1.0 Introduction

Under the Constitution of India “Regulation of Labour and Safety in Mines and Oilfields” is a central subject (Entry 55 of the Seventh Schedule of Article 246). The matter is regulated by the Mines Act, 1952 and the Rules and Regulations framed thereunder. It extends to whole of India including territorial water i.e. upto 12 nautical miles in the sea measured from appropriate base line. These statutes are administered by Directorate-General of Mines Safety (DGMS) under the Union Ministry of Labour & Employment.

1.1 Historical Background

Although exploitation of minerals has been going on in the country from pre-Christian era, it was only towards the end of 19th Century that attempts were made by the state for regulation of employment and working conditions therein. Following the International Labour Conference in Berlin in 1890, the then Government of UK through the Secretary of State for India asked the Government of India to consider the desirability of undertaking legislation for inspection of mines in general and coal mines in particular and for regulation of employment therein of men, women and children. Accordingly in 1894, Mr. James Grundy was appointed as first ever Inspector of Mines in India within the organization of Geological Survey of India. Mr. Grundy recommended that provisions be made for the minimum age of employment; notice of opening and of accidents, first-aid, management and supervision etc. Major disasters at Kolar Gold Field in 1897 and at Khost Coal Mines, Baluchistan (presently in Pakistan) in 1898 expedited finalization of the first Mines Act which was enacted on 22nd March, 1901. A Bureau of Mines Inspection was started in Calcutta on 7th January 1902 to administer the provisions of the Mines Act, 1901. The organization was renamed as Department of Mines and its office was shifted to Dhanbad in 1908. In 1960, the organization was renamed as Office of the Chief Inspector of Mines. Again in 1967 the name of the organization was changed to Directorate-General of Mines Safety (DGMS). In 1988 DGMS was declared a Scientific and Technological Organization.

Apart from administering the Mines Act and legislation framed thereunder, DGMS also administers certain allied legislation. A list of legislation administered by DGMS is given at Appendix-I.

1.2 Organizational Set-up of DGMS

Directorate-General of Mines Safety is a multi-disciplinary organization with Inspecting Officers from Mining, Mechanical and Electrical engineering and Occupational Health disciplines. Officers appointed to different technical posts in DGMS are selected by U.P.S.C. They are required to have Degree in Mining or Mechanical or Electrical Engineering with several years of experience, varying from seven to ten years of working in responsible capacity in mines or allied industry. Besides, officers of mining cadre posses First Class Mine Manager's Certificate of Competency. The Occupational Health cadre is manned by qualified and experienced medical personnel.
The organization has its headquarters at Dhanbad (Jharkhand) and is headed by the Director-General of Mines Safety. At the headquarters, the Director-General is assisted by specialist staff-officers in mining, electrical and mechanical engineering, occupational health, law, survey, statistics, administration and accounts disciplines. The headquarters has a technical library and S&T laboratory as a back-up support to the organization. Extensive computerization has been done in head office and in the field offices to upgrade the standard of work. The head office and some of the field offices have access to the internet enabling these to place themselves at par with other developed countries of the world so far as the communication with the use of computer is concerned. DGMS has a plan to establish a network for all its offices through Internet. A web page on DGMS has already been launched during the centenary year.

The field organization has a two-tier network of field offices. The area of jurisdiction of DGMS covering the entire country is divided into 8 zones, each under the charge of a Deputy Director-General. There are three to four Regional offices under each zonal office. Each Region is under the charge of a Director of Mines Safety. There are in all 29 such Regional Offices. Sub-regional offices have been set up in important areas of concentrated mining activities away from Regional office. There are 3 such sub-regional offices, each under the charge of a Deputy Director. Each Zone, besides having inspecting officers of mining cadre has officers in electrical, mechanical engineering and occupational health disciplines.

Organization chart of DGMS are at Appendix-IIA & IIB. Table - 1 shows the discipline-wise strength of inspecting officers as on 31.12.2012. A statement showing posting of Group ‘A’ & ‘B’ officers in DGMS during the year 2012 are given at Appendix-III.

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>DESIGNATION</td>
<td>DISCIPLINE</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Director General</td>
<td></td>
</tr>
<tr>
<td>Dy. Director General</td>
<td></td>
</tr>
<tr>
<td>Director</td>
<td></td>
</tr>
<tr>
<td>Dy. Director</td>
<td></td>
</tr>
<tr>
<td>Assistant Director</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
</tr>
</tbody>
</table>

S – Sanctioned    P - In Position
1.3 Role and Function of DGMS

Enforcement of the provision of the Mines Act, 1952 and Rules, Regulations and Order made thereunder and drafting appropriate legislation to absorb the technical advancement as well as to make the same comprehensive, practicable and legally sound. Setting standards, by overseeing compliance thereof as intensively as the resources permit and through a variety of promotional initiatives and awareness programme, the officers of DGMS exercise preventive as well as educational influence over the mining industry. DGMS is also promoting the concept of 'self-regulation' as well as 'workers' participation in safety management. With changing scenario, attempts are being made to superimpose its traditional role of seeking compliance by legal sanctions and work prohibition optimally, with advisory and other safety promotional initiatives; thereby creating an environment in which safety is given due priority.

Current functions of DGMS broadly include:
1. Development and updating of legislation and issue of guidelines and circulars periodically.
2. Inspection – overseeing compliance of the statutes by the management through sample inspection as and when required
3. Investigation into:
   (a) accidents
   (b) dangerous occurrences - emergency response
   (c) complaints & other matters and
   (d) taking corrective action and action against delinquents
4. (a) Grant of :
   (i) statutory permission, exemptions & relaxations
   (ii) approval of mine safety equipment, material & appliances
   (b) Interactions for development of safety equipment, material and safe work practices
5. Safety promotional initiatives including:
   (a) Organization of -
      ▪ National Conference on Safety in Mines
      ▪ National Safety Awards
      ▪ Safety Weeks & Campaigns
   (b) Safety Information Dissemination
   (c) Preview of project reports & mining plans
   (d) Promoting -
      i) safety education and awareness programme
      ii) workers' participation in safety management through -
         • workmen's inspector
         • safety committee
         • tripartite reviews
6. Conduct of examinations for grant of competency certificates.
1.4 Gazette Notification

Following gazette notifications were issued during the year 2012:

<table>
<thead>
<tr>
<th>TABLE:2</th>
<th>Notification No. &amp; date</th>
<th>Brief subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>A-31014/01/2011-ISH-II dated 2.5.2012</td>
<td>Appointment of Shri Vir Pratap to the post of Dy. Director of Mines Safety (Mining) in DGMS.</td>
</tr>
</tbody>
</table>

1.5 Measures to improve safety in mines:

Since mining is beset with many inherent hazards, detailed precautions have been laid down in the Mines Act, Rules and Regulations framed there under to guard against dangers in mines and it is the responsibility of the mine management to comply with the same. While the onus of providing for and ensuring safety in mines rests with the mine management, DGMS has the responsibility to see that the safety statute is kept updated to absorb the technical advancements as well as to make the same comprehensive, practicable, legally sound and also to carry out periodic inspection of mines to oversee compliance of safety laws. The Mines Act and the subordinate legislations framed there under is periodically updated for the purpose. Each and every accident involving fatality is enquired into by an officer or a team of officers of DGMS. A few accidents involving serious bodily injury and most of the important dangerous occurrences are also investigated by DGMS Officers. Arising out of inspections and enquiries conducted by DGMS, one or more of the following actions, as appropriate, is taken: -

(a) drawing the attention of the mine management about the contraventions of the statutes etc.;
(b) withdrawal of statutory permission, approval, relaxation or exemption granted;
(c) serving an improvement notice;
(d) imposition of a prohibitory order;
(e) suspension of statutory certificate of competency held by managerial and supervisory personnel, if found negligent in the discharge of duties;
(f) prosecution of person(s) held responsible;
(g) punitive action taken departmentally by mining companies.

Mine management is also addressed to take steps as are considered necessary by the inspecting/enquiry officer to rectify the defects or deficiencies in working condition or system.
1.6 Inspection & Enquiries

Discipline-wise number of inspections and enquiries made by the inspecting officers are given in table:3.

<table>
<thead>
<tr>
<th>TABLE:3</th>
<th>NUMBER OF INSPECTIONS AND ENQUIRIES MADE DURING THE YEAR 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discipline of Inspection Service</td>
<td>Coal Mines</td>
</tr>
<tr>
<td></td>
<td>Inspections</td>
</tr>
<tr>
<td>Mining</td>
<td>2819</td>
</tr>
<tr>
<td>Electrical</td>
<td>761</td>
</tr>
<tr>
<td>Mechanical</td>
<td>148</td>
</tr>
<tr>
<td>Occupational Health</td>
<td>109</td>
</tr>
<tr>
<td>TOTAL</td>
<td>3837</td>
</tr>
</tbody>
</table>

1.7 Improvement Notices & Prohibitory Orders

1.7.1 Coal Mines

78 (Seventy eight) improvement notices under various provisions of the statutes were issued as a result of inspections of the mines during the year 2012. These improvement notices were issued for various types of serious defects, details of which are given in table:4 below:

<table>
<thead>
<tr>
<th>TABLE:4</th>
<th>IMPROVEMENT NOTICES ISSUED UNDER SECTIONS 22(1) AND 22A(1) OF THE MINES ACT, 1952 IN COAL MINES DURING 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>SL.NO.</td>
<td>NATURE OF DEFECT</td>
</tr>
<tr>
<td>1.</td>
<td>High benches in opencast workings</td>
</tr>
<tr>
<td>2.</td>
<td>Inadequate support</td>
</tr>
<tr>
<td>3.</td>
<td>Poor ventilation</td>
</tr>
<tr>
<td>4.</td>
<td>Inadequate coal dust suppression</td>
</tr>
<tr>
<td>5.</td>
<td>Isolation stopping</td>
</tr>
<tr>
<td>6.</td>
<td>Improper/ non-provision of travelling road</td>
</tr>
<tr>
<td>7.</td>
<td>Danger of Inundation</td>
</tr>
<tr>
<td>8.</td>
<td>Unstable workings</td>
</tr>
<tr>
<td>9.</td>
<td>Lag in stowing</td>
</tr>
<tr>
<td>10.</td>
<td>Accumulation of gases</td>
</tr>
<tr>
<td>11.</td>
<td>Defective Electrical installation</td>
</tr>
<tr>
<td>12.</td>
<td>Inadequate earth leakage protection</td>
</tr>
<tr>
<td>13.</td>
<td>Defective winding rope</td>
</tr>
<tr>
<td>14.</td>
<td>Other defects in winding installation</td>
</tr>
<tr>
<td>15.</td>
<td>Defective shot-firing practices</td>
</tr>
<tr>
<td>16.</td>
<td>Others</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
</tr>
</tbody>
</table>

38 (thirty eight) prohibitory orders under Section 22(3), 22A(2) and 22(1A) of the Mines Act, 1952 were issued during the year 2012. These orders were imposed for various dangerous conditions prevailing at the mines, details of which are given in table 5:
TABLE:5

PROHIBITORY ORDERS ISSUED UNDER SECTIONS 22(3) AND 22A(2) AND 22(1A) OF THE MINES ACT, 1952 IN COAL MINES DURING 2012

<table>
<thead>
<tr>
<th>SL.NO.</th>
<th>NATURE OF DEFECT</th>
<th>NO. OF CASES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>High benches in opencast workings</td>
<td>16</td>
</tr>
<tr>
<td>2.</td>
<td>Inadequate support</td>
<td>01</td>
</tr>
<tr>
<td>3.</td>
<td>Poor ventilation</td>
<td>02</td>
</tr>
<tr>
<td>4.</td>
<td>Inadequate coal dust suppression</td>
<td>01</td>
</tr>
<tr>
<td>5.</td>
<td>Isolation stopping</td>
<td>01</td>
</tr>
<tr>
<td>6.</td>
<td>Improper/ non-provision of travelling road</td>
<td>02</td>
</tr>
<tr>
<td>7.</td>
<td>Danger of Inundation</td>
<td>03</td>
</tr>
<tr>
<td>8.</td>
<td>Unstable workings</td>
<td>00</td>
</tr>
<tr>
<td>9.</td>
<td>Lag in stowing</td>
<td>00</td>
</tr>
<tr>
<td>10.</td>
<td>Accumulation of gases</td>
<td>00</td>
</tr>
<tr>
<td>11.</td>
<td>Defective Electrical installation</td>
<td>00</td>
</tr>
<tr>
<td>12.</td>
<td>Inadequate earth leakage protection</td>
<td>00</td>
</tr>
<tr>
<td>13.</td>
<td>Defective winding rope</td>
<td>01</td>
</tr>
<tr>
<td>14.</td>
<td>Other defects in winding installation</td>
<td>01</td>
</tr>
<tr>
<td>15.</td>
<td>Defective shot-firing practices</td>
<td>00</td>
</tr>
<tr>
<td>16.</td>
<td>Others</td>
<td>10</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>38</td>
</tr>
</tbody>
</table>

1.7.2 Metalliferous Mines

In metalliferous mines inadequate benching and unstable slope in opencast workings and non-appointment of manager and supervisory officials in the mines were the main reasons for which improvement notices and prohibitory orders were issued. Notices issued under Sections 22(1) & 22A(1) of the Mines Act, 1952 during the year 2012 were 219 (Two hundred nineteen). Prohibitory orders under Sections 22(1A), 22A(2) and 22(3) issued in Metalliferous Mines during the year 2012 were 242 (Two hundred forty two). Details of the improvement notices and prohibitory orders issued during 2012 are given in table: 6 & 7 respectively.

TABLE:6

IMPROVEMENT NOTICES ISSUED UNDER SECTIONS 22(1) AND 22A(1) OF THE MINES ACT, 1952 IN METALLIFEROUS MINES DURING 2012

<table>
<thead>
<tr>
<th>SL.NO.</th>
<th>NATURE OF DEFECT</th>
<th>NO. OF CASES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Non-appointment of qualified manager and supervisory officials</td>
<td>113</td>
</tr>
<tr>
<td>2.</td>
<td>Inadequate benching and sloping in opencast workings</td>
<td>97</td>
</tr>
<tr>
<td>3.</td>
<td>Miscellaneous</td>
<td>09</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>219</td>
</tr>
</tbody>
</table>

TABLE:7

PROHIBITORY ORDERS ISSUED UNDER SECTIONS 22(3), 22A(2) & 22(1A) OF THE MINES ACT, 1952 ISSUED IN METALLIFEROUS MINES DURING 2012

<table>
<thead>
<tr>
<th>SL.NO.</th>
<th>NATURE OF DEFECT</th>
<th>NO. OF CASES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Non-appointment of qualified manager and supervisory officials</td>
<td>144</td>
</tr>
<tr>
<td>2.</td>
<td>Inadequate benching and sloping in opencast workings</td>
<td>95</td>
</tr>
<tr>
<td>3.</td>
<td>Miscellaneous</td>
<td>03</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>242</td>
</tr>
</tbody>
</table>
1.7.3 Oil Mines

03 (Three) notices issued under Sections 22(1) & 22A(1) of the Mines Act, 1952 during the year 2012. No prohibitory orders under Sections 22(1A), 22A(2) and 22(3) issued in Oil Mines during the year 2012. Details of the improvement notices and prohibitory orders issued during 2012 are given in table: 6A & 7A respectively.

<table>
<thead>
<tr>
<th>TABLE:6A</th>
<th>IMPROVEMENT NOTICES ISSUED UNDER SECTIONS 22(1) AND 22A(1) OF THE MINES ACT,1952 IN OIL MINES DURING 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>SL.NO.</td>
<td>NATURE OF DEFECT</td>
</tr>
<tr>
<td>1.</td>
<td>Non-appointment of qualified manager and supervisory officials</td>
</tr>
<tr>
<td>2.</td>
<td>Others</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TABLE:7A</th>
<th>PROHIBITORY ORDERS ISSUED UNDER SECTIONS 22(3), 22A(2) &amp; 22(1A) OF THE MINES ACT,1952 ISSUED IN OIL MINES DURING 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>SL.NO.</td>
<td>NATURE OF DEFECT</td>
</tr>
<tr>
<td>1.</td>
<td>Non-appointment of qualified manager and supervisory officials</td>
</tr>
<tr>
<td>2.</td>
<td>Others</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
</tr>
</tbody>
</table>
1.8 Permission, relaxations and exemptions

1.8.1 Coal Mines

849 (eight hundred forty nine) permissions/exemptions and relaxations were granted in coalmines during the year 2012. Details of such cases are given in table:8.

<table>
<thead>
<tr>
<th>TABLE:8</th>
<th>PERMISSIONS, RELAXATIONS &amp; EXEMPTIONS GRANTED IN COAL MINES DURING 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>SL.NO.</td>
<td>Particulars of Permissions, Relaxations &amp; Exemptions</td>
</tr>
<tr>
<td>1</td>
<td>Extraction of coal by methods other than bord &amp; pillar beneath areas free from surface features</td>
</tr>
<tr>
<td>2</td>
<td>Extraction of coal by methods other than bord &amp; pillar below surface features</td>
</tr>
<tr>
<td>3</td>
<td>Extraction of coal by bord &amp; pillar methods beneath areas free from surface features</td>
</tr>
<tr>
<td>4</td>
<td>Extraction of coal by bord &amp; pillar methods beneath surface features</td>
</tr>
<tr>
<td>5</td>
<td>Development below surface features including development in contiguous seams/sections</td>
</tr>
<tr>
<td>6</td>
<td>Blasting coal off the solid</td>
</tr>
<tr>
<td>7</td>
<td>Development within 60m. of waterlogged workings</td>
</tr>
<tr>
<td>8</td>
<td>Workings within 7.5m. / Adjustment of mine boundaries</td>
</tr>
<tr>
<td>9</td>
<td>Exemptions from different provisions of regulations</td>
</tr>
<tr>
<td>10</td>
<td>Others</td>
</tr>
<tr>
<td>TOTAL</td>
<td>849</td>
</tr>
</tbody>
</table>

1.8.2 Metalliferous Mines

2330 (Two thousand three hundred thirty) permissions/relaxations/exemptions under different provisions of the statutes were granted during the year 2012. Particulars are given in table:9.

