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Impact Of Daylight In Northern Style Hindu Temple

Aarushi Dwivedi
** Department of Architecture, Faculty of Architecture and Ekistics, Jamia Millia Islamia, New Delhi*

Abstract
Temples serve as places of learning, art, architecture, and culture in addition to serving as places where god and humanity interact. The social, economic, and traditional value systems in India are influenced by temples. Vedic tradition is deeply ingrained in Hindu temples. The Vastu Shasta serves as the foundation for the basic shape and style of Hindu temples. Due of Vastu Shasta's emphasis on the movement of the sun, the temple's design also incorporates sunlight. Hindu bodily parts are important to Vastu Shasta because they aid in temple architecture. This paper analyses the impact of daylight in the Hindu temple. The study has principal purpose is to compare 2 northern Hindu temple with respect to daylight. The primary goal of the study is to compare two northern Hindu temples in terms of daylight. Study of Hindu temples in literature, their forms and designs, their sites, their manuals, their vastu purush mandalas, and their constituent parts are the first steps toward achieving this goal. This is crucial for the planning process. Learn the guidelines for temple architecture with regard to daylight and the science behind it. Study daylight principle and the quality of light in holy places as well. Case studies for the sun temple at Konark and the sun temple in Modhera are presented. The thesis comes to the conclusion that daylight has an effect on a Hindu temple.
Keywords: *Northern style Hindu temple, Vastu Shasta, daylight.*

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I. INTRODUCTION

Daylight is the light that exists just before the sun sets. It has an effect on Hindu temple planning, Vastu Shasta, and plays a significant part in Hinduism. It serves as a source of lighting and heating and is a crucial component of passive architecture. Vedic customs are at the foundation of Hindu temples. It is indicative of Indian ancient Sanskrit writings. A temple represents the five principles of dharma, kama, artha, moksa, and karma by symbolically incorporating all the components of the Hindu universe: good, bad, human, as well as the elements of the Hindu concept of cyclic time and the essence of life. A Hindu temple, known as a mandir in Indian languages, is a place of worship for Hindus Vedic traditions are used in the symbolism and architecture of Hindu temples, which frequently include squares and circles.

II. NORTHERN STYLE HINDU TEMPLE

- Nagara style is the name given to the fashion used in northern temples.
- • It typically lacks ornate boundary walls or entrances.
- • Later temples had multiple shikharas, although the earliest ones only had one.
- • Depending on the design of the shikhara, there are numerous subdivisions of nagara temples. • The garbhagriha is always situated precisely beneath the tallest tower.
- • the most prevalent name for the straightforward shikhara, whose walls are square at the base.
- • The "Latina" or "rekha-prasada" form of shikhara is defined as a curve or slope that inclines toward a point at the summit.
- • The 8th-century shrine has a square centre and was built with lesser shrines before the shikhara was added as the temples' crowning ornament.
- Shikhara originated in the Deogarh Temple in Madhya Pradesh, where it is customary to construct complete temples on stone platforms with steps leading up.
- It typically lacks ornate boundary walls or entrances.
- The earliest temples had a single shikhara (tower), while subsequent times saw the emergence of several shikharas.The tallest tower is always exactly beneath the garbhagriha.

2.1 Nagara temples can be divided into many different types according to the shikhara's shape:

A. Latina/ Rekha- Prasada

- The walls of this straightforward and widely used style of shikhara are square at the base and bend or slope inward to a point on top.
- The garbhagriha is typically housed in Latina-type buildings.

Phamsana type shikhara

- Their roof is made up of numerous slabs that gently ascend to a single point above the centre of the structure, and they are wider and shorter than Latina type.
- Phamsana roofs have a straight incline that slopes upward rather than an inward curve, and they are frequently employed for mandapas in north Indian temples when the main garbhagriha is housed in a Latina structure.

B. Valabhi type shikhara

- These are square structures with a roof that slopes upward to a vaulted room.
- This temple's shape was influenced by prehistoric construction designs that were already in use.

