CHAPTER - II

CONSERVATION AND PRESERVATION OF LIBRARY MATERIALS
2.1 Introduction: -

Conservation is a term, which embraces three closely related ideas, “preservation, protection and maintenance.” According to American Council of Learned Societies (ACLS) [1] area of conservation commences with the creation of text, extends to publication thence to acquisition and then storage in the library for access and use. This means conservation concerns with authors, publishers, librarians and readers. But librarians have more responsibility of preserving the library reading material. The term conservation is two folded i.e. preservation and restoration. In preservation, preservative measures are taken to stop or to check or retard deterioration, and in restoration, special treatment is to be given to the reading materials in order to bring them back to their original shape. Restoration is a technical area and needs special skills, which may not be possible for every librarian to possess it. The library material is handled either by the library staff or the users.

Preservation of library material is most serious problem in today’s librarianship. Libraries are more concentrating on dissemination of information than the preservation of library materials. Techniques for organizing and disseminating information are developing fast, but conservation field is still neglected. If due attention is not given for the conservation of library material, then there is every possibility that our cultural heritage and “nation’s collective” memory may disappear. Our libraries are without trained personal in conservation. In this context, E. W. Browning [2] says,” Libraries have asked for and library schools have trained assistants in book selection, in cataloguing, and classification but not in conservation and preservation. The terms ‘preservation’, conservation and restoration have been used interchangeably in library literature until last few years. Currently conservation is the more specific
term is particularly used in relation to specific objects, whereas 'preservation' is a broader concept covering conservation as well as actions relating to protection, maintenance and restoration of library collections. Christopher Clarkson [3] emphasizes this broader aspect when he states that 'preservation' encompasses every facet of library life, it is he says, preventive medicine.... The concern of everyone who walks into, or works in, a library for Clarkson conservation is 'the specialized process of making safe, or to a certain degree usable, fragile period objects' and restoration expresses rather extensive rebuilding and replacement by modern materials within a period object, catering for future of more robust use. He neatly distinguishes the three terms by relating them to the extent of operations applied to an item; restoration implies major alterations, conservation minimal and preservation none. Another British author, Diana Grimwood Jones [4] points out a further useful distinction between conservation and preservation, the former term is primarily concerned with ensuring that the original artifact is maintained and secure, whereas the latter form applies to various strategies for preserving the intellectual content.

The terms conservation, preservation and restoration are defined by various organizations. International federation of Library Associations and Institutions (IFLA) [5] has defined these terms as under.

**Preservation:** - Includes all the managerial and financial consideration including storage and accommodation provisions, staffing levels, policies, techniques and methods involved in preserving library and archive materials and the information contained in them.

**Conservation:** - Denotes those specific policies and practices involved in protecting library and archival materials from deterioration, damage and decay, including the methods and techniques devised by technical staff.
Restoration: - Denotes those techniques and judgments used by technical staff engaged in the making good of library and archives material damaged by time, use and other factors.

Harrods's Librarians Glossary [6] has defined these terms as

**Conservation (Archives):** The use of chemicals and other physical procedures in treatment or storage to ensure the preservation of a document.

**Preservation (Archives):** - [i] the primary functions of an archive depository to provide adequate facilities for the care, protection and maintenance of the archives of whatever kind. [ii] Specific individual and collective measures taken for the repair, restoration, protection and maintenance of the archives.

Preservation is a broader term than conservation and is a management process; conservation is a technical and / or craft process. Conservation means the protection and wise use of our natural resources. Conservation means guarding these resources so the greater number of people may use them wisely.

J. R. Wit [7] mentions that natural resources are not only limited, but also many of them can also be easily damaged or destroyed. Men cut down trees and mine metals for use in building and manufacturing. They destroy forests to clear the land for farming. They pollute streams and make the water unfit for use. They overwork the soil and make it useless for growing more crops. Conservation is concerned not only with the resources we need today, but also with resources for the future. In each generation, every person's share of the world becomes smaller because our population is growing rapidly. Conservation also means, safeguarding human resources. Our well being depends not only on soil, trees, and
minerals. It also depends on our health and on the services we receive. Conservation of human and natural resources help make and keep our homes, our country, and soil and our world better places in which we live.

2.11 Artefact Versus Content Preservation

A key concept central to the preservation effort is that of distinguishing between the intellectual properties of an item and its physical properties. For example, a book’s intellectual properties lie in the text and its meaning, while its physical properties are carried in its construction, materials and design. If the content (the intellectual properties) of a book is to be preserved, then photocopying or microfilming, or even reading the text onto a cassette tape will suffice. For many items in library collections this kind of preservation is all that may be required, both for current use and in the future. If, however, the artifact itself (the book’s physical properties) is to be preserved, then different methods will need to be applied to that item. It may need to have its paper deacidified then strengthened to improve its ability to be handled, its binding refurbished, and it may require enclosing in a custom made archival quality box.

Artefact preservation is usually chosen, when the item as a physical object has special value because it is old, it has beauty, it is rare, it has some historical significance, or it has a high monetary value. Such criteria can be difficult to define and apply to items in a collection in some cases the artifact is preserved for its bibliographical significance. For example, although most users of newspapers are satisfied with a microfilm of the paper, the newspaper or printing historian will require evidence about such things as paper quality and size of page which can only be derived from the physical objects themselves. It may therefore be important to some users that at least a sample of the artifact be conserved.
One of the key decisions to be made in a preservation program is what to conserve, there is not yet a clear consensus about when the content should be conserved in preference to the artifact. In his influential 1966 report Gordon William [8] carefully examined the distinction between the 'physical' and 'intellectual' properties of a book. He noted that for some books the intrinsic physical characteristics of some of them also provide significant information about the text itself or its authenticity, or about the society that produced it and he strongly recommended the retention of an original copy of all significant books in a central storage facility.

Artefact conservation may be appropriate for national heritage collections with a legislative and moral responsibility to retain objects for as long as possible (e.g. legal deposit collection), it is probably not appropriate for most other libraries, whose aims are usually more immediate and are often defined in terms of availability to users.

