

**GOVERNMENT OF INDIA  
GEOLOGICAL SURVEY OF INDIA**



**POLICY GUIDELINES FOR ESTABLISHING  
NATIONAL DRILL CORE LIBRARIES IN GSI**

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**CONTENTS**

<b>Chapter</b>			
<b>I</b>		<b>INTRODUCTION</b>	3
	<b>I.1</b>	General	3-4
	<b>I.2</b>	Present procedure of Drill Core Preservation in GSI	4
	<b>I.3</b>	Status of core libraries world over	5
<b>II</b>		<b>CONSTITUTION OF COMMITTEE TO FORMULATE GUIDELINES</b>	7
	<b>II.1</b>	General	7
	<b>II.2</b>	Terms and reference	7
<b>III</b>		<b>REVIEW OF THE PRESENT STATUS OF GSI DRILL CORE LIBRARIES</b>	8-10
	<b>III.1</b>	Central Region - Nagpur	8
	<b>III.2</b>	Western Region - Akwali	9
	<b>III.3</b>	Southern Region – Hyderabad	9
	<b>III.4</b>	Eastern Region – Bhubaneswar	9
	<b>III.5</b>	Northern Region – Lucknow	10
<b>IV</b>		<b>POLICY GUIDELINES SUGGESTED BY THE COMMITTEE</b>	10-18
	<b>IV.1</b>	Identification of Centers for establishing National drill core libraries	10
	<b>IV.2</b>	Criteria for selection of drill core for preservation	11
	<b>IV.3</b>	Preservation of drill core	13
	<b>IV.3.A</b>	Core box specifications	13
	<b>IV.3.B</b>	Methodology for preservation of drill core in boxes	13
	<b>IV.4</b>	Stacking procedure for drill core boxes in core library	13
	<b>IV.5</b>	Drill core submission protocols	14
	<b>IV.6</b>	Facilities to be provided in core library	14
	<b>IV.7</b>	Format for creation of digital data base	15
	<b>IV.8</b>	Operation of core library	16
	<b>IV.9</b>	Access policy to core data in core library	17
	<b>IV.10</b>	Mechanism to generate petrological and chemical data of skeletonized sample	17
<b>Annexure</b>	<b>I</b>	Letter for constitution of the committee	
<b>Annexure</b>	<b>II</b>	Guidelines from CHQ for preservation of drill core-1977	
<b>Annexure</b>	<b>III</b>	Guidelines from CHQ for preservation of drill core-1998	
<b>Annexure</b>	<b>IV</b>	Table for data storage	
<b>Photos</b>	<b>1A &amp;B</b>	View of Regional drill core Repository, CR, GSI, Nagpur	
<b>Photos</b>	<b>2A &amp;2B</b>	View of Regional drill core Repository, WR, GSI, Akwali	
<b>Photos</b>	<b>3A &amp;3B</b>	View of Regional drill core Repository, ER, GSI, Bhubaneswar	

## **POLICY GUIDELINES FOR ESTABLISHING NATIONAL DRILL CORE LIBRARIES IN GSI**

### **I. INTRODUCTION**

#### **I.1: General**

Drilling is a very expensive method for collecting subsurface lithological, structural and mineralization information. It may be difficult to take-up drilling in any area again and again on account of various constraints. The drill cores recovered depict valuable data on geological set up and, therefore, is a treasure of immense information that can be used in future for establishing a generalized stratigraphic sequence of the area. The cores preserved for posterity may be useful in the search for mineralization, palaeontological studies, solving stratigraphic problems, etc. in future with advancement of technology.

The well known rationale for core preservation is saving the costly, basic data end-product of exploration, reducing duplication of expenditure and allowing for future geoscientific studies as new concepts evolve. In case of the cores obtained in any mineral investigation project, they may be useful to re-evaluate the mineral prospect in light of the changing economics and geological concepts. The advancements in mining and metallurgical technology and rise in prices of metals may render more deposits presently un-economic or sub-economic to become economically more viable. Thus it may be needed to restudy the sub-surface data and reanalyze the core samples. The drill cores preserved in the library will obviate the need to redrill in the already explored area.

Earlier cores generated from the investigations were preserved in temporary sheds in field camps and office premises in wooden boxes. But these were prone to insect attack and used to be exposed to atmosphere causing damage to the core boxes leading to loss of core. Hence, it was imperative to properly store and index the huge quantity of core generated. A policy decision of preservation of drill cores in GSI was taken in 1977 and guidelines were issued (Annexure-II). Guidelines for sharing of the core samples with non-GSI exploration agencies were issued in 1998 (Annexure-III).

As per the recommendation of High Powered Committee on functioning of GSI at Chapter 9.55 of the report National Drill Core Libraries have to be established and maintained by GSI at each Regional Office. GSI should prepare the framework for a National Core Repository (Library) in line with the best international practice, so that, the drill core samples are archived

with the National Core Repository (Library) at the Regional Drill Core Libraries with suitable category and indexing. It has also been recommended that digital records of drill cores preserved should be maintained online through the portal and a policy should be put in place which allows use of core samples by the concession holders on appropriate terms and conditions. In Chapter XIII of draft New MMDR Act (yet to be passed in the Parliament), it is proposed to establish National Core Repository for preservation and archiving of drill cores generated during mineral exploration

### **1.2: Present Procedure of Drill Core Preservation in GSI**

In the Geological Survey of India the programme of setting up of Drill Core Libraries at five Regional Offices was taken up from the field season 2003-04 under the X Five Year plan period and considerable progress has been made since then. From the field season 2003-04 onwards each Region/Wing is having programmes relating to creation of core library. Under this item significant boreholes from each investigation were identified and the available core is preserved in Galvanized Iron (GI) sheet boxes with proper records prepared for lithologs, structure, nature of mineralization and other important parameters. Skeletonization was taken up observing available guidelines. At present, most of the Regions have completed skeletonization of drill cores from past investigations. As per the present practice the officers associated with the drilling investigations have to submit the skeletonized drill core in GI sheet boxes with full details to the drill core Libraries for preservation.