III. CASE STUDY

A. SUN TEMPLE _ KONARK (1250 A.D)

1) konark is the combination of the words kona and arka.In reference to the temple that was devoted to Lord Surya, kona means angle and arka means sun.Kalinga design
2) The temple is built like a wheeled chariot, or "ratha," and is drawn by seven horses, which stand for the sun's seven rays. It is also supported by a massive platform with twelve gaint wheels.
3) It has lovely sculptures carved into it, and the spokes are adorned with a medal-shaped piece of jewellery.
4) On each of its three sides, there are three shrines with stairways leading to niches that each have a life-size carving of the sun deity.
5) The wall is completely sculptured with lovely dancers performing while playing musical instruments, illustrating the fundamentals of human existence.
6) Two elephant statues guard the entryway.
7) The upper, tapering portion, known as the "pida," is fluted and is topped with a shaped "kalasha" or "amlaka."
8) The exterior of Bada is covered in sculptures that include up to 1500 elephants arranged in various patterns, along with soldiers on horses in the bottom row.

Figure:1 sun temple konark

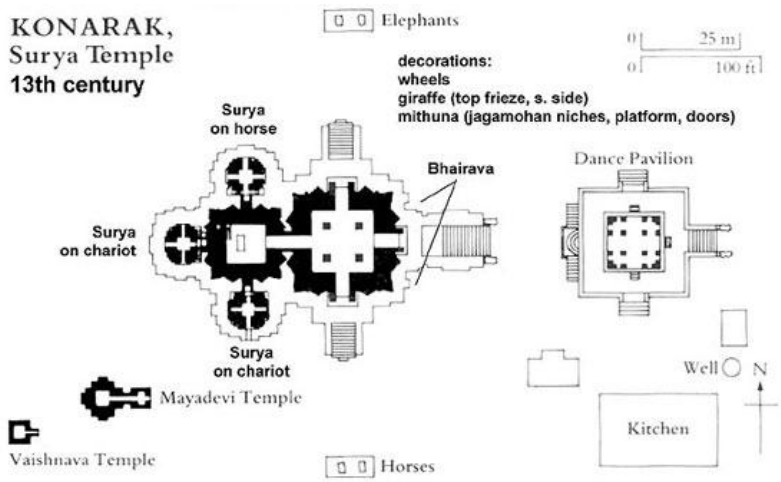


Figure:2 Plan of sun temple Konark

MAIN ATRACTION

1) Patterns in geometry all over the temple
2) The engraved wheels and spokes that represent the sun's rays
3) At the entrance, there are architectural sculptures of war horses, elephants, and lions.
4) The Nata Mandir (4) (Dancing Hall)
5) To catch the Sun's rays at sunrise, noon, and sunset, the temple has three representations of the Sun God.
6) The numerous pictures of elephants, muties, dancers, and musicians.
7) The temple's second floor, which houses its renowned sexual sculptures.

8) The Archaeological Survey of India's Sun Temple Museum
9) The Temple of the Nava Graha (Nine Planets)
10) In 1984, UNESCO, an agency of the United Nations Educational, Scientific, and Cultural Organization, designated the Konark Sun Temple as a World Heritage Site.

B. SUN TEMPLE – MODHERA (1026-27 CE)

1) It is a superb example of Indian temple building.
2) Bhima I of the Solanki dynasty ordered its construction.
3) Suryavanshis, or the offspring of the "Sun deity," were regarded to be Solankis.
4) It is located 18 miles south-east of contemporary Patna.
5) The Mehmood of Ghazni demolished it.
6) It is dedicated to Surya, the solar god.
7) The sun's rays are intended to strike the picture of Surya when the sun rises in this temple.The inner sanctum diety faces east.
8) There are temples dedicated to Shiva as Nataraja and Ganesha.
9) It was constructed following 1026–1027 CE, during the rule of Chaulukya dynasty leader Bhima I.
10) It is reported that there were 108 shrines on these steps at one time. It is difficult to estimate how many of them are still alive.
11) The sanctum sanctorum was constructed such that, on solar equinox days, the first rays of the rising sun would illuminate the picture of Surya.
12) The whole life cycle of a human being, from conception to death, is also depicted.

Figure:3 Sun temple Modhera

STRUCTURE

1) The surya kunda, a sizable sacred pool, faces the temple. It is sometimes referred to as Rama Kund. It is square-shaped. From north to south, it is 176 feet long, and from east to west, it is 120 feet. It contains pyramid-shaped steps that are arranged in geometric designs.
2) The temple is separated into the main temple, known as gudha mandapa, and the pillared hall, known as sabha mandapa.