2.2 Different types of library materials: -

Today the libraries are confronted with many different types of material besides books. Manuscripts, maps, photographic material, audio-visual material, microfilms, films and number of other items present the modern librarian new problems. These problems range from acquisition of these materials to management and utilization of it. Although there are a number of standards and rules for the handling of such materials, and although these are applicable in all types of special and general libraries, nevertheless the actual form and content of catalogue and index entries and the methods of filing are subject to the work which they are intended perform. In fact, if these were possible to generalize about the factors governing the storage of special materials, following points would probably prove uppermost in the minds of most librarians, accessibility, protection, recording, economy in storage. The researcher has considered following
types of materials for digitization. To conserve and preserve it, one should know its common properties and salient features. These features would be helpful while undertaking its digitization.

2.21 MANUSCRIPTS:
Paul Mosher [9] mentions that handwritten manuscripts were the chief records of human history for about 5000 years, until the time when printing became general throughout the 'western World'. Manuscripts are precious part of our cultural heritage. Great ancient scholars dedicated their lives for creating written records of knowledge. Manuscript is a term used for any document written by hand or by a machine such as a typewriter or a personal computer. The word is often used to distinguish an author's original version of a work from the printed copy. In addition, manuscript refers to any handwritten document from ancient times until the introduction of printing in the 1400s.

Harrod's Librarians Glossary [10] defines manuscripts as, “A document of many kind which is written by hand, or the text of a music or literary composition in hand written or typescript form, and which, in that form, has not been reproduced in multiple copies.


a) Written by hand and not printed, abbreviated as MS-singular and MSS-plural.

b-1) A book, document or the like written by hand, writing hand, writing of any kind as distinguished from printed matter.

2) Written character or written document in general, writing as opposed to print.
Papyrus manuscripts were first written in Egypt almost 6000 years ago. The ancient Egyptian prepared the writing material from a reed-like plant, called the papyrus. The manuscript sheets were pasted together into rolls or volumes, which were usually twenty to thirty feet long. The University of Michigan has nearly 7,000 papyrus manuscripts, which is largest in the U.S.A.

The use of skins as writing material is probably as old as the invention of writing. Parchment was first used as manuscript material because it was cheaper than papyrus. It was also easier to write on with a pen and it lasted longer than papyrus. The monks of the middle ages copied onto parchment many ancient classics from decaying papyrus rolls. Paper was an invention of Chinese, even though the word paper comes from the Egyptian papyrus. The ancient Chinese wrote their earliest manuscripts on narrow wood or bamboo strips, or on silk rolls. After they learned to make paper, they sought methods of making it easier to handle.

2.22 RARE BOOKS:
To define 'a rare book' is very difficult. According to David Clement [12] "A book which is difficult to find in the country where it is sought ought to be called simply rare; a book which is difficult to find in any country may be called very rare, a book of which there are only fifty to sixty copies existing, or which appears so seldom as to suggest that there never had been more, at any time than that number of copies, ranks as extremely rare; and when the whole number of copies do not exceed ten, this constitutes excessive rarity or rarity in the highest order" Mr. Burton do not agree with the classification made by Clement David about rare books. He wrote, "Books may be rare enough in the real or objective sense of the term, but if they are not so in the nominal or subjective sense by being sought after, rarity goes for nothing. A volume may be unique, any stand
quite alone in the world but whether it is so, or one of a numerous family is never known, for no one has ever desired to posses it.”

Cunha [13] has identified following factors upon which one can decide which is the Rare Book –
- Relation to each damaged book to the entire collection.
- Research or historical importance of the volume
- Importance based on frequency of use.
- Permanent versus temporary importance of each book.

Rare book collection differs from the general library collection in a number of ways-
- Materials are unique and therefore not amenable to normal assumptions about condition or importance.
- Collections are more likely to be developed and maintained to conform to some abstract concept of excellence or completeness rather than to respond to the immediate needs of any constituency.
- Frequency of use cannot be assumed to be reliable indicator of the value of a rare book to the collection.
- Relatively small size and relatively high cost per items may permit an attentiveness to detail not possible in the large collection.

Rare documents have some intrinsic values. These documents have tacit component of knowledge. Digitization has two facets, one is quantitative while other is qualitative. In the context of quantitative facet, one has to look towards document purely from the technical viewpoint, such as; nature of that document, how old it is and in what form it can be transformed. At what level it can be preserved i.e. binding, lamination, digitization, microfilming etc. Caroline Arms [14] rightly mentions that
document does not merely mean something is scribbled in the past and which is needed for preservation for the future, but in that document, highest eternal values humanities, greatest treasure of knowledge is also contained in so in order to make available and get acquainted with this piece of information, to the generations to come it is to be preserved. So here subjective element, the qualitative element exists which is required for up-gradation, upliftment and transcendence of humanity for example

2.23 GRAPHIC MATERIAL:

Webster [15] defines graphics as the art or science of drawing—especially mechanical drawing. As applied to visual materials, however, the term 'graphics' or 'graphics materials' has a broader meaning than drawing alone. The original Greek graphikos included painting as well as drawing and the verb 'graphein' means to write as well as to represent by means of lines. The concept of graphics can be described as materials, which communicate facts and ideas clearly, and forcibly through a combination of drawings, words and pictures. The instructional values of graphic materials lie generally in their capacity to attract attention and to convey certain type of information readily. The graphic material can be categorized into following groups:

a) charts
b) diagrams
c) graphs
d) posters, paintings

a) **Charts**: Charts may be defined as combinations of graphic and pictorial media designed for the orderly and logical visualizing of relationships between key facts or idea. Charts can be classified as, tree chart, flow chart, tabular chart.
b) **Diagram**: A diagram is a simplified drawing designed to show interrelationships primarily by means of lines and symbols. While charts are highly condensed visual summaries of facts and ideas, diagrams are even more condensed and rely heavily on symbolic means of representing ideas.

c) **Graphs**: Graphs may be defined as visual representations of numerical data. A table of figures may contain a wealth of valuable information, but a graph of the same data presents the gist of that information quickly and effectively. Furthermore, graphs reveal important relationships in the data relationship such as trends and variations from normal. There are many kinds of graphs. Among those most commonly used are the line, bar, circle or ‘pie’ and the pictorial graph. Each type has certain advantages.

