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Investigating the Affected Factors on the Design of Display Case for Paper Work

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Abstract

Museum display cases are usually one of the most expensive parts in museum interior design and furniture; museum display cases are very special and have a lot of limitations in the selection of used materials. Usually, even the micrometer environment in museum shelves and display cases should be valuable in the primary control of a collection (1). The protected manuscripts in museums are particularly vulnerable in terms of vulnerability and difficulty in maintaining. The mechanisms of damage and preventive protection of these works and their changes over time depend entirely on environmental conditions (2). Display cases, as a means of protection, protect the works by increasing the security of the objects and confining them in an appropriate, stable and secure environment (3 and 4). In general, four main groups of factors cause damage to the manuscripts: 1- Physical factors 2- Chemical factors 3- Biological factors 4- Unexpected factors (5), each of which imposes specific requirements in the design and manufacture of display cases for protection. Due to the specific circumstances of these works, these requirements need to be collected and formulated in a purposeful way for the design of the display cases. This article has attempted to clarify what features each display case must have in order to be stable and to protect a manuscript by reviewing specialized texts, authoritative articles, and library resources. Finally, an example of an appropriate design based on the stated conditions is examined.

Keywords: Manuscript; Protection; Preventive Protection; Display Case Design; Museum; Display Case

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1. Introduction

Among the types of works preserved in museums, manuscripts are of particular importance because they directly represent the thoughts and ideas of people and nation. Since the language and the emergence of the script are formed for communication between humans and the transmission of messages, manuscripts contain great meanings and signs of ancestors' identity, so more attention and a deeper examination of how to preserve the manuscripts that are the link of the past and future are essential.

2. Literature Review

Manuscripts are referred to as old books that are handwritten and not printed. At the same time, in librarianship literature; manuscripts are also referred to as single-copy writings produced by the author, such as the text of a work; whether literary, scholarly, or historical work, which is prepared by a writer to be given in print. The preservation of such manuscripts in large collections of research and academic libraries is usually due to their research importance or archival value (Mahawar, 2013).

But what is called "manuscript" in Persian literature is a book generally produced in the pre-circulation printing period in Iran and Islamic countries, and the preparation of a critical editing and so-called "correction" and production of their catalog are the important areas of literary research in Iran and other Islamic countries. Similar efforts have been made in the West over the classical and medieval versions of the past centuries.

2.1. Production of Ancient Manuscripts

In the early Middle Ages (500 to 1000 AD), monasteries and abbey were the main centers of book production. Priests and monks spread Christianity through their network of churches and abbey, by keeping the Latin language and remnants of classical knowledge alive. Abbeys were literary and written centers, and writers worked in its writing rooms and wrote religious and non-religious works.

At the pinnacle of the Middle Ages (1000 to 1200 AD) we are seeing an increase in the number of churches and abbeys and, consequently, manuscripts. The monks worked in the writing rooms and made books for two major markets: non-religious books for the nobles and kings, and religious books for the clergy. During periods of increasing demand for manuscripts, monks invited non-clerical writers to work alongside them. With the gradual disappearance of church monopoly on education and the increasing demand for non-religious books, many non-clerical writers set up workshops near universities and business centers. In the early Renaissance (1400-1300 AD) humanists in Italy copied ancient manuscripts of popular authors. Although the production of religious books continued after 1300, the demand for educational books increased by the middle of the thirteenth century and also new and innovative ways of producing books emerged. The result was an increase in the production of uniform manuscripts which are consistent with the original text.

In Islamic civilization, manuscripts were originally devoted to the Holy Quran, but it gradually developed. From the first period of Abbasid rule, the government customs and the establishment of a political system flourished in the Muslim world following the Sassanian or Greek-Roman governments. So, some local governments, as well as some princes and officials, created copy

centers. These centers employed copywriters and librarians. The scribes and copywriters were virtuous and calligraphic, and served as minister, courtier, and secretary in the court in the first AH century. At the Samani, Ghaznavid, and Seljuk governments, there were many writing centers.

