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The Architecture and Beyond of Tread and Riser

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Abstract

The primary constitution of stairs is the arrangement of horizontal and vertical measures known as tread and riser. This is the simplest arrangement that essentially conveys people from one level to the other with required comfort and safety. Steps are a universal symbol with multiple interpretations. They are the most generally used similes in art, philosophy and psychology. Stairs occupy a unique status in the built environment because they not only convey people, but also symbolize the psychological, spiritual and artistic aspects of human nature. The mental significance and symbolic connotations of steps are deeply rooted. Understanding the role of stairs in different spheres of human need and expression is crucial in approaching its design. The pattern of stairs is dependent on the type of materials and other related design considerations. It is one of the

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unique architectural entities that reflect the various facets of social, psychological, artistic, metaphysical and religious dimensions. The importance of physical activity in the rising sedentary life styles is linked to the design of building elements, especially the staircases. The advancement in technology has displaced the role of stairs into an inconsequential means of emergency escape. But the importance of physical activity in the rising sedentary lifestyle has revitalized the concept of stairs as an active building component. The mono functional approach to staircases in high-rise buildings, especially as the means of escape in emergency situations, indicates that the design of staircases as multi functional element is still under the confines of design explorations. This paper is an attempt to understand the concept of stairs not only from the evolutionary point of view, but also the associated metaphoric meanings and its emerging multi facet identity. The concept of vertical accessibility in the form of tread and riser arrangement makes stairs a timeless phenomenon. The approach to multi utility architectural elements stretches beyond physical functions and should integrate the various dimensions of space making and society. In this regard stairs are a pioneering entity that has a potential to relate to many spheres of human thinking. It is clearly evident that stairs are not bound within the confines of architecture. Their origin, utility and design have far more influential qualities that travel beyond the realms of function and symbolism. It is further discussed that in the present age stairs have become as an inspiration for physical well being. The issues involved with age based capabilities demand a certain design approach that satisfies the sensitive relation between built environments and building elements.

INTRODUCTION

The primary constitution of stairs is the arrangement of horizontal and vertical measures known as tread and riser. These are the basic elements that are responsible in creating the rich cultural and technical facets of staircase architecture (Alan & Blanc 2001). The stairs are one of the primitive elements in architectural history. Every civilization has used some version of stairs or ladders to reach higher elevations. Even in the present era of high rise architecture the role of stairs is irrefutable (Berger, Theuring & Adolph 2007). The different design aspects of staircases can be traced through thousands of years of human history. A settlement called Catal Huyuk during 7000 BC in Asia Minor region of Turkey had houses connected to each other with no doorways (Mellaart 1962; Steadman 2000). The access was from a hole in the roof by means of a movable ladder (Mellaart 1962). This settlement is clear evidence that man had the device and ease of moving vertically from prehistoric times.

Steps have always been an essential part of a shelter. To be a few feet above the ground creates safety and protection. This occurred naturally as the action of climbing trees translated into the aspect of protection against wild animals and escape from the water logging in rainy seasons (Alan & Blanc 2001).

Arranging blocks of stone that form accessible horizontal and vertical surfaces leading to changes in levels has been a method from primitive days. As civilizations progressed, places of congregation were built high up on a mountain or high structure was erected followed by a series of steps. The set of steps that connect two different levels is termed as a staircase or stairway. According to Campbell and Tutton (eds 2014) a short staircase is a part of the extensive remains of the prehistoric Tarxien Temple and Saflieni Hypogeum site in Malta, that date back to 3600 - 2500 BC. These are probably the earliest free standing megalithic monuments in the world. They state that almost every significant building from the ziggurats of ancient Mesopotamia to the present day has accentuated the identity of stairs. Staircases are compelling and enigmatic because they not only invite ascent or descent, but also create subtle excitement to see what unfolds above or below (eds Campbell & Tutton 2014).

Figure 1.
Pyramid of the Magician, Uxmal. Templer, John. *The Staircase.* Cambridge, Mass., London, The MIT Press, 1994. *(Pallasmaa 2000, p.11)*

Apart from the basic function of conveying people to different levels, stairs inspire different analogies in artistic, psychoanalytic and philosophical interpretations (eds Campbell & Tutton 2014). Staircases are an example of the interaction between building design, the surrounding environment and users (Zimring et al. 2005). Staircases are an important feature that influences user behavior, both physically and visually. It is not only the tread and riser that constitutes the staircase, but the supporting elements such as the rail, the material of the staircase, and landings, that augment the conveyance of people in a safe and comfortable manner. This process has reinvented itself from primitive times to the present era of skyscrapers, multi planar artistic endeavors and life style awareness activities. This paper is an attempt to understand the concept of stairs not only from the evolutionary point of view, but also the associated metaphoric meanings and its emerging multi facet identity.