<table>
<thead>
<tr>
<th>TABLE:9</th>
<th>PERMISSION, EXEMPTIONS &amp; RELAXATIONS GRANTED IN METALLIFEROUS MINES DURING 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>SL.NO.</td>
<td>Particulars of Permissions, Exemptions &amp; Relaxations</td>
</tr>
<tr>
<td>1</td>
<td>Stopping of blocks</td>
</tr>
<tr>
<td>2</td>
<td>Use of HEMM with deep hole blasting</td>
</tr>
<tr>
<td>3</td>
<td>Use of ANFO and/or more than one explosive in a shot hole</td>
</tr>
<tr>
<td>4</td>
<td>Working under railways and roads</td>
</tr>
<tr>
<td>5</td>
<td>Appointment of managers of more than one mine/ permit manager etc.</td>
</tr>
<tr>
<td>6</td>
<td>Appointment of surveyor of more than one mine</td>
</tr>
<tr>
<td>7</td>
<td>Others</td>
</tr>
<tr>
<td>TOTAL</td>
<td>2330</td>
</tr>
</tbody>
</table>

1.8.3 Oil Mines

433 (four hundred thirty three) permissions/relaxations/exemptions were granted during the year 2012 under various provisions of the Oil Mines Regulations, 1984. The details of such cases are given in table:10.

<table>
<thead>
<tr>
<th>TABLE:10</th>
<th>PERMISSION, EXEMPTIONS &amp; RELAXATIONS GRANTED IN OIL MINES DURING 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>SL.NO.</td>
<td>Particulars of Permissions, Exemptions &amp; Relaxations</td>
</tr>
<tr>
<td>1</td>
<td>Well head installations</td>
</tr>
<tr>
<td>2</td>
<td>Laying of oil pipe line</td>
</tr>
<tr>
<td>3</td>
<td>Notices under Regulation 51 for GGS/EPS etc.</td>
</tr>
<tr>
<td>TOTAL</td>
<td>433</td>
</tr>
</tbody>
</table>
1.9 Prosecutions

17 (seventeen) prosecutions were instituted in coal mines during the year 2012. In respect of non-coal mines, 92 (Ninety two) prosecutions were launched during 2012. Contraventions of provisions of statute for which these prosecutions were instituted are given in tables: 11 & 12.

Details of prosecution cases as on 31.12.2012.

<table>
<thead>
<tr>
<th>No. of prosecution launched during the year 2012.</th>
<th>No. of prosecution launched during the year 2012.</th>
<th>Total cases pending for 2012.</th>
<th>Total cases disposed during 2012.</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>92</td>
<td>1041</td>
<td>536</td>
</tr>
</tbody>
</table>

**TABLE:11 PROSECUTIONS INSTITUTED IN RESPECT OF COAL MINES DURING 2012**

<table>
<thead>
<tr>
<th>SL NO.</th>
<th>CONTRAVENTION</th>
<th>NO. OF CASES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Contraventions leading to accidents</td>
<td>16</td>
</tr>
<tr>
<td>2.</td>
<td>Non-submission or submission of incorrect plans, returns, notices etc.</td>
<td>-</td>
</tr>
<tr>
<td>3.</td>
<td>Non-appointment of qualified persons as senior supervisory officials</td>
<td>-</td>
</tr>
<tr>
<td>4.</td>
<td>Contraventions under Indian Electricity Act or Rules</td>
<td>-</td>
</tr>
<tr>
<td>5.</td>
<td>Other violation of serious nature</td>
<td>01</td>
</tr>
<tr>
<td>6.</td>
<td>Miscellaneous violations</td>
<td>-</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>17</strong></td>
</tr>
</tbody>
</table>

**TABLE:12 PROSECUTIONS INSTITUTED IN RESPECT OF NON-COAL MINES DURING 2012**

<table>
<thead>
<tr>
<th>SL NO.</th>
<th>CONTRAVENTION</th>
<th>NO. OF CASES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Contravention leading to accidents</td>
<td>17</td>
</tr>
<tr>
<td>2.</td>
<td>Contravention of orders under sections 22(1A), 22(3), Reg. 108 etc.</td>
<td>73</td>
</tr>
<tr>
<td>3.</td>
<td>Non-appointment of qualified persons as senior supervisory officials</td>
<td>-</td>
</tr>
<tr>
<td>4.</td>
<td>Non-appointment of qualified persons as subordinate supervisory officials</td>
<td>-</td>
</tr>
<tr>
<td>5.</td>
<td>Non-provisions of protective equipment</td>
<td>-</td>
</tr>
<tr>
<td>6.</td>
<td>Other miscellaneous contraventions</td>
<td>02</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>92</strong></td>
</tr>
</tbody>
</table>
2.0 Coal Mines

2.1 General

Number of operating coalmines during 2012 was 582 as compared to 592 in 2011. Company-wise number of coal mines and production is given in table: 13.

<table>
<thead>
<tr>
<th>COMPANY</th>
<th>Underground</th>
<th>Opencast</th>
<th>Both</th>
<th>Total</th>
<th>Production (in million tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal India Limited</td>
<td>270</td>
<td>162</td>
<td>30</td>
<td>462</td>
<td>440</td>
</tr>
<tr>
<td>Singareni Collieries Company Ltd.</td>
<td>40</td>
<td>18</td>
<td>1</td>
<td>59</td>
<td>73</td>
</tr>
<tr>
<td>Others</td>
<td>13</td>
<td>45</td>
<td>3</td>
<td>61</td>
<td>105</td>
</tr>
<tr>
<td>TOTAL</td>
<td>323</td>
<td>225</td>
<td>34</td>
<td>582</td>
<td>618</td>
</tr>
</tbody>
</table>

Table-14 shows the number of underground coalmines having gassy seams of different degrees.

<table>
<thead>
<tr>
<th>Degree of gassiness</th>
<th>Number of Mines during 2011</th>
<th>Number of Mines during 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>I only</td>
<td>249</td>
<td>237</td>
</tr>
<tr>
<td>II only</td>
<td>94</td>
<td>100</td>
</tr>
<tr>
<td>III only</td>
<td>14</td>
<td>7</td>
</tr>
<tr>
<td>I &amp; II</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>I &amp; III</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>II &amp; III</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>I, II &amp; III</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>370</td>
<td>353</td>
</tr>
</tbody>
</table>

*Figures for 2012 are provisional.

During the year total numbers of working mines have decreased from 592 in 2011 to 582 in 2012. Output of coal increased from 602 million tonnes in 2011 to 618 million tonnes in 2012. Coal mines under M/s. Coal India Limited contributed 440 million tonnes of coal during the year 2012. Average daily employment in mines decreased from 366,037 in 2011 to 358,123 in 2012. The output per manshift was increased from 5.15 in 2011 to 5.35 during 2012. Trend in average daily employment and output per man shift in coal mines is given in table- 15.
<table>
<thead>
<tr>
<th>Year</th>
<th>Belowground Employment (in '000 number)</th>
<th>Output (in '000 tonnes)</th>
<th>Opencast Employment (in '000 number)</th>
<th>Output (in '000 tonnes)</th>
<th>Above Ground Employment (in '000 number)</th>
<th>Output (in '000 tonnes)</th>
<th>Total Employment (in '000 number)</th>
<th>Output (in '000 tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1951</td>
<td>178</td>
<td>30199</td>
<td>36</td>
<td>4784</td>
<td>138</td>
<td>352</td>
<td>34983</td>
<td>0.35</td>
</tr>
<tr>
<td>1961</td>
<td>230</td>
<td>44887</td>
<td>60</td>
<td>10822</td>
<td>121</td>
<td>411</td>
<td>55709</td>
<td>0.45</td>
</tr>
<tr>
<td>1971</td>
<td>228</td>
<td>58552</td>
<td>43</td>
<td>17090</td>
<td>111</td>
<td>382</td>
<td>75642</td>
<td>0.67</td>
</tr>
<tr>
<td>1981</td>
<td>302</td>
<td>76205</td>
<td>55</td>
<td>51120</td>
<td>156</td>
<td>513</td>
<td>127325</td>
<td>0.81</td>
</tr>
<tr>
<td>1991</td>
<td>316</td>
<td>70731</td>
<td>67</td>
<td>167206</td>
<td>171</td>
<td>554</td>
<td>237757</td>
<td>1.40</td>
</tr>
<tr>
<td>1992</td>
<td>312</td>
<td>71062</td>
<td>67</td>
<td>178879</td>
<td>173</td>
<td>552</td>
<td>249941</td>
<td>1.47</td>
</tr>
<tr>
<td>1993</td>
<td>308</td>
<td>73672</td>
<td>68</td>
<td>189335</td>
<td>170</td>
<td>546</td>
<td>260607</td>
<td>1.53</td>
</tr>
<tr>
<td>1994</td>
<td>293</td>
<td>70644</td>
<td>67</td>
<td>196878</td>
<td>164</td>
<td>524</td>
<td>267522</td>
<td>1.63</td>
</tr>
<tr>
<td>1995</td>
<td>287</td>
<td>68512</td>
<td>68</td>
<td>216074</td>
<td>158</td>
<td>513</td>
<td>284586</td>
<td>1.80</td>
</tr>
<tr>
<td>1996</td>
<td>281</td>
<td>70127</td>
<td>68</td>
<td>233970</td>
<td>157</td>
<td>506</td>
<td>304097</td>
<td>1.91</td>
</tr>
<tr>
<td>1997</td>
<td>279</td>
<td>69062</td>
<td>68</td>
<td>247619</td>
<td>156</td>
<td>503</td>
<td>316681</td>
<td>2.01</td>
</tr>
<tr>
<td>1998</td>
<td>270</td>
<td>68571</td>
<td>69</td>
<td>251324</td>
<td>152</td>
<td>491</td>
<td>319895</td>
<td>2.09</td>
</tr>
<tr>
<td>1999</td>
<td>258</td>
<td>68101</td>
<td>71</td>
<td>247088</td>
<td>147</td>
<td>476</td>
<td>315189</td>
<td>2.12</td>
</tr>
<tr>
<td>2000</td>
<td>249</td>
<td>66225</td>
<td>69</td>
<td>268092</td>
<td>140</td>
<td>458</td>
<td>334317</td>
<td>2.34</td>
</tr>
<tr>
<td>2001</td>
<td>239</td>
<td>64134</td>
<td>69</td>
<td>277379</td>
<td>130</td>
<td>438</td>
<td>341513</td>
<td>2.51</td>
</tr>
<tr>
<td>2002</td>
<td>225</td>
<td>65330</td>
<td>69</td>
<td>297982</td>
<td>129</td>
<td>423</td>
<td>363312</td>
<td>2.75</td>
</tr>
<tr>
<td>2003</td>
<td>216</td>
<td>63632</td>
<td>69</td>
<td>315556</td>
<td>132</td>
<td>417</td>
<td>379188</td>
<td>2.91</td>
</tr>
<tr>
<td>2004</td>
<td>211</td>
<td>61921</td>
<td>70</td>
<td>347347</td>
<td>124</td>
<td>405</td>
<td>407268</td>
<td>3.19</td>
</tr>
<tr>
<td>2005</td>
<td>205</td>
<td>64087</td>
<td>70</td>
<td>356758</td>
<td>124</td>
<td>399</td>
<td>420845</td>
<td>3.35</td>
</tr>
<tr>
<td>2006</td>
<td>196</td>
<td>61213</td>
<td>76</td>
<td>369120</td>
<td>114</td>
<td>386</td>
<td>430333</td>
<td>3.50</td>
</tr>
<tr>
<td>2007</td>
<td>188</td>
<td>62302</td>
<td>80</td>
<td>418821</td>
<td>111</td>
<td>379</td>
<td>481123</td>
<td>3.95</td>
</tr>
<tr>
<td>2008</td>
<td>187</td>
<td>66290</td>
<td>77</td>
<td>440004</td>
<td>105</td>
<td>369</td>
<td>506294</td>
<td>4.25</td>
</tr>
<tr>
<td>2009</td>
<td>186</td>
<td>66835</td>
<td>80</td>
<td>491982</td>
<td>108</td>
<td>374</td>
<td>558817</td>
<td>4.67</td>
</tr>
<tr>
<td>2010</td>
<td>182</td>
<td>69998</td>
<td>83</td>
<td>531880</td>
<td>105</td>
<td>370</td>
<td>601878</td>
<td>5.05</td>
</tr>
<tr>
<td>2011</td>
<td>178</td>
<td>69032</td>
<td>86</td>
<td>538240</td>
<td>102</td>
<td>366</td>
<td>607272</td>
<td>5.15</td>
</tr>
<tr>
<td>2012</td>
<td>172</td>
<td>63341</td>
<td>88</td>
<td>553628</td>
<td>98</td>
<td>358</td>
<td>617969</td>
<td>5.35</td>
</tr>
</tbody>
</table>

Note: Figures for 2012 are provisional.
2.2 Accidents

2.2.1 Major Accidents

There was no major accident in coal mines during the year 2012.

2.2.2 Accident scenario

During the year 2012, number of fatal accidents and fatalities increased in compared to the year 2011. Number of fatal accidents during the year 2012 was 83 and number of fatalities was 87 whereas in the year 2011, number of fatal accidents and fatalities were 65 and 67 respectively.

Table 16 indicates the trend of accidents and rates of fatalities.

<table>
<thead>
<tr>
<th>YEAR</th>
<th>Av. No. of accidents</th>
<th>Accident rate</th>
<th>Av. No. of fatality</th>
<th>Fatality rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1901-1910</td>
<td>74</td>
<td>0.77</td>
<td>92</td>
<td>0.94</td>
</tr>
<tr>
<td>1911-1920</td>
<td>138</td>
<td>0.94</td>
<td>176</td>
<td>1.29</td>
</tr>
<tr>
<td>1921-1930</td>
<td>174</td>
<td>0.99</td>
<td>219</td>
<td>1.24</td>
</tr>
<tr>
<td>1931-1940</td>
<td>172</td>
<td>0.98</td>
<td>228</td>
<td>1.33</td>
</tr>
<tr>
<td>1941-1950</td>
<td>236</td>
<td>0.87</td>
<td>273</td>
<td>1.01</td>
</tr>
<tr>
<td>1951-1960</td>
<td>222</td>
<td>0.61</td>
<td>295</td>
<td>0.82</td>
</tr>
<tr>
<td>1961-1970</td>
<td>202</td>
<td>0.48</td>
<td>260</td>
<td>0.62</td>
</tr>
<tr>
<td>1971-1980</td>
<td>187</td>
<td>0.46</td>
<td>264</td>
<td>0.55</td>
</tr>
<tr>
<td>1981-1990</td>
<td>162</td>
<td>0.30</td>
<td>186</td>
<td>0.35</td>
</tr>
<tr>
<td>1991-2000</td>
<td>140</td>
<td>0.27</td>
<td>170</td>
<td>0.33</td>
</tr>
<tr>
<td>2001-2010</td>
<td>87</td>
<td>0.22</td>
<td>108</td>
<td>0.27</td>
</tr>
<tr>
<td>2011-2012</td>
<td>74</td>
<td>0.20</td>
<td>77</td>
<td>0.21</td>
</tr>
</tbody>
</table>

Table 17 gives year-wise fatal accidents, fatalities, and death rates in coal mines.

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of fatal accidents</th>
<th>No. of fatalities</th>
<th>Death Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Per '000 persons employed</td>
<td>Per 100,000 manshifts worked</td>
<td>Per million tonnes output</td>
</tr>
<tr>
<td>1951</td>
<td>278</td>
<td>319</td>
<td>0.91</td>
</tr>
<tr>
<td>1961</td>
<td>222</td>
<td>268</td>
<td>0.65</td>
</tr>
<tr>
<td>1971</td>
<td>199</td>
<td>231</td>
<td>0.60</td>
</tr>
<tr>
<td>1981</td>
<td>165</td>
<td>184</td>
<td>0.36</td>
</tr>
<tr>
<td>1991</td>
<td>138</td>
<td>143</td>
<td>0.26</td>
</tr>
<tr>
<td>2001</td>
<td>105</td>
<td>141</td>
<td>0.32</td>
</tr>
<tr>
<td>2002</td>
<td>81</td>
<td>97</td>
<td>0.23</td>
</tr>
<tr>
<td>2003</td>
<td>83</td>
<td>113</td>
<td>0.27</td>
</tr>
<tr>
<td>2004</td>
<td>87</td>
<td>96</td>
<td>0.24</td>
</tr>
<tr>
<td>2005</td>
<td>96</td>
<td>117</td>
<td>0.29</td>
</tr>
<tr>
<td>2006</td>
<td>78</td>
<td>137</td>
<td>0.36</td>
</tr>
<tr>
<td>2007</td>
<td>76</td>
<td>78</td>
<td>0.21</td>
</tr>
<tr>
<td>2008</td>
<td>80</td>
<td>93</td>
<td>0.25</td>
</tr>
<tr>
<td>2009</td>
<td>83</td>
<td>93</td>
<td>0.25</td>
</tr>
<tr>
<td>2010</td>
<td>97</td>
<td>118</td>
<td>0.32</td>
</tr>
<tr>
<td>2011</td>
<td>65</td>
<td>67</td>
<td>0.18</td>
</tr>
<tr>
<td>2012</td>
<td>83</td>
<td>87</td>
<td>0.24</td>
</tr>
</tbody>
</table>

In the year 2012, number of serious accidents decreased compared to that of the year 2011. Number of serious accidents and number of persons injured during 2012 were 515 and 526 as compared to 534 and 557 respectively during the year 2011. As far as the serious accident rate is concerned, it has decreased. The serious injury rate per thousand persons employed in 2012 was 1.44 as compared to 1.52 in 2011. The rate per lakh manshift worked has
decreased to 0.45 in 2012 from 0.47 in 2011. The rate per million tonnes output decreased to 0.87 in 2012 from 0.92 in 2011. Table 18 gives year-wise number of serious accidents, no. of persons injured and serious injury rate.

