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**Shri Narendra Modi**  
Prime Minister of India

“ Skilling is building a better India.  
If we have to move India towards  
development then Skill Development  
should be our mission. ”



**COMPLIANCE TO  
QUALIFICATION PACK – NATIONAL OCCUPATIONAL  
STANDARDS**

is hereby issued by the

**GEM AND JEWELLERY SKILL COUNCIL OF INDIA**  
for

**SKILLING CONTENT : PARTICIPANT HANDBOOK**

Complying to National Occupational Standards of

Job Role/ Qualification Pack: **‘Assorter’ (Basic)** QP No. **G&J/Q3601/NSQF Level 3’**

Date of Issuance: Jan 20<sup>th</sup>, 2017  
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\*Valid up to the next review date of the Qualification Pack or the  
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*Pyankumar Kothari*  
Authorised Signatory

(Gem and Jewellery Skill Council of India)

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Sincerely,



Prem Kumar Kothari

Chairman, GJSCI

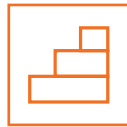
## About this book

1. This Participant Handbook is designed to enable training for the specific Qualification Pack(QP).
2. Each National Occupational (NOS) is covered across Unit/s.
3. Key Learning Objectives for the specific NOS mark the beginning of the Unit/s for that NOS.
4. The symbols used in this book are described below.
5. This book is about Assorting diamonds.
6. This book will introduce Assorters to mining and 4Cs of diamond.

## Symbols Used



Key Learning  
Outcomes



Steps



Tips



Notes



Unit  
Objectives



Exercise

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# 1. Introduction, Diamond Formation and Mining

Unit 1.1 - Introduction, Diamond Formation, Mining and Sources



G&J/N3601



## Key Learning Outcomes

**At the end of this module, you will be able to:**

1. Know the derivation of the word diamond.
2. Understand the formation of diamonds in nature.
3. Know the various properties of diamond.
4. Understand the Various types of sources.
5. Know the different types of diamond rough.
6. Understand the various types of mining techniques.
7. Understand the concept of recovery from ore.
8. Know the various historical and current sources.
9. Know the various mining companies.

## Unit 1.1: Introduction, Diamond Formation, Mining and Sources

### Unit Objectives

**At the end of this unit, you will be able to:**

1. Understand the evolution of the word diamond.
2. Understand in detail the formation of diamond.
3. Understand the properties of diamond.
4. Understand the Various types of sources.
5. Know the different types of diamond rough.
6. Understand the various types of mining techniques.
7. Understand the concept of recovery from ore.
8. Know the various traditional and current sources of diamonds.
9. Know the various mining companies.

### 1.1.1 The Word Diamond

Diamond is derived from 'adamas' - a Greek word , Adamas in greek language means unbreakable and its lustre is called as adamantine, adamantine means unconquerable.

### 1.1.2 Formation of Diamonds

Formation of diamonds requires the following:

- **High temperature** (1500 to 1800C)
- **High pressure** (45,000 to 60,000 kilobar)
- **Most important, Carbon** (99.95%)

Diamonds are formed at high temperature and high pressure at an approximate depths of 120 to 190 kilometres in the Earth's mantle. eclogite and peridotite are Carbon containing minerals which provide the carbon source, and the growth occurs over long period from 1 billion to 3.3 billion years (which is approx 25% to 75% of the age of the Earth).are transported close to the Earth's surface through deep volcanic eruptions by magma, which cools into rocks termed as **kimberlites** and **lamproites**.

### 1.1.3 Diamond Properties

Properties of diamond:

- Chemical composition: Carbon
- Hardness: 10 on Mohs scale (Hardest Mineral on earth crust).
- Specific gravity: 3.52 .
- Refractive index (RI - it is the ratio of speed of light in air to speed of light in gem): 2.417

### 1.1.4 Various Types of Sources

Following are the types of sources:

#### 1. Primary

- Once diamonds have been transported to the surface by magma through volcanic pipe, they may erupt and be distributed over a large area. A volcanic pipe which contains diamonds is known as a primary source of diamonds. For example, - dykes and veins.

#### 2. Alluvial source

- Also known as secondary sources of diamonds include all areas where a significant number of diamonds have been eroded out of their kimberlite or lamproite block area, and accumulated because of water or wind action.
- These include alluvial deposits and deposits along existing and ancient shorelines, river beds, where loose diamonds tend to deposit because of their size and density.
- Marine source is a type of alluvial source.

### 1.1.5 Types of Diamond Rough

Following are the types of diamond rough:

#### 1. Gem quality:

- These are those roughs which are used in jewellery.

#### 2. Near gem quality:

- They are those diamonds roughs which have borderline colour and clarity and can be used both in jewellery and industry depending on market conditions.

#### 3. Industrial:

- They are those roughs which are used for industrial purpose like cutting, polishing purpose.

## 1.1.6 Types of Mining

Following are the types of mining:

### 1. Open pit

- It is also called as surface mining.
- The ground is removed/ dug in layers to create a pit.
- Example: Big hole at Kimberley in South Africa. Measuring 1 mile in circumference and 440 yards deep.

### 2. Shaft

- These are Deep or underground mining.
- These are vertical stopes around the perimeter and pipe with horizontal shafts leading into pipe.

### 3. Alluvial

- Secondary mining is done in rivers, streams, dry beds and ocean shores.
- Primitive mining: Done with panning with pie thins and plastic buckets.
- Mechanized mining: Done with giant earth movers to help shift over burden.
- Marine mining is done in Namibia.



Fig. 1.1.6.1 Open pit mines



## 1.1.6 Types of Mining



Fig. 1.1.6.2 Open pit mines

### 1.1.6 Types of Mining



*Fig. 1.1.6.3 Shaft / Underground mines*