Figure 2.
A Jacob's ladder in landscape terms: steps called 'the sky ladder' at Tai Shan, China (551 BC) (from Schuster, F., Treppen. Hoffman Verlag, 1949) *(Alan & Blanc 2001, p. 5)*

PATTERNS OF TREAD AND RİSER

There is no limitation to the pattern of arranging treads, risers and the additional features that provide safe access to the different floors of a building. Risers divide the total vertical climb into small increments that the legs can negotiate comfortably and treads provide uniform level and secure footholds (Allen 2005). Hawker describes that a step is both the action of vertical foot movement as well as horizontal foot rest that supports the movement from one level to another (Erickstad 2012). The wide array of tread and riser patterns reflects the relation between staircase design approach and the building typology.

Type, Purpose and History

The history of the staircase is not linear. Different types of stairs are designed, the majority of which are innovated and reinvented (eds Campbell & Tutton 2014). According to Miles (1999) the function of a staircase must be deduced from its physical remains. He states that the formal pairs of stone staircases are a characteristic of western Greek temples. The foundations in them emphasize that the interior stairs were an integral part right from the temples inception (Miles 1999).

There are different ways of arranging the steps in a staircase. Based on the type of material and the kind of purpose to whom it

is catering to, type of staircase is designed. The geometrical arrangement of treads and risers in various patterns defines the names of different types of staircases. Direct flight, dog legged, open well, helical, imperial, double stairs are some of the general patterns of stairs. In many instances design of a staircase has been often the combination of these typical patterns and gets distinguished based on the materials and the type of structural system adopted.

According to Campbell and Tutton (eds 2014) the cantilevered stairs were invented by the ancient Greeks and reinvented by Andrea Palladio in Convento Della Cartia, Venice in 1561. They state that islands of Naxos and Andros in the Cyclades have two remarkable cantilevered staircases, both from the Hellenistic period, 500-300 BC. These staircases still survive in their circular towers that stand without visible support of the internal open well. The texts from Palladio's *the four books of Architecture* have been influential in the creation of dramatic structures of the turret and emphasize the advantages of open well stairs with stone cantilevers (eds Campbell & Tutton 2014). The direct flights of stair are the most popular in ceremonial approach and are often the most delightful because of the alignment of line of movement and line of visibility from one level to the other levels (Alan & Blanc 2001). It is the Renaissance and Baroque styles that recreated many of the grand straight flight stairs as an epitome to royalty (eds Campbell & Tutton 2014). During that time, many original and majestic forms of staircases can be observed. In I570, Palladio exhibited his staircase designs as *inventions* and the Renaissance was the period of innovation for the staircase forms like a spiral, converging flight and double-helix (Wilkinson 1975; Good 2009). Further the straight flight design was developed into open well stair and the Imperial stair.

Among the early civilizations, the Romans were pioneers in staircase design and construction. This is evident from the fact that the sheer scale of Roman buildings demanded a complex system of stairs. There is an overwhelming evidence for domestic stairs, especially in dog-legged form in residential and commercial structures of the Roman times (eds Campbell & Tutton 2014). Templer states that the grand formal stairs of the Renaissance and Baroque palaces were generally dogleg (Erickstad 2012). The palaces and public buildings were extensively composed of monumental dog-legged staircase during the Renaissance in Venice. Apart from this, a conventional dog-legged courtyard staircase was a highly adorned processional component in both Romanesque and Gothic palace

architecture. It was designed to express the grandeur that articulated the social hierarchy (Good 2009).

Straight flights, spiral forms and multi turn stairs are the general patterns found in many fortifications, castles and religious buildings. According to Alan and Blanc (2001) three turn stairs were predominantly used during Roman times and their presence in the remains at Ostia reveal multi storied tenement structures that once raised five storey's. The defense was an important aspect in the design of multi turn stairs, apart from saving in space. Approach stairs in citadels like Alhambra are strategically planned for right handed swordsmen fighting in defense. The attackers unless left handed were at a disadvantage at every landing (Alan & Blanc 2001). Neil states that even though defense was a major consideration, 'the idea of the clockwise spiral stair was designed to aid a defensive force is a popular myth' (as cited in eds Campbell & Tutton 2014, p. 37).