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of serious accidents</th>
<th>No. of persons seriously injured</th>
<th>Per '000 persons employed</th>
<th>Per 100,000 manshifts worked</th>
<th>Per million tonnes output</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>667</td>
<td>720</td>
<td>1.64</td>
<td>0.53</td>
<td>2.10</td>
</tr>
<tr>
<td>2002</td>
<td>629</td>
<td>665</td>
<td>1.57</td>
<td>0.50</td>
<td>1.83</td>
</tr>
<tr>
<td>2003</td>
<td>563</td>
<td>590</td>
<td>1.42</td>
<td>0.45</td>
<td>1.56</td>
</tr>
<tr>
<td>2004</td>
<td>962</td>
<td>991</td>
<td>2.45</td>
<td>0.77</td>
<td>2.42</td>
</tr>
<tr>
<td>2005</td>
<td>1106</td>
<td>1138</td>
<td>2.85</td>
<td>0.91</td>
<td>2.70</td>
</tr>
<tr>
<td>2006</td>
<td>861</td>
<td>891</td>
<td>2.31</td>
<td>0.73</td>
<td>2.07</td>
</tr>
<tr>
<td>2007</td>
<td>923</td>
<td>951</td>
<td>2.51</td>
<td>0.78</td>
<td>1.98</td>
</tr>
<tr>
<td>2008</td>
<td>686</td>
<td>709</td>
<td>1.92</td>
<td>0.59</td>
<td>1.40</td>
</tr>
<tr>
<td>2009</td>
<td>636</td>
<td>660</td>
<td>1.76</td>
<td>0.55</td>
<td>1.18</td>
</tr>
<tr>
<td>2010</td>
<td>480</td>
<td>511</td>
<td>1.38</td>
<td>0.43</td>
<td>0.85</td>
</tr>
<tr>
<td>2011*</td>
<td>534</td>
<td>557</td>
<td>1.52</td>
<td>0.47</td>
<td>0.92</td>
</tr>
<tr>
<td>2012*</td>
<td>515</td>
<td>526</td>
<td>1.44</td>
<td>0.45</td>
<td>0.87</td>
</tr>
</tbody>
</table>

* Provisional

Note: No. of seriously injured of fatal accidents are also considered for computation of no. of persons seriously injured & serious injury rates.

2.2.3 Analysis of accidents

All fatal accidents and major serious accidents were inquired into by officers of DGMS. An analysis of accidents enumerated in the following paragraphs is based on the findings of such enquiry and information submitted by the mine management.

2.2.3A By place

Total 83 fatal accidents involving 87 fatalities occurred during the year 2012 as compared to 65 fatal accidents and 67 fatalities during the year 2011. Overall fatality rate has increased in 2012 as compared to the year 2011. Overall serious injury rate during the year 2012 has decreased to 1.44 from 1.52 in 2011. 25(30%) fatal accidents occurred in belowground workings with fatality rate of 0.16, 39(47%) in opencast workings with fatality rate of 0.47 and 19(23%) in aboveground with fatality rate of 0.19 during the year 2012. Table 19 gives the trend of fatal and serious accidents with fatality rate in different working places.
### TABLE: 19

**TREND IN FATAL & SERIOUS ACCIDENTS AND DEATH & SERIOUS INJURY RATES; (PLACEWISE) - COAL MINES PER THOUSAND PERSONS EMPLOYED**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>Fatal accidents &amp; death rates</th>
<th>Serious accidents &amp; ser. injury rates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Below ground</td>
<td>Open cast</td>
</tr>
<tr>
<td>2001</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>67 (0.43)</td>
<td>26 (0.38)</td>
</tr>
<tr>
<td>2002</td>
<td>48 (0.27)</td>
<td>22 (0.32)</td>
</tr>
<tr>
<td>2003</td>
<td>46 (0.33)</td>
<td>23 (0.35)</td>
</tr>
<tr>
<td>2004</td>
<td>49 (0.27)</td>
<td>32 (0.47)</td>
</tr>
<tr>
<td>2005</td>
<td>50 (0.34)</td>
<td>28 (0.42)</td>
</tr>
<tr>
<td>2006</td>
<td>44 (0.52)</td>
<td>24 (0.33)</td>
</tr>
<tr>
<td>2007</td>
<td>25 (0.13)</td>
<td>35 (0.46)</td>
</tr>
<tr>
<td>2008</td>
<td>32 (0.21)</td>
<td>29 (0.45)</td>
</tr>
<tr>
<td>2009</td>
<td>39 (0.25)</td>
<td>29 (0.40)</td>
</tr>
<tr>
<td>2010</td>
<td>41 (0.33)</td>
<td>40 (0.51)</td>
</tr>
<tr>
<td>2011*</td>
<td>23 (0.13)</td>
<td>29 (0.35)</td>
</tr>
<tr>
<td>2012*</td>
<td>25 (0.16)</td>
<td>39 (0.47)</td>
</tr>
</tbody>
</table>

* Provisional

Note: i) Figures in bracket indicate death/injury rate.

ii) No. of seriously injured of fatal accidents are also considered for computation of no. of persons seriously injured & serious injury rates.

2.2.3B By cause

Tables 20 & 21 give the trend in fatal and serious accidents in coal mines due to different causes during the year 2012 followed by graphical representation. As can be seen 33(40%) of fatal accidents were caused by transportation machinery (other than winding), 12(14%) due to machinery other than transportation machinery, 11(13%) due to ground movement, 10(12%) due to falls other than fall of ground and and 3(4%) each in explosives, electricity and Gas dust etc., 1(1%) in winding in shaft and other contributed 7(8%). 515 serious accidents occurred during the year out of which 251(49%) were caused by falls other than falls of ground.
### TABLE: 20
**TREND IN FATAL ACCIDENTS DUE TO DIFFERENT CAUSES IN COAL MINES**

<table>
<thead>
<tr>
<th>Cause</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011*</th>
<th>2012*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground movement</td>
<td>21 (28)</td>
<td>26 (32)</td>
<td>22 (26)</td>
<td>15 (16)</td>
<td>11 (12)</td>
</tr>
<tr>
<td>Winding in shafts</td>
<td>1 (1)</td>
<td>-</td>
<td>-</td>
<td>1 (1)</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Transportation machinery (other than winding)</td>
<td>28 (29)</td>
<td>31 (31)</td>
<td>41 (44)</td>
<td>28 (29)</td>
<td>33 (33)</td>
</tr>
<tr>
<td>Machinery other than transportation machinery</td>
<td>10 (10)</td>
<td>15 (15)</td>
<td>7 (7)</td>
<td>6 (6)</td>
<td>12 (12)</td>
</tr>
<tr>
<td>Explosive</td>
<td>1 (1)</td>
<td>-</td>
<td>2 (16)</td>
<td>1 (1)</td>
<td>3 (3)</td>
</tr>
<tr>
<td>Electricity</td>
<td>5 (6)</td>
<td>2 (2)</td>
<td>8 (8)</td>
<td>5 (5)</td>
<td>3 (3)</td>
</tr>
<tr>
<td>Gas, Dust etc.</td>
<td>2 (6)</td>
<td>2 (4)</td>
<td>1 (1)</td>
<td>-</td>
<td>3 (5)</td>
</tr>
<tr>
<td>Falls other than fall of ground</td>
<td>10 (10)</td>
<td>4 (4)</td>
<td>10 (10)</td>
<td>5 (5)</td>
<td>10 (10)</td>
</tr>
<tr>
<td>Other causes</td>
<td>2 (2)</td>
<td>3 (5)</td>
<td>6 (6)</td>
<td>4 (4)</td>
<td>7 (8)</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>80 (93)</td>
<td>83 (93)</td>
<td>97 (118)</td>
<td>65 (67)</td>
<td>83 (87)</td>
</tr>
</tbody>
</table>

Note: Figures in parentheses denote the number of persons killed.
* Figures are provisional

---

### TABLE: 20A
**TREND IN FATAL ACCIDENTS IN DIFFERENT PLACES OF COAL MINES**

<table>
<thead>
<tr>
<th>Place</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011*</th>
<th>2012*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belowground</td>
<td>32 (39)</td>
<td>39 (46)</td>
<td>41 (60)</td>
<td>23 (24)</td>
<td>25 (28)</td>
</tr>
<tr>
<td>Opencast</td>
<td>29 (35)</td>
<td>29 (32)</td>
<td>40 (42)</td>
<td>29 (30)</td>
<td>39 (40)</td>
</tr>
<tr>
<td>Aboveground</td>
<td>19 (19)</td>
<td>15 (15)</td>
<td>16 (16)</td>
<td>13 (13)</td>
<td>19 (19)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>80 (93)</td>
<td>83 (93)</td>
<td>97 (118)</td>
<td>65 (67)</td>
<td>83 (87)</td>
</tr>
</tbody>
</table>

Note: Figures in parentheses denote the number of persons killed.
* Figures are provisional

---

**Trend in Fatal Accidents due to different causes in Coal Mines during 2012**

- **Ground movement**: 13% (40% of other causes)
- **Winding in shafts**: 1% (4% of other causes)
- **Transportation machinery (other than winding)**: 40% (7% of other causes)
- **Machinery other than transportation machinery**: 14% (4% of other causes)
- **Electricity**: 4% (2% of other causes)
- **Explosive**: 4% (7% of other causes)
- **Gas, Dust etc.**: 4% (1% of other causes)
- **Falls other than fall of ground**: 12% (10% of other causes)
- **Other causes**: 8% (4% of other causes)

---

---

**Total**: 83 (87)

---
**TABLE: 21**

<table>
<thead>
<tr>
<th>Cause</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011*</th>
<th>2012*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground movement</td>
<td>69 (73)</td>
<td>57 (68)</td>
<td>53 (62)</td>
<td>39 (50)</td>
<td>41 (46)</td>
</tr>
<tr>
<td>Winding in shafts</td>
<td>0 (0)</td>
<td>3 (4)</td>
<td>-</td>
<td>14 (19)</td>
<td>4 (5)</td>
</tr>
<tr>
<td>Transportation machinery (other than winding)</td>
<td>126 (128)</td>
<td>103 (108)</td>
<td>72 (84)</td>
<td>90 (94)</td>
<td>73 (74)</td>
</tr>
<tr>
<td>Machinery other than transportation machinery</td>
<td>40 (42)</td>
<td>36 (37)</td>
<td>24 (24)</td>
<td>33 (34)</td>
<td>21 (21)</td>
</tr>
<tr>
<td>Explosive</td>
<td>1 (1)</td>
<td>3 (5)</td>
<td>5 (11)</td>
<td>3 (4)</td>
<td>0 (1)</td>
</tr>
<tr>
<td>Electricity</td>
<td>0 (0)</td>
<td>2 (2)</td>
<td>3 (3)</td>
<td>1 (1)</td>
<td>3 (3)</td>
</tr>
<tr>
<td>Gas, Dust etc.</td>
<td>0 (14)</td>
<td>1 (2)</td>
<td>-</td>
<td>-</td>
<td>1 (3)</td>
</tr>
<tr>
<td>Falls other than fall of ground</td>
<td>351 (352)</td>
<td>309 (312)</td>
<td>221 (223)</td>
<td>247 (248)</td>
<td>251 (251)</td>
</tr>
<tr>
<td>Other causes</td>
<td>99 (99)</td>
<td>122 (122)</td>
<td>102 (104)</td>
<td>107 (107)</td>
<td>121 (122)</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>686 (709)</td>
<td>636 (660)</td>
<td>480 (511)</td>
<td>534 (557)</td>
<td>515 (526)</td>
</tr>
</tbody>
</table>

* Figures are provisional

Note: Figures in parentheses denote the number of persons seriously injured and it includes seriously injured from fatal accidents also.

---

**TABLE: 21A**

<table>
<thead>
<tr>
<th>Place</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011*</th>
<th>2012*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belowground</td>
<td>516 (536)</td>
<td>490 (506)</td>
<td>348 (370)</td>
<td>379 (397)</td>
<td>361 (368)</td>
</tr>
<tr>
<td>Opencast</td>
<td>74 (76)</td>
<td>50 (54)</td>
<td>62 (69)</td>
<td>74 (79)</td>
<td>58 (62)</td>
</tr>
<tr>
<td>Aboveground</td>
<td>96 (97)</td>
<td>96 (100)</td>
<td>70 (72)</td>
<td>81 (81)</td>
<td>96 (96)</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>686 (709)</td>
<td>636 (660)</td>
<td>480 (511)</td>
<td>534 (557)</td>
<td>515 (526)</td>
</tr>
</tbody>
</table>

* Figures are provisional

Note: Figures in parentheses denote the number of persons seriously injured and it includes seriously injured from fatal accidents also.
2.2.3B.1 Ground movement

During the year 2012, ground movement accounted for 11(13%) fatal accidents and 41(8%) serious accidents. Further break-up of fatal accidents due to ground movement is given in table 22.

<table>
<thead>
<tr>
<th>Cause</th>
<th>No. of accidents</th>
<th>Persons killed</th>
<th>Persons seriously inj.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fall of roof</td>
<td>5</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>2. Fall of side</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) belowground</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>(b) opencast</td>
<td>2</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Sub-Total</td>
<td>5</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>3. Others</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) bumps</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>(b) air blast</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>(c) land slide</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>(d) collapse of pillar</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>(e) over hang</td>
<td>1</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Sub-Total</td>
<td>1</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>GRAND TOTAL</td>
<td>11</td>
<td>12</td>
<td>3</td>
</tr>
</tbody>
</table>

2.2.3 B.2 Roof fall

Strata control is a major problem affecting safety and productivity in underground mines. Experience of the past clearly brings out that roof fall is one of the predominant causes of fatalities in bel owground coal mines and that trend continues even today. There were 11 accidents due to ground movement involving 12 fatalities and 03 serious injuries during the year 2012, out of which 5 accidents were due to fall of roof, 5 accidents were due to fall of side and 1 due to over hang. Roof fall accidents accounted for 6% of all fatal accidents in coal mines and it contributed 20% of all fatal accidents in belowground operations. Further critical analysis of roof fall accidents for the last five years 2008 to 2012 revealed the following:

I. Physical and Working Condition factors

1. **Method of work:** Accident mainly occurred in Depillaring districts. 38% (26% in caving district and 12% in stowing district) of the fatal accidents occurred in Depillaring district, 48% in Board & Pillar development and 14% in other places.

2. **Height of working:** 52% of the fatal accidents occurred in gallery height upto 3m, 28% in 3m to 5m and 5% above 5m.

3. **Width of gallery:** 1% of the fatal accidents occurred in width of galleries between 0 - 3.0 m and 1% between 3.01 m - 3.50 m. 11% between 3.51-4.00 m, 53% between 4.01 - 4.50 m and 28% occurred in width of galleries above 4.50 m.

4. **Distance from face:** 37% of the accidents occurred within 5m of the working face and 19% between 5.01 to 10m, 7% between 10.01 to 20.00m and 20% above 20.01m. Thus 56% of the accident occurred within 10m of the freshly exposed roof from the working face.

5. **Type of support:** 14% of the fatal accidents occurred in areas supported by timber support only, 5% in timber and steel support, 17% in areas supported by roof bolts &
others and 64% in other supports. However, areas supported by roof bolts seems to be prone for roof fall. Steel supports, especially roof bolts, are more stable if they are fixed properly and in time.

6. **Adequacy of support:** Accident analysis revealed that in 64% of cases supports provided was inadequate, which means sufficient number of supports were not provided before engaging persons at work and majority of the accidents could have been averted had proper supports been provided before engaging the persons at work and front line supervisors been attentive for providing adequate supports. It also reveals that in 31% cases accident occurred although adequate support was provided.

7. **Operation at the time of accident:** 15% of the fatal accidents occurred during each of loading (manual) and dressing operation, 7% during each of drilling, loading by machine, supporting and withdrawal of supporting operation and 6% during inspecting, Thus 44% of the accidents occurred during primary job of face preparation and manual loading. This can be avoided by adequately training the face workers for paying more attention towards identification of bad roof and testing for its weakness and by providing temporary supports before erecting permanent support. 27% of the fatal accidents occurred due to other activities.

8. **Time elapsed after blasting:** 25% of the roof fall accidents occurred within 30 minutes of blasting operation which correlates with the operation at the time of accident as mentioned above. This also means that sufficient time was not allowed for the roof to settle before engaging persons. 10% of the fatal accidents occurred between $\frac{1}{2}$ - 1 hour, 9% between 1 to 2 hours and 31% of the fatal accidents occurred beyond 2 hours of blasting operation and in 25% of cases no blasting operation was carried out.

II. **Geological factors**

9. **Thickness of seam:** 44% of the fatal accidents occurred in coal seam having thickness upto 3.0 m., 23% in 3 to 6 m. and 9% each in seams with thickness between 6-9m and above 9m. Thus roof fall occurred in all types of coal seams irrespective of their thickness but seams with higher thickness have lesser share in total accidents.

10. **Depth of cover:** 33% of the fatal accidents accounted in depth of cover 0 to 100m, 25% between 101 to 200m, 23% between 201 to 300m, 9% between 301 to 400m and 4% occurred above 400m.

11. **Thickness of fall:** 13% of the fatal accidents occurred having thickness of fallen strata varying between 0 to 0.15m, 37% between 0.16 to 0.3m. Thus 50% of accidents had thickness of fall between 0 to 0.3m. 30% of fatal accident occurred having thickness of fallen strata between 0.31 to 1.0 m thick and 15% occurred beyond 1.00m thick.
Fall of roof was mainly due to geological reasons such as presence of slicken sides, hidden slip planes, or due to weathering of strata etc. which could have been effectively controlled had adequate and timely supports been provided.

12. **Nature of fallen strata:** 40% of the fatal accidents occurred due to fall of sand stone roof, 30% due to coal and 39% due to shale and rest of the fatal accidents occurred due to combination of any two. It indicates that practically all types of roof are likely to fall in absence of adequate supports.

**III. Personal factors -**

13. **Designation:** 33% of the persons involved in roof fall accidents were loader, 22% support personnel, 9% of subordinate supervisory staff, 12% dresser, 5% driller and others 16%. Mainly face workers were involved in the accidents as they are first to approach the face and stay beneath the green roof areas for longer duration.

14. **Age:** In 34% of the total accidents persons involved were in the age group of 46-50 years, 17% between 51-55 years, 15% each between 41-45 years and 56-60 years, 7% between 31-35, 6% between 36-40 years and 3% each between 21-25 and 26-30 years.

15. **Shift of working:** 48% of the fatal accidents took place in 1st shift, 27% in 2nd shift and 25% in 3rd shift. Thus it is observed that roof fall occurred mainly in first shift due to more number of persons employed during day time.