Other centers of transcription were the hermitage and shrines of the mystics, each has a library. The tradition in the hermitage was that the mystical works were transcribed and compared with each other. There was another group involved in transcribing and book publishing. They were called "voraghan", many of whom were learned people and scholars, and they have been copied many books. The other group was calligraphers, who were originally in the same class with the scribes, but later formed independent centers, especially in the eighth century.

In the early 8th century AH, One of the most active transcription centers in Tabriz, the Mughal Throne, was founded by Rashid al-Din Fazlolah (618-718 AH) and transcription rituals of the pre-Mughal Divine transcription Center were applied. In the 9th century, another center was established in Herat, on the request of the Minister, Amir Alishir Nawaei (906-864). Arabic, Persian, and Turkish manuscripts continued to be produced and reproduced under the Safavid and Qajar rule, some of which were masterpieces of writing and book-editing.

2.2. How to Maintain and Preserve Manuscripts

The factors that cause damage to the manuscripts are divided into four groups: 1- Physical Factors 2- Chemical Factors 3- Biological Factors 4- Unexpected Factors .Each of these factors has divisions and combating each of them needs the necessary knowledge and expertise. And a manuscript library should be aware of all the factors and always be ready to fight those factors. Preservation of manuscripts is very sensitive, managing the selection and using a variety of disinfection methods and restoration of works are not an easy task. Collection management in addition to the expertise of librarianship and knowledge and familiarity with manuscripts should be familiar with chemistry and related areas (Fadaee, 2007). It is therefore necessary, first, that the manuscripts keep in an appropriate conditions such as free from contamination, temperature, and humidity. And secondly, manuscripts that have been damaged in any way are protected by helpful measures (Azimi, 2010).

In some manuscripts ,there are some points which are important for their introduction, for example in addition to the beautiful appearance, the manuscript might have other elements, such as script, volume, paper, illumination, etc., that is privileged in terms of a quality or antiquity. Therefore these elements should be mentioned in the description section.

The written description is:

1. The copy is the author's handwriting or quotation from the author's handwriting.
2. The copy is one of the great scholars' handwriting.
3. At the margin of the book, there are descriptions and corrections with the author or scientists handwriting.
4. It belongs to one of the grandee and scholars' library.
5. It is dedicated to a particular mosque or place.

In all these cases, the notes should be written down clearly and precisely and the same should be written if the copy is short. If there is an incomplete copy, this defect should be noted and if the manuscript is completed later, the new information should be written and the date of the transcription should be noted (Bayani, 1974).

3. Display Case

The Display case is a case that, in addition to the aesthetic role of precious historical, cultural and artistic works, also plays a role in protecting the works. We also look at the display case function by examining types of light sources needed to illuminate stand space, as well as the protective measures required to create a standard display case.

3.1. Main Nature of the Display Case

To preserve all the objects that represent the history and culture of a nation, manuscripts are part of these works, so it is natural to need a place designed for this purpose (Cassar and Martin, 1994; Cassar, 1995), because if these objects, exposed to destruction over time, are kept in an inappropriate place, they are affected easily by any external factor and they are deformed from its original form and may even be completely destroyed (Watts and Crombie, 2007). Many factors influence the preservation of manuscripts as an important work in introducing a nation's cultural history, such as the environment, light, air, temperature, as previously mentioned. If any of these do not meet the required standards, the works are easily damaged and can be destroyed. Therefore, in order to preserve this cultural authenticity, we need to build and design well-proportioned and strong cases visually. If Manuscripts display cases build beautifully and based on their features as well as their identities, they will enhance our visual acumen and they are by themselves cultural, display and protection tools.

3.2. Typology of Museum Display Cases

The display cases are divided into four major groups based on their standing and location:

a. Standing or floor display cases
b. Flat display cases
c. Wall Hanging display cases
d. Built-in display cases

Each of the mentioned types is subdivided into other subgroups based on their capabilities, structure, used materials and type of lighting, air conditioning and air circulation. In the following, they will be described briefly.