According to Good (2009) Leonardo da Vinci formulated the concept of double staircases. They had become a part of multi-family residential structures during the Renaissance. Two flights of steps are positioned in a criss-cross manner that creates separate routes for the courtiers and service providers, avoiding visual conflicts and maintaining least possible travel distances. He states that double staircase was originally devised as a part of military architecture to minimize the chance for treachery and conspiracy among the soldiers heading to battlefield (Good 2009).

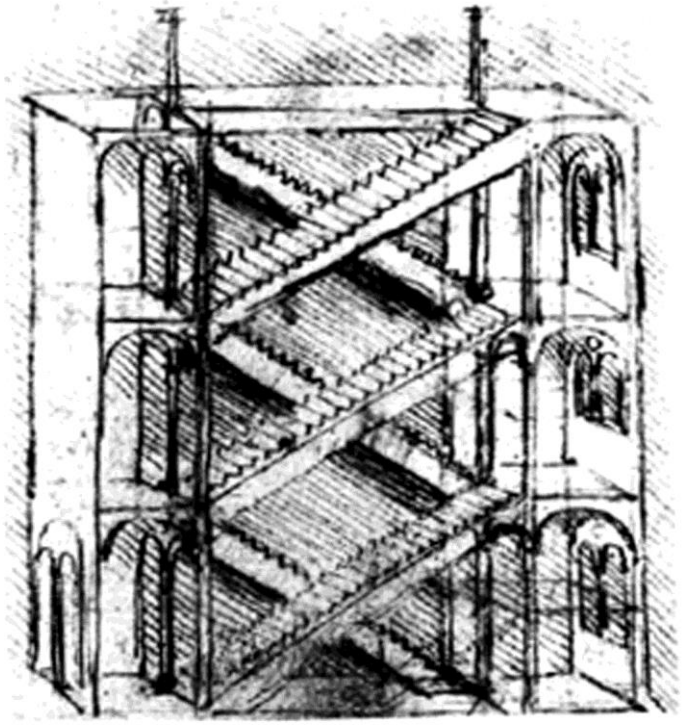

Figure 3.
Leonardo da Vinci's sketch for a double staircase *(Good 2009, p. 81)*

Helical staircases were common in the middle ages and since then many compositions have evolved such as the double helix and composite sculptural designs (Erickstad 2012). A classic example of a double spiral staircase is in the palace of Chambord de chateau, supposed to be designed or influenced by Leonardo DA Vince ideas (Tanaka 1992). This staircase enables the royal path to be separate from the rest, but at the same time with openness of the balustrades establishes the visual connections (Alan & Blanc 2001; eds Campbell & Tutton 2014). The grace of helical theme can be further understood in two examples. First, the famous exit ramp of the Vatican museum in Italy, designed by architect Giuseppe Momo in the 1932. In this, the diameter of the stairwell reduces as one descends, creating a dramatic effect of vertical splendor. Second the spiral gallery at the Guggenheim Museum in New York designed by Frank Lloyd Wright in 1956. The long curving ramp is perhaps the most celebrated pattern in the modern architectural history that not only emphasizes form but also the material (Alan & Blanc 2001).

Figure 4.
Exit stairs, Vatican Museum *(Alan & Blanc 2001, p. 25)*

Figure 5.
Gallery spiral, Guggenheim Museum, New York, 1956 (Frank Lloyd Wright): view downwards *(Alan & Blanc 2001, p. 25)*

Wilkinson (1975) states that monumental interior staircases find their origin from the late medieval period, during which imperial stairs were the most celebrated form. First constructed in Escorial, Spain, Imperial stair starts with one straight arm, and then after the landing, turning by 180 degrees and leading up to the upper floor with two arms to the left and right (Wilkinson 1975). This stair composition is developed upon a particular perspective view, which was a predominant quality of Renaissance (eds Campbell & Tutton 2014; Wilkinson 1975).

