers at the mine

Number of mineworkers	Assessed points
（1） More than 50	20
（2） More than 10 to less than 50	10
（3） Less than 10	5

2. The perception on mine safety among senior managers and mineworkers at the mine

The extent of perception on mine safety	Assessed points
（1） High level	5
（2） Ordinary	10
（3） Low level or quite bad	20

3. The occurrence of mine disaster at the mine (within past 5 years)

The extent of mine disaster	Assessed points
（1） The occurrence of fatalities, and mine disasters also occur frequently	20
（2） The occurrence of slight injuries	10
（3） Non-casualty	5

4. Mine buildings, structures and facilities that there are risks of mine pollution at the mine

Mine buildings, structures and facilities that there are risks of mine pollution	Assessed points
（1） Applicable mine buildings, structures and facilities	20
（2） Non-applicable mine buildings, structures and facilities	0

※ Mine buildings, structures and facilities such as a mine wastes dump, a slag dump and a tailings dam prescribed in Article 9 of Mine safety Law, Article 13 of its Regulation, and in Article 21 of the Law, Article 49 of its Regulation that there are risks of mine pollution.

5. Occurrence of mine pollution at the mine (within past 5 years)

The extent of mine pollution	Assessed points
（1）The extent of some damages to third party, or unsolved problems have remained by mine pollution.	30
（2）There are risks of mine pollution problems, but not occurred.	20
（3）Practically nothing	5

Ⅱ. Decision of frequency for a general inspection at the mines

1. Frequency for a general inspection (prevention of mine disaster)

Frequency	Sum of assessed points
（1） Two(2) times a year	45 ～ 60
（2） One(1) time a year	25 ～ 40
（3） One(1) time 2 years	15 ～ 20

※ Sum of assessed points are calculated by addition to above 1. Number of mineworkers, 2. The perception on mine safety and 3. The occurrence of mine disaster.

2. Frequency for a general inspection (prevention of mine pollution)

Frequency	Sum of assessed points
（1） Two(2) times a year	70 ～ 90
（2） One(1) time a year	45 ～ 65
（3） One(1) time 2 years	15 ～ 40

※ Sum of assessed points are calculated by addition to above 1. Number of mineworkers, 2. The perception on mine safety, 4. Mine buildings, structures and facilities that there are risks of mine pollution and 5. Occurrence of mine pollution.

Ⅲ. Necessary items for the implementation of general inspections

1. Calculating a rough estimate and securing budgets for general inspections

(Ex. expenses for traveling and accommodations for staff, purchases on inspection equipment, expenses for analysis and so on)

2. Discussion and decision about general inspection system

(Number of staff, collaboration with regional staff and so on for each general inspection)

3. Designing a policy for an annual inspection plan

Consideration about the Establishment of Supervised Governmental Structures involved in the Enforcement of Mine Safety Law and its Regulations

February 2017

1. Process on Consideration and Collaboration Work about the Establishment of Supervised Governmental Structures involved in the Enforcement of Mine Safety Law and its Regulations

(1) Confirmation of the current administrative duties in GDMR, and required workload and staffs involved in the enforcement of Mine Safety Law and its regulations

1) WT members confirmed the current administrative duties and engaged staffs in the present five (5) Departments of GDMR, and reported contents of them to JICA short-term experts (STEs).

2) STEs gave the technical guidance to WT members about duties, frequency of the work, required workload and required staffs involved in the enforcement of Mine Safety Law and its regulations in GDMR as the supervised governmental organization based on prepared document, and took Q& A through lectures.

3) STEs considered and collaborated work with WT members about reviewing the document above concerning duties, frequency of the work, required workload, and required staffs of future GDMR, and divided the duties into following four (4) categories, and revised the document.

a) The duties that are under the control of suitable internal Department of GDMR

b) The duties that are under the joint control or work sharing in plural internal Departments of GDMR

c) The duties that are under the joint control or work sharing in the plural internal Departments of GDMR and provincial DMEs

d) The duties that are under the control of a newly-established Department (or Section) of GDMR

(Seeing the attached table No.1 "The process of confirmation of required duties and the establishment of supervised governmental structures involved in the enforcement of Mine Safety Law and its regulations")

2. Proposal on the Establishment of Supervised Governmental Structures involved in the Enforcement of Mine Safety Law and its Regulations

(1) Reviewing the supervised governmental organization of GDMR involved in the enforcement of Mine Safety Law and its regulations

1) Necessity of a newly-established Department (or Section) based on the results of

categorizing the duties.

STEs considered and collaborated work with WT members about categorizing the duties involved in the enforcement of Mine Safety Law and its regulations into suitable three (3) Departments of GDMR : Department of Mining (D.M.), Department of Construction Material Resources (D.C.) and Department of Mineral Exploration Management (D.M.E.), and following duties aren't suitable any internal Departments of GDMR, and it needs a newly-established Department (or Section) to manage and handle the duties.

(The acceptance of a report about an occurrence of a mine disaster or mine pollution problems, and a screening of the document in regard to a mine disaster or mine pollution problem)

a) The duties toward the acceptance of contents of a major mine disaster that the concessionaire reports to GDMR.

b) The duties toward a screening of the documents on the "detail report of the mine disaster or accident and taken measures" that concessionaire reports to GDMR.

c) The duties toward a screening of the report in regard to the state of incident, list of emergency measures taken, and plans for restoration work and list of completed work that the concessionaire submits to GDMR when mine pollution problem occurs or highly likely to occur.

(The proper duties of mine safety inspectors)

d) The duties toward the power of a mine safety inspector to inspect safety-related duties, facilities, records, documentation and other safety-related matters, as well as question the people concerned at a mine and quarry as a general inspection (prevention of mine disaster and of mine pollution problems).

e) The duties toward an inspection of the facts that a mineworker reports to the provincial Director of mines sector or a mine safety inspector in case there is a violation of the Mine Safety Law, or there is a risk of such damage occurring at the mine and quarry.

f) The duties toward the power of a mine safety inspector to carry out the authority of the Director General of GDMR in case the mineral-related operations violate Mine Safety Law, or there is an imminent safety risk at the mine and quarry.

g) The duties toward the power of a mine safety inspector to carry out the authority of the Minister in charge of mines sector in case there is an imminent safety risk due to excavation outside the concessionaire's mining area.

h) The duties toward the power of a mine safety inspector to carry out the authority of the Minister in charge of mines sector in case there is a need for urgent rescue

of a disaster victim.

(Establishment of a mine safety training section and management of mine safety training system)

i) The duties toward preparing training curriculums and implementation of mine safety training for nominated mine safety inspectors and technical mine safety personnel at mines and quarries in the mine safety training section of GDMR/MME.

Considering for the matters of its jurisdiction of a newly-established Department (or section) of GDMR, the duties above are divided into two (2) categories of the "inspection" and "training", and lumping the duties of inspection and training together is better than separating each other because they are also closely related to securing mine safety and environment preservation, for an example, "Department of Inspection and Training for Mine Safety (tentative)" can be a feasible organization for management and treatment of the duties effectively and efficiently.

2) Precondition for calculating on quantities of workload (person-day) per a year and number of required staffs involved in the enforcement of Mine Safety Law and its regulations in GDMR

a) Numbers of 20 mines, 300 quarries, and 70 exploration mining areas near future in Cambodia are adopted as the basis of calculation that WT members offered.

b) STEs and WT members considered and decided that mine safety inspectors would conduct general inspections at 20 times/ a year for mines, 200 times/ a year for quarries and 35 times/ a year for exploration mining areas based on the "annual inspection plan" and would conduct special inspections at 4 times/ a year caused by mine disasters or mine pollution problems.

c) STEs and WT members considered and decided that mine safety trainings on the object of nominated mine safety inspectors and technical safety personnel would be held 4 times/a year and three (3) persons in charge of the training would support for 10 days/a time in the mine safety training section of GDMR.

d) Quantities of workload (person-day) per a year are calculated as follows.

(Quantities of workload (person-day) per a year)

= (Required workload (person-day) for managements per an item of duties) x (Number of items per a year)

e) Number of required staffs are calculated as follows.

(Number of required staffs)

= (Quantities of workload (person-day) per a year) ÷ (Number of annual working days (20days x12 months))

3) Calculation on quantities of workload (person-day) per a year and number of required staffs (including mine safety inspectors) involved in the enforcement of Mine Safety Law and its regulations in GDMR

The total quantities of workload per a year are 5,861.4 person-day as entire GDMR, and large quantities of workload are listed up in the following table.

High rank of the duties and quantities of workload

The outline of the duties	Frequency of the work	Quantities of workload (person-day/a year)
a) Duties toward a general inspection or a special inspection by mine safety inspectors	Once several months in case a general inspection	2,072
b) Duties toward a screening of the document on the " monthly safety report" that the concessionaire submits	Once a month	2,040
c) Duties toward a screening of the document on the copies of "mine safety diagram" that the concessionaire submits	Once a year	640
d) Duties toward implementation of mine safety training in the mine safety training section	Once several months	120

The total number of required staffs (including mine safety inspectors) are 25 persons in the results of calculation.

And, it is considered that a minimum number of ten (10) mine safety inspectors are necessarily arranged in the newly-established Department (or Section) of GDMR.

a) Department of Mining (D.M.)

635.6 person-day ÷ (20 days x12 months) = 2.6 ≒ 3 persons in addition

b) Department of Construction Material Resources (D.C.)

2,752.6 person-day ÷ (20 days x12 months) = 11.4 ≒ 12 persons in addition

c) Department Mineral Exploration Management (D.M.E.)

72.8 person-day ÷ (20 days x12 months) = 0

d) The newly-established Department (or Section)

2,400.4 person-day ÷ (20 days x12 months) = 10 persons in addition

Number of required staffs (including mine safety inspectors) involved in the enforcement of the Law and its regulations in GDMR

	Enrollments	Number of required staffs	Total
1. Department of Mining	23	3	26
2. Department of Construction Material Resources	31	12	43
3. Department of Department of Mineral Exploration Management	20	0	20
4. A newly-established Department (or Section)	-	10	10
Total	74	25	99

(2) Establishment of a mine safety training system taken the lead by GDMR

1) A mine safety training system targeted on nominated mine safety inspectors

The supervision and guidance on mine safety and environment preservation to mines and quarries conducted by the supervised governmental organization of GDMR alone are considered to be physically and functionally difficult because number of the mineral-related operations are expected to develop and expand depending on the economic situation in Cambodia in the future.

Therefore, specific measures concerning supervision and guidance to mines and quarries conducted not only GDMR but also provincial DMEs (PDMEs) as a premise for designation of mine safety inspectors in the office of PDMEs or by coordinating with PDMEs are considered to be the best optimum policy.

When considering supervised governmental structures on mine safety in Cambodia in the near future, the training system targeted on nominated mine safety inspectors that provides well knowledge of mine safety, security and environmental management and OJT on a general inspection and a special inspection is an urgent task, and the well-planned management of the training for increasing the number of mine safety inspectors is important subjects in GDMR.

After first training for nominated mine safety inspectors with making good use of

training program, for an example, who will be the core of the inspectors and take the role of leaders and guide their subordinates. To achieve this objective, it is important and easy method to constitute a mine safety training system taken the lead by GDMR.

When establishing a mine safety training system targeted on nominated mine safety inspectors, the experienced mine safety inspectors serve as instructors along the line of the needs of the system, and the mine safety inspection manuals which have already been transferred to WT members in the JICA project can be utilized as the teaching materials.

A general inspection on mineral working fields and mine facilities at mines and quarries conducted by experienced mine safety inspectors that also makes a better use of a practical training for the trainees.

2) A mine safety training system targeted on nominated safety engineers at mines and quarries taken the lead by GDMR

The working environment conditions at mines and quarries are worse and the disaster occurrence rate is higher than other industries in common.

It needs to establish a mine safety training system targeted on nominated safety engineers that provides well knowledge of mine safety and skills of techniques in order to eliminate the risks of mine disasters, and to maintain safety, security and environmental preservation at mines and quarries.

In Japan, with the central government taking the lead, the following mine safety training system had been conducted successfully under the old Mine Safety Law.

This system will be useful when investigating the establishment of a mine safety training system targeted on nominated safety engineers in Cambodia, as a reference.

a) Establishing training facilities named "Mine Safety Center" where various training courses, such as risk prediction trainings, relief trainings, safety practices and editing of training textbooks were held by instructors.

b) Holding study classes for mining-related Laws and regulations

c) Conducting OJT by experts at mines

(3) Promotion of enlightening campaigns for mine safety taken the lead by GDMR

Most concessionaires and mineworkers at mines and quarries were lack of understanding on "Safety" and "Environment preservation" because a lot of dangerous and unsafe acts were found around the mineral working fields and mine

facilities during conducting OJTs with WT members in the Project.

In order to improve these issues, promotion of enlightening campaigns for mine safety taken the lead by GDMR is a top priority to uplift mine safety awareness of the concessionaires and mineworkers.

In Japan, the central government, local agencies, and non-governmental organizations have engaged continuously in enlightening campaigns for mine safety.

The following enlightening campaigns for mine safety have been conducted as annual events for a long-term.

Those events will be useful when investigating the enlightening campaigns for mine safety in Cambodia, as a reference.

a) Application of risk management system to mine safety, and widespread use of the system at mines

b) Editing educational textbooks and videos about mine safety and mine pollution control, etc.

c) Holding a national mine safety week
(collecting of slogans about mine safety, safety research contests, and mining site tours, etc.)

d) Official awards for mine safety

(4) Practical use of information and statistic data concerning mine disasters and mine pollution problems taken the lead by GDMR

When a mine disaster or mine pollution problem occurs in Japan, the Department of Industrial Safety and Inspection (DISI) dispatches mine safety inspectors to the mine for investigation the causes of the disaster or mine pollution problem.

The DISI provides information and statistic data about the causes, countermeasures and kinds of the disaster or mine pollution problem to mines and related organizations nationwide after the investigation conducted by mine safety inspectors.