Display cases are divided into two major groups according to the type of access:

A. In standing or wall hanging display cases, the access is made from the lid so several lid-opening mechanisms are available:

i. Movement of the sliding, in different directions
ii. Hinged lid, at different levels and sides of the hypothetical cube volume.

B. In some standing, access to the object can be achieved by completely removing the case around the object with the help of various issues such as vacuum fastener, handle and special small cranes.

C. Flat display cases also allow access to the various modes that is the combination of the two movements mentioned above.

D. In some built-in or false-walled windows, access is made from behind the wall.

Access selection should provide ease of access to objects for replacement, restoration and cleaning, and also be designed to increase the safety factor against theft.

Display cases can be divided into two categories in terms of light usage:

A. No-light display case inside the display cases; in this case, objects can be seen by natural light or artificial light sources located on the ceiling above the display case.

B. Lighting display cases inside the display case should be checked to see if objects are visible through the various sources of artificial light inside the display case or not.

In type A display cases, there is no problem about damage caused by artificial light for objects. The technical and construction issues are simpler. The cost of making the display case is lower and there is no problem in maintaining the electrical equipment inside the display case. The issue of light reflection should also be considered. Conversely, the possibility to move display cases is limited depending on the location of light on the ceiling or walls. It is not possible to use light capabilities for showing and emphasizing objects and so on. In Type B display cases, although they are more attractive and beautiful than type A, the problems with light source placement such as air circulation, the quality and quantity of light, access to maintenance, etc. must be taken into account.

Display cases are divided into two main categories according to the type of production:

A. Commercial or mass-produced; these display cases are manufactured and marketed by specific manufacturers in different dimensions and types of wall hanging, standing, and so on.

B. Custom-made or limited-production; in these cases, designers considered particular location, object-type, and so forth and applied to the design.

Type A display cases are cost-effective and time-saving, while Type B display cases are time-consuming and costly, but they also have the advantage of custom-made items and, if they are properly designed, they are more compatible with object and environment features and require the necessary coordination with the architectural space of the location and even in some cases fix the existing architectural defects. Whereas display cases of type A are boxes that need to be arranged in the space to express their movement against the available space.

3.3. Standard Materials for Making Display Cases

Key materials for the construction of the display enclosure include steel, aluminum, stone and glass. These substances are connected by neutral inert materials (Watts and Crombie, 2007; Sharif-Askari and Abu-Hijleh, 2018).

3.4. Standard Structure of Display Cases

A) ***Internal Panels***: They include horizontal or vertical display screens inside the environment or space of internal panels of display case. The material can be coated and selected and final polishing or various buffers can be used.

B) ***Multi-Bay***: This is a term used for large display case made with multiple accesses; these display cases are fixed or have multiple structural panels along at least one view.

C) ***Locks***: All display cases are equipped with Abloy locks and some have additional mechanical locks for added security.

D) ***Soffit***: Sometimes it refers to the player frame or the diffuser or the lighting hood. In fact, soffit is the visible underside at the top of the system channel. Generally, soffit connects the lighting joints and separated shelving channels.

E) ***Structural Panels***: These panels are made instead of glass and can be used for further reinforcement of large display cases; they provide a higher level of security for fixed components or support additional components such as shelves or lighting systems.

F) ***Baseboard***: The baseboard is a physical barrier to the underside of the display case and provides high security and sealing.

G) ***Glass Joints***: The connecting points between the glass components of a display case can make a significant difference to the aesthetics of a display case; these joints are also critical to the performance of sealing and structural.

H) ***Shelving***: There are several optional choices for shelves inside the display case. The most common of these are adjustable shelving systems. The lever / arm shelves are mounted on the rear structural panel and the type of pendants uses a separated channel in the soffit.

I) ***Lighting***: Display cases equipped with illuminated lid can be used to coordinate all types of lighting systems, whether on top of a player or inside the panel (soffit). Certain types of lighting systems can also be mounted on interior panels.

J) ***Access***: A range of solutions can be provided proportional to the displayed objects and access. These include tensile hinged door, lifting and electric elevator.