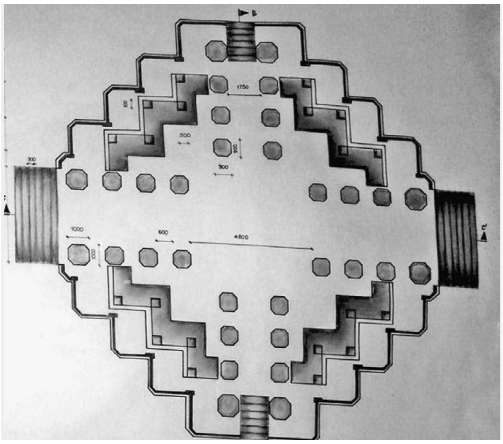


Figure:4 plan of sabha mandapa

1) This building was elevated on a large terrace made of sturdy stone with a brick front.
2) The temple is divided into two distinct buildings that are joined by a small hallway.
3) An enclosed rectangular building with compartments, the assembly hall (gudha mandapa), and the shrine (garbha griha), on one hand, and an open pillared hall (sabha mandapa) on the other
4) The entire structure's axial length is 145 feet.
5) The sabha mandapa is based on a square that is almost 50 feet broad and is positioned diagonally with the axial line on the plan.
6) Its sides are punctuated by recessed chases at regular intervals.
7) The temple's rectangular portion is 80 feet by 50 feet, and its design includes angles, which make it stand out from the surrounding buildings.
8) There is only one entrance, which is through a pillared portico on the east and links with the "sabha mandapa's" western or back doorway.
9) Five window apertures, each with a well-proportioned aperture, are spaced at regular intervals along the sides.
10) The elevation is divided into the three sections that have already been mentioned, with the "pitha," or basement, consisting of carved mouldings, rising above the roomy "mandovara," or panelled wall-face, elaborately decorated with sculptures of human figures, each of which is housed in a niche.
11) This enclosed area's interior is divided equally into two compartments, each of which is a square with a side of 25 feet.
12) Sabha mandapa designed in the customary Gujarati style around an octagonal pillared rooms, with the front or eastern being the "gudha mandapa," or assembly hall, with 8 columns around a central octagonal nave.
13) Sloping seats are arranged in rectangular offsets around its perimeter.

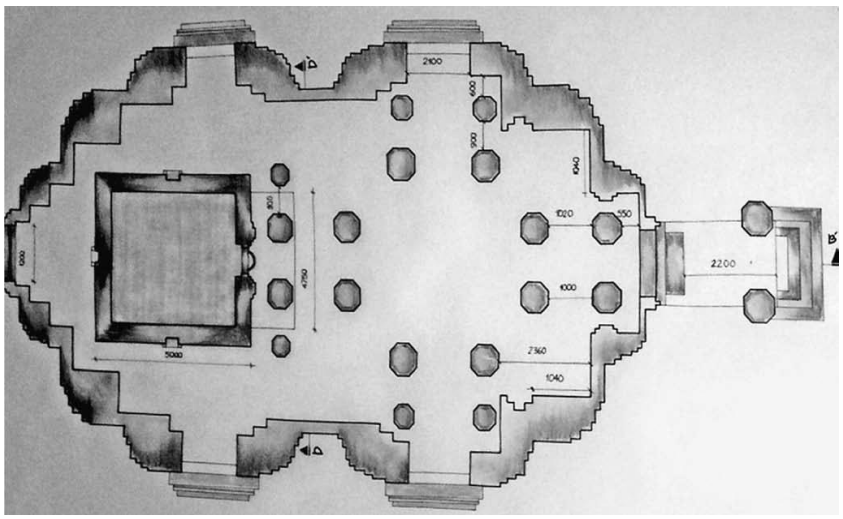


Figure:5 Plan of Gudamandapa

IV. COMPARATIVE ANALYSIS

SUN TIME	SUN TEMPLE KONARK	SUN TEMPLE MODHERA
SUN RISE	05.55 AM IN WINTERS 05.41 AM IN SUMMERS	07.05 AM IN WINTERS 06.33 AM IN SUMMERS
SUN SET	17.07 PM IN WINTERS 18.02 PM IN SUMMERS	17.53 PM IN WINTERS PM IN SUMMERS