In understanding the different patterns of stairs, it becomes imperative to consider the term *step well*. It directly indicates the function and utility of this peculiar kind of well monument found in some parts of India. Both words of the term step and well characterize its inherent features. Juneja (2001) states that step well is the most intricate and complicated structure from design and construction point of view. It consists of three major architectural parts, namely, the vertical well, the stepped corridor leading down to the water and intermediate tower like pavilions which are open halls. All these combine to form a utilitarian and social function that not only satisfy the thirst, but also act as a place of gathering or resting, during summer seasons Juneja (2001).

The advancement in building materials is an important component in the evolution of the pattern of staircases. The arrival of wrought iron and later steel and reinforced concrete allowed design of stairs to be independent of their adjoining walls. They were used in creating more dramatic effect that exposed their inherent exquisite structural simplicities (eds Campbell & Tutton 2014). The use of concrete, steel and lately glass as staircase material has given rise to old patterns of stairs in new forms of visual delights. Alan and Blanc (2001) note that an all time example of the architecture of tread and riser for building material point of view is the design of ramps and stairs by Le Corbusier. Using these elements he transformed spaces into sculpted volumes that interpenetrated the floor spaces and became the hallmark of the Corbusian ideal (Alan & Blanc 2001).

Figure 6.
Villa Savoye, 1929-31, Architects: Le Corbusier and Pierre Jeaneret. Stair and ramp *(Alan & Blanc 2001, p. 57)*

Aspects of Comfort and Safety

Designing for vertical movement of people in and around buildings requires extreme attention to anthropometrics (Allen 2005). Walking on flat ground is easier than accessing a staircase. Climbing stairs means moving the body against gravity, that requires high energy and descending stairs means balancing the body weight and controlling the forward movement (Berger, Theuring & Adolph 2007). The drawbacks of the staircase are that they are not universally accessible and become fatigued after negotiating few steps (Allen 2005). A fall on a stairs is a potential risk that is inherent of any staircase. Stair climbing is always problematic for the elderly because of their weakening strength and stability (Berger, Theuring & Adolph 2007).

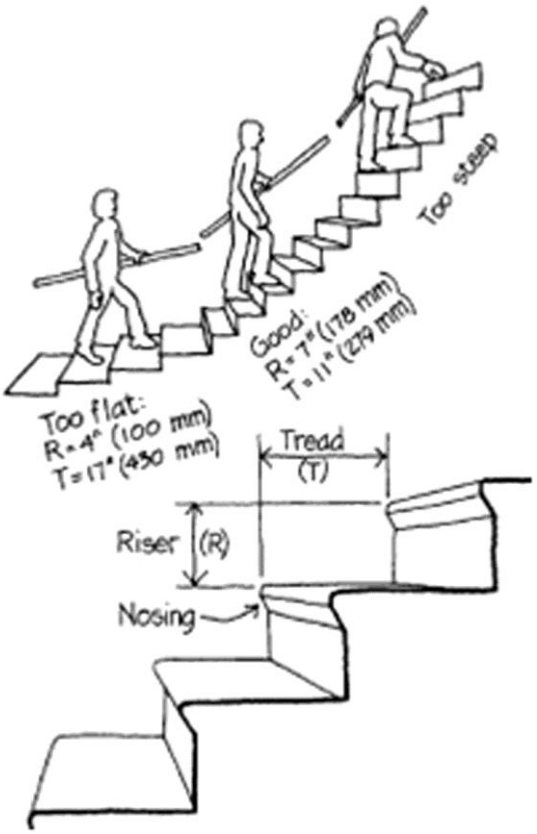

Figure 7.
Three types of tread and riser proportions *(Allen 2005, p. 165)*

Comfort and Safety are the two critical considerations in a staircase design. The question of safety deals with minimizing the chance of falling and when the fall happens, minimizing the seriousness of the injury. Campbell and Tutton (eds 2014) observed that the descent of stairs is associated with more falls than the ascent. They state that the appropriate measurements of the stair have been the concern of architectural theorists since Vitruvius of Rome to the Renaissance theorists like Leon Battista, Alberti and Andrea Palladio. According to them, the earliest recommendations for tread and riser proportions are from Vitruvius. He suggests that stairs should follow the proportions of Pythagoras triangle, with three being the riser, four the tread and a pitch of 37 degrees. Further, in 1698, the first mathematical relationship between the riser and tread is found in Blondel (2R + G = 0.6 m), followed by Violet Le Duc's pitch of 22 degrees in 1840 and the Newlands equation of R x G = 1.67 m in 1865. In 2000 as per BS 5395, 2R + G should be in the range of 0.55m to 0.7m (eds Campbell & Tutton 2014, pp. 254-255]. The rule of thumb in today's architectural practice is riser plus tread should be equal to 0.63m. Even this present practical rule of thumb only guarantees a certain average physical comfort (Pallasmaa 2000).