K) ***System Channels and Security***: This section of display cases includes functional components such as locks and alarms, access mechanisms and lighting. System channels are also used for glass mounting and structural panels in display case construction.

L) ***Frameless / All-Glass***: In most display cases, the frameless or all glass without vertical framing or vertical preserver is considered.

M) ***Sealing***: Many exhibitions require high levels of sealing in order to achieve optimal air exchange and environmental control. For access panels of display case, we use insulator or silicone sealants between the glass joints of fixed panels and molded dense silicone sealants.

N) ***Wall Mounted***: We can design display cases wall mountable, especially wall type . These display cases can be screwed to the surrounding wall panels so that the back is completely enclosed or mounted on the wall surface and can even be pulled out by the lever.

O) ***Environmental Control***: This usually refers to the active or passive humidity tool inside the display case. These systems are generally stabilized by the plinth and attached to it through the display plates.

P) ***Plinth***: These display cases can be standing (independent) or mounted on a plinth. The plinth can be fixed by lock or in separated shelves and can also be used to control the environment or lighting equipment of homes. We can also design display cases based on existing plinth, desks and shelves or ledges (in the desired space).

3.5. Standard for Designing Museum Display Cases

Display case safety: *Glass*: The glass in a display case must protect the objects inside, without reducing the aesthetic of the display case. But which one is better? Natural glass or plastic glass, Table 1 shows the comparisons between silicate glass and acrylic glass.

Table 1 Comparison between silicate glass and acrylic glass

Organic glass	Ordinary glass	Properties
Almost yes	No	Safety glass
No	Yes	Non-flammable

No	Yes	Drill-Proof
No	Yes	Scratch proof
Yes	No	Colorless
No	Yes	Antistatic
Yes	No	Light weight

There are also laminated glasses which are not completely safe from impact. But they don't break with a hammer blow. Double glass with a thickness of 9 to 8 mm with a plastic layer provides good safety. This type of glass should be used in places where display cases are not visible at a glance and are located in hidden corners of the building.

Generally, glass with a thickness of at least 6 mm is also suitable. The same thickness is required for organic glass. In terms of protection, ordinary glass, multilayer glass and organic glass are the same.

We prefer ordinary glass generally than organic glass, especially for permanent exhibitions, because it is scratch proof and easy to clean. This type of glass can also be made anti reflex and the anti-UV properties can be added for multilayers.

Organic glass has also been used repeatedly in contemporary exhibitions, as it enables display cases of varying sizes and shapes to be set up quickly. However, the type of used glass is important for assembling the sturdy and stable parts of the display case.

Electronic Protection Systems

An advanced specialized system includes warning devices (sensors and pressure mechanisms), a central unit with an unrelated power source and a communication system which is capable of recording the fastest reactions.

The selected system must act quickly and alert before thieves can accomplish their goal. Unfortunately, there is not always the necessary coordination between museums and police centers, so museums must have their own security personnel.

Alarms

A thief looks first to make sure the display case is really locked or not.

Alarms alert when the lock is open with the "Opening Detector", so it reassures the curator that the display case are lock.

Another type of alarms "Glass Breaking Detector" warns breaking the glass window. There is a microphone that is sensitive to specific frequencies depending on the type of glass cup, but unfortunately their sensitivity is to the extent that they operate with the slightest noise. There is no previous defect in a system that uses a glass called a warning glass, the electrical circuits are located between the two layers with weak current in the sandwich cups; when they break, the current cuts off immediately, and the alarm system alerts.

Although the diameter of the wires in electrical circuit is only 0.1 mm and the wires are 5 cm apart, this system is rarely used due to visual disturbances.

In another type of double-glazed glass, electric apparatus is located only in one corner of the secure glass. As we know, these glasses are crushed into very small pieces and immediately electrical current cut off and a warning system alert.

"Motion Detectors" are the next type of alarms that work with infrared radiation and are sensitive to any movement within the display case, such as the movement of a burglar's hand inside the display case.

"Removal detectors" are types of alarms that are produced in two types: first, they start sending signals when something comes close to the object, and second, it starts working when the object is moved inside the case.

