1. INTRODUCTION

The environmental impacts from the quarry and crusher industry in the U.A.E, have to be assessed, controlled and monitored with respect to the U.A.E cabinet resolution (20) /Article (23) of 2008. The terms of this resolution applies to all the existing and new quarries.

\textbf{Article (23) : The minister shall issue the resolutions organizing crushers and quarries activities, management, operation processes and transportation of products, including guidelines of the operations process and the pollutants monitoring mechanisms, as well as any other resolutions necessary to implement the provisions of this resolution.}

With the introduction of new resolutions by the Ministry of Environment and water, it will be mandatory for all the existing and new quarries and crushers in the United Arab Emirates, to follow these regulatory guidelines for achieving effective environmental controls. The major focus will be on dust and noise emissions , in addition to health and safety practices, ecological factors, management and transportation.

\textbf{1.1 SCOPE OF REGULATORY GUIDELINES}

- The implementation of these regulations will be with immediate effect for new licenses and permits for quarry and crusher operations.
- Existing quarries and crushers should complete implementation of environmental control systems, as per the regulatory guidelines within 12 months from the date of issue.
- These regulatory guidelines will also apply to all the existing quarries and crushers of cement plants, ceramic and terrazzo tile factories, marble factories and other related industry.
- All the quarry and crusher operators/companies will submit a copy of their planning and schedule of implementing the guidelines within 2 months from the date of this issue.
- Competent authorities (Federal & Local) will ensure and follow up implementation of these regulatory guidelines with immediate effect.
- Authorities from the Ministry of Environment and Water / Federal Environmental Agency will make regular visits to the quarries and crushers to follow up with the implementation of these regulatory guidelines at site, in addition to collection of current data. Also a fool proof monitoring systems will be deployed.
- To obtain a NOC ( No Objection Certificate ) from the Federal Environmental Agency, EIA procedures to be followed as per article (4) of cabinet resolution (20)
- The recommended environmental standards are stated in Appendix- A
2. GUIDELINES FOR QUARRYING

All quarrying operations in the UAE will follow the following guidelines for their day to day quarrying operations with respect to drilling, blasting, material handling, in-site hauling and transportation. For more details refer guidelines booklet A.

2.1 DRILLING

2.1.1 All drilling equipment will be fitted with proper dust collection system. Proper disposal arrangements to be made for the fine dust collected in bags or filters.

2.1.2 If sufficient water is available, then wet dust suppression during drilling is recommended.

2.1.3 All the drilling operators and supervising staff will adopt proper safety measures during drilling operations, includes wearing dust mask and ear plugs.

2.1.4 Hours of operation: Drilling operations will be carried out during daylight hours only from 7AM—8PM, for quarries located less than 3 km from residential areas.

2.1.5 All the drilling and ancillary equipment will be maintained in good working order to reduce fumes and noise. Fume filters are recommended for the diesel engines.

2.1.6 For large drilling equipment equipped with cab for operators, the cabs should have good sealing and fitted with dust filters.

2.1.8 Avoid secondary jackhammer drilling. Hydraulic breakers to be adopted for reducing size of large rock boulders.

2.2 QUARRY BLASTING

2.2.1 Set optimum blasting parameters to reduce dust emissions, ground vibrations, air overpressure, fly rock and noise. Records of all blasting parameters to be maintained for better control and optimization. The parameters include:
- Proper spacing of blast holes depending on hole diameter
- Maintaining a safe drilling angle for the quarry face
- Calculating optimum quantity of explosives for charging
- Use of delay detonators for reducing ground vibrations
- Maintaining proper stemming depth to minimise fly rock
- Avoid using detonator cords over the ground
- Maintain proper log of all the parameters

2.2.2 All blasting operations will be supervised and carried out by competent personnel only. In addition to the company’s explosive expert / blasting engineer,
local civil defense and police authorities will be present at the site to supervise and monitor the operations for safety and security.

2.2.3 The blasting area will be sprayed with water before charging explosives and prior to blasting to reduce dust emissions. Quarry operations should not be conducted at less than 100 meters from the blasting area.