Stairs have the potential to be as deadly as their use (eds Campbell & Tutton 2014). Templar states that 'a lack of a system of design principles has obliged designers to make assumptions or to guess at what constitutes a stair that is safe, comfortable, and convenient' (Erickstad 2012, p. 55). The number of risers in

a flight plays an important role in the safety and comfort of using the stairs. According to Allen (2005) flights less than three risers often escape the notice and can lead to a fall, whereas flights more than 16 or 18 risers cause fatigue. Long flights are needed to be broken with periodic *landings* whose minimum dimensions should be equal to the width of the stair (Allen 2005). The need for landing has been considered since the Renaissance. Alberti mentions, having an unbroken flight of more than seven or nine steps requires landing, which acts as a place to check or contain the fall. Even Palladio considered this aspect as a crucial element in staircase design (eds Campbell & Tutton 2014).

According to Scott (2005) staircase is the most serious accident prone area that individuals encounter in the building environment. He states that the highest chance of a fall occurring on the stairs is during the swing phase and weak slip resistance of the tread has the maximum potential to cause tripping (Scott 2005). Templar (cited in eds Campbell & Tutton 2014) study found that a majority of accidents happen on top three steps or bottom three steps. He states that 'There is no direct correlation between the number of steps and occurrence of accidents' and that the design of the staircase, distractions and the poor maintenance of the steps are the major causes of stair falls (cited in eds Campbell & Tutton 2014, p. 250).

Jackson and Cohen 'concluded from an in-depth analysis of 40 stairway accidents that the greatest problem with accident stairways was not individual (user) or external variables, but dimensional inconsistency inherent in some stairways' (cited in Scott 2005, p. 11). The vulnerability of falling and the effort of using stairs must be minimized by the comfortable accommodation of bodily movement (Allen 2005). Handrails and guardrails must be designed and positioned in such a form and location that they should be easily grasped in an event of potential fall. The issues regarding the tread and riser relationship, handrails, lighting, slip resistance, irregularity of design, and user behavior, such as running and carrying items are crucial factors in designing a safe and comfortable staircase.

ANALOGY OF ASCENT AND DESCENT

Understanding the metaphoric meaning of a stair is as important as analyzing its practical function and evolution. Pallasmaa (2000) emphasizes that throughout the timeline of architectural history, stairs has represented various social and spiritual ideas like power, prestige, abode of gods and way to higher planes of consciousness. He states that climbing steps symbolizes a conventional longing of the human psyche to reach the higher spheres of universe (Pallasmaa 2000). It is interesting to note that the majority of the temples of ancient civilizations is often terraced in the form of steps, but at a gigantic scale. According to Bollas (2000) some anthropologists believe that ziggurats were created as memory of mountains which were left behind by the Sumerians, who migrated from a more

mountainous region or perhaps they created them as an expression of devotion that resembles the might of nature (Bollas 2000).

Symbolic connotations associated with stairs are represented in, ancient Egyptian and Mexican pyramids, Greek temples, Biblical depictions, Buddhist shrines, Renaissance palaces, and many other belief systems and cultures. The creation of an elevated structure indicates the social or spiritual status. This principle is still applied in geographical positioning the buildings and structures of importance. It is the architecture of a staircase that is pivotal in creating an influence and impact on people and the society at large. The Greek's experience of architecture is believed to have primarily influenced their philosophical thought. Their analogy with a building paved way for the idea of knowledge and the structural properties of their language (Onians 1992). Miles (1999) observes that, during the Roman Empire, especially in the temples of Syria, Lebanon, and the east side of the Jordan River, stairs for ritual ceremonies were a prevalent architectural feature. In the Mediterranean world the sacred buildings exemplified the experience of ascent as a symbol of achieving proximity to the divine (Miles 1999).