### 2.24 MAPS:

Basically, maps provide location data and serve as source material for such information. Its purpose is to show the patterns of the earth’s physical and human features, drastically reduced in size for study in one place. According to Brown [16] most important types of information made available from map is –

- **Surface features** such as rivers, plains, mountains and other land or water forms.
- **Places** and their location or distance from each other.
- **Scientific data** such as movement of air masses, ocean currents or geological formations.
- **Social or cultural data** such as population or language pattern.
- **Political data** such as boundaries between states or countries, types of government or election result.
- **Economic data** such as industrial production, agricultural products or trade patterns among nations

Any of this information can be shown on either maps or globes. Globes, however, usually contain only political information and surface features. Maps are very different from books and periodicals: the modern type has no author, and sometimes they have no real title. Dates are very often lacking, and in the case of foreign maps it is not always easy to identify the part of the world depicted. The problem of arranging them and filing them in a way which will exploit them fully are complicated by the different forms which they take—not only the size, but also in presentation, some are wall-maps, others are globes, some are roller maps, quite apart from the minor problems of very different maps being printed on both sides of the same sheet or a number of important inset maps being included in a haphazard fashion.

There are several methods through which maps can be stored. The horizontal method of filing map is however less satisfactory than the vertical method. In the first place, owing to the shallow drawers, a cabinet for horizontal filing—whether of wood or steel—has as much space devoted to partitions as to actual map space. In the second, it is easier to extract and replace a map from a vertical than from a horizontal position and maps of different sizes can be filed together vertically without any danger of the smaller maps being overlooked.

Collison [17] suggests that small atlases can be filed on ordinary bookshelves, but large atlases of folio or greater size should preferably be filed horizontally, and on deep shelving of the roller type to facilitate withdraw and replacement. Larger maps are often suspended from the ceiling or walls, being unrolled by cords at eye-level. A better system is to store them rolled up in vertical containers rather like large umbrella-stands, or to file them horizontally in deep shelves in cupboards. Edges of
maps should be bound with cloth or tape by a special edge-binding machine.

**2.25 AUDIOVISUAL MATERIAL:**

The technological advances, and in particular the new media and formats for recording information, has demanded the adoption of new techniques and methods for handling information. Librarians and archivists have not found it easy to cope with the changes. Audio-visual materials in libraries and archives have thus to a large extent suffered from both physical and intellectual neglect. It is only within the last decade or so that the realization has begun to dawn that audio-visual materials are an important component within the general information network and that more attention should be paid to these materials both to ensure their preservation and to enhance their exploitation as source of information.

Peter Mazikana [18] observed that the advent and advance of new technology and of the new information media have not been uniform throughout the world. The preservation of audio-visual materials requires a coordinated and sustained approach at institutional, national and international levels. There are already in existence national, international and non-governmental organizations concerned with audiovisual materials. The international Federation of Television Archives (FIAT), the International Film and Television council (IFTC), the International federation of Film Archives (FIAF), the International Association of sound Archives (IASA), the International Federation of Library Associations (IFLA), the International council of Archives (ICA), and numerous others at national and regional levels.

The preservation of audiovisual materials requires the appropriate equipment for inspection, rewinding, retensioning or transfer to fresh materials and new formats.
2.25.1 GRAMOPHONE RECORDS:

Robert Collison [19] has taken an extensive review of storage equipments and methods for special materials in libraries the earliest medium for the recording of sound was the cylinder, invented by Thomas Edison in 1877, and by 1888 several American firms were marketing cylinders containing music or spoken presentations. Gramophone Records, owing to their form, composition and fragility, need to be protected against almost all the enemies of libraries—fire, water, heat, friction, rough handling, pressure and excessive movement, are all hazards which must be guarded against. Records are best shelved vertically in heavy manila envelops on shelves divided by thin struts at intervals of 7 inches or less. They should be filed close together so that they stand upright but at the same time are not too tight. It is usual to have separate sequence for the various sizes - 10 inches, 12 inches etc. The advent of long-playing records which need even greater protection against wear and tear has been met in the united states by the provision of individual record holders consisting of tough pressboard covers with flat spines and rounded corners, to these strong craft paper envelopes are attached by means of gummed binding strips. The envelope opens on the inside to prevent the record from slipping out.

Gramophone records cannot be filed like books, and they cannot be catalogued with as much speed or quite as easily as either books or music. Their treatment requires a completely new approach on the part of the librarian. Their handling and indexing induces new problems, which need careful solution. Thus a book or a volume of music can usually be regarded as a homogeneous whole, behind whose compilation lays a definite policy or purpose. That is not the case for gramophone records, where the music one side of the disk may have no connection with that on the other side.
Gramophone records, owing to their form and the materials of which they are composed, as well as their fragility, need to be protected against all the enemies of the libraries. It can be generally said that gramophone records are damaged by environmental elements; e.g. moisture, excessive heat, pollution and to some extent growth of fungi, rough handling, pressure and excessive movement. They should be best shelved vertically in heavy manila envelopes on shelves controlled heat and humidity is essential for long-term conservation of these materials.

2.25.2 FILMSTRIPS:

The Filmstrips has often been called, “a heeful in a handful”. This description is apt since the equivalent of a hundred charts, pictures, drawings, or text cards can be placed on a length of film, wound into a roll and placed in a container approximately 1 inch in diameter and 1 ½ inches high. This compression of ideas and resources into such small space results, often, in comparable savings in costs of production and distribution.

Filmstrips are composed of a series of still pictures and titles or captions placed in sequential order on 35mm film from 2 to 6 feet long, with sprocket holes on each side. They are commonly between twenty and fifty frames (individual pictures) in length, although they may be as long as 100 frames. Filmstrips are produced in black and white or color. James Brown [20] mentioned some of the common purposes for using filmstrips are as follow: -

- To provide a basis for understanding symbols.
- To help teaching skills i.e. “flow-to” filmstrips are common.
- To provide information.
- To stimulate aesthetic appreciation.
- To develop interest in further pursuit of topic.
Filmstrips are usually well protected by their individual metal containers, and need merely to be kept in a safe place. The shape and size of the containers makes their storage on shelves unsuitable and uneconomical, and filmstrips are therefore best filed in shallow boxes or drawers fitted with partitions or shaped bars to hold the canisters in position.