The owners of mining right (concessionaires) and safety committees at mines that get the information and statistics data concerning a mine disaster or mine pollution problem investigate at similar places in the mineral-related operations based on the information.

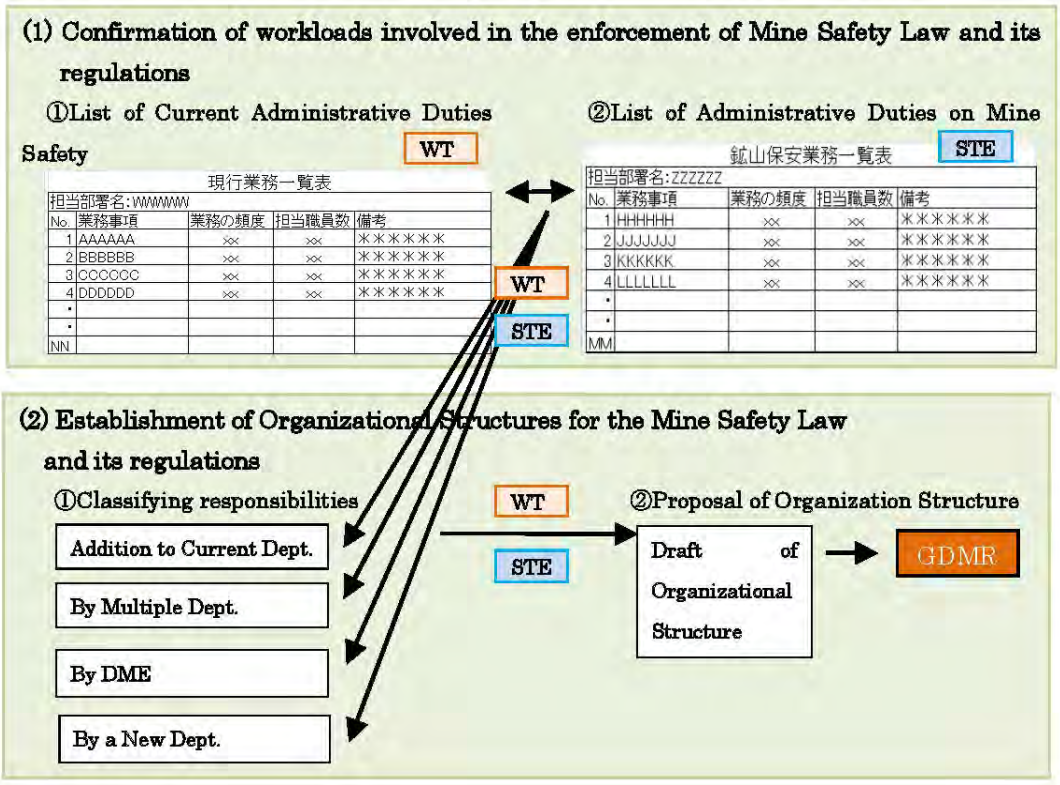
Implementing safety measures when similar places are discovered is useful in eliminating risks of the disasters or pollution problems.

The practical use of information and statistic data concerning the investigation of a mine disaster or mine pollution problem conducted by mine safety inspectors to

mines and quarries nationwide is the essential key to eliminate risks of similar disasters or pollution problems taken the lead by GDMR after the enforcement of Mine Safety Law and its regulations.

The attached table No.1

"The process of confirmation of required duties and the establishment of supervised governmental structures involved in the enforcement of Mine Safety Law and its regulations"



Management and Sharing of Safety Information about the Inspection Results such as Inspection Reports of Mines in GDMR and Provincial DMEs

February 2017

1. Necessity inspection results about management and sharing of mine safety information in the supervised governmental organization of GDMR and provincial DMEs are as follows.

(1) General inspection report concerning prevention of mine disaster

(2) General inspection report concerning prevention of mine pollution

1) Synthetic report concerning prevention of mine pollution

2) Report on a waste stone dump, a slag dump or a tailings dam

3) Report on mine water or wastewater

4) Report on noise

5) Report on vibration

6) Report on mine smoke (soot) or dust

7) Report on mining wastes, dioxin-kinds or land excavation

(3) Special inspection report concerning mine disaster

(4) Special inspection report concerning mine pollution problems

(5) Inspection report based on a mineworker's report

(6) Inspection report on the closed mine or suspended mine

(7) The "Monthly Safety Report" that is submitted by the concessionaire every month.

(8) The "Detail Report of Mine Disaster or Accident and Taken Measures" that is reported by the concessionaire.

2. Specific management and sharing method of mine safety information (proposal)

Short term experts (hereinafter referred to as "STEs") for mine safety team once discussed with STEs for database team about management and sharing method of mine safety information, compiling various reports into a database and keeping them in the server, taking necessary information and making best use of them efficiently and effectively between GDMR and provincial DMEs, and STEs reached following conclusions together.

(1) Procedures of the database compilation about mine safety information

Reports such as a general inspection report and/or a special inspection report made by "Word" and/or "Excel", convert into PDF, and hand it to a database manager of GDMR. And then database manager input them to the server.

As statistic documents for mine safety such as the "Monthly Safety Report" need

update, it is necessary to input them by digital data such as "Excel" with a specified format, and then database manager input them to the database every month.

Following table shows an example on summarize of information in the "Monthly Safety Report" at a mine.

Monthly Report

Name of mine
Kinds of minerals
⋮

Number of mine workers

	Ave.	End of M.
Surface		
Underground		

Production record
⋮

Safety record
Number of disasters

Roof collapse	Wall collapse	Rock fall	Fall down		Total

Number of injured mine worker

Fatal	Serious	Slight	Minor	Total

(2) Management and sharing method about mine safety information on database

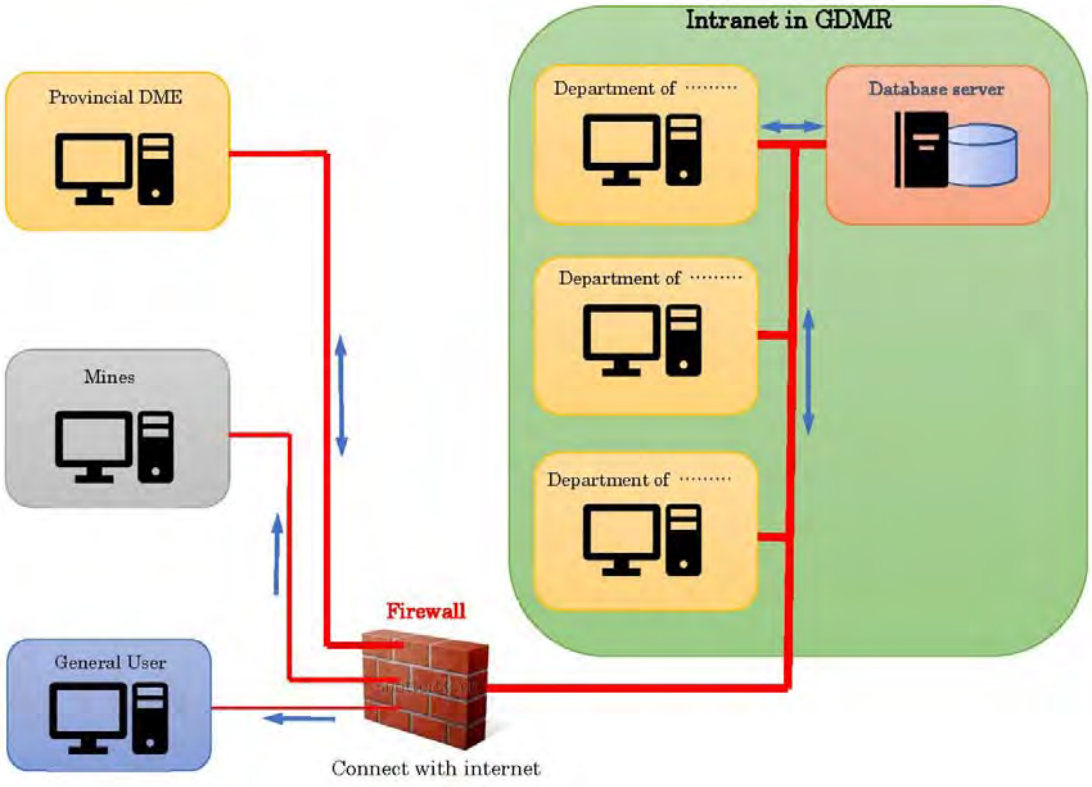
When staffs of MME/GDMR share mine safety information, it is necessary to build information management system.

Mine Safety Information has been managed in the folder of "Inspection" in the "GDMR Database" that was structured by the database team through the JICA Project.

Mine safety information of each mine is saved to a server installed in GDMR by the database manager, and shared through LAN in MME/GDMR.

From provincial DMEs, it is necessary to connect the server in GDMR by intranet connection through the optical line for shear the information.

In this case, it is necessary to prevent the invasion in the server of the outsider by the password that the database manager or manager of server in GDMR published for security measures on managing the mine safety information.


Intranet in GDMR
Provincial DME
Department of .....
Database server
Department of .....
Mines
Department of .....
Firewall
General User
Connect with internet

Special Inspection Report

using Mine Safety Inspection Manuals at Open-pit Mines

November 1, 2016

The concerned mine safety inspectors submit the special inspection report as follows regarding mine disaster that was occurred at Lim Heng Quarry on 16/10/2016, and execute the inspection during the period from 18/10/2016 to 20/10/2016 based on the provision of Article 3, Paragraph 1 of the Mine Safety Inspection Rule.

1. Name of mine: Lim Heng Quarry

2. Kinds of minerals, licensed number of the mining area: Lime stone, mining area 6ha

3. Address of the Quarry: Obrasat, Mongkonbori, Banteay Meanchery Province

4. Name of the concessionaires of the Quarry: Mr. Lim Heng

5. Name of supervisor of the Quarry: Mr. Lim Seng

6. The occurrence date of mine disaster: October 16, 2016 (around 13:20)

7. Kinds of mine disaster: Rock collapse

8. The occurrence site of mine disaster: Mineral working field

9. Fatalities /casualties (name, age, kind of occupation, victim degree)

1) Mr. Thon Rotha 37 Mine machine driver (excavator), fatality

2) Mr. Lem Kim Long 26 Mine machine driver (excavator), fatality

3) Mr. Hem Long 52 Mineworker, fatality

10. The general condition of operation in the Quarry:

Lim Heng Quarry is the open-pit mining which has operated in 2002 (license renewed 2 times) to produce quarries approximately 1,800 t/day using four of excavators, two of drilling machine, seven of dump truck(10t car), slurry explosives and ANFO explosives, and have employed 33 number of mineworkers (27 men, 6 women).

11. The occurrence situation of mine disaster:

The content that Mr. Lim Seng who is the supervisor of the Quarry explained the occurrence situation of mine disaster is as follows.

The supervisor of the Quarry posted two mineworkers who developed the bench that doubles as a mine road and a digging face (hereinafter referred as "the Second bench") for digging the lower part from middle section of the mineral working field as an excavator driver and a guide of the machine, and posted a mineworker who

loaded rocks onto a dump truck as an excavator driver at the lower part of the working field on October 16.

At about 13:20, sudden rock collapse occurred in a top part of the mineral working field and two mineworkers who operated an excavator and guided the machine in the Second bench were engulfed in disintegration products and suffered.

In addition, rock collapse occurred continually in the middle section of the mineral working field and a mineworker who operated an excavator to load rocks onto a dump truck at the lower part of the working field was engulfed in disintegration products and suffered.

According to the explanation of the supervisor of the Quarry, a heavy rain had continued around the Quarry for seven days before mine disaster outbreak, digging work had stopped while raining, and digging work reopened from 16th.

12. The situation of mine disaster after its occurrence

The JICA experts, GDMR/ WT members and DME staff executed OJT on special inspection in the mineral working field of Lim Heng Quarry, as follows.

1) The situation of the whole of mineral working field and the lower part of the working field

As for mineral working field of open-pit mining, digging development is carried out for west direction, and the big slide on the slope of the south side is recognized that appeared after an upper rock sliding or collapsing along a slant of the joints.

The mine road for the upper part is installed in the north side edge of the working field.

According to the explanation of the supervisor of the Quarry, rock collapse seemed to occur in the neighborhood of central top of the working field, and it is recognized that bedrocks in the neighborhood of the top part of the working field seemed to be scraped off and a large amount of the rock piled up that collapsed towards a trace.

The Second bench is developed for north and south direction in the middle section of the working field, and it is recognized that the nearby Second bench which rock collapse seemed to be occurred is in a condition to have been buried because of collapsed rock.

As for getting the height of the top of the working field, an angle of inclination was measured using a clinometer at the side of an electric light pole for the power in the lower part of the working field, and as a result of calculation was

almost 60m. (Seeing the attached photoNo.1)

In the lower part of the mineral working field, one excavator overturns at the 46m spot of the south direction that starts from the foundation of an electric light pole for the power, and the excavator is in a condition that the driver's box was smashed and one of caterpillar came off. (Seeing attached photo No.2)

According to the explanation of the supervisor of the Quarry, this excavator is operated to develop a mine road and a digging face in the Second bench.

A large quantity of rocks which collapsed pile up on the right side of the excavator towards the mineral working field and are in a condition to have piled up until the middle of the working field slope in the state that weeds and mud attached in a part of disintegration products.

In addition, one excavator is confirmed at the 25m spot of the northeast 30 degrees direction that starts from the foundation of an electric light pole for the power, and the excavator is in a condition that the driver's box was smashed and one of caterpillar came off. (Seeing attached photo No.3)

According to the explanation of the supervisor of the Quarry, this excavator is operated to load rocks onto a dump track in the lower part of the mineral working field.

In the open space of the north side where collapsed rocks piled up, three dump trucks stop all with loaded rocks.

In addition, a crusher is installed in the other side, and one dump truck stops at this side of the slit to the crusher.

2) The situation of the First bench and the Second bench

The mine road is developed in the north side edge of the mineral working field, and the bench (hereinafter referred as "the First bench") diverges at the halfway from the road, and it is with a terminal in the place where approximately 30m extended by a measurement with the eye from the turning point.