According to Onians (1992) the political career during Roman time, was regularly thought in terms of the ascent of a staircase of honors. He states that the Romans developed the linguistic expressions such as Podium, the tribunal and rostrum which reflected the social authority and hierarchy, whereas the word podium, which is Greek in origin, does not in that language carry any allusion of associated status. In Greece, statues often stood either singly on a simple slab at ground level or collectively on a larger base; Romans raised statues on individual pedestals whose relative height indicated the importance of the person commemorated (Onians 1992).

Heaven and Hell are considered as one of the strongest connotations of the staircase throughout history (Erickstad 2012). Rising stairs end in Heaven, whereas descending stairs eventually lead down to the underworld is a popular notion among different belief systems (Pallasmaa 2000). Irrespective of any faith, spaces of worship are constructed in higher elevations symbolizing the way to heaven by climbing steps. Alan and Blanc (2001) describe a differing connotation with steps that lead into sunken chambers or that disappears under water. They state that the psychology of descent below ground water is diametrically opposite to the optimism in climbing. The cistern temples in India are among the significant examples where the descent indicates the ceremonial cleansing at the lowest level (Alan & Blanc 2001). Slessor explains that the steps on the banks of the Ganges River in India represent Hindu rituals of life and death (Erickstad 2012). The theme of descent and purification is an analogy to express the descent required for penance that eventually leads to ascending the higher levels of consciousness.

Figure 8.
Water steps and tank, Temple at Chidambaram, India (courtesy of Timothy Blanc) *(Alan & Blanc 2001, p. 71)*

The steps are very common as a symbol in iconography. The Dictionary of Symbols by Biedermann states that 'steps and stairways represent the ascent to a higher plane' (cited in Erickstad 2012, p. 19). From the inner life point of view, accession to a higher level indicates the 'upward impulse' that is not relative to any actual ascent (Cirlot 1971, p. 20). Mircea Eliade states that 'ascensions of all kinds, such as climbing mountains or stairs or soaring upwards through the air, always signify that the human condition is being transcended and that higher cosmic levels are being attained' (cited in Cirlot 1971, p. 20). Usually stairs represent the essential ideas such as ascension, gradation, and communication between different vertical levels. The actual number of steps involved carries a prominent symbolic significance (Cirlot 1971). In medieval churches, three steps leading to the altar symbolize faith, love, and hope (Erickstad 2012). According to Humphrey and Vitebsky (2003) Baroque architects of the 18th Century built 'sacred stairways' so that the approach to a church was itself instilled with spiritual reverence. They further state that the best known analogy of steps in a church is the Rome's church of Santa Trinita approached through three flights and three landings representing the trinity (Humphrey & Vitebsky 2003). The famous eighteen steps of the Sabarimala temple in India is also an example of the metaphysical significance associated with the

number of stairs. In Freemasonry, the degrees of initiation are represented through the steps.

Three steps correspond to moderation, justice, and benevolence. Seven steps represent the seven liberal arts of the medieval world, the seven ages of man, and the seven cardinal virtues, believed to lead to self-knowledge, mastery and improvement (Pallasmaa 2000, pp. 10-11).

Onians (1992) suggests that architectural metaphors are present very much in the day to day communications. He states that they uniquely satisfy humans mentally because they recall the way architecture satisfies physically. Stairs carry more associated symbolic undertones due to the fact that they are indirectly used in representing many developmental stages. One such example is the symbolic connotation associated with a regularly used term 'wage scales' that is derived from Latin *scala*, meaning ladder or stair (Onians 1992, p. 206). According to Sigmund Freud 'the regular rhythm of stairs also addresses our dream imagery through its essence as a sexual metaphor' and the image of stairs in a dream symbolized repressed sexual desires (Pallasmaa 2000, p. 10). Carl Jung, the founder of analytical psychology observes that,

The depiction of steps and ladders in dream symbolism portrays the process of psychic transformation with up and down movements. Our psychic prehistory is in truth the spirit of gravity, which needs steps and ladders because, unlike the disembodied airy intellect, it cannot fly at will (Erickstad 2012, p. 65).

The French philosopher Gaston Bachelard states that, 'the stair mediates between the different metaphysical realms of the house of our dreams' (Pallasmaa 2000, p. 9). He further theorizes

'the psychology of the house in terms of verticality and the dialects of up and down. This is explained by the descriptions of the Attic and Cellar as inhabiting areas of the mind, both accessed by staircases…We move down to the basement and ascend to the attic, creating references to our real and imaginary lives' (Erickstad 2012, p. 72).