2.25.3 FILMS:
The film enables a teacher to re-create in the classroom events, actions, or processes occurring anywhere in the world at any time. Through the film, many “real” experiences may be shared by every student and viewer, and the handicaps of time, size, and distance may be overcome. Integrated use of educational films with other instructional materials offer an efficient means of improved learning in a wide variety of classroom situations. Characteristics of films are as below:

- Films combine “sight in motion” with various sounds to act upon two senses at a time.
- Films compel attention through the use of motion and directed sight in a semi darkened room.
- Films can help to overcome important intellectual barriers to learning.
- Films help to re-create the past.
- Films provide common experiences.
- Films provide a continuity of action.
- The main interest of a film in most types of libraries is in its subject. In the majority of libraries the holdings of films are very small. Their shapes and substance deprive them of the full appreciation of their actual value. The policy therefore, should be to exploit their unique qualities to the utmost, while at the same time preserving a routine, which protect them adequately and adds as little as possible to the
work of a busy staff. Librarians need to know some of the important
types of films.
The storage of films introduces new problems; first of all, their shape, size
and substance make it essential that they should be stored horizontally.
Secondly, there is the very real danger of fire, which is best met by storing
films in metal cabinets, or in asbestos – lined drawers, which can be
closed and locked; it must be remembered too that films are rarely shown
in the library itself, their exhibition involves their being transported to other
places in suitable containers. The unstable nature of films, and especially
the inflammability and inherent chemical instability of nitrate film base
items, needs to be kept in mind. Regular inspection of the films should be
made so that any signs of decomposition may be detected before the
damage becomes widespread.

2.26 MICROFILM:
Micrographic was invented early in 1839; however, it's use in libraries
started in late 1930s when libraries began making microfilm copies of rare
documents for public use and also began converting newspaper files to
microfilm as a means of conserving storage space and preserving
newsprint, which generally has a rapid decomposition rate in its original
form by the 1950s, there was a widespread realization that microfilm could
be used not only for the preservation of back files and oversized
documents, but an integral part of active information systems. According
to John Avedon [21] micropublishing is a communications technique,
which uses photographic processes to miniaturize printed or graphic
material. It involves four phases.

a. Photographing the material
b. Duplicating or reproducing the microcopies for distribution.
c. Retrieving stored micro images by means of manual or
   automatic device, and
d. Displaying images on a reader screen for viewing and using a reader-printer for producing hard copies

Commission on Preservation and Access [22] observed that compared with other modern information media, microfilm has the advantage that the material undergoes no fundamental technical transformation and is thus "future-proofed." The analog-stored information is directly accessible, with relatively little effort, to the human eye. Increasing national and international compatibility of microfilming systems ensures acceptance across national borders. Microforms can be economically created, duplicated, and distributed. Microfilm systems can be combined with electronic data processing (edp) access systems. But microfilm can also be efficiently digitized with microfilm scanners. This will become more economical as the reproduction quality and financial viability of digital access systems improve.

Microforms are a very viable way to preserve information. Archival permanence can be provided when needed; however, the permanence of the image depends not only on using the film, but also on the manner in which it is processed and stored. Microfilms can be affected by the humidity of the atmosphere, but the degree of permanence acetate microfilm is equal to that of paper given suitable storage, humidity and temperature conditions. Ideal conditions for microfilm include storage in metal-usually aluminum-containers, when not in use. The standard construction of a suitable container is described in the British standard Institution's storage of microfilm (B.S.1153 of 1955)
2.3 Deterioration agents for library material:

Library materials contain a great variety of substances, the vast majority of which are organic and thus subject to deterioration. In a practical sense, deterioration means a decrease in the ability of a material to fulfill its intended function. Library materials transmit information to a user. Thus deterioration can be any action Physical, Chemical or Biological that interferes with that transfer. Deterioration, an irreversible process, must not be allowed to progress beyond the point where the intellectual content cannot be reformatted, or converted to a different medium, when appropriate.

Deterioration of library materials result from the action of agents present in the library environment. In most cases the agent promote degradation by reacting with the substances that comprise library materials. The specific location and climate where a library is located determines which potential agents are present to shorten the useful life of materials. Marrow [23] has described the few deterioration agents for library materials, which are as, light, heat, humidity, Gaseous Air Pollution, particular matter, fungi, Insects, people and disasters.

2.31 LIGHT:-

Light is the form of radiation that one can see; radiation is measured in wavelength. Wavelengths of ultraviolet, visible and infrared radiation are potential deteriorative agents within a library environment. The shorter the wavelength, the more potent the effect of the radiation. Radiation is a form of energy that promotes deterioration by activating chemical reactions. The minimum energy a molecular must receive in order to read is ‘activation energy’. Activation energy is different to specific materials,
and reaction will not occur if the activation energy for a material is not reached. Light is very effective source of activation energy.

Since it is obviously impossible to keep light away from library materials, some deterioration is inevitable. The rule of reciprocity states that by controlling exposure to light one can control the rate of deterioration. This can be done either by controlling the type and amount of light (the intensity) or by controlling how long an object is exposed to light. This principle is particularly important in the exhibition of rare and unique materials. It can be summarized by the following formula:

\[ \text{Total exposure} = \text{Time} \times \text{Intensity}. \]

There are three sources of illumination common to libraries—natural light coming in through windows and skylights, tabular fluorescent lamps and incandescent bulbs. The quality and uniformity of the light are also important considerations. It is generally understood that greater intensities of light (more than 35 foot-candles) are not necessary or desirable in libraries and contribute to eye fatigue.

2.32 HEAT:-

Like light, heat is a form of energy that promotes deterioration. Temperature is a measure of the intensity of heat energy. The higher the temperature, the faster the library materials will deteriorate. The usual rule of thumb is that for every 10°C (18°F) rise in temperature, the rate of chemical reaction doubles. However, the rate of chemical reactions in cellulose (paper and cloth) doubles for each 5°C (9°F) rise in temperature.