As for getting the direction and dip of the joints of the mineral working field, the direction and dip of the joints are measured using a clinometer at the slope of the First bench in the neighbor hood of turning point because the outskirts that rock collapse occurred were dangerous, the direction is the North 10 degrees West, the dip is 45 – 48 degrees East.

The Second bench is developed in the place where the mine road rises around 20m in height by the divergence of the road and the First bench.

Width of the Second bench is approximately 15-20m by a measurement with the eye because upper part slope is danger of rock collapse.

One drilling machine is confirmed in the middle of the Second bench, and the tip of the bench becomes dead-end by collapsed rocks.

As for vertical slope of the Second bench, a lot of board-formed joints develop and there are many cracks entered the right angle for a direction of the joints in the deposit of limestone between the Second bench and top part of the mineral working field. (Seeing attached photo No.4)

3) The situation of the top part of the mineral working field

A mine road is not developed in the upper part from the divergence of the road and the Second bench, it needs to rise on foot along a peak to top part of the mineral working field.

According to the explanation of the supervisor of the Quarry, the top part of the working field where rock collapse seemed to be occurred is in neighborhood of boundary line of mining area with the adjacent mine (quarry).

The top part of working field that the supervisor indicated is overgrown with weeds, the situation of the bedrock and the presence of the crack outbreak have not be confirmed the details because it does not close to the slope side for danger of re-collapse.

13. The causes of mine disaster

The causes of the mine disaster (rock collapse) are estimated as follows.

1) The mineral working field of Lim Heng Quarry is composed mainly deposit of limestone, and the board-formed joints (as for the direction the North 10 degrees West, the dip 45-48 degrees East) develop a lot into the deposit of limestone, and there being many cracks entered the right angle for a direction of the joints between the Second bench and top part of the working field.

2) It is thought that digging in the lowest part of the mineral working field operated at the start, then the bench doubles as a mine road and a digging face that develops one after another continuously in the slope middle section of the working field. However, the slope of digging face is easy to slide or collapse because the slope of the digging face runs side by side with the direction and dip of board-formed joints. (Seeing attached drawing No.2)

3) According to the explanation of the supervisor of the Quarry, a heavy rain had continued around the Quarry for seven days before mine disaster outbreak, digging work had stopped while raining.

4) It is estimated from the above-mentioned situation that rainwater penetrates in the joints and cracks of the deposit of limestone between the Second bench and top part of the mineral working field by 7-day heavy rain before occurrence of mine disaster (rock collapse), and is in a condition to be easy to perform slide of bedrock of the deposit.

Rock collapse (the first) seems to be occurred under the influence of vibration by the operating or digging work of an excavator arranged in the Second bench of the mineral working field.

In addition, by the shock of rock collapse that the bedrock of the interval from the top part to the Second bench caused rock collapse (the second) of a slope in the lower part of the working field from the Second bench.

(seeing the attached photo No. 5)

14. The countermeasures against mine disaster (rock collapse)

1) In the case of the Quarry concerned, it is thought that it will be a plan to operate

digging in the lowest part of the mineral working field, then bench doubles as a mine road and a digging face that develops one after another continuously in the slope middle section of the working field.

2) As for vertical slope of the Second bench, a lot of board-formed joints develop and the slope of digging face is easy to slide or collapse because the slope of the face runs side by side with the direction and dip of board-formed joints, so operation by the current digging method is in danger of the rock collapse again.

3) Therefore, it thinks that digging from top part towards the lower part of the mineral working field sequentially is only safety digging method when it is going to resume operation of the working field of the Quarry which board-formed joints develop a lot into the deposit of limestone.
For a safety digging method, blowing up bedrock with a loose blasting in the lower part slope side of digging face and digging the blasting point using an excavator from the safe position afterward.

4) It is necessary to extend a mine road to top part of the mineral working field early in the case of the Quarry concerned.

5) However, the digging process from top part towards the lower part of the mineral working field performs a threat of the rock collapse in the upper slope of the digging face being easy to slide or collapse as described in above 2) and it needs to think about its solution.
When considering the countermeasures against rock collapse, a choice of "a cooperative digging" is the most desirable plan about boundary part of mining area with an adjacent mine (quarry) because the digging method of "the cooperative digging" does not build permanent walls in both mines (quarries) in the future.
Seeing the attached "reference items" on the practical method of "the cooperative digging"

6) Geological survey must be implemented and a reasonable mining plan need to be designed before starting the operation of mineral working in open-pit mines (quarries) for prevention of mine disaster in general.

15. Participants of OJT on Special Inspection

GDMR
Mr. Hong Bona
Mr. Ty Pisethcheat
Mr. Lay Zanith
Mr. Kong Sitha
Mr. Im Sim
Mr. Sou Phirak
Mr. Yin Ratanak

DME
Mr. Mak Sopheaktra

JICA
Mr. Akira Shichinohe
Mr. Sakae Kashima
Mr. Atsushi Aoki

Interpreter
Mr. Kry Meng Ang

≪Reference items≫

The practical method of "the cooperative digging"

1. It is prohibited to dig the part of 30m from the boundary line of mining area in the case of, for an example, A mine (quarry) and B mine (quarry) each other according to the administrative advice concerning a mining in Kingdom of Cambodia, and permanent walls are built in both mines (quarries) in the future.
(Seeing the attached drawing)

2. The Japanese mining administration admits "the cooperative digging" to the owners of mining right (concessionaires) of A mine (quarry) and B mine (quarry) if it is necessary and reasonable reasons with the result that the boundary part of mining area should be dug and the permanent walls in both mines (quarries) will not be built in the future.

3. As a premise to admit "the cooperative digging", the following matters become requirement.

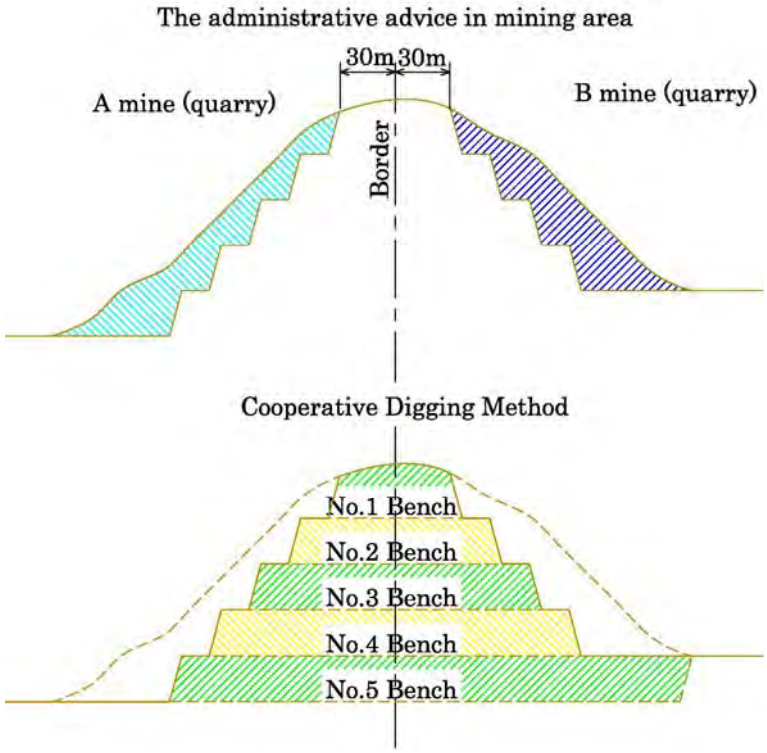
1) To grasp about a correct reserve each other after A mine (quarry) and B mine (quarry) carried out surveying around the part of 30m from the boundary line of mining area.

2) To be almost same level on top part of mineral working field both A mine (quarry) and B mine (quarry) in the boundary part of mining area.

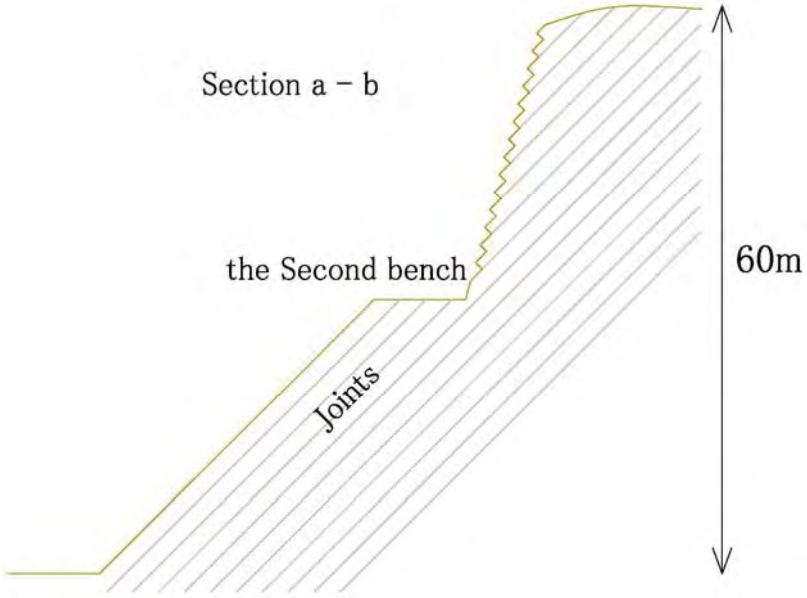
3) To agree on the contract of "the cooperative digging" about the practical digging method, the distribution of mineral products and so forth concerning digging in the boundary part of mining area between the concessionaires of A mine (quarry) and B mine (quarry).

4) To give a permission by the Minister in charge of mining sector for concessionaires of A mine (quarry) and B mine (quarry) to dig the boundary part of mining area after screening the contents of the contract of "the cooperative digging" and there is no obstacle.

4. The owners of mining right (concessionaires) of A mine (quarry) and B mine (quarry) should implement digging in the boundary part of mining area and distribute mineral products by the distribution ratio based on the contract of "the cooperative digging".
(Seeing the attached drawing No.1concerning practical digging method in the boundary part of mining area)



Drawing No. 1



Drawing No. 2

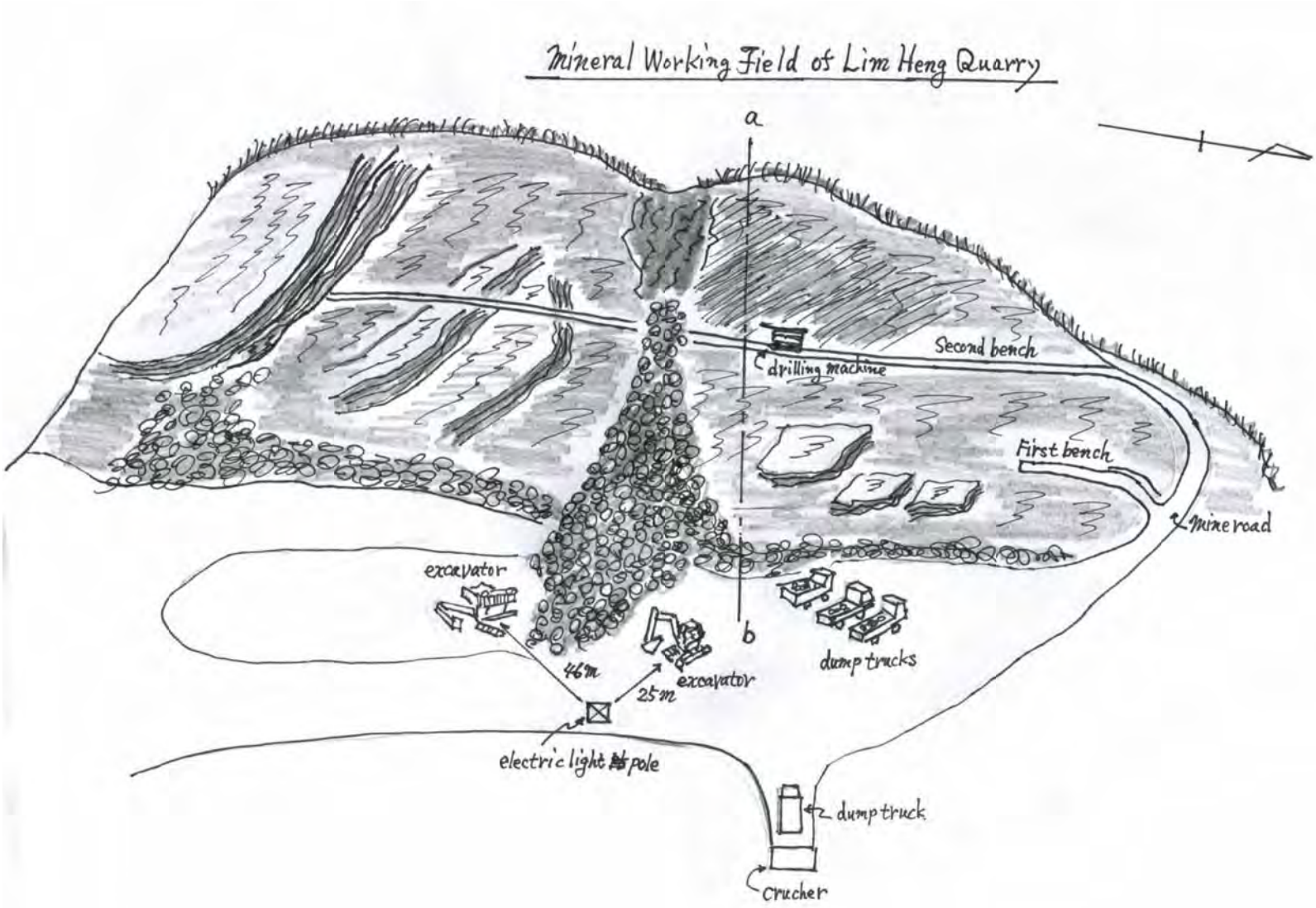
Photo No. 1

Photo No. 2

Photo No. 3

Photo No. 4

Photo No. 5


Mineral Working Field of Lim Heng Quarry
a
b
Second bench
drilling machine
First bench
mine road
excavator
46m
25m
excavator
dump trucks
electric light pole
dump truck
crucher

Promotion of Enlightening Campaigns for Mine Safety

November 2016

1. Purpose of enlightening campaigns for mine safety

The purposes of enlightening campaigns for mine safety should be not only promoting voluntary safety, heightening awareness of security but also contributing to the prevention of mine disasters/accidents and mine pollution problems at mines in Kingdom of Cambodia.