The five Regional Drill Core Libraries established in Geological Survey of India are located at Southern Region-Hyderabad, Central Region-Nagpur, Eastern Region-Bhubaneswar, Western Region-Akwali and Northern Region-Lucknow. The cores generated from investigations carried out by the erstwhile Coal Wing and AMSE Wing of GSI are preserved in the respective Regional Centre where the investigation is conducted by the Wings. All the core libraries are looked after presently by Geologists as part time assignments.

### **1.3: Status of core libraries world over**

Core Libraries are established world over for preservation of drill core in the second half of the 20<sup>th</sup> century and thousands of meters of cores are preserved and utilized by private and

government organizations for further scientific studies. Networks of core libraries are established in countries like Australia, Canada and United States. The Table 1.3.1 furnishes the quantified details of cores preserved in the various core libraries abroad.

**Table 1.3.1: QUANTUM OF CORE IN THE VARIOUS LIBRARIES- ABROAD**

SL. No.	Name of the core Library	Country	No. of boreholes	Length of Core preserved
1	Morington Core Library, Tasmania	Australia	3000	460 km
2	W B Geoscience Centre at Londonderry, Sudney West	Australia	-	
3	Indooroopilly Library	Australia	7500 boreholes	650 km
4	Department of Natural Resources and Water (NRW) Queensland	Australia	10,000 drill holes	375 km
5	M N Drill Core Library, Deptt. Of Natural Resources	Minnesota	3540 drill holes	606 km
6	Manitoba Mineral Resources Division (There are 33 govt. operated storages in Canada)	Canada		260 km
7	Core Library, South Carolina	USA	1200 drill holes	
8	Kansas Core Library	USA	4000 boreholes 55,000 boxes	
9	Mercury Data Centre	USA	-	600 km appxi.

The Core libraries world over follow certain procedures and regulations while providing the facilities for inspection and sampling of drill cores by industry and research geoscientists.

These are as below:

1. The core is classified as confidential and open-file core.
2. The open file drill core is made available for examination during the office hours at a short notice of a few days in prescribed form. The intimation is required for making necessary arrangements.
3. Visitors to core libraries must confine their activities to the office and core examination area and are not permitted to assist in taking out the core from storage area of the building,
4. Each of the core library contains a file of all available data, i.e. drill core logs, cross sections, maps and, assay results.

5. Strict procedures are adhered to during sampling and cutting of core,
6. When only less than 25% of the full diameter of the core exists, it is not allowed to be sampled,
7. No more sample than, reasonably needed quantity of core is to be removed and restricted sampling is allowed to preserve the core as much as possible,
8. Any pieces of the core remaining after testing are to be returned to the archive within 90 days at their cost from the date samples are taken,
9. The users have to provide a list of the samples removed,
10. The Kansas Geological Survey has the system of inserting card at appropriate position listing the details of complete information of the person to whom core is provided, depth intervals, type of work to be carried out and results thereof.
11. Thin and polished sections prepared or other data produced, should be returned to the archive upon completion of the study,
12. The Libraries are required to be provided a copy of the results, data, reports, publications, interpretation, assay, logs from the examination of the core,
13. This information becomes part of the public record,
14. Utmost care is taken to keep the samples in the boxes from where they are taken out for studies,
15. The theft of the core is considered a criminal offence and is punishable.

**Core libraries provide facilities as listed below for sample preparation and study:**

- a. Core cutting instruments like core splitter and diamond saws for slicing/cutting of the core,
- b. Buckets/brushes for cleaning of the core before study,
- c. Acid solutions, 10% acid for testing of carbonates and
- d. Binocular microscopes for study of thin and polished sections.

**Core Acquisition**

- a. Mineral exploration companies are required to deposit drill core to the library on relinquishment of lease.
- b. Core offered is evaluated by the library to establish its scientific, educational or economic use.
- c. Key drill hole core and sample intervals of most value are systematically collected, indexed and stored.

## **II. CONSTITUTION OF COMMITTEE TO FORMULATE GUIDELINES**

### **II.1: General**

It is accepted that mineral drill core is valuable and should be archived for future reference. The future availability of mineral drill cores will thus enhance the mineral prospectivity of India. The Geological Survey of India has taken up a programme of setting up of Drill Core Libraries under five Regional Offices during the X<sup>th</sup> five year plan period and considerable progress has been made. Though GSI has started storing its drill cores generated during mineral exploration in regional core libraries at present there is no statutory requirement for drill core generated by mineral exploration by GSI and other agencies to be stored in GSI core libraries. Hence need for establishing National drill core library was felt and the Director General, Geological Survey of India constituted a committee (Annexure-I) to Review the present status of establishment of core Libraries/Libraries in different regions of GSI and prepare a framework for a National Drill Core Library in line with the best international practice, with the following Members:

- i. Shri K. K. K. Nair, Dy. D. G. & Head, Mission-II & HOD, CR, GSI, Nagpur – Chairman
- ii. Shri M.S. Jairam, Director, Monitoring, CHQ, GSI, Kolkata – Member.
- iii. Shri V. K. Khadse, Senior Geologist, Central Region, GSI, Nagpur -- Member Secretary.

### **II.2: Terms and reference**

The terms and reference of the committee constituted are as follows:

1. To review the existing policy (copy of the letter no. 1/1/Drill/Core/97/TCC, dated: 05.03.1998 enclosed) on sharing of core samples with non-GSI exploration agencies.
2. To prepare a framework for a National Drill Core Libraries in line with the best international practice, if necessary backed by suitable legislation, so that drill core samples are archived with the National Drill Core Libraries at Regional Drill Core Libraries, with suitable category and indexing.
3. To suggest suitable mechanism to generate petrological and chemical data of skeletonized core samples and /or preparation of database from existing analyses, particularly from mineralized zones.
4. To suggest a standard format for creation of database on the preservation status and availability of samples including up-gradation of existing facilities with search capability.