2.2.4 Handling and proper transportation of explosives from storage areas to the site will be carried out by competent authorities including policing. The explosives storage areas will meet all the specifications set by the ministry of interior.

2.2.5 Blasting should not be carried out in adverse weather conditions. Avoid blasting when the wind direction is toward local residential areas.

2.2.6 30 minutes prior final detonation Proper warning by siren and red flags will be given, to alert all the staff and public to keep 500 meters away from the blast area.

2.2.7 It is mandatory to monitor ground vibrations and noise from a recommended distance of 500 meters from the quarry face towards the nearest local residential area. All the data to be provided to the competent authorities. Properly calibrated measuring equipment will be used for collecting the vibration and noise data.

2.2.8 Air quality data for Nitrogen Monoxide, Nitrogen Dioxide and Carbon Monoxide to be monitored for at least one blasting operation in a month. It is preferable for the local competent authority to monitor this data. A copy of this report to be sent to the regional ministry of environment and water.

2.2.9 The total explosives consumption (including type of each explosive and detonators, etc used) for each blast along with the measurements (L x W x D) of the blasting area should be provided to the competent authorities. Any other details pertaining to the blasting parameters should be provided.

2.3. MATERIAL HANDLING

Material handling will include all the quarry operations related to cleaning of quarry face, loading of material to dumpers or trucks, use of hydraulic breakers for breaking large size rocks, etc.

2.3.1 Regular mechanical maintenance will be carried out on all the material handling equipment to cut down fumes and noise. Safe practices will be adopted at all times during operation. Only licensed and trained operators will run these equipment.

2.3.2 All the operator cabs will be properly sealed for dust and noise and fitted with dust filters.
2.3.3 Quarry working floors should be sprayed with water from time to time to reduce dust emission during operations.

2.3.4 It is preferable to fit fume filters to all diesel engines

2.3.5 All material handling operations inside the quarry will be carried out during daylight timings only.

2.4 HAULING IN-SITE

2.4.1 Hauling of quarry material to the crushing plant by dump trucks will be carried out only during daylight hours.

2.4.2 Hauling roads should be planned with low gradients and set to follow safe speed limits with proper warning signs.

2.4.2 Hauling roads will be paved or sprayed with water mixed with a suitable wetting agent (Calcium chloride- CaCl₂, magnesium chloride- MgCl₂, etc.) to prevent dust and improve visibility

2.4.3 Dump truck operator cabs will be properly sealed and fitted with dust filters.

2.4.4 Trucks leaving the quarry with rocks directly to projects sites will be properly covered. The material should not be loaded above the height of the body.

2.4.5 Install caution boards showing speed limits, road conditions and directions.

2.4.6 Use larger capacity dump trucks to reduce frequency and noise.
3. GUIDELINES FOR CRUSHERS

Crusher operations will include primary and secondary crushing, screening, material handling and transport

3.1 PRIMARY CRUSHER

3.1.1 The complete primary crushing plant will preferably be fully encapsulated with a proper steel structure to reduce noise and dust emissions.

3.1.2 Dust collectors either dry (bag house) or wet suppression methods should be employed to reduce dust emissions to meet the recommended standards.

3.1.3 The waste material (≤2") collected from the primary vibrating feeder will be stored into silos to prevent wind whipping. This generally is sold as “Road Base” to projects.

3.1.4 The crusher operator cabs will be properly sealed with dust filters.

3.1.5 The output from the primary crusher should preferably be stocked in silos for easy feeding into secondary crushers and to prevent dust emission.

3.1.6 Proper maintenance of the primary crushing plant should be carried out to prevent excessive noise and other problems.

3.2 SECONDARY CRUSHER

3.2.1 All secondary crushers will have dry dust collection or wet suppression control methods to bring down the dust emissions to recommended standards. Encapsulating the secondary crushers in necessary.

3.2.2 The material inlet and outlet locations of the secondary crushers will be properly sealed to prevent dust leakage using rubber curtains. Soft rubber curtains are preferable, as they will fall on the top of the material, giving better dust protection.