2. Concrete contents of enlightening campaigns for mine safety

The promotion of enlightening campaigns for mine safety shall be conducted as follows in Japan.

(1) Making guide books on mine safety, and providing books for the good sake of mine safety training

(2) Creating videos about mine safety, and making better use of education materials

(3) Holding some workshops or seminars concerning mine safety

(4) Mine safety educational activities using home page

(5) Making posters or brochures on enlightening campaigns for mine safety

(6) Holding a commendation ceremony for excellent safety mines by the authorities

(7) Continuous development of enlightening campaigns for mine safety by setting up "National mine safety week"

3. Safety promotion activities at mines in Japan

3-1 Implementing safety promotion activities introduced a model case of ABE mine

(1) Details of activities

1) Yearly safety plans

The safety supervisor shall provide instruction to the secretary-general of the safety committee (the director of the Environmental Safety Department) for the establishment of important safety measures for the year in question and shall implement the safety measures upon drafting a yearly safety plan for the definite promotion of the established safety measures.

2) On-going safety activities

In addition to the important safety measures established in the yearly safety plan, ABE mine shall tackle the following safety promotion activities as on-going safety activities.

a) Activities for promoting the reduction of risk factors

b) Activities for promoting the improvement of the reliability of facilities

c) Daily safety promotion activities

d) Activities for promoting safe operation

(2) Implementation systems

1) For the safety promotion activities, everyone, the organization of ABE mine shall be united, with the safety supervisor at the top, and this organization shall tackle these activities.

2) After the office of the safety committee (the Environmental Safety Department) has established the yearly safety plan and safety promotion activities in cooperation with the relevant departments and has received the approval of the safety supervisor, the yearly safety plan and safety promotion activities are to be implemented after discussion and deliberation in regards to the safety committee has been performed.

3) Each department at ABE mine shall incorporate the details of the yearly safety plan and safety promotion activities into their "yearly production/safety plan" and implements it.

3-2 Items regarding the recording of safety promotion activities

In regards to the implementation status of the "yearly safety plan" and of the "yearly production/safety plan" of each department, the office of the safety committee (the Environmental Safety Department) shall record and keep the results of periodic hearings conducted by the safety supervisor and other relevant parties. Furthermore, those records are to be reflected in the safety plan of the following year.

3-3 Implementing system, measures and evaluation methods for securing safety

(1) Implementing system for securing safety

1) Execution of the survey on mine safety conditions

The members of survey on mine safety conditions stipulated in Mine Safety Law and its regulations shall be nominated by the safety supervisor of the mine, and form teams of the survey.

The survey teams on mine safety conditions shall find out and evaluate risk factors concerning following items at the mine, and take appropriate measures that need improving as the effect of the survey, and then shall report the results to the safety supervisor and safety committee.

a) When mineral-related operations start at the mine after getting permission by the Minister in charge of mines sector

b) When mineral-related operations suspend for more than one month, and the operations renew

c) When mineral-related operations have significant modification

d) When the right of mineral-related operations at the mine is renounced, or the operations are abolished.

2) Execution of the survey on prediction of risk factors using "risk management system"

Each department of the mine forms the teams of the survey on prediction of risk factors, and teams must execute the survey using risk assessment methods at mineral working fields and mine facilities as follows every month, and then consider investigation and evaluation of risk factors, and countermeasures of them.

The results of the survey on prediction of risk factors shall be reported to the safety supervisor and safety committee.

a) The conditions of mineral working field and its neighboring

b) The conditions of surrounding at the mine

c) Harmful items that cause mine disaster/accident or mine pollution problem

3) Execution of safety patrols

a) During safety week and health week that shall be designated by "yearly safety plan", the safety supervisor, technical safety manager and deputy technical safety managers shall patrol and examine the mineral working fields and mine facilities of the mine for securing safety.

b) In addition excepting for the safety week and health week, the deputy technical safety managers shall patrol and examine the mineral working fields and mine facilities, and acquire the actual conditions of the work sites of mineworkers and make effort improving problems.

3-4 Confirmation of the implementation statuses of mine safety activities

(1) Confirmation method concerning statuses of mine safety activities

In order to check the implementation status of mine safety activities at the mine, members of the inspecting team nominated by the safety supervisor shall be formed in order to conduct internal inspection regarding mine safety activities.

Furthermore, the office of internal inspection team is in the Environmental Safety Department.

(2) Confirmation period concerning statuses of mine safety activities

The periods of internal inspection regarding mine safety activities shall be twice a year, in April and October as the periodic inspection, and extra inspection shall be implemented by the instruction of the safety supervisor.

(3) Confirmation details of the internal inspection

For the specific details of the internal inspection regarding mine safety activities, the office staff of the internal inspection shall make a plan before the execution of the inspection, and the plan shall be approved by the safety supervisor and safety committee.

(4) Confirmation report regarding mine safety activities

For the report on the results of the internal inspection regarding mine safety activities, the office staff shall summarize the information as the "report on internal inspection regarding mine safety activities" after implementing the internal inspection, and then shall submit the report to the safety committee after explanation details of the report to the safety supervisor.

3-5 Evaluation of the implementation statuses of mine safety activities

(1) The results of the survey on mine safety conditions shall be deliberated in the safety committee.

However, when, as a result of deliberation, the measures to be taken require additional measures to be added, the department in charge shall reconsider the measures to be taken, then the safety committee shall deliberate on those measures again.

3-6 Recording the confirmation and evaluation results

(1) Records of mine safety activities must be kept for a period of ten (10) years.

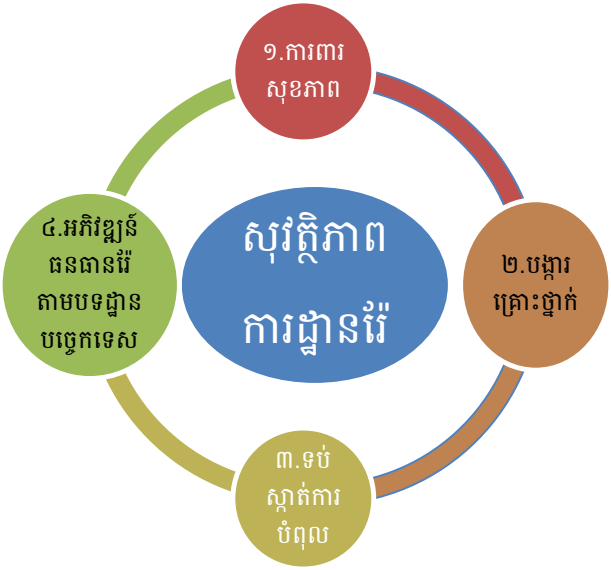
(2) The proceedings deliberated by the safety committee must be kept for a period of three (3) years.

សៀវភៅណែនាំ
សុវត្ថិភាពការដ្ឋានរ៉ែ

February 2017

ការដ្ឋានរ៉ែមានសុវត្ថិភាព

គឺការពារជីវិតរបស់លោកអ្នក



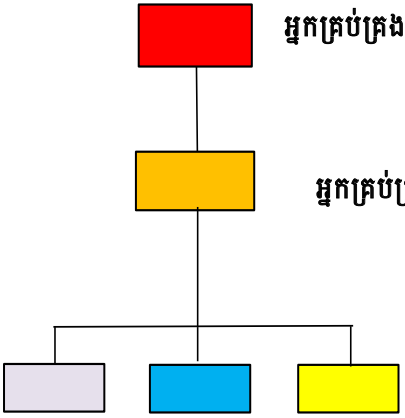
❖ កាតព្វកិច្ចអ្នកគ្រប់គ្រងសុវត្ថិភាពការដ្ឋានរ៉ែ

1. **ការពារសុខភាព**
2. **ទប់ស្កាត់គ្រោះថ្នាក់**
3. **ទប់ស្កាត់ការបំពុលបរិស្ថាន**
4. **អភិវឌ្ឍន៍ធនធានរ៉ែ តាមបទដ្ឋានបច្ចេកទេស**

រចនាសម្ព័ន្ធសុវត្ថិភាពសម្រាប់អនុវត្តនៅការដ្ឋានរ៉ែ

ម្ចាស់អាជីវកម្ម នៅការដ្ឋានរ៉ែ ដើម្បីរក្សាបានសុវត្ថិភាព ចាំបាច់ត្រូវចាត់តាំងជ្រើសរើស អ្នកគ្រប់គ្រងសុវត្ថិភាពរួម និងបើអាចធ្វើទៅបានលើសនេះទៀត ត្រូវជ្រើសរើស អ្នកគ្រប់គ្រងបច្ចេកទេសសុវត្ថិភាព និងអ្នកគ្រប់គ្រងការងារ ថែមទៀត។

រចនាសម្ព័ន្ធគ្រប់គ្រងសុវត្ថិភាពនៅការដ្ឋានរ៉ែ



អ្នកគ្រប់គ្រងសុវត្ថិភាពរួម

អ្នកគ្រប់គ្រងបច្ចេកទេសសុវត្ថិភាព

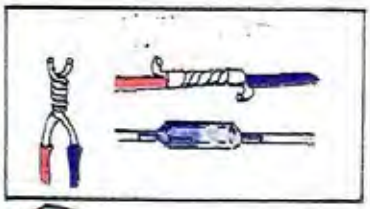
បុគ្គលិកបច្ចេកទេសសុវត្ថិភាព

(អ្នកទទួលបន្ទុកបំផ្ទុះនិងសុវត្ថិភាពក្រៅរូង
អ្នកទទួលបន្ទុកផ្នែកអគ្គិសនី
អ្នកទទួលបន្ទុកផ្នែកគ្រឿងចក្រ ។ល។)

ការងារទាំងនេះត្រូវមានសញ្ញប័ត្រនិងការអប់រំ ជាមុនសិន

ក្នុងករណីអនុវត្តការងារទាំងនេះ គឺត្រូវការរៀនសូត្រដើម្បីប្រលងយកសញ្ញាប័ត្រនិងទទួលការបណ្តុះបណ្តាលផ្នែកសុវត្ថិភាព។

អ្នកជួសជុល



មានសញ្ញប័ត្រថ្នាក់ជាតិ

ការងារបើកបរFork lift

ការងារផ្សារ

បច្ចេកទេសបើកបរ Excavator និង Bulldozer

ការបើកបររថយន្តដឹកវ៉ៃប្រភេទធុនធ្ងន់ (Dump truck)

ការងារជំនាញផ្នែកបំផ្ទុះថ្ម

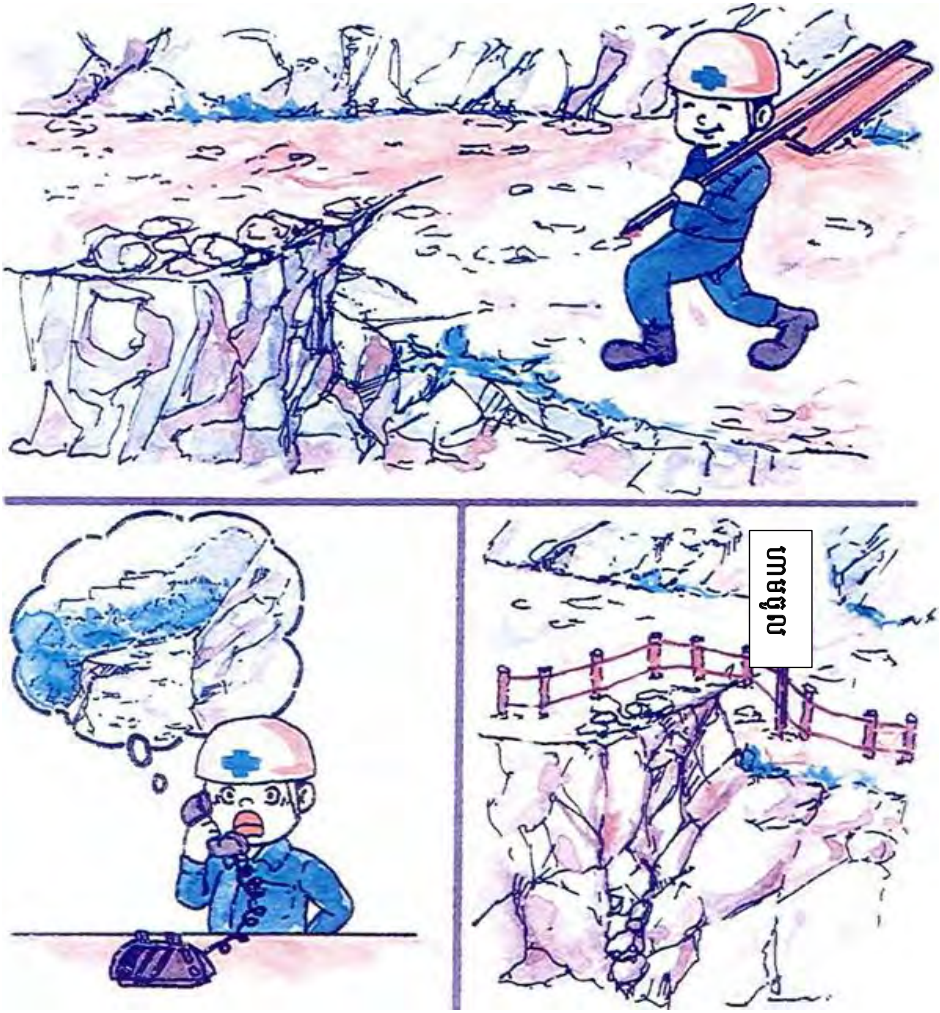
ចំពោះបន្ទប់សំរាកឬការិយាល័យរបស់ការដ្ឋានវ៉ែ ត្រូវសរសេរបិតបង្ហាញពី 「បទបញ្ជាឬសេចក្តីប្រកាសផ្សេងៗដែលកម្មកររ៉ែត្រូវគោរព」 ។