5. To identify services that can be extended free of cost vis-à-vis those that are to be charged.
6. To suggest changes as necessary on sharing of core samples on demand by non-GSI agencies/ Research Institutes etc.
7. A policy regarding use of core samples by concession holders on appropriate terms and conditions.
8. To set norms for online maintenance of digital records of drill cores preserved through GSI Portal.
9. Any other aspect the committee considers necessary.

### **III: REVIEW OF THE PRESENT STATUS OF GSI DRILL CORE LIBRARIES**

The committee constituted to Review the present status of establishment of core Libraries/Libraries in different regions of GSI and prepare a framework for a National Drill Core Libraries in line with the best international practice, held its meeting at Hyderabad on 1.04.2010 and again at Nagpur during the month of May, 2010 and held discussions regarding new policy guidelines. Chairman of the Committee also wrote letters to all Regional Heads to provide status of the drill core libraries. The Chairman of the committee visited the Regional Drill Core Libraries established by Central, Southern, Western and Northern regions of GSI and studied the present Status. The status of the core Libraries in regions of GSI is as follows:

#### **III.1 Central Region- Nagpur:**

The core library has been set in the premises of GSI Complex, Seminary Hills, Nagpur. An old ore dressing plant handed over by IBM has been renovated and converted to core Library. The Library is preserving cores in 5072 galvanized iron (GI) sheet boxes stacked in heavy duty racks. Core boxes representing 361 skeletonized boreholes and 73 stratigraphic boreholes belonging to 85 investigations including Coal and AMSE investigations with computerized data backup up to the end of 2009-10, are stored in this Library (Photo-1A and 1B).

Central Region has preserved the available core systematically with proper labeling and also developed a computerized data base system. Maps showing locations of drilling projects are exhibited in the Core library. Placards showing the details of the investigation are exhibited along with the drill core boxes stacked in the Racks. Preliminary facilities for study of the core



are made available. There is a facility to study the thin and polished sections of the drill core within the core library.

A computer application using MS ACCESS for storage of data and VISUAL BASICS-6 set of forms for display has been developed in 2004 taking help of local vendors. The complete data pertaining to the projects, boreholes and the drill core is loaded on the computer application. The data preserved includes details about the project details, borehole details, lithology, mineralization and structural details. EPMA studies, major oxides and trace elements chemical analyses, thin and polished section studies reports and their photos are also stored and displayed. The complete information about the length of core preserved in each box, its location in the core Library can be searched on the computer application. The computer application has a facility to search the projects by six different criteria like commodity, district, and state, name of the worker, FSP item code and title of the project on a computer application which is kept in the Core library. A progress report on complete procedure followed in preservation of drill core, details of core preserved are available in the Library.

### **III.2 Western Region-Akwali:**

The core Library has been set up in an old exploration camp of IBM on which minor repairs were carried out. Cores are being preserved in GI sheet boxes stacked in steel racks. Since the inception of the project up to end of Sept., 2009 a total of 32,143 m of drill cores have been skeletonized and preserved in GI Boxes. The core library of Western Region (Photo 2A and 2B) is located at a remote place where it is difficult to reach by public transport. Electricity is provided by a diesel generator set.

### **III.3 Southern Region-Hyderabad:**

CPWD has handed over a shed located in GSI Complex, Bandalaguda, Hyderabad which has been converted into the Core Library for Southern Region after carrying out civil and electrical repairs. GI core boxes have been procured and steel structural racks have been manufactured for storing core boxes. Skeletonization of drill core of around 15,000m has been completed. The Core Library is located at a very well connected place. There is a need to add representative drill core from investigations carried out in Southern Region. At present the Library preserves core for a few investigations only. The data pertaining to the drill core needs to be loaded on computer application.

### **III.4 Eastern Region-Bhubaneswar:**

Construction of a permanent core shed has been completed at Bhubaneswar (Photo- 3A and 3B). The core for 12 projects is preserved in 1549 GI sheet boxes. Permanent brick-mason racks have been systematically constructed. There is good height and ventilation provision within the core library. There are rooms for establishing an office and laboratory. Here also the data pertaining to the drill core needs to be preserved on a computer application.

**III.5 Northern Region-Lucknow:**

An existing shed within the premises of GSI Complex, Lucknow is accommodating the core boxes already skeletonized and transferred into GI core boxes and stored in steel racks which have been fabricated for stacking of the core boxes. A total of 2918 core boxes of 34 boreholes have been skeletonized and 10,882 meters of core has been completed up to March, 2009. A total of 1470 core boxes are kept in the core library. The Table 3.5.1 furnishes the quantified details of cores preserved in the various core libraries of Geological Survey of India

**Table 3.5.1: QUANTUM OF CORE IN NATIONAL LIBRARIES- IN GEOLOGICAL SURVEY OF INDIA**

<b>Name of the core Library</b>		<b>No. of boreholes</b>	<b>Length of Core preserved</b>
Central Region, GSI, Nagpur	INDIA	350 boreholes	20 km
Western Region, GSI at Akwali	INDIA	50 projects	32 km
Eastern Region, GSI, Bhubaneswar	INDIA	12 investigations	1549 boxes
Northern Region, Lucknow	INDIA	34 projects	10 km approxi.
Southern Region, Hyderabad	INDIA	-	15 km approxi.