Libraries cannot keep materials in constant, total darkness; they cannot store materials permanently at extremely low temperatures. Thus deterioration from the effect of heat is inevitable. Libraries however, can
significantly reduce the rate of deterioration by lowering temperature. Library materials stored at 70°F will deteriorate approximately half as fast as library materials stored at 79°F. Any material composed of organic materials that are easily oxidized should be stored at as low a temperature as is practical. This will reduce the heat-induced energy of the molecules and slow down the degradation process.

Fluctuations in temperature are undesirable because many library materials are made up of several component materials that absorb heat. Rapid and frequent changes in temperature will cause stress that leads to structural breakdown.

2.33 HUMIDITY:-
The ability of air to hold moisture is dependent on temperature since warmer air can support more moisture. Because of this dependence, humidity is usually expressed as a percentage of the maximum amount of water the air could hold at a particular. Marrow [24] has given the below mentioned formula measure termed the relative humidity (RH)

$$RH = \frac{\text{Amount of water in a given quality of air}}{\text{Maximum amount of water that the air can hold at that temperature}} \times 100\%$$

In a sealed container, such as an exhibit case or shipping container, the amount of water vapor in the air remains constant so that condensation can easily form if the temperature is raised or alternatively lowered and raised.

Water acts as a physical agent of deterioration by causing hygroscopic materials to undergo dimensional changes. When RH increases, moisture is reabsorbed. This process of expansion and contraction can cause
library materials to break apart physically. This kind of physical stress is exacerbated by the fact that different component materials absorb moisture at different rates and in different amounts.

2.34 GASEOUS AIR POLLUTION:

The burning of fossil fuels (coal, petroleum, oil and natural gas) causes concentrations of gaseous air pollutions in cities and industrial areas. It is these concentrations of man made pollutants that promotes the deterioration of cultural property in libraries and museums of their pollutants, sulfur dioxide is a major deteriorative agent.

When fossil fuels are burned, sulfur impurities combine with oxygen to form sulfur dioxide (SO₂). Since SO₂ is readily absorbed on surfaces, fortunately, the concentration indoors is only one-half of what it is outdoors. However, in urban and industrial areas, that one-half is still a significant concentration.

2.35 PARTICULATE MATTER:

Dust, dirt, sand and smoke constitute a considerable hazard for library materials by soiling and abrading by facilitating the action of water and biological agents and by carrying and combining with gaseous pollutants.

The largest particulates are formed by direct mechanical action – dust formed by grinding process or by fine sand or dirt shot directly into the air. The smallest particulars are formed by chemical processes or from incomplete combustion of fuels. These small particles remain suspended in the air until they become trapped on a surface for example a film with dust, or microfilm can be accessed and used.
2.36 FUNGI:-
Fungi are a large and heterogeneous group of plant organisms; "mold" and "mildew" refer to small, non-parasitic fungi. Fungal growth in libraries usually appears as a fuzzy gray coating or as colourful patterns and blotches. Fungi act as biological agents of deterioration to ingest organic materials and cause weakening and decomposition.

Fungi are very patient. They are very resistant to unfavorable conditions and will simply wait until conditions are right to resume growth. Spores on herbarium specimens have been known to remain viable for as long as 25 years. Fungi are an ever-present danger to library materials.

2.37 INSECTS:-
Insects are very dangerous to library materials. They rapidly ingest paper, cloth, leather, parchment and vellum, and glue and paste. Detection is difficult since it depends on identifying damage, and many insects are nocturnal or do their work in infrequently visited spots. Some insects eat only on the surface, softening and weakening it, while others form elaborate tunnels. Others eat only the glue and paste.

2.38 PEOPLE:-
Human beings are off-cited agents of deterioration, with librarians and bookbinders at the top of the list. Librarians, as policy-makers, are directly responsible for the overall preservation and conservation of their collections. Furthermore, by their example, library patrons learn how to treat library material. Librarians determine standards for environmental control; choose services such as binding and reprography and set policies for shelving and circulation. By inattention to preservation and conservation concerns, they may inadvertently act as agents of deterioration.
Library materials also deteriorate as a result of improper use. Library staff and patrons may cause inadvertent damage by misuse of library materials. There is also deterioration from deliberate abuse. Careless and selfish behaviour will occur in the library setting despite priorities of service to patrons. Library materials are meant to be used. Simple wear and tear is largely unavoidable. Well-meaning but inappropriate treatment can cause deterioration and structural breakdown. Inappropriate treatment is not just a nuisance; it can obscure or destroy information and certainly waste money.

2.39 DISASTERS

Disasters are an ever-present threat to library materials. No library is immune to the devastation that can occur as a result of natural or man-made disasters.

Fire can result in total destruction to a collection. Nearby items not directly engulfed in flames can be irreparably charred or destroyed by soot and smoke. Heat from a fire causes bindings to shrink and warp and plastic-base materials to melt. Water used to fight a fire can cause widespread damage from the water itself, as well as from the force of high-pressure hoses. In addition to fire and heat, water from fire-fighting, floods, tornadoes, high winds and rain, melting snow, roof leaks, burst water plumbing, and so on, is a serious agent of deterioration. Dirt and debris carried by floodwaters can become imbedded in materials and greatly complicate salvage and restoration. Wet book will absorb water and swell and jam themselves onto shelves.
2.4 Conservation and preservation methods-

According to Ross [25] preservation can be achieved by two methods, one is preserving the artifact, and the other is preserving the intellectual contents.

**Preserving the artifact (Physical)**

I) Refurbishing and collection maintenance
II) Fumigation
III) Protective enclosures.
   a) Encapsulation
   b) Phase (Phased) boxes
   c) Other Boxes.
   d) Document folders
   e) Slipcases
   f) Shrink-wrapping
IV) Binding
   a) Recessing
   b) Sewing through the fold
   c) Double-fan adhesive Binding
   d) Over sewing
   e) Other binding methods
   f) Strengthening paperbacks.