Installation of these models is quick and inexpensive, but their major disadvantage is that they start sending signals when the valuable item is fully available to the burglar!

The valuable things in the display case are to be protected against theft and vandalism. the display case must first be equipped with secure locks and all parts of the display case securely fastened together, and monitoring is always necessary (as a guard or an alert system); Because if the burglar has the "time", even the best physical obstacles as misleading as possible will be eliminated.

In a good security system, the alarm signs should be activated as soon as the burglar tries to eliminate the physical barrier. During the museum's closing hours, the announcers must be surrounded not only on the windows, but on all entrances to the gallery as well.

3.6. Role of Support in the Health of Manuscripts

Careful design of the supports can prevent all kinds of damage. Two basic issues need to be carefully considered when designing these supports.

1. Structure of object
2. The material of object

3.7. Role of Materials used in the Health of Manuscripts

Most of the display cases are made of glass, which fortunately have no sustainability problem. The frame and other components of the display cases are another matter. All timbers, recently dried, and some woods have the potential to disperse significant amounts of organic acids in the air even after careful drying. Oak is one of the most prominent of these, and in fact any wood used for tannin production can be hazardous, so by using these woods, lead objects quickly become corroded.

The multilayer timber itself may not have a problem, but the adhesives used in its manufacture can be problematic. This is especially true for cheap plywood, chipboard and block board. Stuffs that are used to attach these woods have the same problem.

Traditional carpentry adhesives which are made of horny skin materials such as horns, skins and fish skin pose another risk.

When they are fresh or decaying, they may produce sulfur compounds that can damage silver objects. Another group of organic acids commonly seen in display cases is linseed oil which is used in paint and putty compounds. Common putty, a combination of linseed oil and bleach, which is used in glass mounting, can disperse acidic steams for a long time before it is completely dry. Similarly, any color made from linseed oil and natural oils.

The third one is the steam from the combination of materials that are used for tightening the seams.

Synthetic and natural tires produce large quantities of sulfur gas due to their use of large quantities of sulfur in their production and during decay or when recently set. In addition, the foam sealing tapes, when made from low-grade polymers, are shredded over time and provide another source for acidifying the environment.

Currently a metal structure covered with a coating or hard glaze of good quality, and the body materials which are used in the manufacturing of motors or home appliances solve these problems.

However, if it is necessary to use wood for aesthetic or other reasons, wood should be covered with a transparent varnish or color. Lacquers, coatings and colors based on polyurethane have been shown to be very effective, and there should be time to dry completely between dyeing and using.

There are no problems with Polyethylene or polybutadiene for sealant than other materials.

The materials of paper, cards and other equipment used for decoration inside the display case should be noted so as not to produce harmful steams. Cheap papers quickly rot and produce acidic materials.

Acid-free paper and paperboard are recommended. Adhesive materials can cause many problems Rubber-based adhesives such as rubber sealants should not be used. Animal-based adhesives provide a good environment for mold growth in humid weather, except for those that have been stabilized by biocides of life-prevention. Adhesive tape and putty should be used carefully when mounting and installing objects in the display case. Some adhesive tapes on both sides are suitable for mounting objects, while some of them not only corrode the metals, but also after a while removing them completely from the artwork is impossible.

We should also be careful about the brighteners. The best ingredients for this work are micro-crystalline waxes that should not be used on high-holes surfaces.

The textiles used inside the display case must be carefully selected. Operations during fabric production may be harmful in some instances, but unfortunately they are not known for every single piece of fabric. Cotton in solid synthetic fabrics should be carefully washed to eliminate any starch they have. Fabrics such as velvet, silk, braid should be tested.

Pins and other metal fasteners may corrode if they are selected from inferior materials. Common types have this defect, and only those made of stainless steel or nickel, copper, manganese alloys. If using chrome plating fixtures, they should be carefully checked to prevent scratches or cracks on their chrome coatings and to be completely safe. Even the use of supports such as Plexi glass and pyrex are not without their own problems. These materials have no problems by themselves, but the adhesives used to form them often contain acetic acid. Supports that are made in this form will quickly have a devastating effect on the display case.