16. **Hours at work:** 37% of the roof fall accidents occurred during 2.01 -3.00, 15% each between 3.01 – 4.00 and between 5.01 – 6.00 hours, 10% between 4.01 – 5.00 and 9% between 6.01-7.00 hours. Thus 77% of the roof fall accidents occurred between 2.01 hours to sixth hours of the shift.

**IV. Management factors -**

17. **Responsibility:** 43% of the fatal accidents were caused due to fault of management and Subordinate Supervisory Staff; 13% of the fatal accidents due to fault of Subordinate Supervisory Staff alone, 10% due to fault of management, SSS & deceased and 7% of the cases management & others. In 6% of cases deceased was responsible.

18. **Company:** Company-wise analysis indicates that 75% of roof fall accident occurred in CIL whereas 20% occurred in SCCL. CIL subsidiary-wise 28% of fatal accidents occurred in SECL, 17% in WCL, 12% in BCCL, 15% in ECL and 1% in MCL and 2% in CCL.
Detailed statistical analysis of roof fall accidents that occurred during last 5 years are given in tabular as well as graphically in the following tables:

1. Distribution of fatal roof fall accidents by method of work

<table>
<thead>
<tr>
<th>Method of work</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2012</th>
<th>2012</th>
<th>total</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Board &amp; Pillar Development</td>
<td>7</td>
<td>10</td>
<td>11</td>
<td>7</td>
<td>4</td>
<td>39</td>
<td>48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Longwall Depillaring</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Caving</td>
<td>5</td>
<td>36</td>
<td>6</td>
<td>25</td>
<td>6</td>
<td>29</td>
<td>3</td>
<td>33</td>
<td>21</td>
</tr>
<tr>
<td>Stowing</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>25</td>
<td>1</td>
<td>5</td>
<td>15</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>Total Depillaring</td>
<td>5</td>
<td>36</td>
<td>50</td>
<td>7</td>
<td>33</td>
<td>23</td>
<td>4</td>
<td>44</td>
<td>31</td>
</tr>
<tr>
<td>Longwall Development</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Caving</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Stowing</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total Longwall</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other Places</td>
<td>2</td>
<td>14</td>
<td>2</td>
<td>8</td>
<td>3</td>
<td>14</td>
<td>3</td>
<td>23</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>100</td>
<td>24</td>
<td>100</td>
<td>21</td>
<td>100</td>
<td>13</td>
<td>100</td>
<td>9</td>
</tr>
</tbody>
</table>

![Graphical representation of the data](image)

Analysis by Method of Work

- Other Places, 11, 14%
- Depillaring Caving, 21, 26%
- Board & Pillar Development, 39, 48%
- Depillaring Stowing, 10, 12%
- Longwall Development
- Longwall Depillaring Caving
- Longwall Depillaring Stowing
- Other Places

![Graphical representation of the data](image)
2. Distribution of fatal roof fall accidents by height of working

<table>
<thead>
<tr>
<th>Height of working (metres)</th>
<th>Number of accidents</th>
<th>2008</th>
<th>%</th>
<th>2009</th>
<th>%</th>
<th>2010</th>
<th>%</th>
<th>2011</th>
<th>%</th>
<th>2012</th>
<th>%</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 2</td>
<td></td>
<td>4</td>
<td>29</td>
<td>2</td>
<td>8</td>
<td>2</td>
<td>9</td>
<td>1</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>2 - 3</td>
<td></td>
<td>7</td>
<td>50</td>
<td>16</td>
<td>67</td>
<td>12</td>
<td>57</td>
<td>2</td>
<td>15</td>
<td>5</td>
<td>56</td>
<td>42</td>
<td>52</td>
</tr>
<tr>
<td>3 - 5</td>
<td></td>
<td>3</td>
<td>21</td>
<td>5</td>
<td>21</td>
<td>6</td>
<td>29</td>
<td>6</td>
<td>46</td>
<td>3</td>
<td>33</td>
<td>23</td>
<td>28</td>
</tr>
<tr>
<td>5 &amp; above</td>
<td></td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>8</td>
<td>1</td>
<td>11</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>not available</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>23</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>14</td>
<td>100</td>
<td>24</td>
<td>100</td>
<td>21</td>
<td>100</td>
<td>13</td>
<td>100</td>
<td>9</td>
<td>100</td>
<td>81</td>
<td>100</td>
</tr>
</tbody>
</table>

Analysis by Height of Working

- 0 - 2: 9%, 11%
- 2 - 3: 42%, 52%
- 3 - 5: 52%
- 5 & above: 28%

2. Distribution of fatal roof fall accidents by width of gallery

<table>
<thead>
<tr>
<th>Width of Gallery (metres)</th>
<th>Number of accidents</th>
<th>2008</th>
<th>%</th>
<th>2009</th>
<th>%</th>
<th>2010</th>
<th>%</th>
<th>2011</th>
<th>%</th>
<th>2012</th>
<th>%</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00 - 2.00</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2.01 - 3.00</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3.01 - 3.50</td>
<td></td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>3.51 - 4.00</td>
<td></td>
<td>3</td>
<td>21</td>
<td>4</td>
<td>17</td>
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<td>5</td>
<td>1</td>
<td>8</td>
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<td>0</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>4.01 - 4.50</td>
<td></td>
<td>8</td>
<td>58</td>
<td>11</td>
<td>46</td>
<td>12</td>
<td>57</td>
<td>6</td>
<td>46</td>
<td>6</td>
<td>67</td>
<td>43</td>
<td>54</td>
</tr>
<tr>
<td>4.51 &amp; above</td>
<td></td>
<td>3</td>
<td>21</td>
<td>7</td>
<td>29</td>
<td>8</td>
<td>38</td>
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<td>15</td>
<td>3</td>
<td>33</td>
<td>23</td>
<td>28</td>
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<tr>
<td>not applicable</td>
<td></td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>23</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>14</td>
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<td>100</td>
<td>13</td>
<td>100</td>
<td>9</td>
<td>100</td>
<td>81</td>
<td>100</td>
</tr>
</tbody>
</table>

Analysis by Width of Gallery

- not applicable: 4%, 5%
- 0.00 - 2.00: 1%, 1%
- 3.01 - 3.50: 5%, 11%

21
4. Distribution of fatal roof fall accidents by distance from face

<table>
<thead>
<tr>
<th>Distance from face (metres)</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00- 5.00</td>
<td>6</td>
<td>7</td>
<td>9</td>
<td>43</td>
<td>7</td>
<td>1</td>
<td>30</td>
</tr>
<tr>
<td>5.01- 10.00</td>
<td>1</td>
<td>7</td>
<td>4</td>
<td>19</td>
<td>1</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>10.01- 20.00</td>
<td>3</td>
<td>21</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>20.01 &amp; above</td>
<td>3</td>
<td>21</td>
<td>4</td>
<td>17</td>
<td>6</td>
<td>29</td>
<td>3</td>
</tr>
<tr>
<td>not applicable/available</td>
<td>1</td>
<td>7</td>
<td>5</td>
<td>21</td>
<td>2</td>
<td>9</td>
<td>4</td>
</tr>
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<td>Total</td>
<td>14</td>
<td>100</td>
<td>24</td>
<td>100</td>
<td>21</td>
<td>100</td>
<td>13</td>
</tr>
</tbody>
</table>

5. Distribution of fatal roof fall accidents by type of roof support

<table>
<thead>
<tr>
<th>Type of support</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No support</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Timber supports only</td>
<td>1</td>
<td>7</td>
<td>4</td>
<td>17</td>
<td>6</td>
<td>29</td>
<td>0</td>
</tr>
<tr>
<td>Timber and steel supports</td>
<td>1</td>
<td>7</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Roof bolts and others</td>
<td>1</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>54</td>
</tr>
<tr>
<td>Other supports</td>
<td>11</td>
<td>79</td>
<td>19</td>
<td>79</td>
<td>14</td>
<td>66</td>
<td>46</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>100</td>
<td>24</td>
<td>100</td>
<td>21</td>
<td>100</td>
<td>9</td>
</tr>
</tbody>
</table>

Analysis by Type of Support

- Other supports, 52, 64%
- Roof bolts and others, 14, 17%
- Timber and steel supports, 4, 5%
- Timber supports only, 11, 14%
6. Distribution of fatal roof fall accidents by adequacy of support

<table>
<thead>
<tr>
<th>Adequacy of support</th>
<th>Number of accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2008</td>
</tr>
<tr>
<td>Adequate</td>
<td>4</td>
</tr>
<tr>
<td>Inadequate</td>
<td>10</td>
</tr>
<tr>
<td>Not applicable*</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
</tr>
</tbody>
</table>

* Provisional

Analysis by Adequacy of Support

- Adequate, 25, 31%
- Inadequate, 52, 64%
- Not applicable*, 4, 5%
7. Distribution of fatal roof fall accidents by operation at the time of accident

<table>
<thead>
<tr>
<th>Operation at the time of accident</th>
<th>Number of accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2008</td>
</tr>
<tr>
<td>Cutting</td>
<td>0</td>
</tr>
<tr>
<td>Charging</td>
<td>1</td>
</tr>
<tr>
<td>Drilling</td>
<td>2</td>
</tr>
<tr>
<td>Maintenance of Machine</td>
<td>0</td>
</tr>
<tr>
<td>Dressing</td>
<td>3</td>
</tr>
<tr>
<td>Dressing &amp; Supporting</td>
<td>1</td>
</tr>
<tr>
<td>Inspecting</td>
<td>1</td>
</tr>
<tr>
<td>Loading (manual)</td>
<td>0</td>
</tr>
<tr>
<td>Loading by machine</td>
<td>3</td>
</tr>
<tr>
<td>Supporting</td>
<td>0</td>
</tr>
<tr>
<td>Blasting</td>
<td>0</td>
</tr>
<tr>
<td>Withdrawal of supports</td>
<td>0</td>
</tr>
<tr>
<td>Operation of Machine/Vehicle</td>
<td>0</td>
</tr>
<tr>
<td>Tramming</td>
<td>0</td>
</tr>
<tr>
<td>Others</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
</tr>
</tbody>
</table>

![Graph showing distribution by operation and year](image)

![Pie chart showing distribution by operation](image)
8. Distribution of fatal roof fall accidents by Time elapsed after blasting

<table>
<thead>
<tr>
<th>Time elapsed after blasting (hours)</th>
<th>Number of accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2008 %</td>
</tr>
<tr>
<td>0.00- 0.50</td>
<td>6</td>
</tr>
<tr>
<td>0.51- 1.00</td>
<td>1</td>
</tr>
<tr>
<td>1.01- 1.50</td>
<td>0</td>
</tr>
<tr>
<td>1.51- 2.00</td>
<td>2</td>
</tr>
<tr>
<td>2.01 &amp; above</td>
<td>4</td>
</tr>
<tr>
<td>not applicable*</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
</tr>
</tbody>
</table>

* Provisional.

9. Distribution of fatal roof fall accidents by thickness of seam

<table>
<thead>
<tr>
<th>Seam thickness (metres)</th>
<th>Number of accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2008 %</td>
</tr>
<tr>
<td>0.00- 3.00</td>
<td>6</td>
</tr>
<tr>
<td>3.01- 6.00</td>
<td>4</td>
</tr>
<tr>
<td>6.01- 9.00</td>
<td>2</td>
</tr>
<tr>
<td>9.01 &amp; above</td>
<td>0</td>
</tr>
<tr>
<td>not available</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
</tr>
</tbody>
</table>
10. Distribution of fatal roof fall accidents by depth of cover

<table>
<thead>
<tr>
<th>Depth of cover (metres)</th>
<th>2008</th>
<th>%</th>
<th>2009</th>
<th>%</th>
<th>2010</th>
<th>%</th>
<th>2011</th>
<th>%</th>
<th>2012</th>
<th>%</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0- 100</td>
<td>8</td>
<td>57</td>
<td>4</td>
<td>17</td>
<td>9</td>
<td>43</td>
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<td>33</td>
<td>27</td>
<td>33</td>
</tr>
<tr>
<td>101- 200</td>
<td>3</td>
<td>22</td>
<td>7</td>
<td>29</td>
<td>4</td>
<td>19</td>
<td>3</td>
<td>23</td>
<td>3</td>
<td>33</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>201- 300</td>
<td>2</td>
<td>14</td>
<td>8</td>
<td>33</td>
<td>7</td>
<td>33</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>23</td>
<td>19</td>
<td>23</td>
</tr>
<tr>
<td>301- 400</td>
<td>1</td>
<td>7</td>
<td>2</td>
<td>8</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td>23</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>401 &amp; above</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>13</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>not available</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>31</td>
<td>1</td>
<td>11</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>100</td>
<td>24</td>
<td>100</td>
<td>21</td>
<td>100</td>
<td>13</td>
<td>100</td>
<td>9</td>
<td>100</td>
<td>81</td>
<td>100</td>
</tr>
</tbody>
</table>

11. Distribution of fatal roof fall accidents by thickness of fall

<table>
<thead>
<tr>
<th>Thickness of fall (metres)</th>
<th>2008</th>
<th>%</th>
<th>2009</th>
<th>%</th>
<th>2010</th>
<th>%</th>
<th>2011</th>
<th>%</th>
<th>2012</th>
<th>%</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00- 0.15</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>17</td>
<td>3</td>
<td>14</td>
<td>1</td>
<td>8</td>
<td>3</td>
<td>33</td>
<td>11</td>
<td>14</td>
</tr>
<tr>
<td>0.16- 0.30</td>
<td>6</td>
<td>42</td>
<td>8</td>
<td>33</td>
<td>6</td>
<td>29</td>
<td>6</td>
<td>46</td>
<td>4</td>
<td>45</td>
<td>30</td>
<td>36</td>
</tr>
<tr>
<td>0.31- 1.00</td>
<td>4</td>
<td>29</td>
<td>10</td>
<td>42</td>
<td>8</td>
<td>38</td>
<td>2</td>
<td>15</td>
<td>0</td>
<td>0</td>
<td>24</td>
<td>30</td>
</tr>
<tr>
<td>1.01 &amp; above</td>
<td>4</td>
<td>29</td>
<td>2</td>
<td>8</td>
<td>3</td>
<td>14</td>
<td>1</td>
<td>8</td>
<td>2</td>
<td>22</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>not applicable</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td>23</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>100</td>
<td>24</td>
<td>100</td>
<td>21</td>
<td>100</td>
<td>13</td>
<td>100</td>
<td>9</td>
<td>100</td>
<td>81</td>
<td>100</td>
</tr>
</tbody>
</table>
12. Distribution of fatal roof fall accidents by nature of fallen strata

<table>
<thead>
<tr>
<th>Nature of fallen strata</th>
<th>Number of accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2008</td>
</tr>
<tr>
<td>Coal</td>
<td>2</td>
</tr>
<tr>
<td>Shale</td>
<td>0</td>
</tr>
<tr>
<td>Sandstone</td>
<td>10</td>
</tr>
<tr>
<td>Coal &amp; Shale</td>
<td>1</td>
</tr>
<tr>
<td>Coal &amp; Sandstone</td>
<td>0</td>
</tr>
<tr>
<td>Shale &amp; Sandstone</td>
<td>1</td>
</tr>
<tr>
<td>Coal &amp; Shale &amp; Sandstone</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
</tr>
</tbody>
</table>

13. Distribution of persons killed in roof fall accidents by designation

<table>
<thead>
<tr>
<th>Category of mine worker</th>
<th>Number of persons killed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2008</td>
</tr>
<tr>
<td>Loader</td>
<td>6</td>
</tr>
<tr>
<td>Support Personnel/Timberman</td>
<td>0</td>
</tr>
<tr>
<td>Dresser</td>
<td>5</td>
</tr>
<tr>
<td>Driller</td>
<td>0</td>
</tr>
<tr>
<td>Trammer</td>
<td>0</td>
</tr>
<tr>
<td>Shotfirer/Explosive carrier</td>
<td>0</td>
</tr>
<tr>
<td>Sub. Supervisory staff</td>
<td>3</td>
</tr>
<tr>
<td>Others</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
</tr>
</tbody>
</table>
14. Distribution of persons killed in roof fall accidents by age

<table>
<thead>
<tr>
<th>Age</th>
<th>Number of persons killed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2008</td>
</tr>
<tr>
<td>18 – 20</td>
<td>0</td>
</tr>
<tr>
<td>21 – 25</td>
<td>0</td>
</tr>
<tr>
<td>26 – 30</td>
<td>2</td>
</tr>
<tr>
<td>31 – 35</td>
<td>1</td>
</tr>
<tr>
<td>36 – 40</td>
<td>3</td>
</tr>
<tr>
<td>41 – 45</td>
<td>2</td>
</tr>
<tr>
<td>46 – 50</td>
<td>3</td>
</tr>
<tr>
<td>51 – 55</td>
<td>2</td>
</tr>
<tr>
<td>56 – 60</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
</tr>
</tbody>
</table>

15. Distribution of fatal roof fall accidents by shift during which accident occurred

<table>
<thead>
<tr>
<th>Shift</th>
<th>Number of accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2008</td>
</tr>
<tr>
<td>1st (7/8 AM to 3/4 PM)</td>
<td>8</td>
</tr>
<tr>
<td>2nd 3/4 PM to 11/12 M</td>
<td>1</td>
</tr>
<tr>
<td>3rd 11/12M to 7/8 AM</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
</tr>
</tbody>
</table>
16. Distribution of fatal roof fall accidents by hours spent at work prior to the accident

<table>
<thead>
<tr>
<th>Hours at Work</th>
<th>Number of accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2008</td>
</tr>
<tr>
<td>0.00- 1.00</td>
<td>0</td>
</tr>
<tr>
<td>1.01- 2.00</td>
<td>1</td>
</tr>
<tr>
<td>2.01- 3.00</td>
<td>3</td>
</tr>
<tr>
<td>3.01- 4.00</td>
<td>1</td>
</tr>
<tr>
<td>4.01- 5.00</td>
<td>1</td>
</tr>
<tr>
<td>5.01- 6.00</td>
<td>5</td>
</tr>
<tr>
<td>6.01- 7.00</td>
<td>3</td>
</tr>
<tr>
<td>7.01- 8.00</td>
<td>0</td>
</tr>
<tr>
<td>8.01 &amp; above</td>
<td>0</td>
</tr>
<tr>
<td>not available</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
</tr>
</tbody>
</table>