**Preserving the intellectual content**: Reformatting.
   a) Photocopying
   b) Microfilming
   c) Photography [Film]
   d) Digitization

Carolyn Horton [26] has described the procedure for refurbishing the collection. According to her following steps are necessary:
   a) Set up a work area and obtain equipment and supplies.
   b) Establish do cementation procedures.
c) Remove the books from the shelves.

d) Dust the books.

e) Sort the books into two categories

Those, which require professional conservation treatment, in those cases, record titles, and either, send to the conservation laboratory for treatment, or reshelve for later action

Those, which can be treated in the library for

Cloth, paper, vellum, alum-tawned binding

a) Sort into treatment categories (clean, repair corners, enclosure etc.)
b) Apply the appropriate treatment or treatments.
c) reshelve

Leather binding other than alum-tawned

a) treat
b) apply leather dressing
c) carry out any other treatment required
d) reshelve

The following conservation and preservation methods are normally used in the libraries.

2.41 FUMIGATION

There are several chemicals which are volatile i.e. they evaporate, either in normal room temperature or with slight rise in the same. As the vapour of some such volatile chemicals are poisonous to the insects, fungi etc, those can be used for protection against enemies of the library collections. This method is known as fumigation. Gaseous poisons used to kill insects etc are called fumigants. The chemicals, which are normally used for this purpose, are either liquid or solid in normal condition. In those libraries
where the problems of fungi and insects attack are moderate to high, or where there is enough possibility of such problems, fumigation will prove to be an extremely effective measure.

There are two types of fumigation, which are mentioned by Mukhopadhya [27], one is ordinary and the other is vacuum fumigation. Vacuum fumigation is recognized as most effective system for this system a special type of steel fumigation chamber is necessary. Generally, these chambers have a capacity of 10 cu. Meter. Within the chamber, books which are to be fumigated-are kept either on book trolley or on shelves. The door of the chamber-which is airtight, is locked properly and air from the chamber is pumped out. After removing the air about 4-5 kgs of ethoxide gas is introduced with the help of electric pump. Ethoxide gas is prepared by mixing 1 part ethylene oxide with 9 parts of carbon dioxide. This gas can destroy both fungi and insects within a very short period and can enter in all parts of the books / documents easily.

Another very significant factor of this system is that it destroys not only fungi and adult insects bur also spores and eggs, this facility is not available in most fumigation systems. The ethoxide gas does not have any adverse effect on library collection. This system requires about three hours to complete the fumigation.

Thymol has been widely used in the past to fumigate infested library materials, although its use is now prohibited in the United Kingdom. It is applied by placing affected materials in an airtight chamber with a dish of thymol crystals, which is then heated by being placed near a low wattage light bulb. The material being fumigated is exposed to thymol vapour for periods of varying from three days to one week. The thymol vapour must not be inhaled and care must be taken to avoid this, especially when
opening the thymol chamber at the completion of the treatment. Skin contact with the thymol crystals must also be avoided.

Ortho-phenyl phenol has been widely used despite some doubts about its effectiveness as a fungicide. It can be applied in several ways, for example, by mixing it with alcohol and applying it as a fog or spray, or by mixing it with alcohol and allowing it to evaporate in a sealed chamber or other enclosed space. As with thymol, care must be taken to avoid inhaling the vapour of ortho-phenyl phenol or allowing skin to come into contact with it.

Tissue paper can be coated or soaked with a fungicide and placed inside books, which need to be treated; the book with its tissues is then placed in a sealed plastic bag for several months. Chemical controls such as fumigation, and the application of pesticides and fungicides, usually offer only temporary relief of the problems they are intended to control for example, when a chemical spray is applied, only the mould which is present is killed, and after a short time new mould spores will drift in and begin to grow if the conditions are right. Similarly fumigation in an enclosed chamber has no residual mould control effects, although it should kill the mould already growing on the items fumigated. Parker goes so far as to state that much of the fumigation that is done in libraries is not warranted considerable expertise is required to apply chemical control methods, there can be health risks associated with their use, and legislation strictly limiting the use of one-common chemicals has been enacted in recent years. For these reasons it is very strongly recommended that expert advice be sought before any fumigation or other application of chemical control measure is carried out. It must be reiterated that untrained personnel this includes all librarians – should not attempt to apply any chemical fumigation methods without first seeking expert advice.
2.42 ENCAPSULATION
Ross Harvey [28] has described encapsulation as one of the preservation methods. Single sheet item can be encapsulated between sheets of a chemically inert transparent plastic such as Mylar. Encapsulation is usually used for very fragile items or where heavy use is expected. Items enclosed in this manner can be handled and can easily be removed from the encapsulation should this be required. Two Mylar sheets at least 2.5 centimeter larger than the item to be encapsulated are cut, the item is laid on one sheet and the other placed on the top, and edges of the Mylar are sealed together. Sealing can be done either by using double-sided adhesive tape, by sewing or by a more expensive process, using an ultrasonic welder. About eight minutes per item is the time needed for this procedure?

2.43 LAMINATION
This process involves hot-sealing a deacidified document with cellulose acetate film of 23 microns (0.00088 inch) thickness and tissue paper in either a steam-heated flat-bed hydraulic press or an electrically heated roller press. A sand-witch or envelope is prepared by assembling the materials in the following order.

```
Tissue paper
cellulose acetate film
document
cellulose acetate film
tissue paper
```

The decidified documents of the volume are placed in such a way that there is a gap of 5vm in between the sheet 1 and 8, 2 and 7, 3 and 6, 4
and 5 respectively of a section. The arrangement of the sheets is in step formation in the manner shown in the following figure.