#### **IV POLICY GUIDELINES SUGGESTED BY THE COMMITTEE**

The recommendations of the committee with regards to the formulation of new policy guidelines are as follows:

##### **IV.1: Identification of centers for National Drill Core Libraries**

The Committee suggests that Geological Survey of India should have six National Drill Core Libraries (NDLC) one in each Region, at a place very well connected by road/rail to major cities. The place where the National Drill Core Library is to be located should have all necessary infrastructure facilities like staying, transport and study of the core preserved. The libraries should be set up at places where GSI offices are located. Officials associated and visitors will be able to give more time and the expenditure on transport and maintenance can be minimized. The committee suggests that GSI should have Six National Drill Core Libraries at following places:

<b>Sl. No.</b>	<b>Region</b>	<b>Station where the Core Library should be located</b>
1	Central Region	Nagpur
2	Southern Region	Hyderabad
3	Eastern Region	Bhubaneswar
4	Western Region	Jaipur
5	Northern Region	Lucknow
6	Northeastern Region	Shillong/Guwahati

It is recommended that the present core libraries situated at Nagpur, Hyderabad, Bhubaneshwar and Lucknow can be upgraded into National Drill Core Libraries by increasing its infrastructure as suggested in guideline. A new National Drill Core Library should be established for Western Region at Jaipur (preferably in the GSI office premise) and for northeastern Region at Guwahati. Once the National core library at Jaipur is established selected core from Akwali Camp can be shifted to Jaipur. Apart from the National Drill Core Library, each Region can have their Regional Core libraries to store core which is not suitable for National Drill Core Libraries. All these core libraries must be manned by a full time experienced geologist with supporting staff. The geologist associated will be responsible for its development and maintenance. There is a need to have uniformity in the data storage and its retrieval pattern. For this there must be a

nodal officer who will be responsible for bringing out uniformity in all core libraries. It is suggested that Mission – II DDG may be made Nodal officer of the Core Library.

#### **IV.2: Criteria for selection of drill core for preservation**

This para describes the method used for the selection of mineral drill cores for National drill core libraries. As storage facility in the core libraries will be limited, the selection of drill core is of critical importance for success of the archival facilities. The libraries have to be established for the benefit of the general public, particularly the exploration industry. The ready availability of drill core will be of significant help to exploration agencies in the formulation of exploration strategies and programs. Only drill cores perceived as valuable to the minerals and exploration agencies, in the broadest sense, is archived.

The selection criteria take into consideration the mineral prospectivity of India. The archived material include drill core for preservation in the National Drill Core Libraries (NDCL) should be done as per the following procedure:

- i. The selected drill core generated from mineral investigations carried out by GSI, various government and Public sector and private parties will be archived in the Core library.
- ii. Cores from significant mines that have closed or are about to close in near future
- iii. Cores from significant mineralization that illustrates a range of mineral commodities, styles of mineralization and tectonic settings
- iv. Cores from geographic spread of deposits throughout India
- v. Cores that may be difficult or expensive to drill in the future such as holes from urban areas, national parks, isolated and remote areas, as well as extremely deep holes
- vi. Cores that illustrates excellent examples of local stratigraphy, significant structural features or unusual geological features
- vii. Cores from prospects or areas that is popular with mineral industries. This includes cores from prospects that may be uneconomic but attracts large amount of attention from prospectors and exploration agencies endeavoring to test new ideas and concepts.
- viii. The drill core should be preserved mineral belt wise. It must represent the lithologies of the area and repetition should be avoided.
- ix. Drill cores obtained from mineral exploration projects and from stratigraphic boreholes will be preserved in the National core libraries.

- iv. The cores from stratigraphic boreholes will be preserved for the full section of the strata drilled.
- v. When there are more number of boreholes drilled at least two boreholes representing the lithological assemblage of the province, parts which have been subjected to thorough Petro-mineralogy and chemical analysis with a view to establishing stratigraphy, lithological type and variation, mineralized zone, nature of wall rock alteration etc., should be preserved completely.
- vi. Cores from mineralized zones intersected in all boreholes and the wall rock alteration zones should be preserved on the basis of petro-mineralogy and chemistry.
- vii. Key drill hole core and sample intervals of most value should be systematically collected, indexed and stored.

### **IV.3: Preservation of drill core**

#### **A. Core box specification:**

For permanent preservation of drill core, it is necessary to preserve the core in galvanized iron GI sheet boxes. Boxes of galvanized iron sheet (about 22 gauge thickness) having 90cm length, 30 cm width and 10 cm height with three adjustable partitions dividing the box longitudinally in four or more compartments are recommended. These boxes are suitable for handling and stacking them in the heavy duty racks.

#### **B: Methodology for preservation of drill core in boxes:**

Before shifting the cores into the core boxes, it must be thoroughly washed with clean water and dried. The depth of the core should be written by good quality black oil paint or it can be engraved by hand machines on the GI sheet separators (*gutkas*) between each run of cores preserved in the core boxes. Borehole number, depth of the core samples and box numbers must be written with black oil paint or can be engraved with punch machines on the GI sheet core boxes.

The sulphide rich zones of mineralization are prone for spontaneous oxidation during the wet periods of rainy season. The acids generated because of moisture can attack the galvanized iron sheet boxes and spoil them. To avoid the oxidation of sulphides a thin coating of transparent varnish can be put over the mineralized zones.

#### **IV.4: Stacking procedures for drill core boxes in core library**

For storage of drill core boxes in the NDCL sufficient number of properly designed heavy duty racks must be made available. The drill core boxes should be stacked in properly designed steel racks (photo 1B, 2B etc). The cores should be stacked systematically in the racks. The core boxes of each project should be stacked in a continuous series of racks kept systematically in the Core library. The racks should be properly arranged taking advantage of the natural ventilation and illumination. Proper arrangements should be made for loading of the core boxes on the racks and their movement. Sufficient space should be there between each row of racks for movement of men and machineries. Proper safety arrangements should be there to avoid any accident due to imbalance in storage racks.

#### **IV.5: Drill Core Acquisition protocols**

The core libraries are established for the benefit of the general public, particularly the exploration industry. Hence it should be made mandatory for all exploration agencies to make submission of all selected mineral core compulsory by amending the MMDR Act appropriately. Core offered is evaluated by the Officer-in-charge of the library to establish its scientific, educational or economic use. As only a small percentage of cores generated from mineral exploration can be stored each year it is necessary to determine criteria for the selection of the core. To be acceptable to all, the core selection process has to be transparent. The selection process for mineral drill core is based on determining the priority that is using a series of selection parameters which will be determined from time to time. GSI being nodal agency for maintaining the National Core Library will be responsible for fixing selection parameters to assign the priority. Once drill core has been obtained from a particular deposit or location, that deposit or location is removed from the list of priorities. Additional core from deposit or location will only be collected if it is substantially better than the existing core.