ការអប់រំចំពោះកម្មករធ្វើការនៅទីកន្លែងមានធូលីហុយ

ចាំបាច់ត្រូវមានការបណ្តុះបណ្តាលពីសុវត្ថិភាពទាក់ទងនឹងធូលីហុយដល់កម្មកររ៉ែនៅទីកន្លែងធ្វើការងារមានធូលីហុយខ្លាំង។

I. កន្លែងជីកយកថ្មរ៉ែនៅការដ្ឋានរ៉ែបើក

1. អ្នកគ្រប់គ្រងត្រូវដើរល្បាតមើលសុវត្ថិភាពនៅការដ្ឋានរ៉ែ

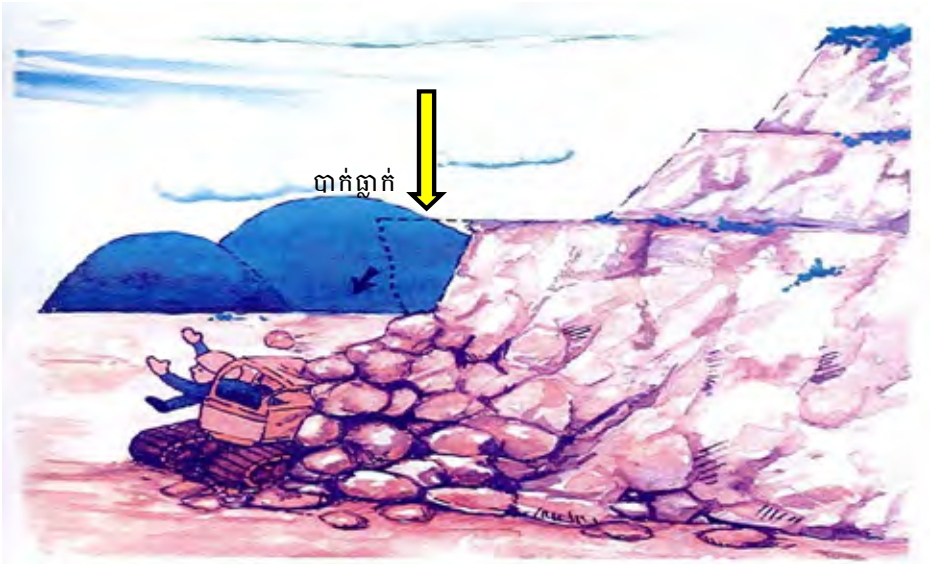


រាយការណ៍ទៅម្ចាស់ក្រុមហ៊ុន

លើកស្លាកសញ្ញានៅកន្លែងមានគ្រោះថ្នាក់

2.ការទប់ស្កាត់ការបាក់ធ្លាក់

ដើម្បីទប់ស្កាត់ ការបាក់ រលំថ្នាំងថ្ម ត្រូវរក្សាជំរាលមុំសុវត្ថិភាព ឲ្យបានសមស្របដោយ តម្រូវឲ្យ កាំ ថ្នាក់នីមួយៗ មានកំពស់សុវត្ថិភាពសមរម្យ។



3. ការត្រួតពិនិត្យ

មុននឹងធ្វើការងារ ត្រូវត្រួតពិនិត្យអំពីថ្មប្រេះ (Loose Rock) ជាមុនសិនករណីមានថ្មបែបនេះ ត្រូវយកថ្មនោះចេញតាមវិធីមានសុវត្ថិភាពជាមុនសិន ។

4. ហាមធ្វើការងារ លើក្រោម នៅពេលតំណាលគ្នា វាអាចមានគ្រោះថ្នាក់ខ្លាំង

5. ការទប់ស្កាត់រអិលធ្លាក់

① ទីកន្លែងទំលាក់ថ្ម ត្រូវប្រើកំណល់មានភាពមាំសម្រាប់កល់កង់ក្រោយ ដើម្បីជៀសវាងរថយន្តរអិលធ្លាក់ធ្លាក់។

② នៅពេលរុញថ្មឬពំនូកដី ទំលាក់ទៅក្នុងចំណោត ត្រូវយកថ្មឬពំនូកដី មួយពំនូកផ្សេងទៀត យកមករុញ ដើម្បីទប់ស្កាត់ការជ្រុលធ្លាក់គ្រឿងចក្រ។

6.ការទប់ស្កាត់ការរអិលធ្លាក់

ពេលធ្វើការនៅទីកន្លែងមានគ្រោះថ្នាក់ឬរអិលត្រូវប្រើជន្ទល់សុវត្ថិភាពហើយអ្នកធ្វើការងារនោះត្រូវពាក់ខ្សែក្រវាត់សុវត្ថិភាព។

7. ការផ្អាកការងារនៅពេលអាចនឹងមានគ្រោះថ្នាក់

នៅពេលអាចនឹងមានគ្រោះថ្នាក់ តាមរយៈរន្ទះភ្លៀង។ល។ សូមផ្អាកការងារ និងភៀសខ្លួនទៅរកកន្លែងមានសុវត្ថិភាព។

II . ចំនុចប្រយ័ត្នចំពោះរថយន្តនិងគ្រឿងចក្រនៅការដ្ឋានរ៉ែ

1. កាតព្វកិច្ចក្នុងការបើកបរសម្រាប់អោយមានសុវត្ថិភាព

① ហាមផ្តុំកលើសចំណុះ

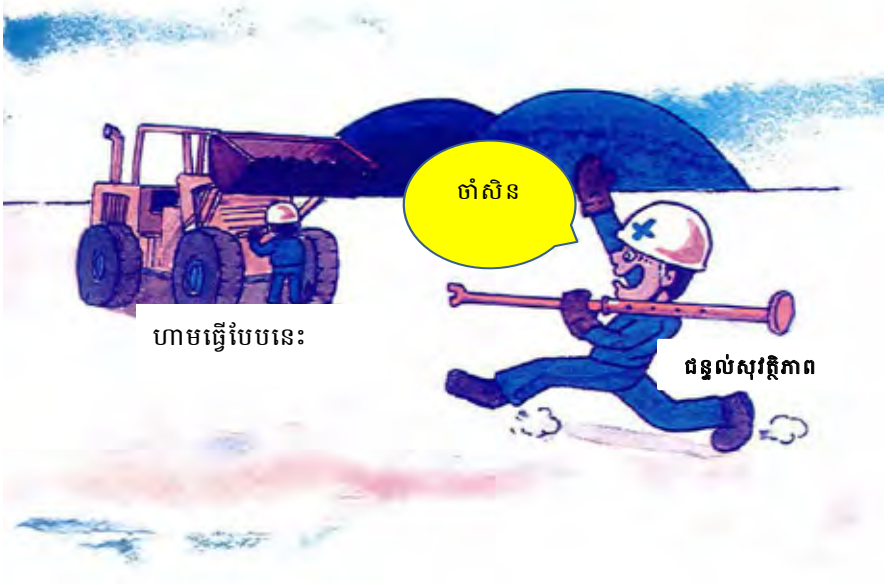
② ហាមប្រើគ្រឿងចក្រខុសពីមុខងាររបស់វា

③ ហាមប្រើគ្រឿងចក្រខុសគោលដៅ (សម្រាប់ជីកឬកាយ)

④ ហាមជិះ ក្រៅពីចំនួនកៅអីមានកំណត់

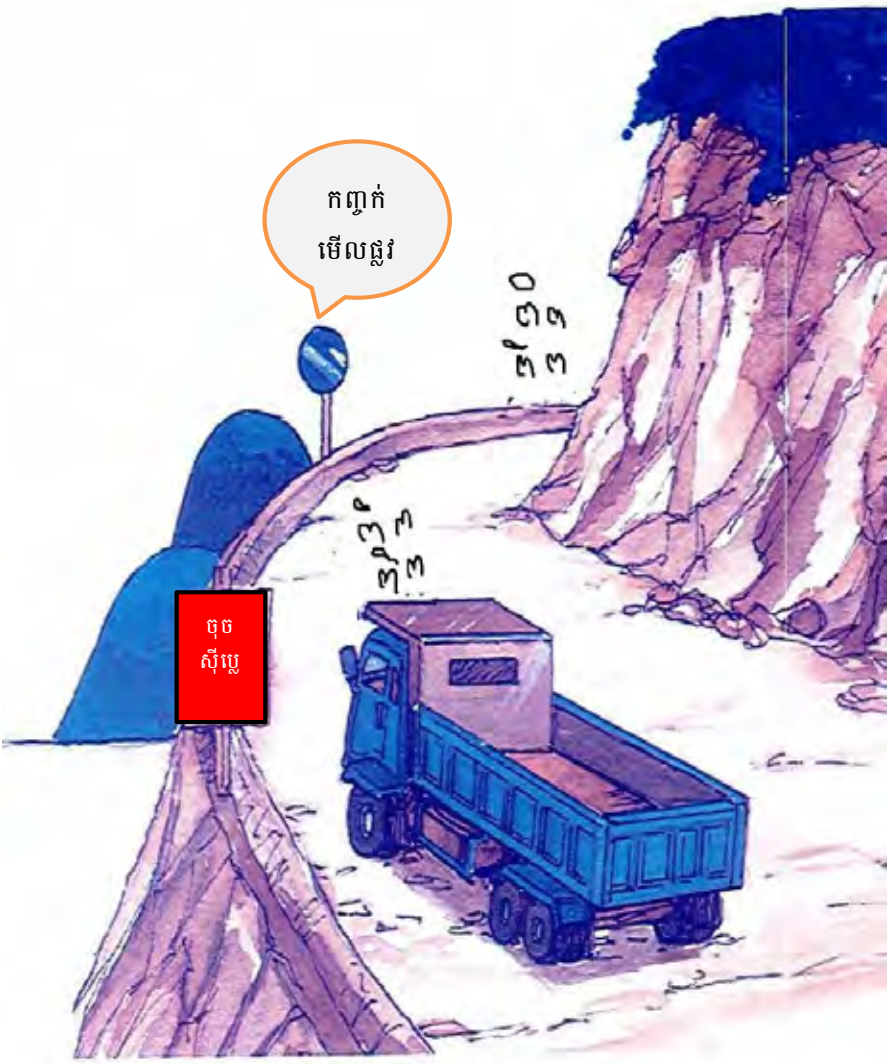
⑤ ហាមចូលដោយគ្មានការប្រុងប្រយ័ត្ន នៅពេលយានយន្ត ឬគ្រឿងចក្រកំពុងដំណើរការ

2. វិធានការ នៅពេលធ្វើការត្រួតពិនិត្យ



នៅពេលជួសជុលក្រោមប៉ែល ត្រូវមានជន្លល់ទ្រត្រឹមត្រូវជាមុនសិន

3. ផ្លូវកោងនៅក្នុងការដ្ឋានត្រូវមានស្លាកសញ្ញា



4. វិធានការចំពោះករណីមុនឃ្លាតចេញពីគ្រឿងចក្រ

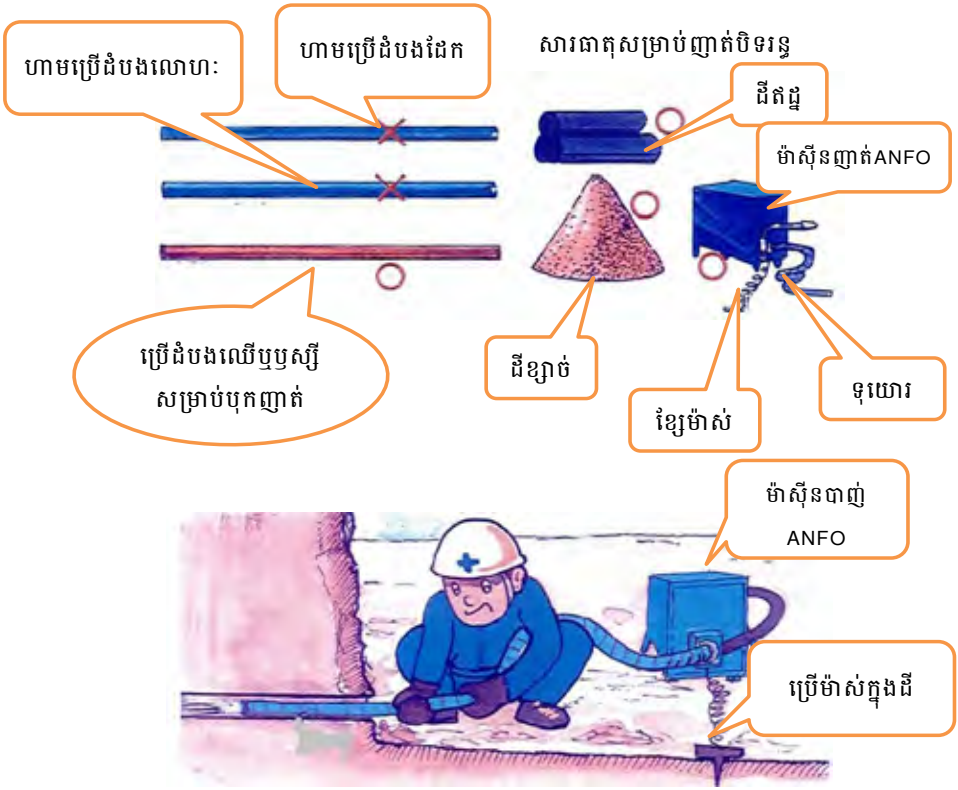
- ហាមជក់ចារី នៅក្បែរប្រេងឥន្ធនៈ
- ពន្លត់ម៉ាស៊ីន ពេលចាក់ប្រេង