3.2.3 The secondary crushers will be properly maintained to reduce noise levels.

3.2.4 Spraying water is recommended to reduce noise inside the crusher.

3.2.5 Material from secondary crushers will be stocked in silos for feeding into screening plants. This will also reduce dust emissions.
3.3 SCREENING

3.3.1 All vibratory screening plants to be fully encapsulated with dry / wet dust collection systems.

3.3.2 The material inlet and outlet chutes of the screening plants to be protected properly with rubber curtains to prevent dust leakage.

3.3.3 The complete screening plant should be regularly maintained to optimize the performance with minimum dust and noise emissions.

3.4 MATERIAL HANDLING

Material handling operations will include stackers, conveyor belts and ancillary units, stock piling, in-site loading and hauling, etc.

3.4.1 All conveyor belt and stacker systems should be properly enclosed on the sides and top with dry dust collection system. In case of wet suppression method with water, this enclosure may not be necessary.

3.4.2 For stock piling of graded material from the screening plant, the conveyors will have proper flexible chutes to prevent wind whipping of fine material.

3.4.3 All stock piles of graded material to be sprayed with water or protected with coverings to prevent dust due to wind whipping. The fine material (3/16 sand) should preferably be stored in silos.

3.4.4 The loading and hauling areas should be sprayed with water from time to time.

3.4.5 All the material handling equipments should be properly maintained to reduce noise and dust leakage.

3.4.6 The ground around the crusher operations area should be sprayed with water from time to time, to prevent / mitigate fugitive dust.
4. GENERAL REQUIREMENTS

These regulatory guidelines will apply to all the quarries and crushers as a general rule.

4.1 All quarries and crushers will submit a detailed map of the quarry and crusher areas showing:
   - Locations of the existing and abandoned quarry faces
   - Location of crushing plant
   - 3D contour maps showing geological features
   - Location for ancillary or additional developments
   - Material storage yards
   - In site roads and dwellings
   - Residential areas around the site

The above maps will be updated and submitted every year to the competent authorities- both at federal and state levels

4.2 Annual Reports to be submitted with the following production and operations data (starting January 1, 2008):
   - Production data showing separately, all the types of materials (armor rock, grizzled rock, graded rocks of different sizes, aggregates, sand, road base, etc.) sold from the quarry and crusher.
   - Drilling and blasting data as in 2.2.7, 2.2.8 & 2.2.9.

4.3 Environmental control methods.
   - It is recommended to hire a good EIA (Environmental Impact Assessment) consultant for selection and installation of proper environmental control and monitoring systems to meet the required emission standards.
   - All quarries and crushers will plant sufficient trees in the area to improve the landscape and ecology.
   - Noise barriers or bunds (minimum 15 feet height) to be constructed along residential areas falling less than 1.0 km. from the quarry and crusher site.
   - It is recommended to use fume filters for all heavy diesel engines.
   - Air quality data and noise measurements to be collected using recommended equipments. The data to be submitted to competent authorities (Federal and State) every month.

4.4 Waste Management
   - Proper care should be taken to dispose all waste products from quarrying and crushing operations. The natural waste products can be utilized for quarry restoration work at a later stage.
   - Quarry areas should be protected from illegal dumping of waste by third parties.
   - Waste oil and other residues from machinery maintenance should be stored in proper containers or cemented pits to avoid seepage to ground water and surrounding soil.
• Only authorized waste disposal contractors should be hired for collection and disposal of waste, including waste oils, batteries, tires, scrap etc.
• A proper waste management record to be maintained.

4.5 Licensing and Permits

• For purpose of obtaining a NOC (no objection certificate) for existing quarries and crushers from the Federal Environmental Agency, all quarries and crushers will submit in detail the site map showing the current operations, planning for future operations, current production data, environmental control & monitoring equipment and methods applied or proposed to be applied within 12 months from the date of issue of these guidelines. Details of the requirements are in the concerned application form.

4.6 Environmental Management System (EMS)

• A well planned environmental management system is a valuable tool for managerial and supervisory staff in quarries and crushers, to meet current and future environmental requirements and challenges. A good EMS will integrate environmental management into company’s daily operations, long term planning and other quality assurance systems. The EMS should be appropriate to the scale of the operations.
• All records concerning the EMS policies, monitoring, training, etc should be provided to the Federal Environmental Agency, as and when requested.