Using certain substances that protect certain types of objects may have a devastating effect on other objects within the same display case. So the objects that are located in a display case should also be controlled in this respect.

4. Display Case Protection against Earth Shocks

The earthquake produces two types of vertical and horizontal motions that can be combined in complex ways. These ground movements start shaking the display case and shaking the objects inside it, and intense movement cause the objects in the display case to overturn and eventually overturn the display case.

What follows is a detailed review of the dimensional details that the display case should have in this regard. But the important point is the volume center of gravity that will be chosen for the display case. The display case should not be too high and should have a sufficiently large plinth. Experience about free standing display cases has shown that if the height is three times more than the smallest dimension of the floor, the display case will be non-stationary.

The display cases used to display art objects usually have three to five glass faces. It is evident that the larger the glass, the weight of the upper part of the display case will be heavier and will be added to the weight if there is a lighting system.

Plexi glass has less specific weight than ordinary glass, but it is easy to scratch and also absorbs dust (due to static electricity) so it is not recommended. One way to reduce the weight of the upper part of the display case is to add weight to the lower part of the display case, for example by placing sandbags behind the plinth plates.

Recently, display cases have been pushed to the use of plinth that is more eye-catching, but this standing will decrease when the plinths become worn out over time (moving). Visitors may accidentally strike and shake them. To prevent vibration, it is best to fasten them to the ground, and the most common way to do this is to use a corner metal fastener mounted on four corners. The display cases that are behind each other can both be tightened to the ground or to each other by T-shaped or U-shaped joints and these results in a more stable surface. Wall-mounted display cases can also be fixed in the same way.

Recently, frame-free standing display cases are made of 4 sheets of glass stuck with silicone resin and a plexi glass ceiling attached to a polymer resin. The use of such display cases should be banned in an earthquake-prone country. Earthquakes aren't the only danger, but first objects must be placed in these Cloche Types and then Cloche Types display case covers them. This has dangers and accidents.

Materials such as wood, metal, or synthetic resins may be used for the exterior frame of the display case, but metal is the best in terms of strength and safety. The single plinths use for displaying contemporary sculptures such as protome and bust. Their bottoms are usually 30 cm wide and have a height of about one meter, which has a high center of gravity and this is bad for standing. In this case, the plinth should be filled with sandbag and attached to the ground.

5. Aesthetic of Display Cases

Communication equipment s such as printed images are only able to transmit copies of objects to the viewer while the museum is capable of displaying the object itself, so designers must emphasize this unique sense of presence and immediacy to cause direct confrontation between the viewer and the object. To this end, display cases should draw attention to the objects inside them purely with the least amount of time. So it is not logical to apply visual decorations and intricacies that take the attention from objects to the display case. The display cases identify with the objects inside them and the surroundings, so they must eventually move in harmony with them.

6. How to Access Objects Inside the Display Cases

Choosing the right way to access the object inside the display case, or How to get an object into it, is one of the issues that have always been overlooked despite its importance. Today in most museums, the display cases impose themselves on the works and the works are not selected based on a display case. It should be noted, however, that each museum object has its own physical and appropriateness needs with different spatial and environmental requirements that is determinant of the type of display case.

In fact, when ordering any display case for the objects, one must pay attention to the specific features and personality of a work. Primarily, the object should be located into or out of the display case as easy as possible. This minimizes the probable amount of physical damage to objects during movement or alignment and facilitates the alignment and access process. On the other hand, by making the right choice, the safety factor of an object can be raised against unforeseen events such as falling or even stealing.

In general, different display cases have five different types in terms of access and the degree of safety of objects.

Display case with Entry or Side Panel

The degree of access to these types of display cases on the entry side is always greater than the opposite. It is advisable not to use these for multiple scattered objects because of the difficulty of aligning and accessing the objects on the opposite side of the entrance, as the alignment and positioning of end-objects will always be difficult and may cause physical damage to other contents of display case.