Analysis by Hours at Work

- 1.01- 2.00, not available, 5, 6%
- 2.01- 3.00, 30, 37%
- 3.01- 4.00, 12, 15%
- 4.01- 5.00, 8, 10%
- 5.01- 6.00, 12, 15%
- 6.01- 7.00, 7, 9%
- 8.01 & above, 2, 2%
17. Distribution of fatal roof fall accidents by responsibility

<table>
<thead>
<tr>
<th>Responsibility</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Misadventure</td>
<td>2</td>
<td>14</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4 5</td>
</tr>
<tr>
<td>Management</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>2 4 5</td>
</tr>
<tr>
<td>Management &amp; Sub-ordinate Supervisory Staff(SSS)</td>
<td>4</td>
<td>29</td>
<td>10</td>
<td>42</td>
<td>8</td>
<td>38</td>
</tr>
<tr>
<td>Management &amp; Deceased</td>
<td>1</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Management &amp; Others</td>
<td>3</td>
<td>22</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>Sub-ordinate Supervisory Staff(SSS)</td>
<td>2</td>
<td>14</td>
<td>4</td>
<td>17</td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>SSS &amp; Others</td>
<td>1</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Management, SSS &amp; Deceased</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>21</td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>Management, SSS &amp; Injured</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>SSS &amp; Deceased</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Deceased</td>
<td>1</td>
<td>7</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>14</strong></td>
<td><strong>100</strong></td>
<td><strong>24</strong></td>
<td><strong>100</strong></td>
<td><strong>21</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

**Analysis by Responsibility**

- **Deceased**, 25%
- **SSS & Deceased**, 14%
- **Mgt., SSS & Injured**, 1%
- **Mgt., SSS & Deceased**, 1%
- **SSS & Others**, 10%
- **SSS**, 9%
- **Mgt., Others**, 6%
- **Mgt., Deceased**, 5%
- **Mgt. & SSS**, 4%
- **Deceased, 4**, 5%
- **Misadventure**, 4%
- **Management, 4**, 5%
- **Mgt. & SSS, 35**, 44%
18. Distribution of fatal roof fall accidents by company

<table>
<thead>
<tr>
<th>Company</th>
<th>Number of accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2008</td>
</tr>
<tr>
<td>BCCL</td>
<td>3</td>
</tr>
<tr>
<td>CCL</td>
<td>0</td>
</tr>
<tr>
<td>ECL</td>
<td>1</td>
</tr>
<tr>
<td>MCL</td>
<td>1</td>
</tr>
<tr>
<td>SECL</td>
<td>5</td>
</tr>
<tr>
<td>NEC</td>
<td>0</td>
</tr>
<tr>
<td>WCL</td>
<td>2</td>
</tr>
<tr>
<td>CIL: total</td>
<td>12</td>
</tr>
<tr>
<td>IISCO</td>
<td>0</td>
</tr>
<tr>
<td>SCCL</td>
<td>1</td>
</tr>
<tr>
<td>TISCO</td>
<td>0</td>
</tr>
<tr>
<td>MIL</td>
<td>1</td>
</tr>
<tr>
<td>All-India</td>
<td>14</td>
</tr>
</tbody>
</table>

**Analysis by Company**

- **WCL, 14, 17%**
- **SCCL, 16, 20%**
- **ECL, 11, 14%**
- **SECL, 23, 29%**
- **MIL, 1, 1%**
- **TISCO, 3, 4%**
- **BCCL, 10, 12%**
- **CCL, 2, 2%**
- **MCL, 1, 1%**
2.2.3B.3 Side fall and over hangs

There were 5 (6%) fatal accidents involving 5 fatalities due to fall of sides. 3 accidents took place in belowground and 2 accidents in opencast workings.

2.2.3B.4 Air blast

There was no accident due to this cause during the year 2012.

2.2.3C Transportation machinery (Winding)

One accident reported due to transportation machinery (Winding) during the year 2012.

2.2.3D Transportation machinery (Other than winding)

There were 33 fatal accidents occurred due to transportation machinery other than winding engine involving 33 fatalities reported during the year 2012. A detail break up of fatalities under this category is given in the table below.

<table>
<thead>
<tr>
<th>TABLE – 23</th>
<th>FATAL ACCIDENTS DUE TO TRANSPORTATION MACHINERY OTHER THAN WINDING IN SHAFTS IN COAL MINES DURING 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cause</td>
<td>No. of fatal accidents</td>
</tr>
<tr>
<td>1. Rope Haulage</td>
<td>2</td>
</tr>
<tr>
<td>2. Mechanical Conveyors</td>
<td>4</td>
</tr>
<tr>
<td>3. Dumpers</td>
<td>21</td>
</tr>
<tr>
<td>4. Wheeled Trackless(Truck, Tanker etc.)</td>
<td>6</td>
</tr>
<tr>
<td>6. Others</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>33</strong></td>
</tr>
</tbody>
</table>

From the above it is seen that dumpers/tippers is the main contributory factor to fatal accidents in opencast coal mines.

2.2.3D.1 Rope Haulages

There were 2 accidents (6% of all accidents) caused due to rope haulages during the year, 2012.

2.2.3D.2 Mechanical Conveyors:

4 accidents (12.12% of all accidents) resulting in four fatalities were caused by belt conveyors during 2012

2.2.3D.3 Dumpers and tippers:

There were 21 accidents due to machineries occurred resulting (63.63% of all fatalities) to dumpers and tippers during the year 2012

2.2.3D.4 Truck & Tankers:

6 accidents occurred causing 6 fatality due to truck & tankers contributing (18.18%) of total accident.
2.2.3E Machinery other than transportation machinery:
There were 12 accidents reported during the year, 2012, which were caused due to machinery other than transportation machinery. The analysis of the caused revealed that –

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>No. of fatal accidents</th>
<th>Persons killed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Drilling Machines</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2. Cutting Machines</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3. Loading Machines (SDL etc.)</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>4. Haulage Engine</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5. Shovels/Draglines etc.</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6. Crushing &amp; Screening Plant</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>7. Other HEMM</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>8. Other Non-Transportation Machinery</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>12</strong></td>
<td><strong>12</strong></td>
</tr>
</tbody>
</table>

2.2.3F Explosives;
There was 3 fatal accidents involving 3 fatalities and 1 serious accident occurred due to explosives during the year 2012.

2.2.3G Electricity;
There were 3 (3.6% of the total) fatal accidents involving 3 persons and three serious accidents due to electricity during the year 2012.

2.2.3H Accidents due to Dust, Gas & Fire;
3 fatal accident occurred involving 5 fatalities and one serious accident due to dust, gas & fire during the year 2012.

2.2.3I Falls other than falls of ground;
Falls other than fall of ground caused 10 (12% of the total) fatal accidents involving same number of lives during the year 2012.

2.2.3J Other causes;
7 fatal accidents involving 8 fatalities were reported due to other cases during the year 2012.
2.2.4 Responsibility

Analysis of accidents as per the persons held responsible for the various causes of accidents during the year 2012 has been indicated in table:25.

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>Responsibility</th>
<th>No. of accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Misadventure</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>Management</td>
<td>12</td>
</tr>
<tr>
<td>3.</td>
<td>Management &amp; Subordinate Supervisory Staff (SSS)</td>
<td>13</td>
</tr>
<tr>
<td>4.</td>
<td>Management, SSS &amp; Co-worker</td>
<td>4</td>
</tr>
<tr>
<td>5.</td>
<td>Management, SSS, Co-worker &amp; Deceased</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>Management, SSS, Co-worker, Deceased &amp; injured</td>
<td>-</td>
</tr>
<tr>
<td>7.</td>
<td>Management, SSS &amp; Deceased</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>Management, SSS &amp; Shotfirer</td>
<td>1</td>
</tr>
<tr>
<td>9.</td>
<td>Management &amp; Shotfirer</td>
<td>-</td>
</tr>
<tr>
<td>10.</td>
<td>Management &amp; Co-worker</td>
<td>3</td>
</tr>
<tr>
<td>11.</td>
<td>Management, Coworker &amp; Deceased</td>
<td>1</td>
</tr>
<tr>
<td>12.</td>
<td>Management &amp; Deceased</td>
<td>4</td>
</tr>
<tr>
<td>13.</td>
<td>Subordinate Supervisory Staff (SSS)</td>
<td>5</td>
</tr>
<tr>
<td>14.</td>
<td>SSS, Shotfirer, Coworker &amp; Deceased</td>
<td>-</td>
</tr>
<tr>
<td>15.</td>
<td>SSS &amp; Co-worker</td>
<td>2</td>
</tr>
<tr>
<td>16.</td>
<td>SSS, Co-worker &amp; Deceased</td>
<td>1</td>
</tr>
<tr>
<td>17.</td>
<td>Coworker</td>
<td>6</td>
</tr>
<tr>
<td>18.</td>
<td>Co-worker &amp; Deceased</td>
<td>6</td>
</tr>
<tr>
<td>19.</td>
<td>Deceased</td>
<td>13</td>
</tr>
<tr>
<td>18.</td>
<td>Others</td>
<td>3</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>83</strong></td>
</tr>
</tbody>
</table>

It can be seen that in 12 (14%) cases management alone and 13 (16%) cases management along with other subordinate staff were responsible. In 5 (6%) of the cases subordinate supervisory staff alone were found responsible. In 13 (16%) cases deceased alone and in 6 (7%) cases the co-workers alone were responsible. These revelations draw the attention towards better planning and implementation of safety status by the management, strict and disciplined supervision by the subordinate supervisory staff and knowledge based effective training for the workers.
2.3 Dangerous occurrences

36 (Thirty-six) dangerous occurrences were reported under the Coal Mines Regulations, 1957 during the year 2012. Details of cause of dangerous occurrences are given below in Table: 26

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Cause</th>
<th>No. of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Spontaneous heating belowground</td>
<td>9</td>
</tr>
<tr>
<td>2.</td>
<td>Spontaneous heating in opencast working</td>
<td>1</td>
</tr>
<tr>
<td>3.</td>
<td>Spontaneous heating at surface</td>
<td>-</td>
</tr>
<tr>
<td>4.</td>
<td>Outbreak of fire underground from spontaneous heating</td>
<td>-</td>
</tr>
<tr>
<td>5.</td>
<td>Outbreak of fire underground from causes other than</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>spontaneous heating</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Outbreak of fire in quarries from causes other than</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>spontaneous heating</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Outbreak of fire in surface from causes other than</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>spontaneous heating</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Premature collapse of workings or failure of pillars/benches/</td>
<td>5+2(Dump</td>
</tr>
<tr>
<td></td>
<td>major roof fall</td>
<td>Failure)</td>
</tr>
<tr>
<td>9.</td>
<td>Influx of noxious gases</td>
<td>-</td>
</tr>
<tr>
<td>10.</td>
<td>Ignition or occurrence of inflammable gas</td>
<td>-</td>
</tr>
<tr>
<td>11.</td>
<td>Over winding of cages etc.</td>
<td>3</td>
</tr>
<tr>
<td>12.</td>
<td>Breakage of winding rope</td>
<td>1</td>
</tr>
<tr>
<td>13.</td>
<td>Breakdown of winding engine, crank shaft, bearing etc.</td>
<td>1</td>
</tr>
<tr>
<td>14.</td>
<td>Breakage, fracture etc of essential parts of machinery or</td>
<td>2(Hard landing)+1(Snapping of direct haulage wire rope)</td>
</tr>
<tr>
<td></td>
<td>apparatus whereby safety of persons was endangered</td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>Irruption of water</td>
<td>1</td>
</tr>
<tr>
<td>16.</td>
<td>Subsidence/potholing</td>
<td>7</td>
</tr>
<tr>
<td>17.</td>
<td>Explosives</td>
<td>-</td>
</tr>
<tr>
<td>18.</td>
<td>Others</td>
<td>2</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>36</td>
</tr>
</tbody>
</table>

A. Spontaneous Heating:

In total 09(Nine) cases of spontaneous heating were reported. Out of 09 cases, 08 were in belowground workings and 1 in opencast workings.

Spontaneous heating in belowground was controlled & confined by sealing those panels by isolation stoppings & in extreme cases either the seam as a whole or the mine as whole was sealed off from surface. In one case, incubation period was reduced from six months to three months whereas in another case it was suggested to complete the extraction of Coal in a panel well within incubation period. Two cases of spontaneous heating occurred in fallen coal of old developed gallery; the area was hydraulic sand stowed & sealed. Three cases of spontaneous heating were reported in galleries/panels having fallen coal. Spontaneous heating and fire in opencast working was due to the presence of old & disused underground workings standing on pillars. Fire was controlled by

i) Spreading incombustible material (stone dust) in the galleries & pillars,

ii) Sprinkling water mixed with sodium silicate

iii) By Back filling
Contributory factors for spontaneous heating:
The primary contributory factors which lead to spontaneous heating and thereby fires:

- Non-sectionlization / improper sectionlization of old workings.
- Not cleaning the old galleries and return airways off fallen coal and not treating thoroughly with stone dust.
- Sluggish ventilation in old workings and depillaring areas.
- Working the depillaring panel beyond the incubation period.
- Not filling up the surface cracks formed due to subsidence and causing leakage of air into the sealed off areas and old workings.
- Not making and maintaining the isolation stoppings as prescribed.
- Stowing Lag in depillaring panel.
- Unavailability of CO detecting instruments & negligency in taking CO samples on routine basis.
- Negligency in monitoring the status of gas samples behind the isolation stoppings.

Corrective measures:

- Rate of extraction has to be made faster by deploying well maintained loading machines and loss of coal in the goaf has to be minimized.
- Isolation and sectionlization stoppings have to be regularly inspected as per statute to detect early stage of spontaneous heating.
- Strengthening of old stoppings.
- Fallen loose coal has to be cleaned off regularly.
- Surface area above the goved out panels shall be filled up to avoid breathing of air.
- All the galleries exposed on the side of entries to the belowground workings in the seam shall be covered effectively to avoid breathing of air through those galleries.
- Rib of coal left as barrier between opencast working and belowground working need to be covered to prevent formation of return circuit through the cracks/fissures developed at the surface.
- There should not be stowing lag in the goaf of depillaring panel.
- Boreholes and subsidence areas, if any should be kept plugged and cracked should be filled up completely.
- Provision of Pressure balancing in the concerned areas.
- Telemonitoring devices should be installed for round the clock monitoring of any emission of noxious/inflammable gases.
B. Other Fires:

There was a case of fire in dumper due to short circuiting of electrical wire. Fire was controlled by using the fire extinguisher.

Corrective measures:

- A code of practice shall be drawn up for dealing with fires at different location in opencast mines, including HEMM. Arrangements for fighting fire should be provided on all heavy earth moving machineries. Such arrangements should, if possible, operate automatically on appearance of fire.
- Timely action has to be initiated if active fire is known to be existed behind the stoppings.
- Reinforcement of stoppings and cleaning of return airway to prevent choking shall be done.
- Adequate precautions shall be taken as per statute while using flame or electric welding or repairing apparatus belowground.
- Availability of Fire Tender in the mine must be ensured.

C. Premature collapse of workings or failure of pillars/ benches/major roof fall:

There was one case of premature collapse of roof fall due to unsystematic working. There were cases of massive roof falls in depillaring districts/panel due to roof not supported adequately.

There were other two cases of roof fall on continuous Miner in different caving panels. In these cases, Management was advised to periodically review the Strata management Plan, Emergency Management Plan etc. & carry out scientific study for routine monitoring of strata. There were cases of overburden dump failure, in one case, a portion of the dump measuring quantities of about 2500 to 3000cum consisting of carbonaceous shale with fire suddenly failed & slid down from a height of 80mtrs.

Corrective measures:

- Strictly follow up with Systematic support plan.
- A study from scientific agency for routine monitoring of strata, warning levels of roof deformation/convergence, load on rib/stook pillars etc. is recommended.
- All the parameters relevant with Strata Management Plan shall be reviewed periodically.
- Height and Width of the benches shall be fixed and maintained as per scientific study and size of the HEMM would be moving on the benches.
- Over burden dump shall not be made close to the edge of the Top Bench.
- Vertical coincident of pillars in contiguous seams shall strictly be maintained.
- Dump shall not be made on back filled area and no road shall also be made at the foot of the dump.
- Continuous monitoring is to be done to check for movement of dump.
A study from scientific institution for dump stability, type of material to be dumped, water drainage system of dumps and hydrostatic & hydro-geological study of places where mining, dumping and pumping is being done is recommended.

Emergency Organisation Plan shall be put in action in case of emergency and shall be reviewed periodically.

**D. Influx of Noxious Gases:**
There was no case of Influx of Noxious Gas.

**E. Ignition or occurrence of inflammable gas:**
There was no case of occurrence of inflammable gas.

**F. Breakage, fracture etc. of essential parts of machinery or apparatus whereby safety of persons was endangered**

There were two cases of hard landing of descending cage which happened due to sudden picking up the momentum in downward direction. In both cases, Management was advised to maintain the automatic contrivance, braking system and other safety devices.

In another case there was snapping of direct haulage wire rope which happened during hauling of a set of loaded tubs. Two front tubs got derailed at a curve, inducing heavy load on the wire rope due to which the rope snapped at a distance of 15 meters from the rope cappel end.

Management was advised to maintain safety devices.

**G. Irruption of water / Landslide:**
There was one case of inrush of water. Inrush of underground water was from old goaved out area of Panel. Management was asked to drill exploratory borehole to prove barrier between old goaved out area & development working.

**H. Subsidence / Potholing:**

There were seven cases of subsidence and potholing due to shallow depth of cover, presence of old working, fire in old workings, accumulation of heavy rain water on low lying areas, presence of fault plane. Pot holes were filled up and the affected area was stabilized properly. At some places the areas have been declared unsafe and suitable actions taken.

Corrective Measures:-

i) Affected areas should be effectively fencing off.

ii) Sign board giving warning of unstable working should be displayed in conspicuous places in local languages.

iii) The entire areas should be monitored for development of any surface crack or subsidence etc.

iv) Smoke of fire should be stopped by dumping overburden/debris in the exposed galleries.

v) The low lying area should be filled up to avoid accumulation of water.
vi) Water drainage network of the area should be made effective so that no accumulation of water take place during continuous rain.

vii) Scientific study should be done to know the status of exact underground working in different seam.

viii) The low cover working area should be demarcated on the surface & surface drains should be made around so that the phenomenon of pot holing should be avoided in future.