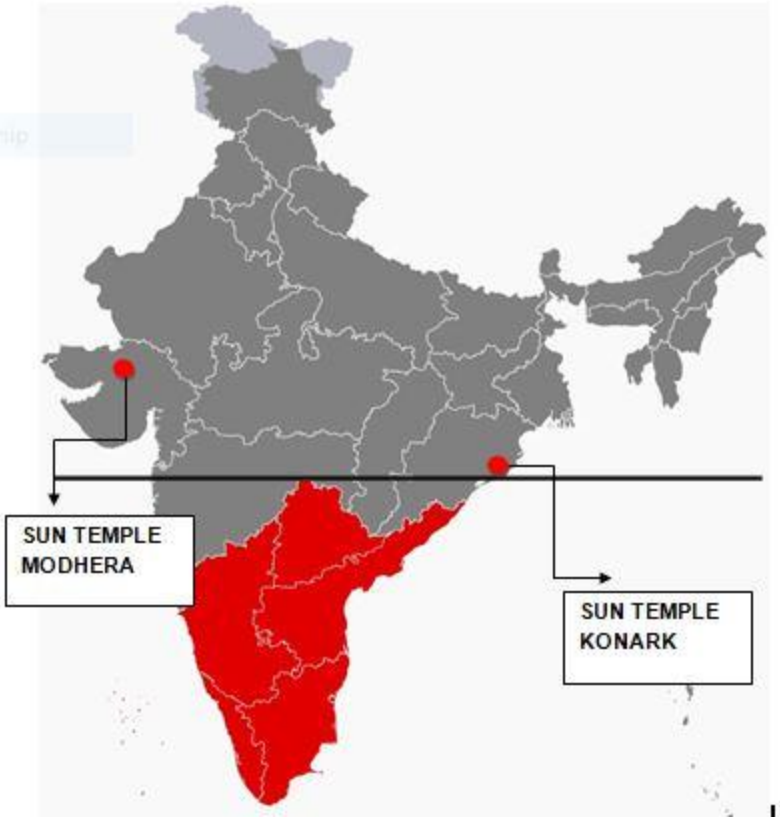
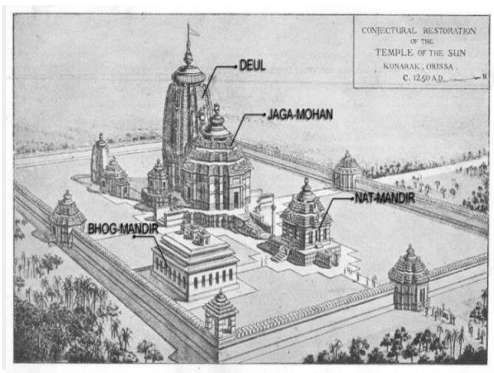
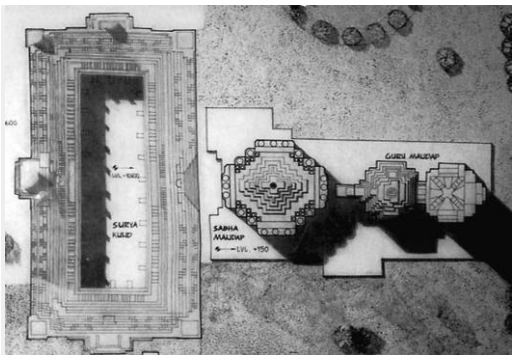


Figure:6 Map showing Both Temples Zone

A. COMPARISION WITH RESPECT TO SUN LIGHT

	SUN TEMPLE KONARK	**SUN TEMPLE MODHERA**
BUILT BY	Narasimha deva I IN 13 CENTURY C.E	Bhima i of the solanki dynasty Built after 1026-27 C.E.
PLAN		
SUN IMPACT	Lord Surya received a temple as a gift. It faces east so that the main entrance is illuminated by the first rays of daybreak. To catch the Sun's rays at sunrise, noon, and sunset, the temple had three images of the Sun God. The most noticeable aspect of this temple is its east-facing entrance, which is designed such that the sun's first rays fall right on it. Rathas, created in the shape of a temple, depict the sun's beams.	This shrine is also devoted to Surya, the solar deity. When the solar equinox occurs, the sanctuary is constructed so that Surya's image is illuminated by the first sunrays as they rise. The Surya figurines are vividly etched on three niches of the shrine in Gudamandapa. Surya Kund is located on the east face of the kund to receive direct sunlight from the sun. The main entrance is located to the west, according to Vastu.