ㆢ. សម្ភារប្រើប្រាស់សម្រាប់ធ្វើការបំផ្ទុះ

1. ប្រយ័ត្នចំពោះចំនុចនៃការប្រើប្រាស់ប្រភេទរំសេវនិងការបំផ្ទុះ

ដើម្បីទប់ស្កាត់ការប៉ះកកិតនៅពេលញាត់រំសេវត្រូវប្រើសម្ភារដូចខាងក្រោម៖

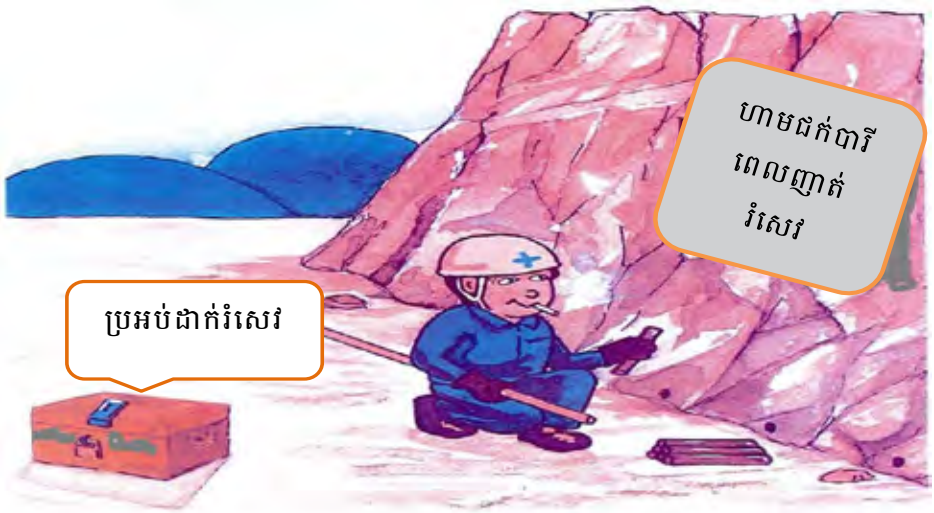
ហាមប្រើដែកឬលោហៈបុកឆ្មុក(Stemming)



① ត្រូវប្រើទុយោរមិនផ្ទុកចរន្ត

② ប្រើខ្សែម៉ាស់តភ្ជាប់ទៅក្នុងដី

③ ត្រូវប្រុងប្រយ័ត្ននៅពេលញាត់



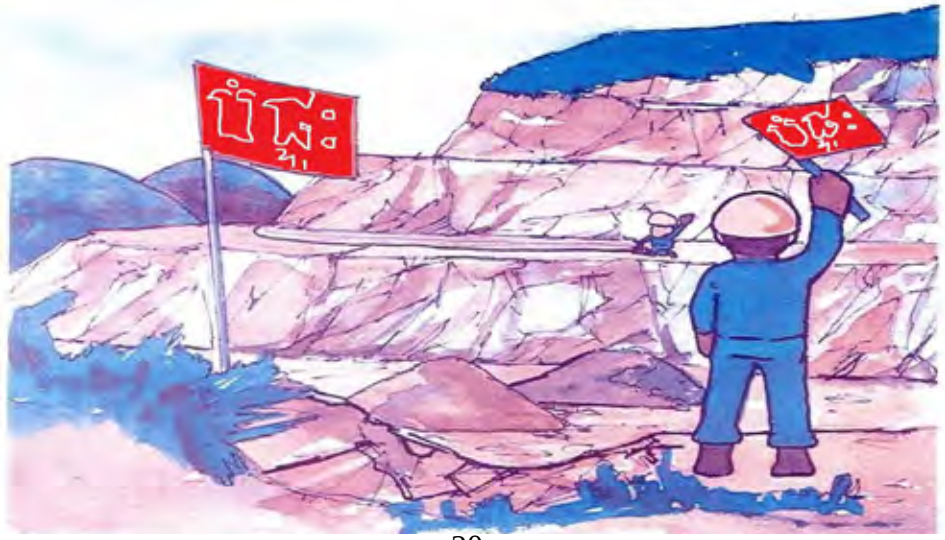
2. វិធានការ នៅពេលធ្វើការបំផ្ទុះ

នៅពេលធ្វើការបំផ្ទុះត្រូវចាត់វិធានការដូចខាងក្រោម៖

① ដាក់មនុស្សយាមមើល ——→ ផ្លូវសំខាន់ៗ

② លើកស្លាកសញ្ញាប្រយ័ត្ន ——→ នៅផ្លូវផ្សេងទៀត

③ ប្រយ័ត្នចំពោះទីកន្លែងធ្វើការបំផ្ទុះ ——→ អ្នកធ្វើការផ្សេងទៀតនៅក្បែរតំបន់ធ្វើការបំផ្ទុះ



3. ការទប់ស្កាត់គ្រោះថ្នាក់តាមរយៈការបំផ្ទុះ

ដើម្បីទប់ស្កាត់គ្រោះថ្នាក់របស់ថ្មផ្លោងទៅខាងក្រៅការដ្ឋានត្រូវគោរពតាមចំនុចដូចខាងក្រោម៖

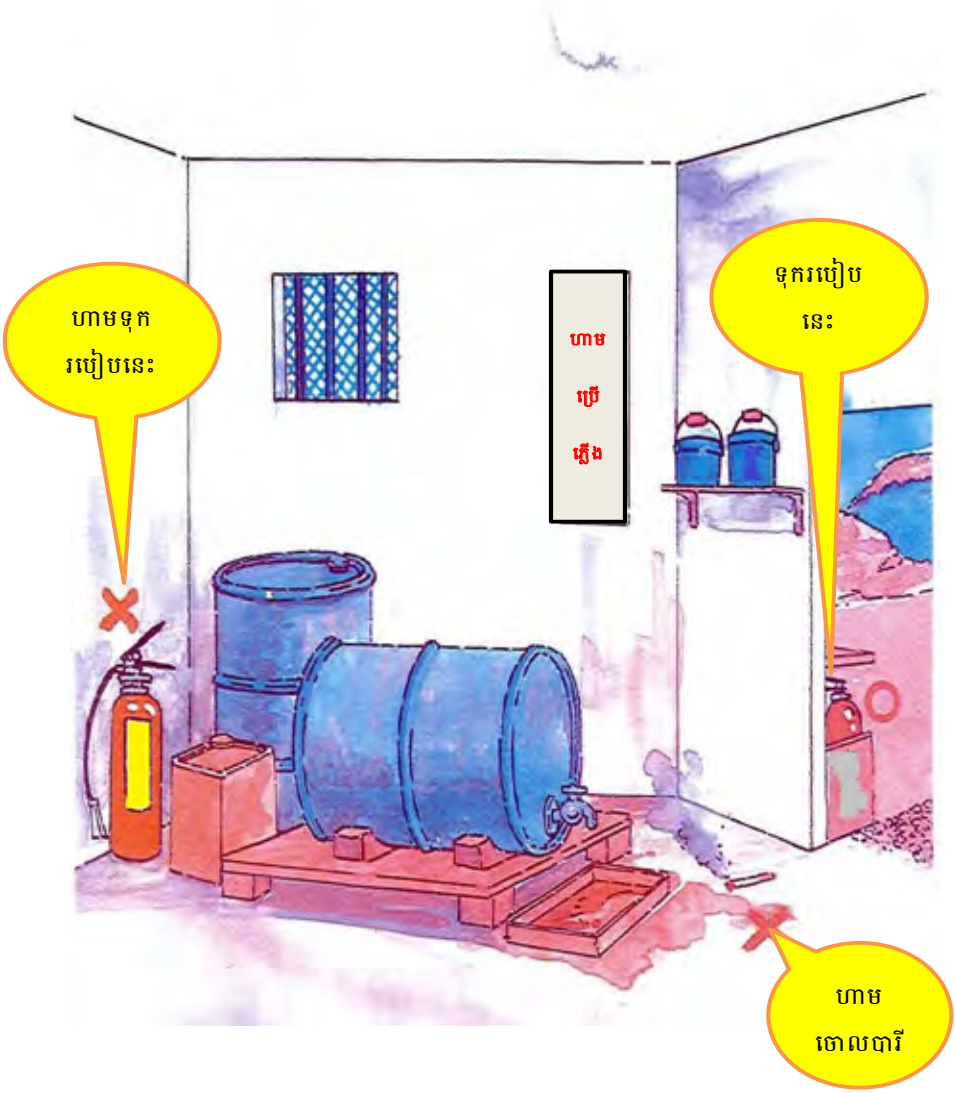
① ដាក់បរិមាណរំសេវតាមលក្ខណៈបច្ចេកទេស

② តំឡើងបរិក្ខារទប់ស្កាត់ការពារ ឬកំណត់តំបន់ហាមមិនអោយមនុស្សចូល(ដាក់អ្នកយាម ឬតម្លើងស្លាកសញ្ញា)

IV. ចំនុចប្រយ័ត្ននៅពេលប្រើប្រាស់ភ្លើងនៅការដ្ឋានរ៉ែបើក

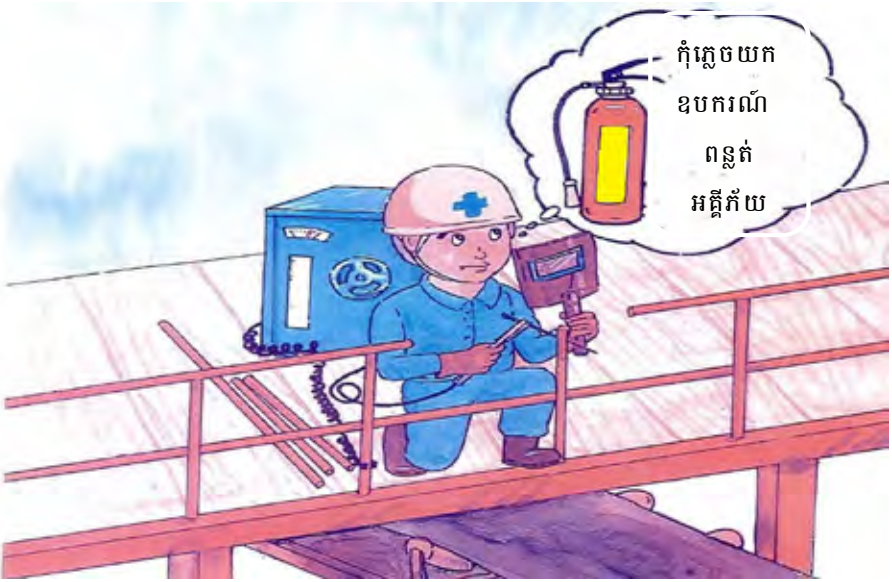
1. បរិក្ខារពន្លត់អគ្គីភ័យនៅក្នុងអគារនៃការដ្ឋានរ៉ែបើក

ចំពោះបរិក្ខារពន្លត់អគ្គីភ័យ ត្រូវដាក់នៅកន្លែងងាយយកមកប្រើប្រាស់



2. ការកំហិតក្នុងការប្រើភ្លើង

នៅពេលធ្វើការផ្សាឬកាត់ដែក ត្រូវមានបរិក្ខារពន្លត់អគ្គីភ័យ នៅក្បែរអ្នកផ្សា។



3. ចំពោះក្រណាត់ឬក្រដាសងាយឆេះ ត្រូវដាក់ក្នុងធុងដែក

ក្រណាត់ជូតដែលមានជាតិប្រេងឬខ្លាញ់ ត្រូវដាក់ក្នុងធុងដែកគ្របឲ្យជិត។

4.ទីកន្លែងប្រើប្រាស់ភ្លើង

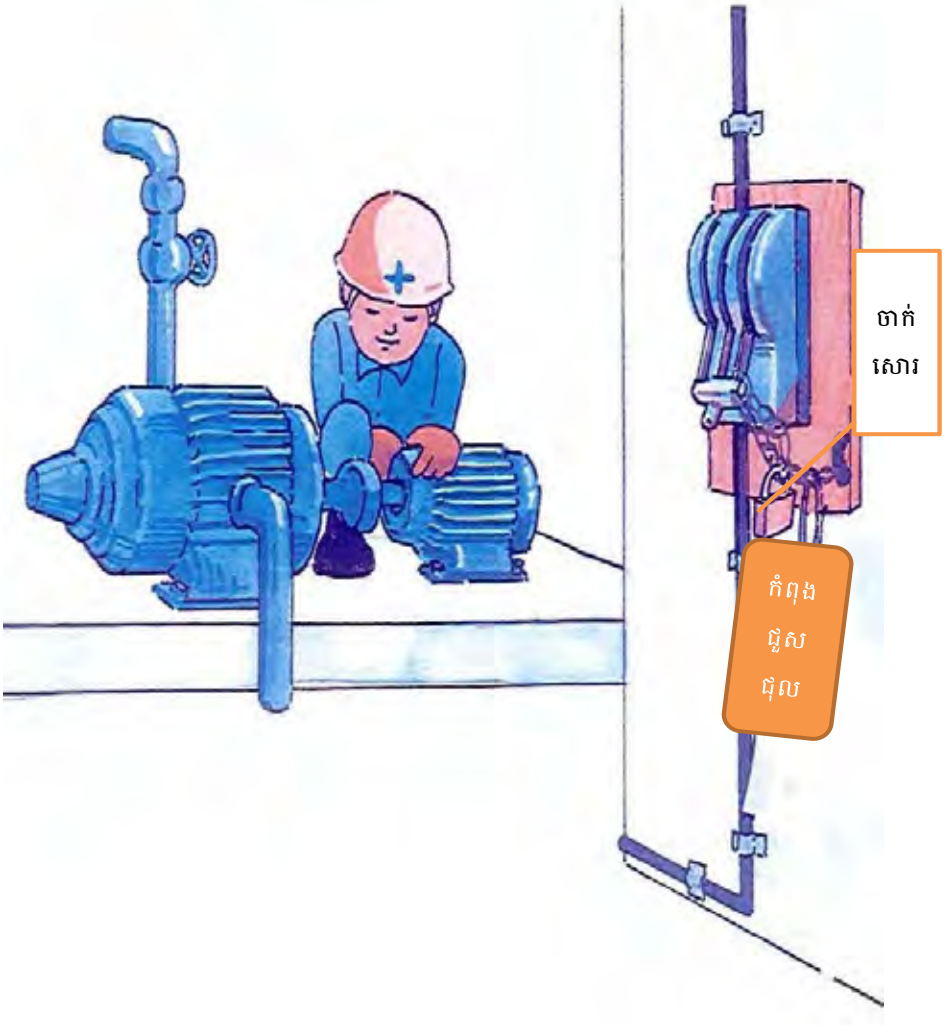
អ្នកបានប្រើប្រាស់ភ្លើង ត្រូវពន្លត់ឲ្យបានច្បាស់លាស់។