I. Other:
There was one case of toppling of truck.
Management was advised to follow up “safe code of practice” & not to use surveyed off vehicles in opencast Mines. Training on simulator for HEMM operators should be provided.

2.4 Technical Developments
During the year 2012, 10.2% of the total production came from underground workings and 89.8% of the total production came from opencast mines. As far as average daily employment was concerned 48.04% were employed belowground, 24.6% were employed in opencast workings and the remaining 27.37% were employed for other surface operations.

During the 2012, 1610 Excavators, 5850 dumpers, 952 drills and 43 draglines were used in opencast mines.

<table>
<thead>
<tr>
<th>Year</th>
<th>Shovels</th>
<th>Draglines</th>
<th>Drills</th>
<th>Dumpers</th>
<th>Others</th>
<th>HP of the machinery</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>787</td>
<td>41</td>
<td>703</td>
<td>3663</td>
<td>1885</td>
<td>2,711,279</td>
</tr>
<tr>
<td>1991</td>
<td>864</td>
<td>41</td>
<td>703</td>
<td>3846</td>
<td>1746</td>
<td>2,972,990</td>
</tr>
<tr>
<td>1992</td>
<td>892</td>
<td>47</td>
<td>829</td>
<td>423</td>
<td>2112</td>
<td>3,227,528</td>
</tr>
<tr>
<td>1993</td>
<td>910</td>
<td>44</td>
<td>802</td>
<td>4385</td>
<td>1952</td>
<td>3,409,140</td>
</tr>
<tr>
<td>1994</td>
<td>946</td>
<td>43</td>
<td>822</td>
<td>4437</td>
<td>1946</td>
<td>3,448,234</td>
</tr>
<tr>
<td>1995</td>
<td>956</td>
<td>42</td>
<td>871</td>
<td>4291</td>
<td>2116</td>
<td>3,639,816</td>
</tr>
<tr>
<td>1996</td>
<td>961</td>
<td>59</td>
<td>864</td>
<td>4038</td>
<td>1856</td>
<td>3,436,437</td>
</tr>
<tr>
<td>1997</td>
<td>1017</td>
<td>42</td>
<td>913</td>
<td>4399</td>
<td>2177</td>
<td>3,703,276</td>
</tr>
<tr>
<td>1998</td>
<td>1106</td>
<td>41</td>
<td>918</td>
<td>4520</td>
<td>2279</td>
<td>3,826,094</td>
</tr>
<tr>
<td>1999</td>
<td>1216</td>
<td>49</td>
<td>962</td>
<td>4776</td>
<td>2372</td>
<td>4,058,489</td>
</tr>
<tr>
<td>2000</td>
<td>1143</td>
<td>43</td>
<td>969</td>
<td>4602</td>
<td>2333</td>
<td>3,938,986</td>
</tr>
<tr>
<td>2001</td>
<td>1172</td>
<td>42</td>
<td>977</td>
<td>4666</td>
<td>2304</td>
<td>3,966,541</td>
</tr>
<tr>
<td>2002</td>
<td>1159</td>
<td>41</td>
<td>972</td>
<td>4721</td>
<td>2136</td>
<td>3,864,244</td>
</tr>
<tr>
<td>2003</td>
<td>1136</td>
<td>39</td>
<td>1003</td>
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</tr>
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<td>922</td>
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<td>1088</td>
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<td>4634</td>
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<td>914</td>
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</tr>
<tr>
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<td>43</td>
<td>952</td>
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<td>2937</td>
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</tbody>
</table>

*Data for the year 2012 are provisional.
(a) Number of machines used in underground coal mines of different coal companies are as follows:

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<tr>
<th>Name of Company</th>
<th>Road header/Dint header</th>
<th>SDL</th>
<th>LHD</th>
<th>Continuous Miners</th>
<th>Coal haulers</th>
<th>Other</th>
</tr>
</thead>
<tbody>
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<td>0</td>
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<td>0</td>
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<td>MCL</td>
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<td>0</td>
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<td>0</td>
</tr>
<tr>
<td>GIPCL</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>NLC</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>JSMDC</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>GMDC</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
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<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>RSMN</td>
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<td>0</td>
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<td>19</td>
<td>894</td>
<td>406</td>
<td>9</td>
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<td>35</td>
</tr>
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</table>

(b) Number of machines used in opencast coal mines of different coal companies are as follows:

<table>
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<tr>
<th>Name of co.</th>
<th>Bucket wheel</th>
<th>Dragline</th>
<th>Surface Miners</th>
<th>Others</th>
<th>170 T</th>
<th>120 T</th>
<th>85 T</th>
<th>50 T</th>
<th>35 T</th>
<th>&gt;20 cu m</th>
<th>19-10 cu m</th>
<th>9-5 cu m</th>
<th>&lt;5 cu m</th>
<th>&gt;250 m m</th>
<th>249-150 mm</th>
<th>&lt;150 m m</th>
</tr>
</thead>
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<td>0</td>
<td>0</td>
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<td>18</td>
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<td>14</td>
<td>110</td>
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<td>11</td>
<td>12</td>
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<td>29</td>
<td>8</td>
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<td>14</td>
</tr>
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<td>0</td>
<td>0</td>
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<td>0</td>
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<td>0</td>
</tr>
<tr>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>23</td>
<td>244</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>76</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
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<td>0</td>
<td>0</td>
<td>0</td>
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<td>13</td>
<td>0</td>
<td>0</td>
<td>6</td>
</tr>
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<td>0</td>
<td>0</td>
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<td>0</td>
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<td>21</td>
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</tr>
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<td>Total</td>
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<td>24</td>
<td>38</td>
<td>651</td>
<td>37</td>
<td>354</td>
<td>395</td>
<td>1071</td>
<td>1862</td>
<td>9</td>
<td>98</td>
<td>310</td>
<td>645</td>
<td>209</td>
<td>435</td>
<td>106</td>
</tr>
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</table>

2.5 Occupational Health

Medical Examination by Appellate Medical Board

Initial and periodical medical examination under Rule 29B of the Mines Rules, 1955 are conducted by management and medical re-examination by Appellate Medical Board constituted by Central Government under Rule 29K.
(a) Progress of Medical Examination in Coal Mines:

<table>
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<tr>
<th>Name of Company</th>
<th>Initial Medical Examination</th>
<th>Periodical Medical Exam.</th>
</tr>
</thead>
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<tr>
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<td>893</td>
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<td>13</td>
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</table>

(b) Cases of Notified Diseases in Coal Mines:

<table>
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<tr>
<th>Mining Companies</th>
<th>Name of Disease</th>
<th>Number of cases</th>
</tr>
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<tbody>
<tr>
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</tr>
<tr>
<td>SCCL</td>
<td>Carcinoma Lung</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Carcinoma Stomach</td>
<td>4</td>
</tr>
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</table>

2.6 Vocational Training

Recognizing the need for safety education to enable the mine workers to prepare them to face the challenges of mining, the Mines Vocational Training Rules were framed in 1966. These rules provide the provision for construction of mine vocational training centers, initial, refresher and special training to mine workers, appointment of training officers, instructors, proper training aids and equipments. It also provides for payment to trainees during the training period. Progress of vocational training in coalmines during the year 2012 was reported to be as follows.

<table>
<thead>
<tr>
<th>Name of the Company</th>
<th>No. of VT Centers</th>
<th>Basic Training</th>
<th>Refresher Training</th>
<th>Special Training</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>Provided</td>
<td>Required</td>
<td>Provided</td>
</tr>
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<td>12748</td>
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<td>1664</td>
<td>5405</td>
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</table>

41
2.7 Workmen’s Inspector, Safety Committee & Welfare Officers

Much greater strides in safety can be achieved by participation of workmen in safety programme, the twin institutions of ‘Safety Committee & Workmen’s Inspector’ have been conceived and given the statutory backing. DGMS is also associated with training of Workmen’s Inspectors to make them effective in discharge of their duties. In coal mines almost all the eligible mines had Workmen’s Inspector and Safety Committee. The table below shows the status of appointment of Welfare Officer, Workmen’s Inspector and formation of Safety Committees during the year 2012.

<table>
<thead>
<tr>
<th>Table: 33</th>
<th>NUMBER OF WORKMEN’S INSPECTOR IN POSITION, SAFETY COMMITTEE, WELFARE OFFICERS IN COAL MINES DURING 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of Company</td>
<td>Welfare Officers</td>
</tr>
<tr>
<td></td>
<td>Required</td>
</tr>
<tr>
<td>BCCL</td>
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2.8 Owner-wise consolidated fatal accident statistics for last 8(Eight) years in coal mines

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Note: Figures for the year 2011 & 2012 are provisional.
## 2.9 Owner-wise consolidated serious accident statistics for last 8 (eight) years in coal mines

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# DGMS Annual Report, 2012

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**Note:** Figures for the year 2011 & 2012 are provisional.
Serious injury includes seriously injured from fatal accidents also.

BG - Belowground  OC - Opencast  AG - Aboveground
3.0 Non-Coal Mines

3.1 General

Information presented in the following paragraphs relates to non-coal mines coming under the purview of the Mines Act, 1952.

Estimated numbers of notified working non-coal mines are over about 8000 out of which 2174 non-coal mines including 86 oil mines submitted returns for the year 2012.

Average daily employment in non-coal mines during the year 2012 was 202910 as compared to 200122 in 2011. Average daily employment in workings belowground, opencast and aboveground during the year 2012 was 7700, 108965 & 84355 as compared to 9783, 104665 & 85674 respectively during the year 2011. The average daily employment in various minerals is depicted in the table below:

<table>
<thead>
<tr>
<th>Mineral</th>
<th>No. of Mines Submitted return</th>
<th>U/G Average daily employment</th>
<th>O/C Average daily employment</th>
<th>Surface Average daily employment</th>
<th>Total Average daily employment</th>
<th>Output ('000 tonnes)</th>
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<td>6305</td>
<td>1123</td>
<td>7428</td>
<td>16808</td>
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<td>229</td>
<td>1454</td>
<td>3782</td>
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<td>2579</td>
<td>11460</td>
<td>3949</td>
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<td>Lime Stone</td>
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<td>23770</td>
<td>6357</td>
<td>30131</td>
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<td>7202</td>
<td>37001</td>
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<td>Galena &amp; sphalarite</td>
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<td>1368</td>
<td>708</td>
<td>1983</td>
<td>4059</td>
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<td>1594</td>
<td>24300</td>
<td>13221</td>
<td>39114</td>
<td>59770</td>
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<td>1594</td>
<td>24300</td>
<td>13221</td>
<td>39114</td>
<td>59770</td>
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Production of Natural Gas (Expressed in Million Cu Meter)
** The figure excludes the production of gas.
Note: Data for the year 2012 are provisional.
3.2 Accidents

3.2.1 Accidents

There was no major accident in Non-coal mines during the year 2012.

There had been decrease in fatal accidents in the year 2012 wherein 39 fatal accidents involving 41 fatalities and 44 serious accidents involving 41 persons seriously injured as compared to 47 fatal accidents involving 53 fatalities and 97 serious accidents involving 99 persons seriously injured during 2011. Table 35 & 36 given below shows trend in fatal accidents, death rates, serious accidents and injury rate in non-coal mines.

### Table 35: Trend in Fatal Accidents & Death Rates in Non-Coal Mines

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<th>Year</th>
<th>Number of accidents</th>
<th>Death rate per 1000 persons employed</th>
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<td>2003</td>
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* Provisional

Table: 36 indicate trend in serious accidents and serious injury rates in non-coal mines.

### Table 36: Trend in Serious Accidents and Serious Injury Rates in Non-Coal Mines

<table>
<thead>
<tr>
<th>YEAR</th>
<th>Number of Serious accidents</th>
<th>Persons seriously injured#</th>
<th>Serious injury rate per 1000 persons employed</th>
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<td>Persons seriously injured</td>
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* Provisional
# Includes seriously injured from serious accidents only
Note: Seriously injured from fatal accidents are also considered for computation of serious injury rate.
Table: 37 depicts trend in accidents due to different cause group for the years 2008-2012.

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<tr>
<td>Electricity</td>
<td>2 (3)</td>
</tr>
<tr>
<td>Gas, Dust etc.</td>
<td>2 (3)</td>
</tr>
<tr>
<td>Falls other than fall of ground</td>
<td>11 (11)</td>
</tr>
<tr>
<td>Other causes</td>
<td>5 (5)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>54 (73)</td>
</tr>
</tbody>
</table>

Note: Figures in parentheses denote the number of persons killed.
* Figures are provisional

**Trend in Fatal Accidents due to different causes in Non-Coal Mines during 2012**

![Pie chart showing distribution of accidents by cause]

<table>
<thead>
<tr>
<th>TABLE:37A</th>
<th>TREND IN FATAL ACCIDENTS IN DIFFERENT PLACES OF NON-COAL MINES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place</td>
<td>2008</td>
</tr>
<tr>
<td>Belowground</td>
<td>3 (4)</td>
</tr>
<tr>
<td>Opencast</td>
<td>35 (42)</td>
</tr>
<tr>
<td>Aboveground</td>
<td>16 (27)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>54 (73)</td>
</tr>
</tbody>
</table>

Note: Figures in parentheses denote the number of persons killed.
* Figures are provisional
### TABLE: 38

<table>
<thead>
<tr>
<th>Cause</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011*</th>
<th>2012*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground movement</td>
<td>1 (8)</td>
<td>1 (4)</td>
<td>1 (4)</td>
<td>5 (6)</td>
<td>7 (8)</td>
</tr>
<tr>
<td>Winding in shafts</td>
<td>2 (3)</td>
<td>3 (6)</td>
<td>2 (2)</td>
<td>3 (4)</td>
<td>3 (3)</td>
</tr>
<tr>
<td>Transportation machinery (other than winding)</td>
<td>9 (12)</td>
<td>11 (14)</td>
<td>5 (5)</td>
<td>11 (15)</td>
<td>3 (3)</td>
</tr>
<tr>
<td>Machinery other than transportation machinery</td>
<td>10 (12)</td>
<td>13 (14)</td>
<td>10 (10)</td>
<td>17 (17)</td>
<td>8 (8)</td>
</tr>
<tr>
<td>Explosive</td>
<td>1 (21)</td>
<td>1 (1)</td>
<td>1 (3)</td>
<td>0 (4)</td>
<td>1 (4)</td>
</tr>
<tr>
<td>Electricity</td>
<td>1 (3)</td>
<td>3 (3)</td>
<td>2 (2)</td>
<td>3 (4)</td>
<td>-</td>
</tr>
<tr>
<td>Gas, Dust etc.</td>
<td>1 (1)</td>
<td>2 (2)</td>
<td>3 (2)</td>
<td>4 (4)</td>
<td>-</td>
</tr>
<tr>
<td>Falls other than fall of ground</td>
<td>39 (39)</td>
<td>39 (39)</td>
<td>31 (33)</td>
<td>51 (51)</td>
<td>20 (20)</td>
</tr>
<tr>
<td>Other causes</td>
<td>19 (21)</td>
<td>23 (23)</td>
<td>7 (7)</td>
<td>7 (7)</td>
<td>2 (2)</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>83 (120)</td>
<td>94 (104)</td>
<td>61 (68)</td>
<td>97 (108)</td>
<td>44 (48)</td>
</tr>
</tbody>
</table>

Note: Figures in parentheses denote the number of persons seriously injured. This also includes serious injury out of fatal accidents.

* Figures are provisional

### TABLE: 38A

<table>
<thead>
<tr>
<th>Place</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011*</th>
<th>2012*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belowground</td>
<td>14 (15)</td>
<td>33 (36)</td>
<td>12 (13)</td>
<td>22 (23)</td>
<td>15 (15)</td>
</tr>
<tr>
<td>Opencast</td>
<td>13 (23)</td>
<td>13 (19)</td>
<td>16 (21)</td>
<td>39 (43)</td>
<td>15 (19)</td>
</tr>
<tr>
<td>Aboveground</td>
<td>56 (82)</td>
<td>48 (49)</td>
<td>33 (34)</td>
<td>36 (42)</td>
<td>14 (14)</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>83 (120)</td>
<td>94 (104)</td>
<td>61 (68)</td>
<td>97 (108)</td>
<td>44 (48)</td>
</tr>
</tbody>
</table>

Note: Figures in parentheses denote the number of persons seriously injured.

* Figures are provisional
Table: 39 shows fatal and serious accidents mineral-wise for the year 2008-2012

<table>
<thead>
<tr>
<th>Mineral</th>
<th>Fatal accidents</th>
<th>Serious accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Galena &amp; sphalerite</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Gold</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Granite</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Iron-ore</td>
<td>11</td>
<td>8</td>
</tr>
<tr>
<td>Lime stone</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>Manganese ore</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Marble</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Oil</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Stone</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Others</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>TOTAL</td>
<td>54</td>
<td>36</td>
</tr>
</tbody>
</table>

* provisional.

### 3.2.2 Analysis of Accidents

The analysis of accidents presented below is based on the findings of enquiries into fatal accidents conducted by officers of DGMS and information regarding serious accidents received from the mine management.

#### 3.2.2.1 Ground Movement

Number of accidents and fatalities due to ground movement shows a matter of concern of the trend in the last five years indicating that it is the high time for the mine management to think and execute an effective plan to reduce fatal accidents due this cause. Percentage wise there were 13 (33.33% of the total) fatal accidents due to ground movement in the year 2012 as compared to 7 (15% of the total) fatal accidents due to ground movement in the year 2011.

#### 3.2.2.1A Roof fall Accidents

There was 3 fatal accident occurred due to roof fall during the year 2012 in non-coal mines.

#### 3.2.2.1B Side fall Accidents

There were 10 fatal accidents occurred due to side fall during the year 2012 in non-coal mines.

#### 3.2.2.2 Transportation machinery (Winding)

One accident reported due to transportation machinery (winding) due to worker slip and fell down on the floor during he year 2012.