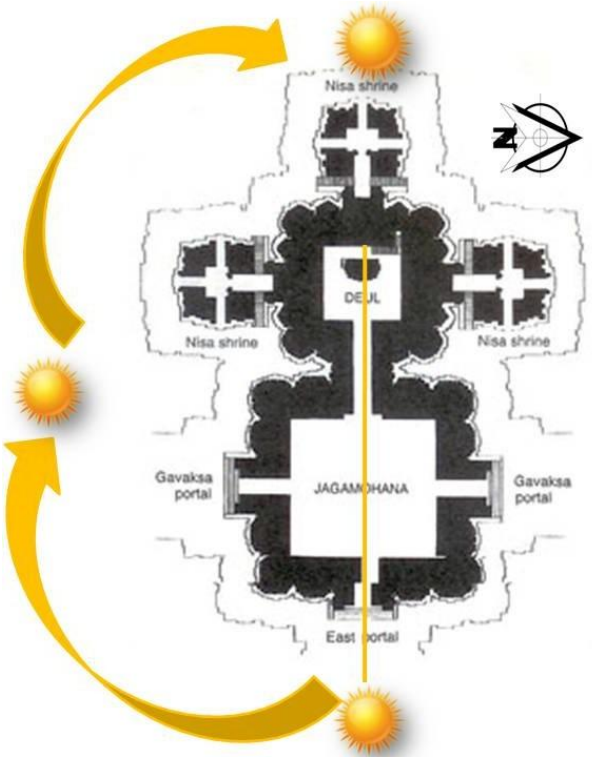


Figure:7 plan of sun temple konark with respect to sun

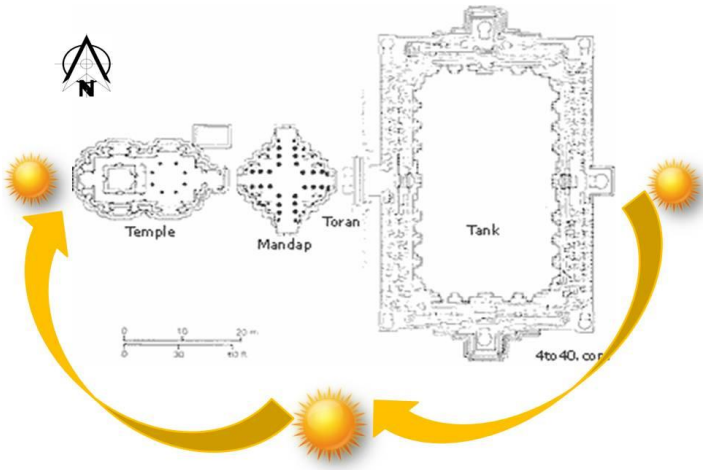


Figure:8 plan of sun temple Modhera with respect to sun

V. GUIDELINES FOR HINDU TEMPLES CONSTRUCTION

A. BETTER CONSTRUCTION OF TEMPLE ACCORDING TO VASTU WITH RESPECT TO DAYLIGHT

1) A plot is shaped like a square or rectangle. Thus, rather of meeting at a corner, the plot's boundaries should be formed by the four principal directions of east, west, north, and south.
2) East and North are the water sources.
3) The land's slope ought to run from south to north and from west to east. South-west to north-east is the slope with the best grade. The natural slope in these directions is ensured by the presence of a sea, river, etc. in the east or the north.
4) North-east water body
5) All restrooms are located outside the temple building, and the washing place before entering the temple is to the east.
6) The south-east corner is designated by the Deepstambha (pillar for illumination), Agnikund (earthen pot in which the fire is created), and Homkund (Pit for Sacred Fire) symbols.