Also, the type of entry in this type of display case makes it impossible or difficult to move and transport objects directionally during the alignment, so as far as possible for greater safety, avoid locating the unified and inflexible works in them. Many excavated objects with low strength must be transported with both hands when moving, as they may be fractured in such display cases. In Figure 1 you will see a sample of a display case with an entry or side panel.

Fig 1 Display case with an entry or side panel

Display case with panel or sliding entry

Due to the large amount of access space, these display cases are among the most suitable types of display cases for different types of objects. It is easy to arrange a variety of works in different dimensions, as well as small objects such as small books in large numbers. In addition, the excavated objects are well located into these display cases. Of course, to use this type of display case, there should be always enough space for panels to move around. The use of these display cases that the panel moves upwards is not recommended due to the numerous dangers and the probable panel collapsing unless full safety principles are met or automatic door opener are used.

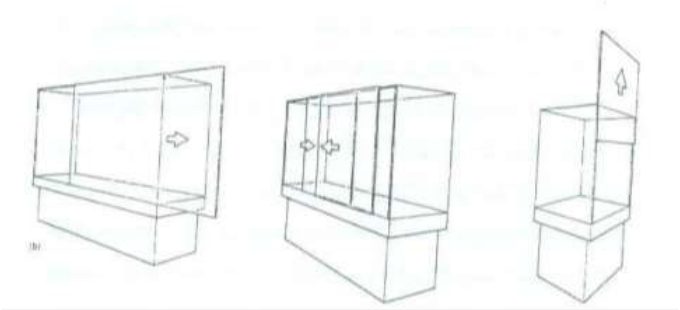

Fig 2 Display case with panel or slider entry

Display case with detachable case

Using this model, which is more for displaying and maintenance of large, high-altitude objects, requires a great deal of care when moving the input panel. Application of this model is not very common due to the strength issues of the panel and its dangers.

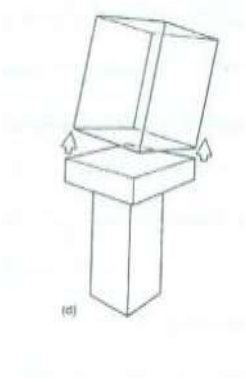

Fig 3 Display case with detachable case

Display cases powered from behind or safety display cases

As mentioned earlier, this display case can be used for optimal protection of valuable items that are generally part of museum special treasures. Placing the main panel behind and no access for irresponsible people, as well as a good level of column or wall support make these display cases safe against various pressures to a high degree of reliability. In addition to the benefits, the underside of these display cases is a good place to store humid-absorbing materials or safety devices.

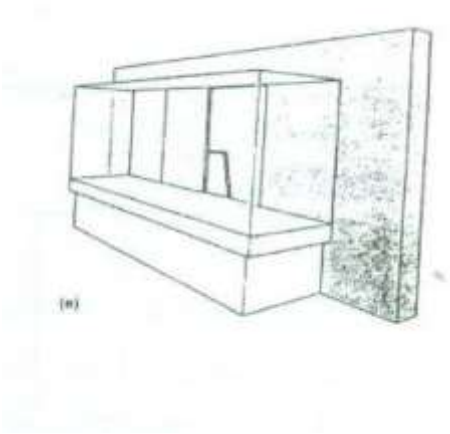

Fig 4 Display cases powered from behind

7. Light in Display Case

There are a few things to consider when designing light in display case:

A) It is necessary to maintain the necessary distance between the light source and the objects. If possible, it is better to use the external lighting for objects inside the display case. The light inside the display case should be reduced to the necessary minimum and the use of high-power bulbs and

projectors should be avoided. For highly sensitive and valuable objects, automatic illumination systems can only be used because these systems start to work when a visitor arrives.

B) Unauthorized fluorescent lamps shall not be used unless the UV absorption filter is applied against it or at least the reflective system is used. It is better that display case glass absorb UV.

C) Regularly monitor wiring inside the display case and the status of the lamps to avoid the risk of fire.