The following protocol should be followed while submitting drill core to the NDCL for archiving:

1. Central and State Government to deposit selected drill cores to the National Core Library.
2. State and Central Public Sector undertakings, Mineral exploration companies are required to deposit selected drill cores to the library on relinquishment of lease.
3. It will be the responsibility of the investigating agency to hand over the cores in GI sheet boxes with full details required for preservation.

4. The drill core must be accompanied by a complete Drill Core Information like summarized lithologs, borehole geophysical logs, chemical analytical results, petrological study results, thin section and polished section samples etc.
5. The Officer-in-Charge of the National Drill Core Library of the area must be intimated at least two working days in advance before core is brought for submission.
6. Drill core donated to the National Drill Core Library shall become property of the Core Library.
7. Submission of any other relevant information that has not previously been supplied is to be encouraged.
8. The Officer-in-Charge may refuse to accept delivery of core that arrives incorrectly packaged or labeled. The removal of the refused core will be the responsibility of the donating agency.
9. All direct costs related to drill core submission as donation will be borne by the agency.

#### **IV.6: Facilities to be provided in Core libraries**

The core library should have attached laboratory for carrying out study. The lab should be equipped with facilities for core cutting (for which diamond saws of different grades and core splitter are essential), thin and polished section preparation equipments, grinding apparatus (ball mill and agate mortar etc.), testing chemicals and binocular microscope to study thin and polished sections.

The Core libraries should have facilities as listed below for sample preparation and study:

- a. Core cutting instruments like diamond saws for slicing/cutting of the core.
- b. Buckets/brushes for cleaning of the core before study.
- c. Acid solutions, 10% acid for testing of carbonates and
- d. Binocular microscopes for study of thin and polished sections.
- e. Instruments like Hyloggers to prevent cutting and sampling of the core must be avoided.

Each core Library should have a file of available data i.e. borehole logs, cross sections, assay results, petrological and petrographic studies reports and maps, photographs etc showing locations of the projects on geological and mineral belt maps.

#### **IV.7: Format for creation of digital data base**

The National Drill Core Libraries should have detailed, systematic information of the drill core preserved on computer for providing it readily to the visiting geoscientists. For this, it is necessary to have a computer programme/ application to store the data. The idea of formulating the computer application is to make available the complete details of the drill core preserved to the worker interested in studying the drill core very quickly and efficiently within the core library. The core library should preserve a separate computer database file for individual drill hole cores containing details of the Project, Project code and year, Commodity, Location (with Taluka, District and State details), Name/s of the worker /s, drill hole logs, cross section, petrological study details including results of thin section and polished section studies, whole rock chemical analyses data, trace element analyses data, assay details etc. for all core samples. Geophysical logging is carried in most of the investigations and the data is very much useful hence the computer application should have the facility to store the data pertaining to geophysical logs.

The Central Region, GSI, has developed a computer application using latest techniques for storage and retrieval of data. Taking the help of a local vendor and a computer application using MS Access for data base and Visual Basic forms display of data was made (Annexure: TABLES FOR STORAGE OF DATA). The computer application has forms for display of Project (Investigation) details, borehole, lithology of core preserved run wise, trace elements analysis data, whole rock analyses data, petrological (both thin and polished section studies separately), EPMA studies and storage details in Core Library. It has been modified to store and display photos of drill core runs and microphotographs of thin and polished sections.

The drill core project number and details can be searched by six different criteria like State, District, Commodity, FSP code number of investigation, Name of the worker and Title of the Project. Based on these details the vendor programmed the Application with facility Search the Project number and other details using six different criteria like Title of the Project, District, State, Geologists associated, Commodity and Item code. With this computer application it is very easy and quick to locate the drill core boxes of a particular depth within the Core Library.

This computer application was developed in 2004, it can be suitably modified taking services of specialists and then used by all National Drill Core Libraries and it can be used for loading the information on GSI Portal.



#### **IV.8: Operation of core library**

Any core library should be as far as possible comprehensive with regard to the cores preserved there for inspection or study purpose by any interested individual / exploration agencies in the country for formulation of exploration strategies and programs, geoscientific research or for preparing database for industrial purpose. Therefore, the core library should be based on the most modern concept of management of the cores and have efficient retrieval system both of the cores proper and the records.

The following protocol is suggested for the core library for its operation:

- (i) Core library will be maintained by a structured mechanism with Director as its head who will be technically under ADG of Policy Support System but administratively under the ADG of the Region.
- (ii) The cores have to be classified as confidential and open-file core.
- (iii) The open file drill core is made available for examination during the office hours. The intimation is required for making necessary arrangements
- (iv) Records of the core library have to be computerized on suitable database format to be made available on-line through the portal.
- (v) The core library will be open to all who are interested in the study of the cores for geoscientific purposes,
- (vi) The records on the cores preserved in the core library will be made available to any individual for the geoscientific studies.
- (vii) All study in the core library and sampling, for which necessary permission has been acquired from authorized official of the Department, should be conducted under strict supervision of the Department personnel.
- (viii) Visitors to core library must confine their activities to the office and core examination area and are not permitted to take the core from storage area of the building.
- (ix) Strict procedures are to be adhered to during sampling and cutting cores. Sampling to be restricted and as far as possible sampling may be avoided for preservation of cores.
- (x) Utmost care is to be taken to keep the sample in the box from where it was taken for the studies.
- (xi) The users have to provide a list of the samples removed
- (xii) The theft of the core is considered as criminal offence and is punishable

- (xiii) Fees will be charged as per the Schedule of Charges in the Department for any service rendered to the individual or party who desires for the same.
- (xiv) Once the study is over the individual or the agency should handover the samples collected along with thin and polished sections prepared and results of his study to the core library in charge for including it in the database. This information becomes the part of the public record.
- (xv) All the drill cores preserved may be photographed and put on computer for viewing.
- (xvi) Any tilting of the core box can lead to permanent mixing of the core, particularly splitted core. Hence, care must be taken to avoid even slight tilting of the boxes.
- (xvii) For bulk movement of the drill core boxes, a specially designed trolley may be used.
- (xviii) The Department reserves the right to refuse permission to study of core samples in the Core Library.