#### 3.2.2.3 Transportation machinery (other than winding)

There were altogether 6 accident involving 6 fatalities due to transportation machinery (other than winding) during the year, 2012.
The cause wise details are given below.

**TABLE-40  FATAL ACCIDENTS DUE TO TRANSPORTATION MACHINERY (OTHER THAN WINDING) IN NON COAL MINES IN YEAR 2012**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Causes</th>
<th>Fatal</th>
<th>Persons Killed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Rope Haulages</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2.</td>
<td>Conveyors</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3.</td>
<td>Dumpers</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>Wheeled Trackless(Truck, Tanker etc.)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>5.</td>
<td>Others</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

**Rope Haulage:**
One accident occurred due to rope haulage.

**Conveyor:**
No accident occurred due to Conveyor.

**Dumpers/Tipper:**
3 accidents occurred causing 3 fatalities due to truck & tanker contributing 50% of total accidents.

**Truck & Tanker:**
Two accidents occurred causing two fatalities due to truck & tanker contributing 33.33% of total accident.

**Other (Wagon):**
No accident occurred due to this cause.

**3.2.2.5 Accidents due to machinery other than transportation machinery.**

**TABLE-41  Fatal accidents due to machinery other than transportation machinery in Non-Coal mines during 2012**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Causes</th>
<th>No. of fatal accidents</th>
<th>Persons killed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Drilling Machine</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2.</td>
<td>Excavator/loader</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>3.</td>
<td>Crane</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>4.</td>
<td>Crushing Plant</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>5.</td>
<td>Other HEMM</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6.</td>
<td>Others Non-Transportation</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

It is seen that most of the accident due to machinery and other machinery were causing due to operator’s negligence, indiscipline and lack of supervisions. Improved standard of training and education of workers are necessary to control such accidents. Some cases the equipment failure was observed due to poor maintenance. Higher standard of maintenance of machinery in the opencast sector are required to be stressed upon.
Table: 42 - Detail break-up of serious accidents due to this cause during 2012.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Number of serious accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Belowground</td>
</tr>
<tr>
<td>Drilling Machine</td>
<td>-</td>
</tr>
<tr>
<td>Cutting Machines</td>
<td>-</td>
</tr>
<tr>
<td>Loading Machine</td>
<td>-</td>
</tr>
<tr>
<td>Shovels, draglines, excavators etc.</td>
<td>-</td>
</tr>
<tr>
<td>Crushing &amp; screening plants</td>
<td>-</td>
</tr>
<tr>
<td>Other HEMM</td>
<td>-</td>
</tr>
<tr>
<td>Others</td>
<td>-</td>
</tr>
<tr>
<td>TOTAL</td>
<td>-</td>
</tr>
</tbody>
</table>

3.2.2.5 Explosives

4 (10% of the total) fatal accidents involving 4 fatalities & one serious accident(2.27%) involving 4 persons occurred due to explosive during the year 2012.

3.2.2.6 Electricity

No fatal accident occurred due to electricity during the year 2012.

3.2.2.7 Dust, Gas & other combustible material

No fatal and no serious accidents occurred due to Dust, Gas & other combustible materials during the year 2012.

3.2.2.8 Falls other than falls of ground

9 (23% of the total) fatal accidents involving 9 persons and 20 serious accidents involving 20 persons occurred due to this cause during the year 2012.

3.2.2.9 Other causes

There was 1 (2.56% of the total) fatal accidents involving 3 fatalities and 2 serious accidents involving 2 persons occurred due to miscellaneous causes during the year 2012.
3.3 Responsibility

The responsibilities fixed as a result of fatal accident enquiry conducted by officers of DGMS in the year 2012 is indicated in the table below:

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>Responsibility</th>
<th>No. of accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Misadventure</td>
<td>2</td>
</tr>
<tr>
<td>2.</td>
<td>Management</td>
<td>11</td>
</tr>
<tr>
<td>3.</td>
<td>Management, Subordinate Supervisory Staff (SSS)</td>
<td>10</td>
</tr>
<tr>
<td>4.</td>
<td>Management, SSS &amp; Co-worker</td>
<td>-</td>
</tr>
<tr>
<td>5.</td>
<td>Management, SSS &amp; Shotfirer</td>
<td>-</td>
</tr>
<tr>
<td>6.</td>
<td>Management, SSS &amp; Deceased</td>
<td>-</td>
</tr>
<tr>
<td>7.</td>
<td>Management &amp; Co-worker</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>Management &amp; Deceased</td>
<td>-</td>
</tr>
<tr>
<td>9.</td>
<td>Subordinate Supervisory Staff (SSS)</td>
<td>4</td>
</tr>
<tr>
<td>10.</td>
<td>Subordinate Supervisory Staff (SSS) &amp; Deceased</td>
<td>1</td>
</tr>
<tr>
<td>11.</td>
<td>Co-Worker</td>
<td>-</td>
</tr>
<tr>
<td>12.</td>
<td>Co-Worker &amp; Deceased</td>
<td>1</td>
</tr>
<tr>
<td>13.</td>
<td>Deceased</td>
<td>3</td>
</tr>
<tr>
<td>14.</td>
<td>Others</td>
<td>5</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>39</strong></td>
<td><strong>39</strong></td>
</tr>
</tbody>
</table>

3.4 Dangerous Occurrence

The table indicated below gives dangerous occurrences reported during the year 2012 under various causes:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Cause</th>
<th>No. of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Overwinding of cages, skip of bucket etc.</td>
<td>-</td>
</tr>
<tr>
<td>2.</td>
<td>Outbreak of fire belowground</td>
<td>2</td>
</tr>
<tr>
<td>3.</td>
<td>Outbreak of fire on surface</td>
<td>2</td>
</tr>
<tr>
<td>4.</td>
<td>Premature collapse of workings or failure of pillars</td>
<td>-</td>
</tr>
<tr>
<td>5.</td>
<td>Breakage of winding rope</td>
<td>-</td>
</tr>
<tr>
<td>6.</td>
<td>Breakdown of winding engine, crank shaft, bearing etc.</td>
<td>-</td>
</tr>
<tr>
<td>7.</td>
<td>Ignition or occurrence of inflammable gas</td>
<td>-</td>
</tr>
<tr>
<td>8.</td>
<td>Breakage, fracture etc of essential parts of machinery or apparatus whereby safety of persons was endangered</td>
<td>-</td>
</tr>
<tr>
<td>9.</td>
<td>Rock burst</td>
<td>-</td>
</tr>
<tr>
<td>10.</td>
<td>Irruption of water</td>
<td>-</td>
</tr>
<tr>
<td>11.</td>
<td>Bursting of equipment under high pressure</td>
<td>-</td>
</tr>
<tr>
<td>12.</td>
<td>Oil well blowout without fire</td>
<td>-</td>
</tr>
<tr>
<td>13.</td>
<td>Fire in pipeline/well heads</td>
<td>-</td>
</tr>
<tr>
<td>14.</td>
<td>Others</td>
<td>5</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>9</strong></td>
<td><strong>9</strong></td>
</tr>
</tbody>
</table>
3.5 Technical Developments

Total numbers of mines working by deploying HEMM is 943. Total number of machines and capacity of shovels and dumpers used in mines have been increased. The following table shows the different types of machines deployed in mines since 2001.

<table>
<thead>
<tr>
<th>TABLE: 45</th>
<th>TREND IN USE OF HEMM IN NON-COAL OPENCAST MINES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
<td>No. of mines</td>
</tr>
<tr>
<td>Elec.</td>
<td>Diesel</td>
</tr>
<tr>
<td>2001</td>
<td>542</td>
</tr>
<tr>
<td>2002</td>
<td>577</td>
</tr>
<tr>
<td>2003</td>
<td>560</td>
</tr>
<tr>
<td>2004</td>
<td>561</td>
</tr>
<tr>
<td>2005</td>
<td>653</td>
</tr>
<tr>
<td>2006</td>
<td>591</td>
</tr>
<tr>
<td>2007</td>
<td>614</td>
</tr>
<tr>
<td>2008</td>
<td>705</td>
</tr>
<tr>
<td>2009</td>
<td>773</td>
</tr>
<tr>
<td>2010</td>
<td>812</td>
</tr>
<tr>
<td>2011</td>
<td>883</td>
</tr>
<tr>
<td>2012*</td>
<td>943</td>
</tr>
</tbody>
</table>

*Figures for the year 2012 are provisional.

Following table shows the various types and quality of explosives used in non-coal mines since 2001.

<table>
<thead>
<tr>
<th>TABLE: 46</th>
<th>TREND IN USE OF EXPLOSIVES IN NON-COAL MINES</th>
</tr>
</thead>
<tbody>
<tr>
<td>YEAR</td>
<td>Consumption of explosives in tonnes</td>
</tr>
<tr>
<td>NG Based</td>
<td>ANFO</td>
</tr>
<tr>
<td>2001</td>
<td>1021</td>
</tr>
<tr>
<td>2002</td>
<td>1092</td>
</tr>
<tr>
<td>2003</td>
<td>1005</td>
</tr>
<tr>
<td>2004</td>
<td>1323</td>
</tr>
<tr>
<td>2005</td>
<td>1382</td>
</tr>
<tr>
<td>2006</td>
<td>608</td>
</tr>
<tr>
<td>2007</td>
<td>566</td>
</tr>
<tr>
<td>2008</td>
<td>655</td>
</tr>
<tr>
<td>2009</td>
<td>471</td>
</tr>
<tr>
<td>2010</td>
<td>438</td>
</tr>
<tr>
<td>2011</td>
<td>917</td>
</tr>
<tr>
<td>2012*</td>
<td>604</td>
</tr>
</tbody>
</table>

*Figures for the year 2012 are provisional.
3.6 Occupational Health & Environments

(a) Progress of Medical Examination in Non-Coal Mines:

<table>
<thead>
<tr>
<th>Name of Company</th>
<th>Initial Medical Examination</th>
<th>Periodical Medical Exam.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Required</td>
<td>Provided</td>
</tr>
<tr>
<td>OIL</td>
<td>188</td>
<td>188</td>
</tr>
<tr>
<td>ONGC</td>
<td>2577</td>
<td>2747</td>
</tr>
<tr>
<td>MOIL</td>
<td>1291</td>
<td>1291</td>
</tr>
<tr>
<td>TATA</td>
<td>875</td>
<td>1133</td>
</tr>
<tr>
<td>SAIL</td>
<td>118</td>
<td>118</td>
</tr>
<tr>
<td>IREL</td>
<td>699</td>
<td>699</td>
</tr>
<tr>
<td>UCIL</td>
<td>159</td>
<td>159</td>
</tr>
<tr>
<td>HGMCL</td>
<td>0</td>
<td>295</td>
</tr>
<tr>
<td>NMDC</td>
<td>1444</td>
<td>1444</td>
</tr>
<tr>
<td>NALCO</td>
<td>257</td>
<td>257</td>
</tr>
<tr>
<td>BALCO</td>
<td>4</td>
<td>249</td>
</tr>
<tr>
<td>HCL</td>
<td>560</td>
<td>560</td>
</tr>
<tr>
<td>CCIL</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ACC</td>
<td>188</td>
<td>188</td>
</tr>
<tr>
<td>MML</td>
<td>179</td>
<td>0</td>
</tr>
<tr>
<td>OMC</td>
<td>1393</td>
<td>118</td>
</tr>
<tr>
<td>GMDC</td>
<td>17</td>
<td>13</td>
</tr>
<tr>
<td>HZL</td>
<td>0</td>
<td>1273</td>
</tr>
<tr>
<td>RSMM</td>
<td>248</td>
<td>230</td>
</tr>
<tr>
<td>Total</td>
<td>10197</td>
<td>10962</td>
</tr>
</tbody>
</table>

(b) Cases of Notified Diseases in non-coal mines:

<table>
<thead>
<tr>
<th>Name of disease</th>
<th>Number of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise induced hearing loss</td>
<td>02</td>
</tr>
</tbody>
</table>
3.7 Vocational Training

Progress of vocational training imparted during the year in major non-coal mining companies has been reported in table below:

### TABLE: 49

<table>
<thead>
<tr>
<th>Cos.</th>
<th>No. of VT Centers</th>
<th>Basic Training Required</th>
<th>Provided</th>
<th>Refresher Training Required</th>
<th>Provided</th>
<th>Special Training Provided</th>
</tr>
</thead>
<tbody>
<tr>
<td>OIL</td>
<td>1</td>
<td>0</td>
<td>1047</td>
<td>0</td>
<td>252</td>
<td>271</td>
</tr>
<tr>
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BG – Belowground  
OC – Opencast  
AG – Aboveground  

Note: Figures for the year 2012 are provisional.  
N.A. = Employment Figures not Available.
### 3.10 Mineral wise consolidated serious accident statistics for the last 8 (eight) years in non-coal mines

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<td>0 0 0 0 0 0</td>
<td>0 0</td>
</tr>
<tr>
<td>Mineral</td>
<td>Year</td>
<td>Serious Accidents</td>
<td>S/Injury Rate per 1000 persons employed</td>
</tr>
<tr>
<td>------------</td>
<td>------</td>
<td>-------------------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Belowground Accident</td>
<td>Open cast Accident</td>
</tr>
<tr>
<td>Mineral</td>
<td>Year</td>
<td>Serious Accidents</td>
<td>S/Injury Rate per 1000 persons employed</td>
</tr>
<tr>
<td>---------</td>
<td>------</td>
<td>-------------------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Belowground</td>
<td>Opencast</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Accident S/Inj</td>
<td>Accident S/Inj</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BG</td>
<td>OC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2008</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2009</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2010</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2011</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2012</td>
<td>15</td>
</tr>
</tbody>
</table>

BG - Belowground  
OC - Opencast  
AG - Aboveground

N.A. = Employment Figures not Available.

Note: i) Figures for the year 2012 are provisional.

ii) Seriously injured from fatal accidents are also considered for computation of no. of serious injury as well as for serious injury rate.
4.0 Approval of Equipment, Appliances, Material and Machinery

Several equipments, appliances, materials and machineries meant for use in mines are required to be approved by DGMS; a list of such equipments is given at Appendix-V. Table below shows particulars of items approved during the year 2012.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Equipment/appliances/materials/ machinery</th>
<th>No. of approvals granted/renewed/extended during the year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Methanometer</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>Helmet</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>Cap Lamp</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>Footwear</td>
<td>19</td>
</tr>
<tr>
<td>5</td>
<td>Gas Detector/Monitor</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>Cap Lamp Bulb</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>Ventilation ducting</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Co detector tubes/aspirator</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>Environmental monitoring system</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Safety goggles</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>Ear plug</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>Visibility harness</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>Dust Respirator (Mask)</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>Full Body Harness/Safety Belt</td>
<td>0</td>
</tr>
<tr>
<td>15</td>
<td>Flame Safety Lamp</td>
<td>1</td>
</tr>
<tr>
<td>16</td>
<td>Noise Dosi-Meter</td>
<td>0</td>
</tr>
<tr>
<td>17</td>
<td>Brattice Cloth</td>
<td>0</td>
</tr>
<tr>
<td>18</td>
<td>Self-rescuers</td>
<td>0</td>
</tr>
<tr>
<td>19</td>
<td>Breathing Apparatus</td>
<td>2</td>
</tr>
<tr>
<td>20</td>
<td>Resuscitator/Reviving Apparatus</td>
<td>1</td>
</tr>
<tr>
<td>21</td>
<td>Hydraulic props</td>
<td>3</td>
</tr>
<tr>
<td>22</td>
<td>Powered support &amp; its components</td>
<td>1</td>
</tr>
<tr>
<td>23</td>
<td>STDA Legs</td>
<td>1</td>
</tr>
<tr>
<td>24</td>
<td>Explosives</td>
<td>12</td>
</tr>
<tr>
<td>25</td>
<td>Exploders</td>
<td>2</td>
</tr>
<tr>
<td>26</td>
<td>Detonators</td>
<td>16</td>
</tr>
<tr>
<td>27</td>
<td>Flame proof equipment - motor, switches, circuit breakers etc</td>
<td>126</td>
</tr>
<tr>
<td>28</td>
<td>Intrinsically safe apparatus</td>
<td>35</td>
</tr>
<tr>
<td>29</td>
<td>Equipment for use in hazardous area</td>
<td>0</td>
</tr>
<tr>
<td>30</td>
<td>Cables</td>
<td>40</td>
</tr>
<tr>
<td>31</td>
<td>Gas Detector and Monitor</td>
<td>1</td>
</tr>
<tr>
<td>32</td>
<td>Cage suspension gears</td>
<td>7</td>
</tr>
<tr>
<td>33</td>
<td>Fire resistant conveyor belting</td>
<td>0</td>
</tr>
<tr>
<td>34</td>
<td>Automatic contrivance/Power break &amp; emergency stock valve</td>
<td>3</td>
</tr>
<tr>
<td>35</td>
<td>Man riding system</td>
<td>4</td>
</tr>
<tr>
<td>36</td>
<td>Fire resistant hydraulic fluid</td>
<td>7</td>
</tr>
<tr>
<td>37</td>
<td>High pressure hose</td>
<td>4</td>
</tr>
<tr>
<td>38</td>
<td>Accreditation of Test House</td>
<td>1</td>
</tr>
<tr>
<td>39</td>
<td>Chair lift system</td>
<td>0</td>
</tr>
<tr>
<td>40</td>
<td>Top man emergency escape device &amp; escape line</td>
<td>0</td>
</tr>
<tr>
<td>41</td>
<td>Audio Video Alarm</td>
<td>0</td>
</tr>
<tr>
<td>42</td>
<td>Winding Rope</td>
<td>0</td>
</tr>
<tr>
<td>43</td>
<td>Automatic Recording Speed Indicator</td>
<td>1</td>
</tr>
<tr>
<td>44</td>
<td>Man riding chair lift system</td>
<td>4</td>
</tr>
<tr>
<td>45</td>
<td>Dust control system</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td><strong>320</strong></td>
</tr>
</tbody>
</table>
5.0 Coal & Metalliferous Mining Examinations during 2012

(i) Board of Mining Examinations under the CMR, 1957

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shri S Puri</td>
<td>Director General of Mines Safety</td>
</tr>
<tr>
<td>Shri J.V. Duttatreyulu</td>
<td>Director (Operations), M/s. Singareni Collieries Co. Ltd.</td>
</tr>
<tr>
<td>Shri Vinay Kumar Singh</td>
<td>Chairman-cum-Managing Director, M/s Northern Coalfields Limited</td>
</tr>
<tr>
<td>Prof. Durga Charan Panigrahi</td>
<td>Prof. &amp; Head of Department, Department of Mining Engineering, Indian School of Mines, Dhanbad.</td>
</tr>
<tr>
<td>Shri Nagendra Kumar</td>
<td>Director (Technical), M/s Eastern Coalfields Limited</td>
</tr>
<tr>
<td>Shri Pradip Kumar Roy Chowdhury,</td>
<td>Director (Technical) Operations, M/s South Eastern Coalfields Limited</td>
</tr>
</tbody>
</table>

(ii) Board of Mining Examinations under the MMR, 1961

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shri S Puri</td>
<td>Director General of Mines Safety</td>
</tr>
<tr>
<td>Dr. Bal Krishna Shivastava,</td>
<td>Professor &amp; Coordinator, Centre of Advanced Studies, Department Of Mining Engineering, Institute of Technology, Banaras Hindu University,</td>
</tr>
<tr>
<td>Shri Diwakar Acharya,</td>
<td>Shri Diwakar Acharya, Chairman &amp; Managing Director M/s. Uranium Corporation of India Ltd.,</td>
</tr>
<tr>
<td>Dr. Upendra Kumar Singh,</td>
<td>Dr. Upendra Kumar Singh, Professor, Department of Mining Engineering, Indian School of Mines University,</td>
</tr>
<tr>
<td>Shri Narendra Kumar Nanda</td>
<td>Shri Narendra Kumar Nanda,Director (Technical) NMDC Limited.</td>
</tr>
<tr>
<td>Shri Avijit Ghosh</td>
<td>Shri Avijit Ghosh, Director(Mining) Hindustan Copper Limited,Tamra Bhavan,</td>
</tr>
</tbody>
</table>

Examiners for Certificates of Competency

Coal Mining Examinations

(a) Following were the Examines for Manager’s Certificates of Competency Examinations held in 2012.