7) The main entrance gate should be larger than the other temple doors.
8) The god murti shouldn't be visible while coming through the main gate.
9) The floors and pillars are either white, yellow, or light saffron in colour.
10) The east should be set up so that between 6 and 9 in the morning, the idol receives direct sunlight.
11) Various gods' idols will be present in a temple, but only Lord Hanuman's idol can face south. Others shouldn't be looking south.
12) The temple is surrounded by open space.
13) The primary idol or temple should be accessible for worshipers to perform Parikrama.
14) Either high hills or areas with a small population are the best locations for temples.
15) To conduct rituals inside the boundaries of the temple, to the west or south.
16) Donation, gift, or charity boxes are in the east or north.
17) The sanctuary shouldn't have the bell there. It need to be near the front of the structure that encloses the sanctuary.
18) The pillars should be either circular, square, rectangular, or octagonal.
19) Parking is permitted in East or North exterior public areas.
20) The temple is exceptionally lucky because it has four roadways on its four exterior walls. It will result in greater prosperity

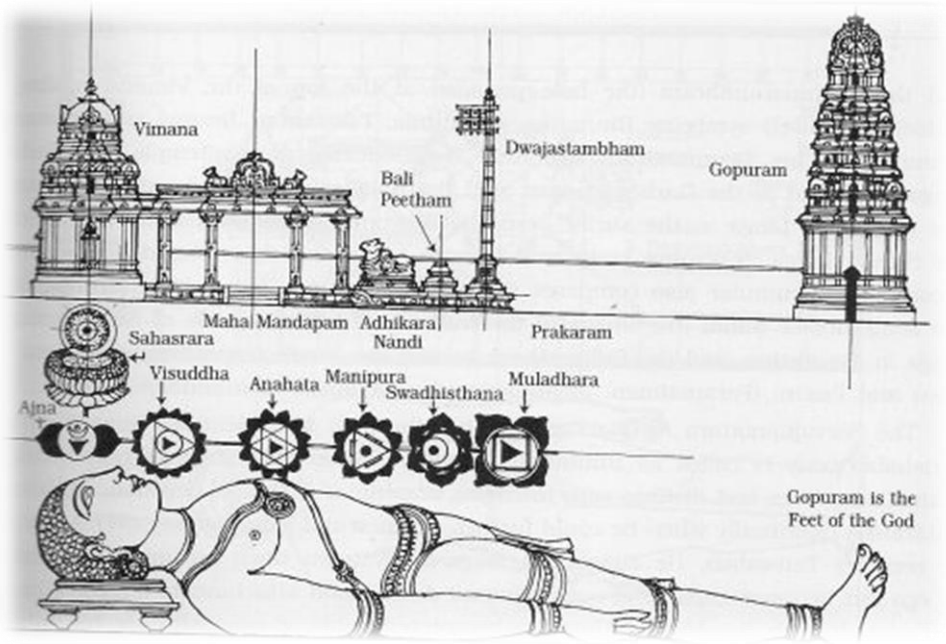


Figure:9 Temple Architecture-Devalaya Vastu

B. LIGHTING DESIGN GUIDELINES

Design requirements for lighting for a future Hindu temple that will perform better in terms of daylight.

- **Uniform Illumination Level**

1) When facing windows and clerestories, face them north and south.
2) Use windows that are high and close to the ceiling.
3) Light that is reflected by the outside surfaces falls over the ceiling and reflects back into the interior space as a result.
4) Utilize clerestories and skylights to add more daylight and contrast-free illumination to interior areas.
5) A glass-topped atrium that will create a thermal buffer zone and allow daylight to penetrate all the way to a building's core while also emitting diffused light.

- **Avoid Direct Glare**

1) To reduce direct glare, use the right glass.
2) Use louvres; the main light source ought never to be in the viewer's line of sight.

3) Use shading to block out sunlight to prevent glare and heat buildup.
4) For the majority of surfaces, especially those with vast areas, use high reflectivity matte finishes. To reroute and improve daylight penetration, this reflects and diffuses building surfaces.
5) Use the right glass to cut down on direct glare.

- **Avoid Veiling Reflections**

1) The light from overhead openings is a source of veiling reflections, despite the fact that low angle light from windows typically isn't one.
2) Use regulated light from skylights and clerestories.
3) Utilize low-angle light coming from apertures.

- **Direct and Diffused light**

1) Use windows to let in light, but don't add more than is necessary.
2) To gather the necessary amount of light,
3) use the smallest windows possible, and reduce thermal penalties.
4) Make use of the light reflected from surfaces and other outside objects, such as buildings. This
5) Light that has been reflected travels up through glass, where it is further diluted and reflected by G. The ceiling.
6) Make use of transparent exterior building materials that also offer thermal
7) Coverage and dappled light. These substances might include glass, plastic, etc.