#### **IV.9: Access policy to core data in core library**

The cores are invaluable commodity to any geoscientist who is pursuing his scientific research on a particular problem in earth science or to an entrepreneur who is in search of a prospect where he can invest. Therefore, access to the core in any core library should be free. The availability details of the cores preserved in any core library should be made available on line or through a database access system. The interested individual should be able to know whether core for the location / prospect in which he / she is interested is available. The use of core should be restricted only to non-destructive physical study only.

#### **IV.10: Mechanism to generate petrological and chemical data of skeletonized samples**

It must be mandatory to all geologists associated with mineral investigations to handover the required quantum of core along with thin and polished sections prepared from the drill core to the National Drill Core Library at the time of submission of the report. It should be the responsibility of the supervisory officer to hand over the core along with the sections made to the NDCL. A large number of thin and polished sections will be generated from such donations.

The computer application to be used for storage of data should have forms for display of Project (Investigation) details, borehole, lithology of core preserved run wise, trace elements analysis data, whole rock analyses data, petrological (both thin and polished section studies separately), EPMA studies and storage details in Core Library. The computer allocation designed

has the facility to store and display photos of drill core runs and microphotographs of thin and polished sections.

From the above it emerges that the core libraries should essentially be a laboratory where further research is automatically generated and entrepreneurs get stimulation to start new enterprises

**Annexure-I: Letter for constitution of the committee.**



**GOVERNMENT OF INDIA**  
**GEOLOGICAL SURVEY OF INDIA**

**OFFICE ORDER**

No : \_\_\_\_\_1/1/GSI/CORE LIBRARY/2009-10/46F

Geological Survey of India  
27, J. L. Nehru Road  
Kolkata – 700 016.  
Dated : 3<sup>rd</sup> March, 2010

**Sub : Core Library in Geological Survey of India (GSI) – New Policy Guidelines**

Geological Survey of India has taken up programme for setting up of Drill Core Libraries under five Regional offices during the Xth Plan period. Considerable progress has been made for setting up of such libraries and a status note on this upto FS 2007-08 is enclosed for ready reference. A draft for National Core Library – Access Policy has also been prepared (enclosed) which can be taken as a base for elaborating the policy framework for the Core Library in GSI.

DG, GSI has constituted a Committee with the following members to review the present status of establishment of Core Libraries in different Regions along with the following Terms of Reference. The Committee is to submit a report within one month from the date of issue of this order.

1. Shri K. K. K. Nair, Dy. DG, Head Mission-II & HOD, CR,GSI, Nagpur – Chairman
2. Shri M.S.Jairam, Director (SG), Monitoring, CHQ, GSI, Kolkata – Member.
3. Shri V. K. Khadse, Senior Geologist, Central Region, GSI, Nagpur -- Member Secretary.

Terms of Reference:

1. To review the existing policy (copy of the letter no. 1/1/Drill/Core/97/TCC, dated: 05.03.1998 enclosed) on sharing of core samples with non-GSI exploration agencies.
2. To prepare a framework for a National Drill Core Library in line with the best international practice, so that, if necessary backed by suitable legislation, drill core samples are archived with the National Drill Core Library at Regional Drill Core Libraries, with suitable category and indexing.
3. To suggest suitable mechanism to generate petrological and chemical data of skeletonised core samples and /or preparation of database from existing analyses, particularly from mineralized zones.
4. To suggest a standard format for creation of database on the preservation status and availability of samples including up-gradation of existing facilities with search capability.
5. To identify services that can be extended free of cost vis-à-vis those that are to be charged.
6. To suggest changes as necessary on sharing of core samples on demand by non-GSI agencies/ Research Institutes etc.
7. A policy to put in place which allows use of core samples by concession holders on appropriate terms and conditions.
8. To set norms for online maintenance of digital records of drill cores preserved through GSI Portal.
9. Any other aspect the committee considers necessary.

The Committee may include additional members as necessary.

( Sujit Dasgupta )  
Director (P&M)  
for Director General, GSI

To :

1. Shri K. K. K. Nair, Dy. DG, Head Mission-II & HOD, CR,GSI, Nagpur – Chairman
2. Shri M.S. Jairam, Director(SG), Monitoring, CHQ, GSI, Kolkata – Member.
3. Shri V. K. Khadse, Senior Geologist, Central Region, GSI, Nagpur -- Member Secretary.

**Annexure-II: Guidelines from CHQ for preservation of drill core-1977  
GOVERNMENT OF INDIA**

No. /Follow-up/ ID(HQ)/HOD/96-97/46P

Dated, 2ndMay, 1997

From  
The Director General,  
Geological Survey of India,  
27, Jawaharlal Nehru Road,  
Kolkata

To  
The Dy. Director General,  
Geological Survey of India, Central Region,  
Nagpur.

Sub: Skeletonisation of drill cores etc. - Follow up of the decisions of the  
10<sup>th</sup> HOD meeting held at Calcutta on 5.3.97.

Sir,

In a follow-up of the decision taken on the Agenda No.16 para no.10.3.14, page no.8 of the minutes of the 10th HOD meeting held at Calcutta on 5.3.97, the following points are enumerated below regarding the skeletonisation of drill cores and its preservation made:

**A) Skeletonisation :**

a) at least two representative boreholes which have been subjected to thorough petro-mineralogy and chemical analysis with a view to establishing stratigraphy, lithological type and variation, mineralised zone, nature of wall rock alteration etc., should be preserved completely.

b) Cores of all boreholes which have intersected the mineralisation should be preserved in the following manner:

i) the mineralised zone/zones.

ii) the wall rock alteration and in beyond, the extent of alteration to be decided on the basis of petromineralogy and chemistry

iii) Portions of boreholes whose chemistry and petro-mineralogy is available other than the above.

c) Stratigraphic boreholes are to be preserved completely.