Temperature and humidity control in display case

The temperature in the display case is directly related to the overall temperature of the galleries. If there is proper ventilation system, the temperature and humidity will usually be acceptable. Just in case, a special case for humectant materials such as silica gel crystals and the like is embedded to lower the moisture content in display case. This case is connected to the interior space of the display case by the holes. Silica gel is a material that is regenerated by heat and restores its dehumidification property, so it must be regularly controlled and recycled. Humidity control is especially important for display cases for discovered items from excavated operations.

8. Design Process for New Display Cases on Museum Display Needs

The display case of a work in a museum is part of the show, and in addition to, it is also important to preserve the work and prevent it from being destroyed and worn out. In the case of the appearance and overall form of the display case, the condition of preserving the works must be positive and useful to the viewer. In this study of design and selection of ideas for preventive protection of artworks, structure of display cases were selected according to the protective principles of metal and glass.

In general, the display case as a case and small environment for the work should be designed to be equipped with an absolute light system, protected against dust and with temperature and humidity control. Display case lighting is done with small lamps mounted inside a display case containing object-focused light. Therefore, the object's proximity and non-proximity to the light should be taken into account, following by lighting and installation of the lamps. The lamps should not be annoying to the viewer either. Therefore, all object protection as well as visiting the objects should be taken into account for the light of the display case. The size of the display case must be appropriate with the size of the work, especially in terms of height. Also disregarding this, the visual problem will cause problems in maintaining the work. Consideration of general standards, such as the side of the opening and closing, the placement of silicon, is one of the issues that should be considered when designing a protective display case.

Regarding the showcase protection measures it can be said that based on the environmental monitoring information and the selection of the effect with the environment as well as the control of the potential environmental damages, it creates favorable conditions for the effect which can more precisely reduce the damaging factors. In addition to the exterior elements of the display case environment, the small interior environment of the display case must also be controlled and the lighting system should not damage the work, as objects are directly exposed to temperature, relative humidity, material reactivity and pest problems and the likelihood of exacerbations will be more in these environments. The case or display case is usually closed with a system, and despite the illumination inside it causes heat, and the temperature inside the display case with the closed system greatly increases the likelihood of damage and leads to problems.

A high temperature makes most molecules active and allows any chemical interactions. On the other hand, relative humidity has a direct relationship with temperature, which together creates unfavorable conditions for objects. Two approaches are commonly used to control display case environments:

A) Keep energy sources away from the display cases as much as possible

B) Reduce the energy impact by installing a barrier inside the display show to reduce oscillations

After introducing and defining the necessary standards of protection for the design of new display cases, the items are considered as a list of essential requirements for preventive protection of the works with the help of display cases, as follows:

1. There is a great need to use slip sensors because of the earthquake-prone country and the age of many museum buildings as well as the movement of visitors around the display cases.

2. The use of a humidity meter due to the placement of the manuscript in a glass case that will spontaneously evaporate, in addition to the climatic features of each geographical area in which the museum is located.

3. Using a thermometer to control the temperature results in chemical changes in the work.

4. Air purifier

5. Gas importing machine

6. Anti-reflective glass that prevents the light of mobile phone cameras on the works and it is also for the protection and security of the works.

7. Secure glass and bulletproof glass to prevent intentional injuries like theft.

8. Light that produces the least heat and it does not cause changes in environmental conditions and exhibits works well and is free of UV and infrared.

9. The book-rack for the protection of spine of book

10. Mirrors to illustrate the manuscript cover along with the text, illuminations and other arrays in the books which are of great value and are both visually and aesthetically valuable.

11. Using adjustable wheels, these wheels will greatly help curators in moving display cases for probable displacements. When the security guards do not need the wheels, the wheels go into the plinth and lock.

9. Conclusion

According to the studies by observing the 11 factors mentioned in the findings of this article, the most optimal design for the protection of works within museums can be achieved. It should be noted that all of these factors have been extracted according to the climatic conditions and characteristics, type and specifications of the manuscript and the type of display required in the manuscript section of museums in the country and can be used as a guide for museum designers.

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