V. ចំនុចប្រយ័ត្នក្នុងការប្រើបរិក្ខារអគ្គិសនី

ទប់ស្កាត់ការឆក់ចរន្តអគ្គិសនី

(1) ត្រូវបិទកុងតាក់ និងចាក់សោរ

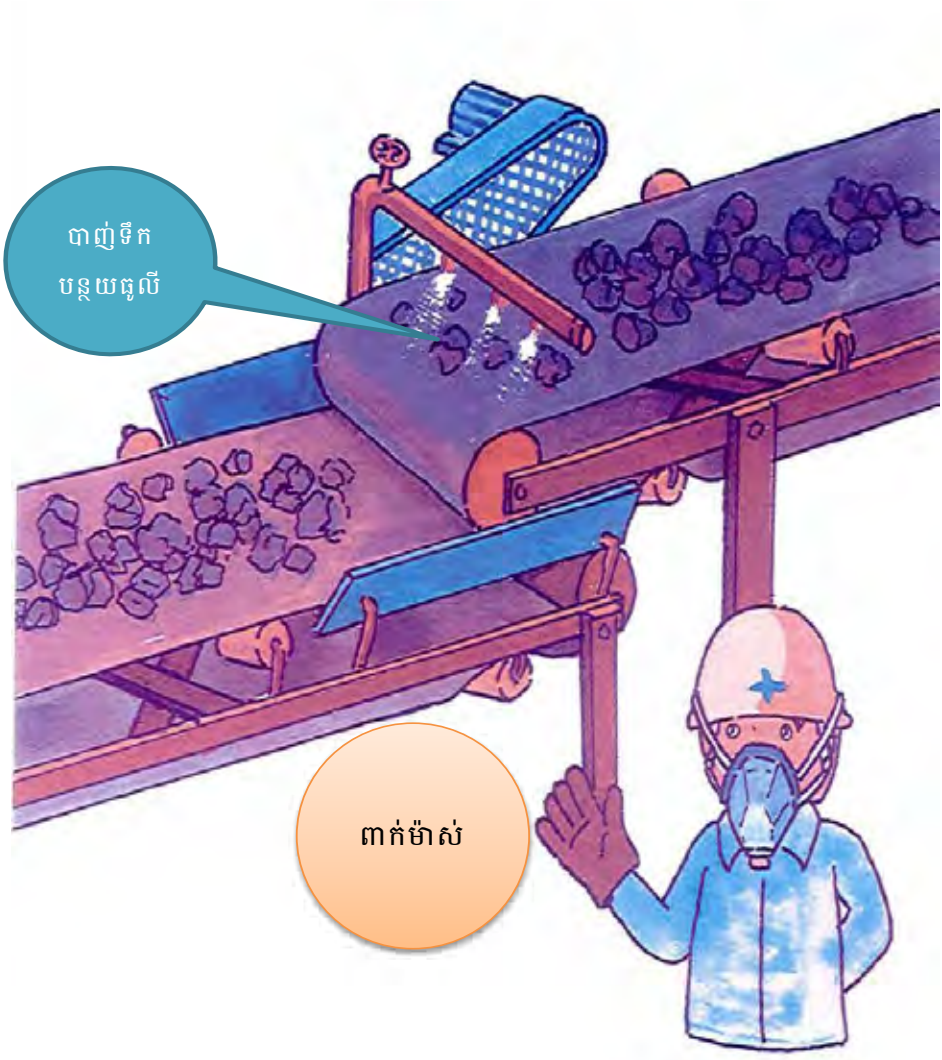
(2) ត្រូវផ្តល់ព័ត៌មានអំឡុងពេលជួសជុល ត្រូវបិទកុងតាក់សិន



VI. ការទប់ស្កាត់ធូលីហុយ នៅការដ្ឋានរ៉ែបើក

1. ទប់ស្កាត់ធូលីហុយ

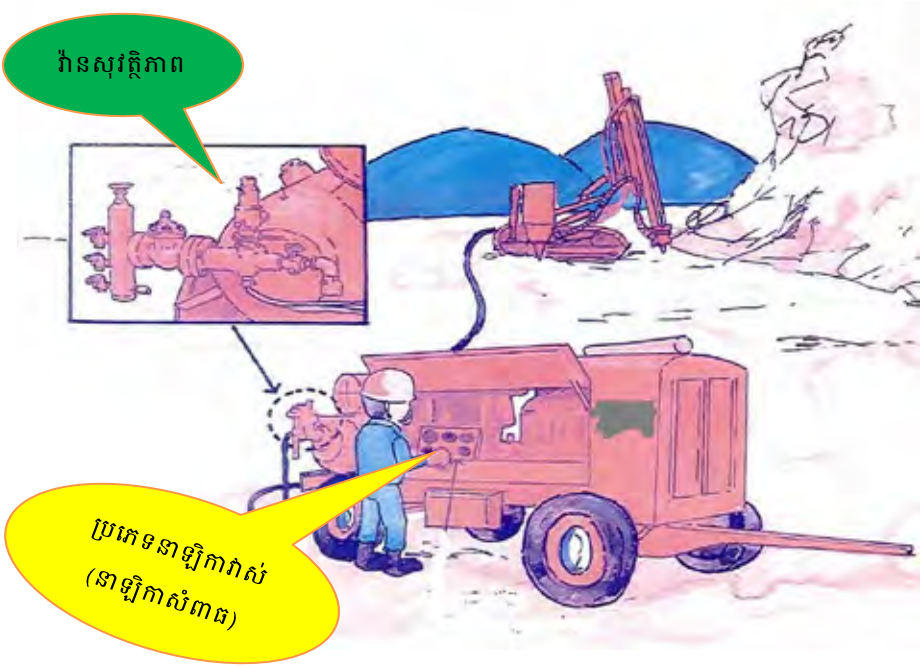
ត្រូវមានបំពាក់ប្រព័ន្ធបាញ់ទឹកនៅផ្នែកខ្សែសង្វាក់ផលិតកម្មដែលជាប្រភពបញ្ចេញធូលីច្រើន ចាំបាច់ត្រូវពាក់ម៉ាស់។



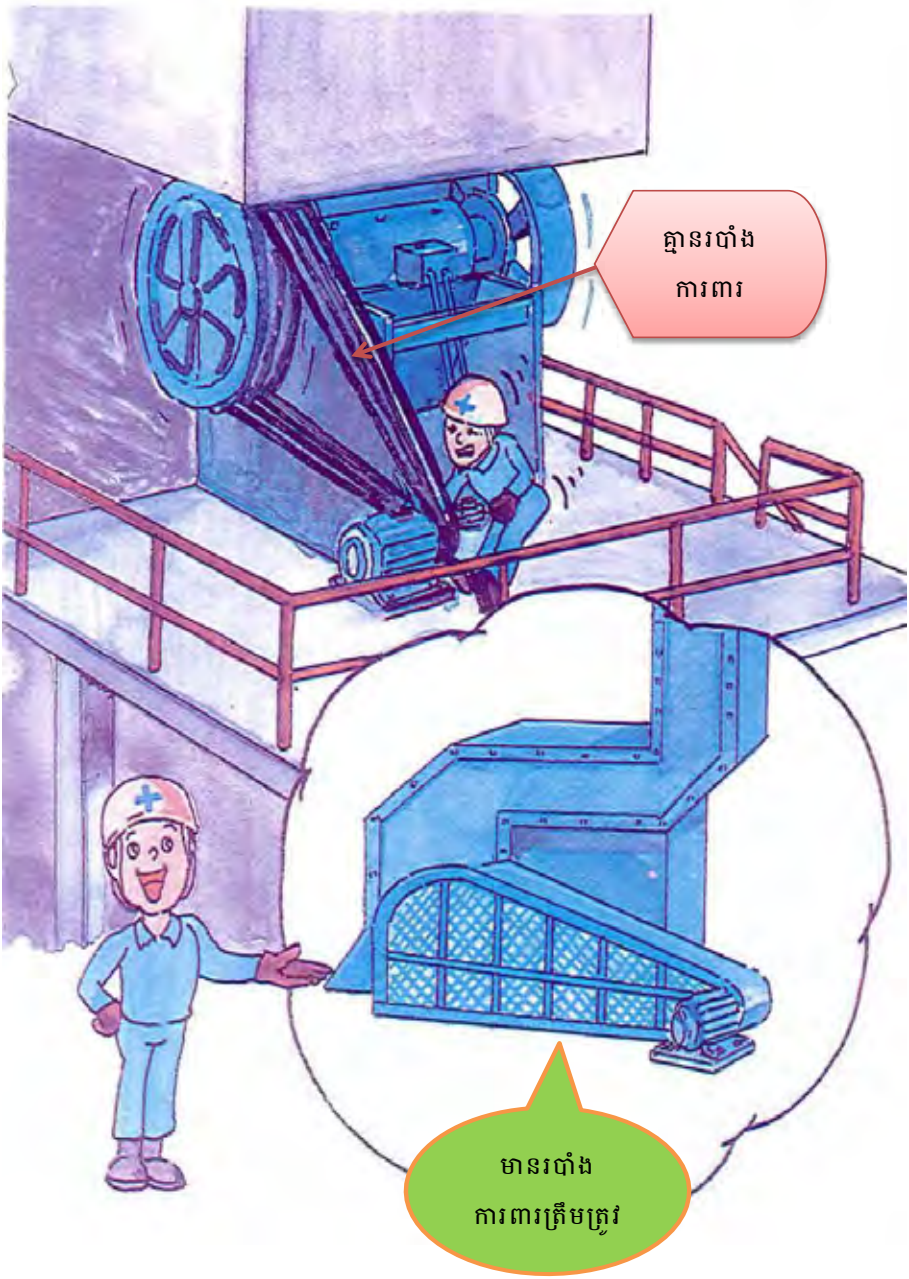
2. ប្រើប្រាស់រថយន្តស្រោចទឹក ដើម្បីកាត់បន្ថយការហុយធូលី នៅការដ្ឋានរ៉ែ

3. ការប្រើប្រាស់ម៉ាស៊ីនខ្យល់

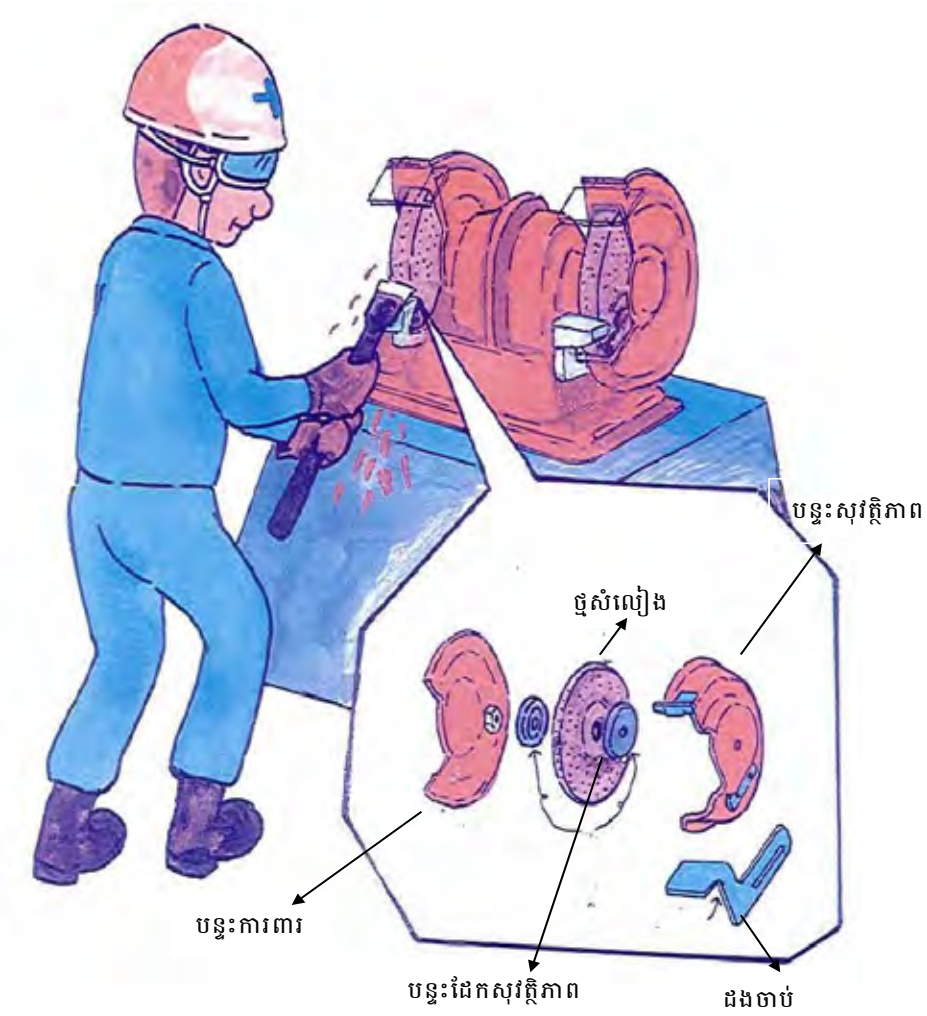
ចំពោះវ៉ាន នាឡិកាសំពាធ នាឡិកាកំដៅ វ៉ានសុវត្ថិភាព បំពង់ខ្យល់ របស់ម៉ាស៊ីនខ្យល់ ត្រូវសំអាតជាប្រចាំ។