**B) Mode of preservation:**

After skeletonisation, the cores are to be preserved in core-boxes of good quality galvanised iron sheets (as per the drawing). The "Gutka's" are also to be of galvanised iron sheet. The core-boxes are to be stacked in a galvanised/painted iron shelf. The numbers' etc., are to be punched in the sheets so that the question of thin information being lost is eliminated. The thickness of the galvanised iron sheet should commensurate with the load to be carried (as cores of various sizes are the enclosed diagram). To avoid the boxes etc. to be rusted, which would normally take a longer time, painting with red oxide may be taken recourse to periodically.

**C) Place of preservation:**

As long as the investigation is running, the cores are to be preserved at the site. After winding up the investigation, it should be sifted to the Regional/OF-Hq or at any centralised place selected by the Region for preservation with all the relevant details.

Sd/-  
(M.Ramakrishnan)  
Dy. Director General, (OP-I)  
for Director General.

**Annexure-III: Guidelines from CHQ for preservation of drill core-1998.**

**GOVERNMENT OF INDIA**

No. 1/1/Drill/Core/97/TCC

Date 5.3.1998

From  
Director General  
Geological Survey of India  
Calcutta-16

To  
The Dy. Director General  
Southern Region  
Geological Survey of India  
Hyderabad.

Sub: Permission to access/sampling by private organizations  
Ref: Your letter No. 12873/TCS/gen/96 dated 10.2.1998.

Sir,

Please refer to your above quoted letter regarding the modalities and conditionalities to be applied for permitting examination of core and drawing the samples by parties who have purchased the reports of the concerned blocks. In this connection it may be stated that the facilities could be provided subject to availability of cores that can be spared and the decision in this respect will lie with the GSI in absolute term. In this connection the following guidelines may be adopted, if you consider the part can be spared.

1. Access to cores and duplicate samples may be given only to the agencies who have purchased GSI report to the corresponding block.
2. The party may be permitted to sample the core keeping the part of the core for future reference.
3. Sampling may be permitted in presence of GSI's officer to ensure that only minimum and reasonable amount of the core is taken out.
4. It may be ensured that only a part of duplicate half of the core sample may be allowed to be taken for their use. It is preferable to insist on use of small portable grooving machine which would scoop a groove of say 5mm depth along the length of the core so that the main part of the core remains undisturbed for future use.
5. It may also be stipulated that the analytical results of the core samples may be made available to GSI for record.
6. Nominal price of Rs 150/- per sample of core length of one meter (or part thereof) may be charged which will take care of any unreasonable demand.
7. The other charges for sending a geologist for the purpose will have to be borne by the party concerned.
8. It is also necessary to continue with the in-house core preservation arrangements in field level followed by storage at selected locations in the individual regions/operations. To facilitate this and to reduce the infrastructural load present practice skeletonising the core should be followed/ The broad parameters are to preserve on or two complete boreholes cores, while keeping only ore zones from other boreholes.

Yours faithfully,  
Sd/-

N.P. CHOUDHURI  
Dy. Director General  
For Director General

**Annexure IV: TABLES FOR STORAGE OF DATA**

**1. GENERAL INFORMATION OF THE PROJECT**

<b>GENERAL INFORMATION OF THE PROJECT</b>					
EXIT	MAIN MENU	SEARCH			
CENTER NAME			PROJECT NUMBER		
AREA		DISTRICT		STATE	
LATITUDE		LONGITUDE		TOPOSHEET NO.	
PROSTCTING DIVI.			COMMODITY		
ITEM CODE		YEAR		AIM OF EXPLORATION	
TITLE OF ITEM					
NAMES OF GEOLOGISTS					
NO. OF BOREHOLES DRILLED		METERAGE		RESERVE ESTIMATED & GRADE	
<b>PROGRESS REPORT DETAILS</b>					
TITLE OF THE REPORT				AUTHORS	
YEAR OF CIRCULATION		LIBRARY ACCESSION NO.		REMARKS	
					<b>UPDATE</b>

**2. BOREHOLE DETAILS**

<b>BOREHOLE DETAILS</b>					
PROJECT NO.		DATE OF COMMENCEMENT		LOCATION	
BOREHOLE NO.		DATE OF COMMENCEMENT		DEPTH DRILLED	
Rr.l. AT COLLAR		INCLINATION		AZIMUTH	
					<b>LITHOLOGY</b>
ANALYSES OF SAMPLES				<b>PETROCHEMISTRY</b>	
YEAR OF ANALYSES		ANALYSIS			
NAME OF THE LAB.		<b>PETROCHEMISTRY</b>			
NAME OF THE ANALYST				<b>EPMA STUDIES</b>	
				<b>STORAGE</b>	
PETROLOGICAL DETAILS			<b>STORAGE DETAILS</b>		
<b>BACK</b>			<b>UPDATE</b>		

**3. LITHOLOGY TABLE**

<b>LITHOLOGY DETAILS</b>											
BOREHOLE NO.		CORE SIZE				MINERALISATION					
FROM DETPH (M)		LITHOLOGY				REMARKS					
TO DETPH (M)		STRUCTURE									
RUN											
CORE RECO. (M)											
CORE RECO. %											
		<b>INSERT</b>			<b>UPDATE</b>					<b>DELETE</b>	
<b>LITHOLOGY TABLE</b>											
ID	BH. NO.	FROM DEP.	TO DEP.	RUN	RECO.	RECO %	CORE SIZE	LITHO.	STRU.	MINERA.	
<b>BACK</b>							<b>UPDATE</b>				
<b>OK</b>											

**4. PETROLOGICAL DETAILS**

<b>PETROLOGICAL DETAILS</b>			
BOREHOLE NO.		DEPTH : ORE MICROSCOPY REPORT	
DEPTH : THIN SECTION STUDY REPORT			
		<b>DELETE</b>	
		<b>UPDATE</b>	
		<b>INSERT</b>	
<b>PETROLOGICAL DETAILS TABLE</b>			
ID	BH. NO.	THIN SECTION REPORT	POLISHED SECTION REPORT
<b>BACK</b>		<b>UPDATE</b>	
<b>OK</b>			