After lamination, this gap portion (laminated tissue) becomes strong enough to serve the purpose of 'guard' for stitching the documents into file covers for the purpose of binding into a volume; the laminated guard can be strengthened by putting in a slip of either bond paper or muslin cloth. During the preparation of a sand-witch or envelope of paired documents as described above all loose fragments and the edges of the documents should be carefully fastened to the acetate film in their proper places with a cotton swab or an artist's brush dipped in acetone. Each sand-witch or envelope is then placed between two sheets of 'Taffon' (tetrafluorethylene), synthetic resin-coated glass fabric) before feeding it into the press. In the case of hydraulic (flat-bed) lamination, the sand-witch is covered with stainless-steel plates and a double thickness of blotters before being placed on the platen. This is to absorb any inequalities, which may exist on the surface of the platen or in the sand-witch, and to ensure uniform pressure on the material to be laminate, regardless of any differences in thickness at the edges of the document. One or more sand-witches may be placed on one platen. In the latter case, the order of the various materials on each platen is as follows.

<table>
<thead>
<tr>
<th>Stainless-steel plate</th>
</tr>
</thead>
<tbody>
<tr>
<td>blotters</td>
</tr>
<tr>
<td>Taflon</td>
</tr>
<tr>
<td>Sandwich or envelope</td>
</tr>
<tr>
<td>Taflon</td>
</tr>
<tr>
<td>blotter</td>
</tr>
<tr>
<td>Taflon</td>
</tr>
<tr>
<td>Sandwich or envelope</td>
</tr>
<tr>
<td>Taflon</td>
</tr>
<tr>
<td>blotter</td>
</tr>
<tr>
<td>Stainless-steel plate</td>
</tr>
</tbody>
</table>

64
For satisfactory and uniform lamination, no more than two sand-witches or envelopes should be placed on each platen. On the basis of research carried out in 1954-57, the United States National Bureau of standards has in fact recommended that two sand-witches or envelopes be placed on one platen.

The temperature required for laminating paper documents varies from 140-150°C and the pressure from 22-36 kg/cm² depending on the condition and type of paper. Between two and-a-half and three minutes are mostly required for lamination, and the entire process, i.e. of heating and cooling, takes from seven to ten minutes. The cellulose acetate, because of the high pressure, penetrates the pores of the document paper as well as the tissue paper.

Steam at a pressure of 5.5 kg/cm² is passed into the platens. As a result, the temperature rises to the required 150°C within two minutes. Simultaneously, pressure is applied to the platens. After three minutes, the escape valve is opened and passing water through them cools the platens. The required pressure is maintained throughout this operation. When the platens have cooled, the pressure is released and the laminated documents are removed. Yash Pal Kathapalia [29] mentions certain precautions which are necessary when repairing documents by this process. Care should be taken to ensure that,

a) there is no smoking in the room and that no naked flame whatever is allowed; and

b) there is proper air circulation and that acetate fumes are removed by means of exhaust fans.

During the last twenty-five years, significant advances have been made in the field of restoration several conclusions have clearly emerged.
a) film of polyvinyl chloride should not be used for the lamination of valuable documents.
b) lamination with cellulose acetate film is a safe method of restoring documents.
c) Polyethylene film used for lamination purposes can be delaminated, and is better for lamination purposes than cellulose acetate films.

2.44 BINDING AS A PRESERVATION MEASURE

Binding has been the major traditional preservation activity in libraries. The specific function of bindings is to protect the book while in use or while it is being stored. In many libraries binding is the only method used to preserve library material. Libraries bind materials for several reasons, which are described by Ross [30], which are as follows –

a) to strengthen items which are manufactured in unsuitable format for the rough and tumble library use. e.g. paperback editions.
b) Need to rebind items whose bindings have become too worn to offer protection to the text of the book.
c) To put together in a more conveniently shelved unit items which were issued serially, or which were issued separately e.g. pamphlets.
d) Security is another reason to bind issues, as it is considered more difficult to steal a large bound volume than a small-unbound item.
e) Binding is used a preservation tool for fragile items, which extends their life as useful items in library collection.

It is important to note the different reasons for binding volumes in libraries and the consequent requirements for bindings of various kinds. In public libraries, binding is used to achieve the maximum number of issues in a circulating collection before a volume is discarded; whereas binding a volume in a research library is to achieve the maximum life possible for
that item. Another reason is that it is cheaper to rebind a volume than to purchase a new one.

Several different kinds of bindings in common use, these are as — recasing, sewing through the fold, Double-fan adhesive binding, oversewing etc. Commercial binders carry out most binding work in today's libraries. Commercial library binderies have received adverse criticism in preservation circles because they have been perceived to apply unthinkingly one style of binding to all material, regardless of how appropriate the binding might be.

2.45 PHOTOCOPYING

Photocopying is best used to copy smaller items. It is an especially suitable format for heavily used items, where microfilm is difficult to use and user resistance Photocopying is not appropriate for works with colored or high quality black-and-white illustrations.

Photocopying has some advantages over other formats. It can, if required, produce a copy, which is in the same or very similar format as the original. The result is relatively permanent if appropriate alkaline paper is used.

This process has some disadvantages — One is the harshness of the process, which may cause damage to fragile items. Photocopying machines themselves are another cause of damage. Damage results from excessive light, including ultraviolet light, excessive heat, and from inappropriate design, which forces materials into stressful positions. Paul Banks comments that 'photocopying is a prime example of the two-edged sword.' The ease of preserving intellectual content of library materials, but at the same time imposing considerable stress on the material. Bindings suffer most of the damage caused by photocopying. Spine damage
results from pushing down on the binding to force the pages flat so that
text near the inner margin can be reproduced. Flipping the book over the
machine for copying sequential pages can cause damage. Sometimes
paper is being bent or folded in-advertently, or deliberately for that matter.
Large bound volumes are particularly at risk, and indeed many libraries do
not allow them to be photocopied.

The British Library has been active in recent years in developing and
making available new photocopiers and new methods of copying. Three
of these have been developed
– the overhead copier, the image digitizer, and electro luminescent
copying. The cost of these photocopiers are high; in 1985 the overhead
photocopier was £ 6900 and the image digitizer £ 20,000 or more
Equipment needed for the electro luminescent copying process cost about
£ 200. Recently released photocopiers have taken note of preservation
needs for example, the Xerox 5042, has a platen the end of which is
angled at 35 degrees to allow better copying of inner margins without
requiring force on the spine and has an optional foot-switch which allows
both hands free for more careful handling of the materials.