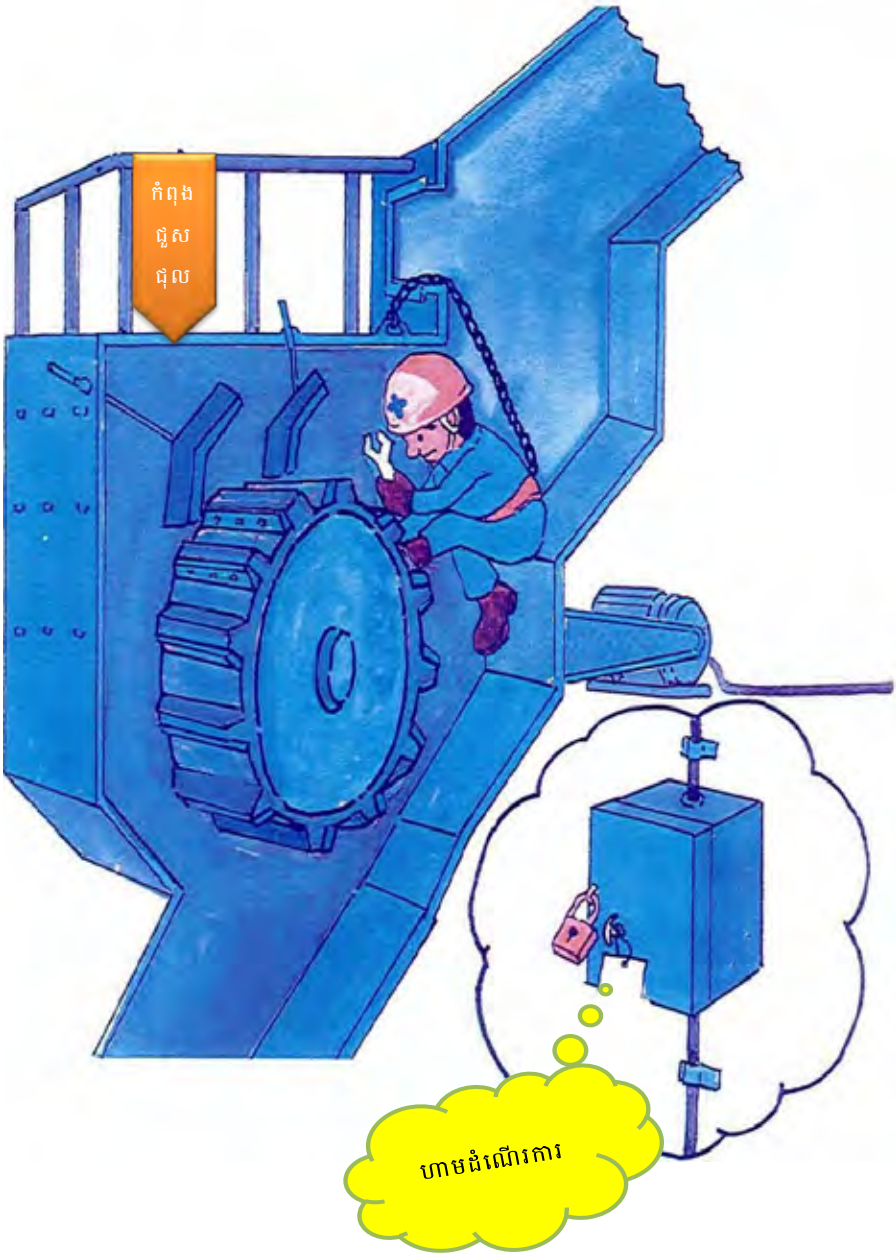
4. ការទប់ស្កាត់គ្រោះថ្នាក់



5. នៅពេលឆាបឬសំលៀងដែក ត្រូវមានសម្លៀកបំពាក់និងបរិក្ខារសុវត្ថិភាព ត្រូវប្រើ មួក វ៉ែនតា ស្រោមដៃ ម៉ាស់ ស្បែកជើងសុវត្ថិភាពនិងកាសត្រចៀក។

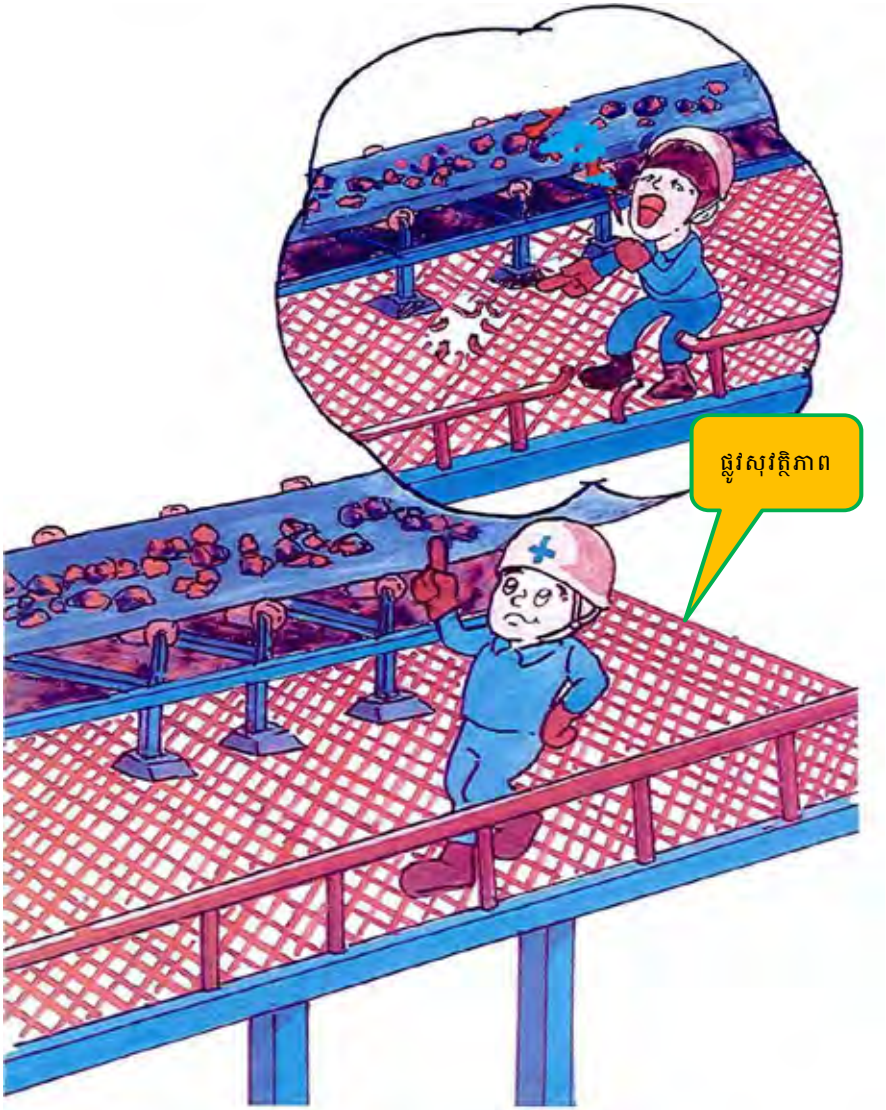


6. វិធានការនៅពេលជួសជុលម៉ាស៊ីន

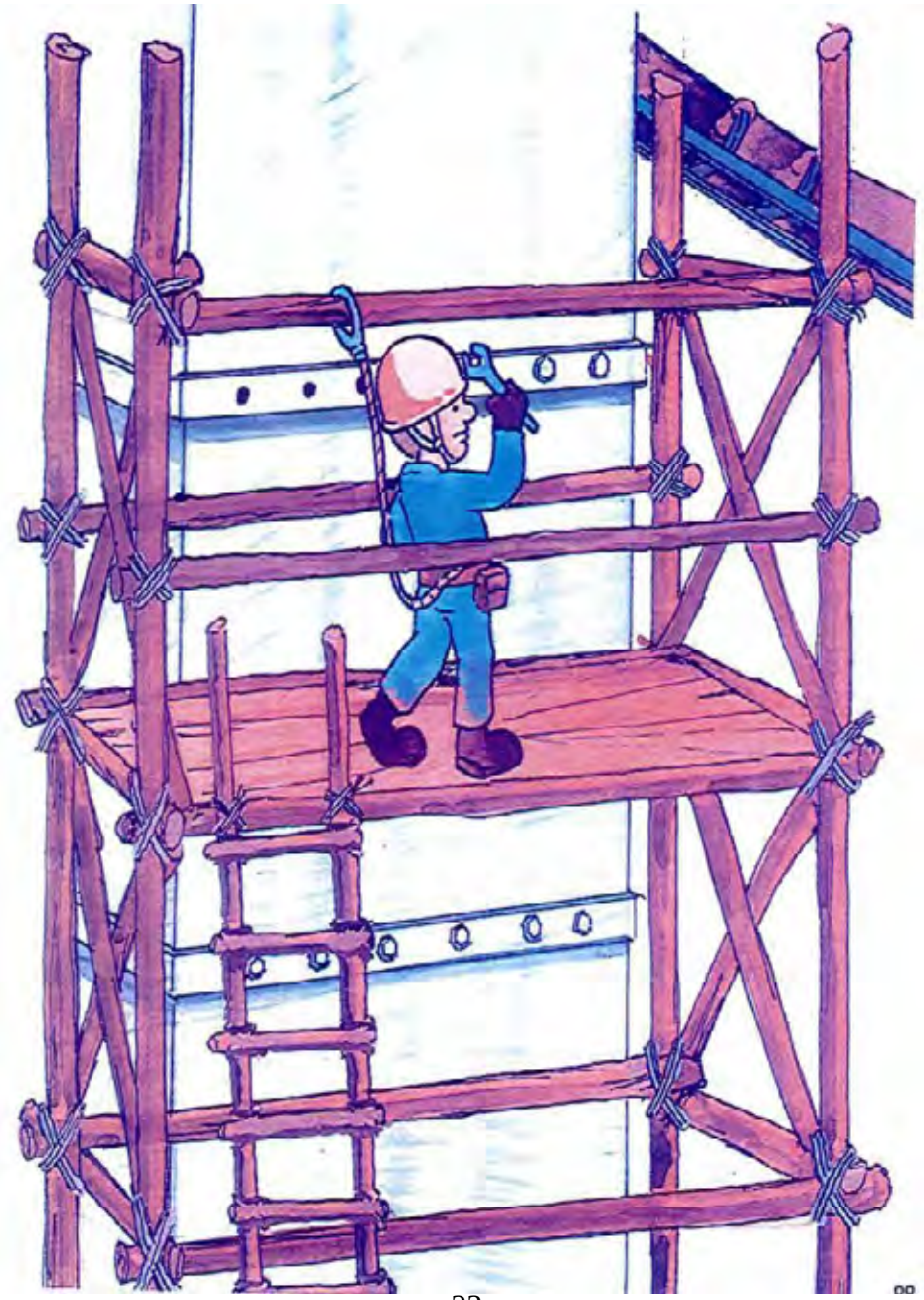


7. ជណ្តើរនិងបង្កាន់ដៃសុវត្ថិភាព

8. ផ្លូវដើរសុវត្ថិភាព



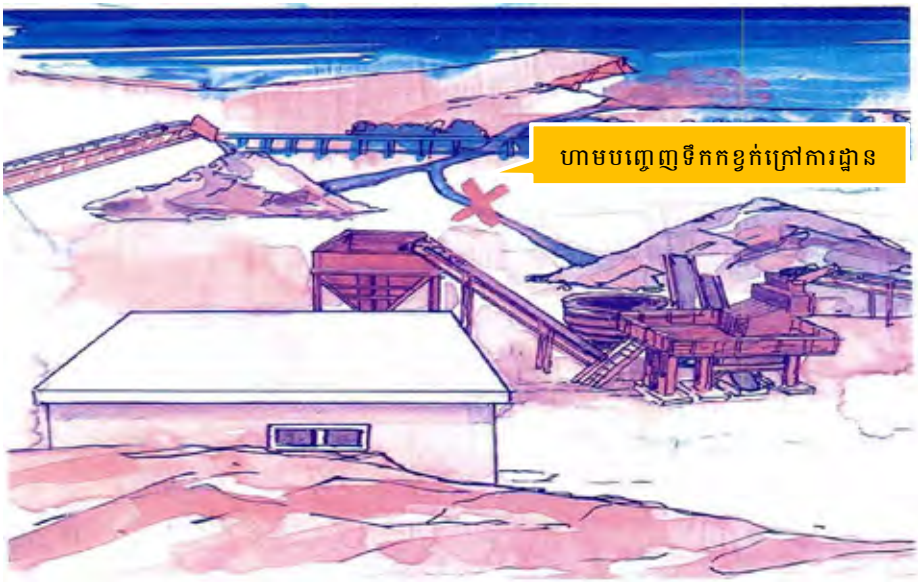
9. ធ្វើការនៅទីខ្ពស់ត្រូវមានខ្សែក្រវ៉ាត់សុវត្ថិភាព



Ⅶ. វិធានការទប់ស្កាត់ការបំពុលបរិស្ថាន

① ត្រូវបាញ់ទឹកសម្អាតជាប្រចាំនៅច្រកចេញចូលការដ្ឋានរ៉ែ

② ហាមបញ្ចេញទឹកកខ្វក់ទៅក្រៅការដ្ឋាន



③ ហាមចោលកាកសំណល់នៅទីកន្លែងសាធារណៈ

④ ហាមទុកកាកសំណល់ហៀរចេញក្រៅការដ្ឋានរ៉ែ

Edited by Working Team members of GDMR

1. Mr. HONG Bona
2. Mr. KONG Sitha
3. Mr. LAI Zanith
4. Mr. TY Pisethcheat
5. Mr. IM Sim
6. Mr. YIN Ratanak
7. Mr. SOU Phires

Japan International Cooperation Agency (JICA)

Ministry of Mines and Energy
General Department of Mineral Resources
in the Kingdom of Cambodia

This textbook is free