<table>
<thead>
<tr>
<th>Subject</th>
<th>First Class manager’s Certificate</th>
<th>Second Class Manager’s Certificate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mine Management, Legislation &amp; General Safety</td>
<td>Shri R B Chakraborty</td>
<td>Shri P. K. Sarkar</td>
</tr>
<tr>
<td>Winning &amp; Working</td>
<td>Shri C. B Sood</td>
<td>Shri J. P. Singh</td>
</tr>
<tr>
<td>Mine Ventilation</td>
<td>Shri S. K. Jagnania</td>
<td>Shri S S. Malhi</td>
</tr>
<tr>
<td>Mining Machinery &amp; Electricity</td>
<td>Shri R.R. Sharma</td>
<td>Shri S. Ghosh</td>
</tr>
<tr>
<td>Mine Surveying</td>
<td>Shri B. B. Sood</td>
<td>Shri S. M. Dalthankar</td>
</tr>
</tbody>
</table>

(b) Following were the Examiners for Surveyor’s Certificate of Competency Examinations held in 2012.

<table>
<thead>
<tr>
<th>Surveying Paper-I</th>
<th>Shri G V Kumar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surveying Paper-II</td>
<td>Shri S. Rajoria</td>
</tr>
</tbody>
</table>

(c) Following were the Examiners for Overman’s Certificate of Competency Examinations held in 2012.

| Paper-I | Shri P. C. Rajak |
Metal Mining Examinations

(a) Following were the Examiners for Manager’s Certificates of Competency Examinations held in 2012.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Ist Class manager’s Certificate (Un-Restricted)</th>
<th>IInd Class Manager’s Certificate (Un-Restricted)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mine Management, Legislation &amp; General Safety</td>
<td>Shri P. K. Sarkar</td>
<td>Shri B P Ahuja</td>
</tr>
<tr>
<td>Winning &amp; Working</td>
<td>Shri S.C.Bhowmick</td>
<td>Shri A Gade</td>
</tr>
<tr>
<td>Mine Ventilation, Explosion, Fires &amp; Inundation</td>
<td>Shri A. K. Lal</td>
<td>Shri M. Kundu</td>
</tr>
<tr>
<td>Mining Machinery</td>
<td>Shri R. R. Kumar</td>
<td>Shri L.S.Sekhwat</td>
</tr>
<tr>
<td>Mine Surveying</td>
<td>Shri P. N..Sarkar</td>
<td>Shri M.Paliwal</td>
</tr>
</tbody>
</table>

(b) Following were the Examiners for Surveyor’s Certificate of Competency Examinations held in 2012

<table>
<thead>
<tr>
<th>Subject</th>
<th>Un-Restricted</th>
<th>Restricted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper-I</td>
<td>Shri G V Kumar</td>
<td>Shri A.K.Sahay</td>
</tr>
<tr>
<td>Paper-II</td>
<td>Shri P.K.Padhi</td>
<td></td>
</tr>
</tbody>
</table>

(c) Following were the Examiners for Foreman’s Certificate of Competency Examinations held in 2012.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Un-Restricted</th>
<th>Restricted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper-I</td>
<td>Dr A K Sinha</td>
<td>Shri P .C. Rajak</td>
</tr>
</tbody>
</table>

Following were the Examiners for Exchange Certificate of Competency Examinations held in 2012.

<table>
<thead>
<tr>
<th>Examination</th>
<th>Examiner</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Class Metal(Coal to Metal)</td>
<td>Shri S I Hussain, DDG,SCZ</td>
</tr>
<tr>
<td>Second Class(Metal to Coal)</td>
<td>Shri P. Ranganatheswar, DMS</td>
</tr>
<tr>
<td>First Class Coal(Metal to Coal)</td>
<td>Shri P. K.Sarkar, DDG(NZ)</td>
</tr>
<tr>
<td>Mine Mate (unrestricted)</td>
<td>S/shri V. Kalundia,DDMS, Manoj Kumar, Manager, Jadugoda Mines and K. Mondal, Manager Banduhurang Mine</td>
</tr>
</tbody>
</table>

Other particulars regarding various examinations held are given in Appendix-IV.
6.0 National Safety Awards (Mines)

6.1 Introduction
During the post-independence era, the mineral industry in India has achieved tremendous growth and also imbibed the latest mining technologies. Along with this growth, there has been corresponding awareness of the need to protect the health and lives of workers. The Constitution of India casts an obligation on all of us to ensure just and humane conditions of work. To give due recognition to outstanding safety performance at the national level, the Ministry of Labour, Government of India, instituted the National Safety Awards (Mines) in 1983 for the contest year 1982.

6.2 Scope
The scheme is applicable to all mines, which come under the purview of the Mines Act, 1952. Such mines have been classified into 7 groups as given below:
   i. Coal mines - Below ground with difficult mining conditions
   ii. Coal mines - Belowground (others)
   iii. Coal mines - Opencast
   iv. Metal mines - Mechanized opencast
   v. Metal mines - Manual opencast
   vi. Metal mines - Belowground
   vii. Oil mines

6.3 Schemes
Among different indices available, the following two have been accepted as indicator of safety performance:

1. Longest accident free period (LAFP) in terms of manshifts worked during three consecutive years ending with the contest year.

2. Lowest injury frequency rate (LIFR) during three consecutive years ending with the contest year.

It is expected that every mine shall endeavor to improve its safety performance. A bad mine has a high injury frequency rate. After obtaining a breakthrough, its next attempt should be to achieve longest accident-free period in terms of manshifts worked.

6.4 Awards Committee
The awards committee is constituted by the Ministry of Labour & Employment with Director-General of Mines Safety as its Chairman, eight representatives of mine managements, eight representatives of trade unions as member and an officer of DGMS as its Member-Secretary.
6.5 Mode of operation

An advertisement is released through DAVP in English, Hindi and other regional languages inviting applications in prescribed proforma for National Safety Awards (Mines). An entry fee of Rs.100/- per application is charged through a crossed IPO drawn in favour of the Administrative Officer/DDO, DGMS and payable at Dhanbad Post Office. The prescribed application form is jointly signed by the mine management and a workers’ representative.

6.6 Presentation of awards

National Safety Awards (Mines) for the contest year 2008, 2009 & 2010 was given away on 21st November 2012 at New Delhi by the Hon’ble President of India.

7.0 Conference on Safety in Mines

The Conference on Safety in Mines is a tripartite forum at the national level in which the employers’ representatives, the trade unions’ representatives, the Government represented by Ministry of Labour & Employment, DGMS, various administrative ministries/departments and State Governments and associated institutions, professional bodies, service associations, etc. take part. They review the status of the safety in mines and the adequacy of existing measures in a spirit of mutual cooperation. The conference also suggests measures for further improvement in safety, welfare and health of mine workers. The first Conference was held in the year 1958 and the tenth conference was held on 26th and 27th November, 2007 at New Delhi. A number of recommendations of these conferences have been given statutory backing and most of the others have been absorbed in management practices and policies.
8.0 Plan Schemes

In order to provide in-house technical support to field offices, DGMS is implementing following Plan Schemes namely:

Ongoing schemes:

(1) “Mine Accident Analysis and Modernization of Information Database (MAMID)"
(2) "Strengthening of Core Functions of DGMS (SOCFOD)"

8.1 “Mine Accident Analysis and Modernization of Information Database (MAMID)"

This is the restructured plan scheme after merging of the two Plan Schemes of Tenth Plan (2002-07) namely (i) Study of Mines Accidents and Development of Mines Safety Information System (SOMA) and (ii) Modernization of Information Database in DGMS (MID) as per the Report of Working Group on Occupational Safety & Health for 11th Five Year Plan 2007-12 of Ministry of Labour and Employment, Government of India – Oct,2006. Keeping the objective of integration in view, these schemes were merged into one scheme “Mine Accident Analysis and Modernization of Information Database (MAMID)".

Objective of the Scheme:

Mine Accident Analysis and Information Database

- To mitigate risk of disasters and accidents in mines through detailed analysis of accidents and dangerous occurrences using risk assessment and management techniques and activate promotional channels;
- Identification of mines having highest risk of accidents/disasters through detailed investigation into the operating systems and environment in the mine and prepare a Risk Management Plan for such mines for implementation; and
- Dissemination of mine information system through various reports, technical instructions' guidelines, circulars on electronic as well as other conventional media.

The major activities taken up during the year included –

- Publication of Standard Note on DGMS as on 1.1.2012
- Analysis of data for Identification of accident-prone mines in respect of coal & lignite mines.
- Compilation of statistics and preparation of manuscript for –
  o Statistics of Mines in India, Vol.II (Non-Coal), 2009
  o Monthly Review of Accidents and
  o Report on Monthly Inspection Analysis
- National Safety Awards (Mines) for the contestant years 2008, 2009 and 2010 were given away on 21st November, 2012 at New Delhi by the Hon'ble President of India.
- Risk Assessment in five coal mines, two non coal mines & in two oil mines has been carried out.
- Video spot was developed with regard to awareness generation for occupational and health on Silicosis through NFDC, New Delhi & it was broadcasted by Prasar Bharti, New Delhi.
- Training was provided to newly recruited Deputy Director of Mines Safety on inspection & Enquiry procedures.
8.2  "Strengthening of Core Functions of DGMS (SOCFOD)"

This is a continuing plan scheme. The scheme had been formulated by merging three on-going plan schemes of DGMS, namely (1) "Augmentation of S&T Capabilities, Mine Rescue Services and Human Resource Development (S&T)(1975)", (2) "Strengthening of Machinery for Conduct of Statutory Examinations (SSEX)(2000-01)" and (3) "Improving Efficiency by Providing Infra Structure Facilities in DGMS (PIF)" along with components like Occupational Safety and Health Surveillance, promotional initiatives and Emergency Response system.

Objectives of the Scheme:

The objectives of the scheme are:

- To render scientific and technological support to the enforcement wing of DGMS in the proper fulfillment and discharge of its statutory duties, responsibilities and advisory role.
- To develop, improve and update need based rescue and emergency response services to the mining industry & to help field offices of DGMS in the form of technical support while taking up rescue and emergencies of specific nature.
- To establish Mine Safety & Health Academy with institutes at different offices of DGMS for imparting structured training to DGMS officers and key personnel of the mining industry.
- Strengthening of Machinery for Conduct of Statutory Examinations
- To develop a structured mechanism for Occupational Health Surveillance & Disease Control in Mining Industry.
- To establish a National Council for Mines Safety with a view to generate safety and health awareness among miners and address their training issues.
- To improve the efficiency of DGMS by providing better infrastructure facilities which include providing own office buildings and residential complexes to the officers and staff members, providing better communication facilities and office equipment and furnishing of offices.

The overall activities are broadly divided into three components:

(1) Science & Technology (S&T) Component:

The Studies and Investigations, Research & Development, Monitoring and Assessment of Hazards that were undertaken and still continuing, are given below:

- Studies and Investigations into the existing methodology and techniques of exploration and exploitation of various types of minerals for improvement in the standards of Safety and Occupational Risks associated therewith
- Studies and Investigations into the new methodology and techniques of exploration and exploitation of various types of minerals for improvement in the standards of Safety and Occupational Risks associated therewith
- Development, Updation and advancement of methods, techniques, processes and materials through interactions, investigations, training etc.
- Standardization of prototype tests and accreditation of testing laboratories /test houses
- Guidelines for accreditation of testing laboratories/test houses
- Guideline for testing steel chocks , Propos, Powered Supports, and other support materials
- Standardization of Ultrasonic Testing Technique and formulation of Acceptance & Rejection Norms for components and vital parts of the machinery & equipment including winding ropes and guides.

- Technical Direction and Guide Lines on various subjects to support the Inspection wings of DGMS as well as to the industry.

- Special Investigations and Studies on :-
  i) Strata Control and Rock Mechanics
  ii) Development of Hidden Slip Detector FOR COAL MINES
  iii) Explosives and Blasting Techniques for improving efficiency and reducing blasting hazards
  iv) Mines Gases, Fires & Explosions for control and monitoring to ensure safety against dangers associated therewith.
  v) Classification of Coal Seam/Mine Prone to Spontaneous Combustion and Fire on Scientific Basis.

- Development of Mine Disaster Control Plan & Emergency Response Mechanism
- Modernization and furnishing of DMRS Laboratories with latest testing instruments and equipments including training
- Medical Examinations, Surveillance and control of Silicosis, Pneumoconiosis, Manganese Poisoning and other occupational disease and disorders in mines.
- Development and furnishing of OSH Laboratories in HQ and other field Offices.
- Establishing a fully equipped Central Mines Safety and Health Academy with Institutes at Dhanbad and Nagpur and creating a core team of well-trained faculty members to train DGMS officers and key personnel in mining industry.
- To develop basic training aids and safety manuals/monographs for use at the institutes and also at in-house training centers in mining companies.

Details of achievement during January to December, 2012:

<table>
<thead>
<tr>
<th>SN</th>
<th>Activity</th>
<th>Achievement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. S&amp;T Cell</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Mine Environment &amp; Fire</td>
<td>14</td>
</tr>
<tr>
<td>2.</td>
<td>Occupational Health Review, Survey &amp; Medical Exam. Etc.</td>
<td>06</td>
</tr>
<tr>
<td>3.</td>
<td>Ground Control</td>
<td>07</td>
</tr>
<tr>
<td>4.</td>
<td>Mine Mechanization</td>
<td>-</td>
</tr>
<tr>
<td>5.</td>
<td>Additional Job: Gas Analysis</td>
<td>-</td>
</tr>
<tr>
<td>6.</td>
<td>Testing of FRHF (Fire Resistant Hydraulic Fluid)</td>
<td>-</td>
</tr>
<tr>
<td>B. Development of Mines Rescue Services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Testing of Filter Self-Rescuer</td>
<td>-</td>
</tr>
<tr>
<td>2.</td>
<td>Testing of Self-contained Self-rescuer (SCSR)</td>
<td>-</td>
</tr>
<tr>
<td>3.</td>
<td>Rescue competition</td>
<td>07</td>
</tr>
<tr>
<td>4.</td>
<td>Field visits</td>
<td>-</td>
</tr>
<tr>
<td>5.</td>
<td>Organization of conference on Rescue/Recovery experience</td>
<td>-</td>
</tr>
<tr>
<td>6.</td>
<td>Monitoring of First aid competition</td>
<td>-</td>
</tr>
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<td>7.</td>
<td>Creation of Rescue Databases on Rescue facilities</td>
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<td>8.</td>
<td>Creation of Rescue Databases on actual Rescue/Recoveries</td>
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<td>9.</td>
<td>Issue of technical circulars</td>
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<td>C. Human Resource Development</td>
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<td>i.</td>
<td>Conduct of training Programmes:</td>
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<tr>
<td></td>
<td>i. DGMS Officers</td>
<td>67</td>
</tr>
<tr>
<td></td>
<td>ii. Key Personnel from mining industry</td>
<td>199</td>
</tr>
<tr>
<td></td>
<td>iii. Workmen’s Inspectors</td>
<td>79</td>
</tr>
</tbody>
</table>
6.3 e-Governance in Directorate General of Mines Safety [e-DGMS]

(A) Objective of the Project/ Scheme :

- Re-engineer work processes to change governance pattern for simplicity, transparency, productivity and efficiency.
- Transform from process bound System to Computerized Automated System.
- Provide Dedicated Network Facility for Data, Audio-Video and Mail messaging with Online Interactive Communication and Data Processing System.
- Computerize Mines Safety Examination & Certification System.
- Develop National Mines Safety & Health Resource Centre.
- Develop National Mine Safety & Disaster Management Network.

(B) Scope :

The Scheme envisages to completely computerize work flow system and procedures to be web enabled with facilities of on-line interactive. In order to achieve the objective, it is proposed to develop infrastructure facilities such as Local Area Network (LAN), Wide Area Network (WAN) and dedicated network facilities supported by Data Centres as well as Data Recovery Centres.

The following subjects shall be undertaken for computerization on priority :

- Mines Safety Examination & Certification System
- Inspections, Enquires and Compliance Tracking System
- Permissions, Approvals, Standards & Testing System
- Mines Statistical Information & Analysis System
- National Archives of OSH in Mines and Disaster Control & Management
- Budget and Finance Management System
- Other Associated Systems

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