2.46 MICROFILMING

There is no doubt that microfilming is currently the most widely used
format for preservation copying. Major libraries throughout the world are
strongly committed to microfilming. Microfilming has a long history of use
in libraries and considerable amount is known about it, including its
longevity if stored under appropriate conditions. Microforms are produced
in several formats, of these microform and microfiche are the most likely to
be encountered in libraries, although other formats, like aperture cards.
Libraries have traditionally produced or purchased 35 mm microfilm this
size is best for the archival purposes and it allows larger size images with
higher quality. Three types of microfilms are available; silver-gelatin, diazo, vesicular. Only silver-gelatin film which has been carefully processed to the appropriate standards should be used for archival master negatives which will be retained for long periods of time. However, it is important, that it should be carefully stored and handled, as it is susceptible to damage from fungi, water and mechanical abrasion. Working copies can be silver-gelatin, but diazo and vesicular have advantages where durability in day-to-day use is more important than archival life. Both diazo and vesicular film is less expensive and more scratch resistant than silver-gelatin. It is fair to say that microfilming has cost advantages over other reformatting processes in current use and over restoration treatments, especially for items with many pages. Another major advantage observed by Alan Calmes [31] is the long-term stability of microforms. If they are created using appropriate processing standards, storage conditions and handling procedures are observed, lifetime of more than 1000 years have been expressed in the literature. The space-saving factor, especially for serials is also significant. Microforms are able to be cheaply and easily copied once a master has been produced. Paper copies of part or all of them can be readily produced if microfilm or microfiche reader-printer are provided. The equipment needed to access microforms is a simple optical device. It is not 'high-tech' with a high probability of becoming obsolescent in a short time, as is the case of CD-ROMs and magnetic tapes.

There are some limitations to microfilm and its usage. The equipment is not user-friendly and many readers have complained about headache, backache and neck-ache. The most often cited argument against microfilming is that they are difficult to use. A. J. Anderson [32] has mentioned the reaction of one reader about the use of microfilm.
"But these dreadful microfilm readers! I had expected to enjoy a pleasant day with the fragile crackle of old newspapers in my hands. Instead I had the devil of a time pressing buttons, twinkling knobs, and peering into an obscurely lit screen. What a disappointment it was! And what a crashing ache in the temples and the back of the neck I developed before the whole unnatural experience was over."

The production, storage and handling of microforms require strict adherence to standards, which can sometimes be expensive and difficult to maintain. Careless handling and storage can easily damage them. But as compared to other preservation methods, microfilming has been proved as a best alternative to preserve library material for generations. Many microfilming projects have proved that microfilm can be used for hundred years without any damage if handled properly and stored in appropriate climate.

2.47 PRESERVATION PHOTOGRAPHY

Preservation photography is one of the preservation methods which is normally applied only to original black-and-white photographic prints. According to Ross [33] the aim is to produce a master negative plus another negative (the interim master negative) from which prints can be taken as required. The master negative should be stored in the best possible condition for example in low temperature storage with the appropriate relative humidity, light and other levels, and should only need to be accessed on the rare occasions when the interim master is worn out and another interim is master is required. Prints can be taken from the interim master negatives whenever required, for example to make a reference copy, or for exhibition purposes. High quality equipment and materials should be used and the services of professional photographers should ideally contracted.
2.48 DIGITIZATION

Libraries link the past and the future, and preservation has always been a key function. Libraries ensure that any type of information is preserved and made available for later use. Despite its very short history, digitization has an unbelievable bad record when it comes to preservation. Witten and Brainbridge [34] mentioned that

- Enormous amount of digital information are already lost forever.
- Information technologies become obsolete very quickly.
- Document and media formats continue to proliferate.
- Technology standards will not solve fundamental issues in the preservation of digital information.

This paints a gloomy picture of digitization as a preservation tool. In 1996, the US Commission on Preservation and Access issued the final report of a Task Force on the Archiving of Digital Information. An impressive group of 21 experts had spent a year in studying the problem. The conclusion was alarming that there is at present no way to guarantee the preservation of digital information. It is noteworthy to mention the efforts of Yale and Cornell University. Project Open Book of Yale University [35] was a multifaceted, multiphase research and development project. Its purpose was to explore the feasibility of large-scale conversion of preservation microfilm to digital imagery by modeling the process in an in-house laboratory. The project unfolded in a sequence of phases designed in part to allow the project to evolve as the digital imaging marketplace changed. Yale converted 2000 volumes from microfilm (representing 440000 images) indexed the volumes, stored the results and tested a prototype web accessed tool developed by Xerox Corporation.

Cornell University's [36] project (Digital to Microfilm Conversion) was the feasibility of adopting digital technology for preservation purposes. The
two-and-a-half year demonstration project tested and evaluated the use of high resolution bitonal imaging to produce computer output microfilm (COM) that could meet national preservation standards for quality and permanence. In the course of the project, 1,270 volumes and accompanying targets (representing 450,000 images) were scanned and recorded onto 177 reels of film. The project led to an assessment of quality, process and cost and to the development of recommendations for the creation and inspection of preservation quality microfilm produced from digital imagery.

Research Libraries Group (RLG) [37] initiated a cooperative microfilming project funded by NEH (National Endowment for Humanities) in 1986. These initiatives promoted wide acceptance of a definition of preservation as prolonging the life of information in documents, rather than the documents themselves when the documents could not be preserved in their original forms. NEH has considered microfilm the preferred preservation choice for embrittled published materials and an accepted access option. A number of earlier projects supported by Commission on Preservation and Access focused on digitization for preservation as well as access. Despite predictions that microfilm could be replaced by digital imaging, early users of this technology came to appreciate that simply digitizing material did not guarantee its continual preservation. Due to this microfilms remains the preferred preservation reformating strategy even as digital imagery has assumed a prominent role in enhancing access to such materials. Since digitization is enhancing at an accelerated rate, it is necessary to study in advantages, disadvantages and processes of digitization which are comprehensively described in the next chapter.
References:


19 Collison, Robert L. Modern storage equipment and methods for special materials in libraries Bath : cedric chivers, 1965 pp. 13-14


26 Harvey, Op. Cit.