**5. EPMA STUDIES DETAILS**

<b>EPMA STUDIES</b>			
BORE HOLE No.		DEPTH (M)	
RESULTS OF EPMA STUDIES			
EPMA STUDIES TABLE			
ID	BORE HOLE	DEPTH	REPORT

**6. STORAGE DETAILS**

<b>STORAGE DETAILS</b>									
BOREHOLE NO.					ROW NO.				
PROJECT NO.					RACK NO.				
FROM DEPTH					SHELF				
TO DEPTH					REMARKS				
CORE BOX NO.									
<b>INSERT</b>			<b>UPDATE</b>			<b>DELETE</b>			
ID	BH. NO.	PROJ. NO.	FROM DEPTH	TO DEPTH	CORE BOX NO.	ROW NO.	RACK NO.	SHELF	REMARKS

**7. PETROCHEMISTRY**

PETROCHEMISTRY DETAILS												
BOREHOLE NO.		SAMPLE NO.		RESULTS OF ANALYSES IN PPM				DEPTH				
		SiO <sub>2</sub>						<b>ADD</b>			INSERT  UPDA RE  DELE TE	
		Al <sub>2</sub> O <sub>3</sub>										
		Fe <sub>2</sub> O <sub>3</sub>										
		MgO										
		CaO										
		Na <sub>2</sub> O										
		FeO										
		K <sub>2</sub> O										
		TiO <sub>2</sub>										
PETROCHEMISTRY TABLE												
INSERT			UPDATE				DELETE					
ID	BH. NO.	SAMPLE. NO.	DEPTH	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	MgO	CaO	Na <sub>2</sub> O	FeO	K <sub>2</sub> O	TiO <sub>2</sub>

**8. SEARCHING OF PROJECT DETAILS**

SEARCHING OF PROJECT DETAILS		
	<input type="radio"/> TITLE OF THE PROJECT	SEARCH CHOICE
	<input type="radio"/> DISTRICT	<input type="radio"/> BEGINNING WITH
	<input type="radio"/> STATE	<input type="radio"/> END WITH
	<input type="radio"/> GEOLOGIST/AUTHORS	<input type="radio"/> EQUAL TO
	<input type="radio"/> COMMODITY	SEARCH KEY
	<input type="radio"/> ITEM CODE	START
	<b>SEARCH RESULTS</b>	

**PHOTOS**



Photo No. : 1A : View of Regional Drill Core Repository, CR, GSI, Nagpur



Photo No. : 1B : View of Regional Drill Core Repository, CR, GSI, Nagpur



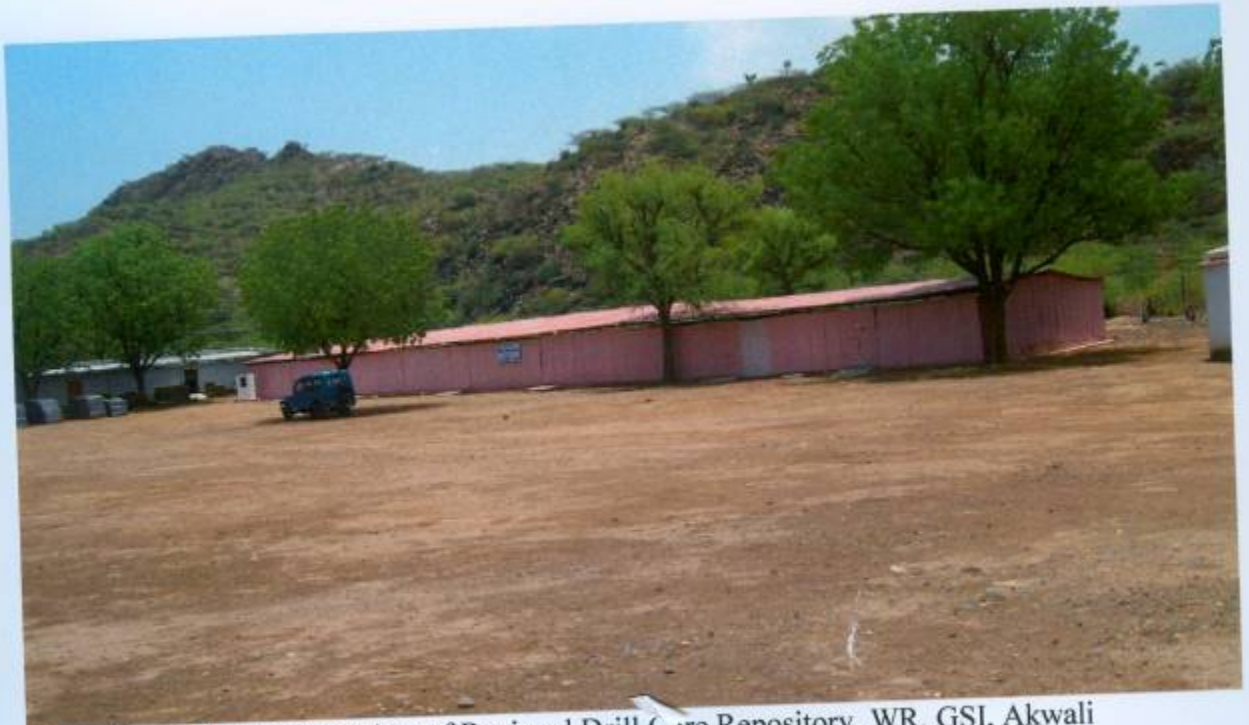


Photo No. : 1A : Outside View of Regional Drill Core Repository, WR, GSI, Akwali



Photo No. : 1B : Inside View of Regional Drill Core Repository, WR, GSI, Akwali



Photo No. 3A: Out side View of Regional Drill Core Repository, ER, GSI, Bhubaneswar



Photo No. : 3B : Out side View of Regional Drill Core Repository, ER, GSI, Bhubaneswar