- **Avoid Brightness Ratios**

1) Use windows to let in light, but don't let in more than is necessary.
2) To prevent direct sunlight, use regulated sunlight in interior rooms.

Lighting Program	controlled sunlight from skylights or clerestories
Illumination Level	Low angle sunshine from apertures
Avoid Direct Glare	controlled light coming through openings
Avoid Veiling Reflection	controlled sunlight from skylights or clerestories
Direct & Diffused Light	Low angle daylight from openings
Avoid Brightness Ratio	controlled light coming through openings
Avoid Direct Sunlight	Use matte surfaces with high reflectivity.

VI. CONCLUSION

1) In this dissertation, the effect of daylight in Hindu temples is discussed. Vastu Shasta and the sun have a significant part in the Nagra and Dravidian architectural styles of Hindu temples, which are closely tied to daylight. The northern Hindu temple is discussed in this dissertation.
2) Temples serve as places of learning, art, architecture, and culture in addition to serving as places where god and humanity interact. The social, economic, and traditional value systems in India are influenced by temples. Hindu temples have their roots in ancient Vedic culture. The Vastu Shasta serves as the foundation for the basic shape and style of Hindu temples. Due of Vastu Shasta's emphasis on the movement of the sun, the temple's design also incorporates sunlight.
3) It was discovered during the study of this temple that the Light escape is exactly and scientifically exploited to create the temple complex majestic and full of positive vibes, which eliminates negative vibes and gives the body enough energy to last the entire day. Hinduism places a great deal of significance on the first ray of sunlight because it represents the sun God. In ancient India, people would worship the rising sun before beginning their days.
4) There is also a lot more room for future research because Hindu temples in India provide many other fields of study, including those for religious scholars, art historians, photojournalists, archaeologists, and other experts. There is room for extensive research on Hindu temples throughout India, not just in terms of lighting but also in terms of architectural technology and structural analysis.

REFERENCES

[1]. The great ages of world architecture by G.k. hiraskar
[2]. http://www.aifas.com/books/saralvastushastra-english.pdf
[3]. http://papers.cumincad.org/data/works/att/ijac20075304.content.pdf
[4]. https://dokumen.tips/documents/hindu-temple-a-case-study.html
[5]. https://www.slideshare.net/Meghaaaaaaaaaa/minor-project-report-on-temple-architecture.
[6]. https://en.wikipedia.org/wiki/Hindu_temple
[7]. http://www.ijstr.org/final-print/nov2017/Vastu-Shastra-And-Feng-Shui-The-Ancient-Sciences-And- Their-Fusion-In-Context-Of-Indian-Architecture.pdf.
[8]. https://www.scribd.com/document/270870413/Hindu-Temple-A-Case-Study
[9]. https://www.slideshare.net/templearch/indian-temple-vastu-shastra
[10]. https://en.wikipedia.org/wiki/Vastu_shastra#Terminology
[11]. https://en.wikipedia.org/wiki/Hindu_temple#Significance_and_meaning_of_a_Hindu_temple.
[12]. http://architectureideas.info/2008/10/vastu-shastra-factors-the-sun-and-its-effects/
[13]. https://www.homeonline.com/hol/home-tips/6-feng-shui-effects-of-sunlight-on-homes.html
[14]. http://www.vaastuinternational.com/vaastutemples.html
[15]. https://www.buildings.com/article-details/articleid/8816/title/principles-and-impacts-of-daylighting
[16]. https://www.slideshare.net/kaash7827/sun-tem-kornak
[17]. https://www.mahashivratri.org/shiva-temples/lingaraj-temple.html
[18]. https://timesofindia.indiatimes.com/travel/destinations/lingaraj-temple/ps47158729.cms
[19]. https://www.slideshare.net/surbhi2910/temple-of-sun-modhera
[20]. http://modhera.blogspot.com/
[21]. https://www.inditales.com/architecture-of-sun-temple-modhera/
[22]. https://www.timeanddate.com/sun/india/mahesana?month=12&year=2019
[23]. https://www.timeanddate.com/sun/india/puri