4.7 Equipment Selection (Recommended)

• It is recommended to deploy large capacity quarry equipment (drilling rigs, dozers, shovels, dumper, etc.) This will help to minimize the operating hours, dust, fume, noise emissions, etc.
• Also deploying larger production capacity and latest technology crushing plants will help to reduce operating hours and emissions.

4.8 Transport of quarry and crusher products:

• All trucks transporting quarry and crusher products should be well maintained and should be in good running condition.
• All trucks carrying quarry and crusher products to customer sites, should properly cover the material to prevent wind whipping.
• The material loaded into the trucks should be below the body level
• Armor rocks loaded into flat bed trailers should be properly checked for loose joints and cracks to prevent falling on to the roads.

4.9 Quarry and crusher Management

• All the quarry and crusher operations will be carried out with a properly set management chart, indicating the individual responsibilities.
• During the quarry and crusher operations, at least one competent engineer or manager should be present at the site all the time. The engineer or manager will have the authority to provide all the information regarding
quarry and crusher operations to competent authorities from local and federal government.

- A log of all the competent authorities and visitors entering the premises should be recorded and maintained. This register can be verified at any time by the competent authorities.

### 4.10 Quarry Rehabilitation / Restoration

Quarry and crusher operators must perform progressive rehabilitation as they extract their sites. Progressive rehabilitation means rehabilitation done sequentially within a reasonable time after extraction of quarry resources is complete. As one area of their pit or quarry is being extracted, rehabilitation must be completed in the areas where the quarry reserves have been stopped or exhausted. Progressive rehabilitation is beneficial in many ways as it:

- Reduces the open areas within a pit or quarry
- Reduces soil erosion potential
- Reduces double-handling of soil / waste materials

### 4.11 Environmental Monitoring

- All the quarries and crushers will install at least one stationery gravimetric dust collector / scanner for PM10 and all particulates measurements. The data will be provided to local and federal competent authorities every month. The authorities will also inspect the monitoring equipment from time to time.
- Competent authority from the Federal Environmental Agency will visit the quarry and crusher sites to assess and monitor the emissions on a regular basis.
- The Ministry of Environment and Water / Federal Environmental Agency will have the right to enforce alternative monitoring systems if necessary.

### 4.12 Safety and Emergency

- All the quarries and crushers should follow the safety standards set by the ministry of interior and local authorities.
- A water tanker with high pressure pump, should always be made available at site to combat any fire hazards due to accidents.
- All staff at site should be trained to follow safety standards.
APPENDIX-A

RECOMMENDED ENVIRONMENT CONTROL STANDARDS

1. AMBIENT AIR QUALITY

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging period</th>
<th>Standards</th>
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<tr>
<td></td>
<td>ug/m³</td>
<td>ppb</td>
</tr>
<tr>
<td>SO₂</td>
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<td>350</td>
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<tr>
<td></td>
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</tr>
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</table>

µg/M³ = microgram per cubic meter, 1 µg = 0.001 milligram, µm = micro meter= 0.001 millimeter
ppm = parts per million
so₂ – Sulfur Dioxide, CO – Carbon Monoxide, NO₂ – Nitrogen Dioxide, O₃- Ozone
TSP: Total suspended particles, PM10: Respirable dust < 10µm
2. PERMISSIBLE NOISE LEVELS

<table>
<thead>
<tr>
<th>Exposure Hrs</th>
<th>Noise Level dB</th>
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</thead>
<tbody>
<tr>
<td>8 Hr</td>
<td>90 dB</td>
</tr>
<tr>
<td>4 Hr</td>
<td>95 dB</td>
</tr>
<tr>
<td>1 Hr</td>
<td>105 dB</td>
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<tr>
<td>30 Min</td>
<td>115 dB</td>
</tr>
</tbody>
</table>

3. GROUND VIBRATION (BLASTING)

Peak Particle Velocity (PPV) – < 6 mm/sec