Another important arena that holds the analogy of stairs is movies. Staircases are used to depict many themes in cinema. It is the general observation that climbing stairs implies withdrawal into privacy and descending signifies entry into the social sphere. They are used frequently in movies not only as a motif, but also as a crucial feature that renders the particular genre. The staircase is probably one of the unique architectural elements that not only connect levels, but also relate to the different physical, social and metaphysical expressions.

SIGNIFICANCE OF STAIRS IN THE PRESENT TIMES

Even in this era of digitalization and skyscrapers, the relevance of stairs has not diminished, but getting enhanced. The shift in the attention of staircase from a grand central element to the cornered and subdued element as an emergency escape is again reinventing itself as the agent of physical well being. This is because of the rising sedentary life styles which is one of the outcomes of technological advancements. Since most of the people tend to spend the majority of their day in buildings and its immediate surroundings, the connection between physical activity and building elements becomes very obvious. In this regard, there can be no denial that the physical environment plays an important role in affecting the health of an individual. Zimring et al. (2005) states physical environmental factors in four different scales, starting from urban design, site selection and design, building design, and building element design. They emphasize that the design strategies at the building level, such as motivational point of decision prompts, aesthetically pleasing staircases, and accessible physical activity facilities are assuming a new level of significance from the design perspective (Zimring et al. 2005).

Considering the relation between physical activities and building elements, it is obvious that stairs have the real potential to influence an individual's fitness and health issues. These are part of almost every building and their usage is only a matter of choice and fitness. According to Zimring et al. (2005) there are two kinds of classifications of understanding the physical activity, Instrumental and Hybrid. A building in which there is no option of mechanical means of vertical transport, leads directly to the instrumental physical activity. Whereas an individual makes a choice of taking the stairs, for any number of reasons, then a stair climbing is neither instrumental nor purely recreational, but a hybrid of the two. They state that even a modest increase in the use of stairs can have positive health effects (Zimring et al. 2005). In this regard,

'The Harvard Alumni Health study of 11,000 men found that those who climbed at least 20 floors per week had a 20% lower risk of stroke. It has been suggested that two minutes of additional stair climbing per day would result in weight reduction of 1.2 pounds per year, more than eliminating the one pound per year average weight gain by U.S. adults' (cited in Zimring et al. 2005, p. 190).

According to Nicoll and Zimring (2009) there are two types of design strategies for promoting stair usage. Pull strategies that combine education, activity programs, and environmental interventions that make staircase use both appealing and habitual in existing buildings. Push strategies that are designed to obligate behavioral changes toward physical activity (Nicoll & Zimring 2009). The environmental push strategies require a fundamental change in the design of building typologies. Based on this approach, staircases are to be designed not only for

vertical means of conveyance, but also as an encouragement for healthy life style.

It is not unusual to notice that a staircase is also used as an art installation, sculpture and as a landmark. Erickstad (2012) states that significance of stairs in art and photography seems to arise from the aspiration of transcendence to different planes of movement. An artist who utilized extensively the actual function and the inherent symbolic connotation of stairs in expressing multidimensional thinking patterns is M C Escher. He created an endless maze of different planes through his labyrinthine composition of stairs. Many of his drawings featured the illusion of never ending staircases and elevated the symbolic significance of stairs to a whole new level (Erickstad 2012). According to Alan and Blanc (2001) one of the noteworthy usages of stairs as art installations was by Louise Bourgeois. His exhibition of three sculptures at the New Tate Museum in 2000 received extraordinary attention and praise, in which staircase spirals around the central columns (Alan & Blanc 2001). The infinite staircase by artist Olafur Eliasson in the front of the KPMG accounting firm, Munich, Germany is one of the most intriguing form of interactive staircase installation. Ghose (2011) explains the presentation of Vivekananda speech by Jitish Kallat on the risers of the Grand Staircase of Art Institute's historic Michigan Avenue building. Illuminated by 68, 700 light emitting diodes in five colors, the speech starts at the beginning of the risers, progresses upwards and equally distributes among the three dispersing flights. A visitor experiences the visual and linguistic form of the entire speech irrespective of the flight chosen (Ghose 2011). This in stallation is of particular relevance because it integrates the practical, symbolic and spiritual connotations of steps and speech.

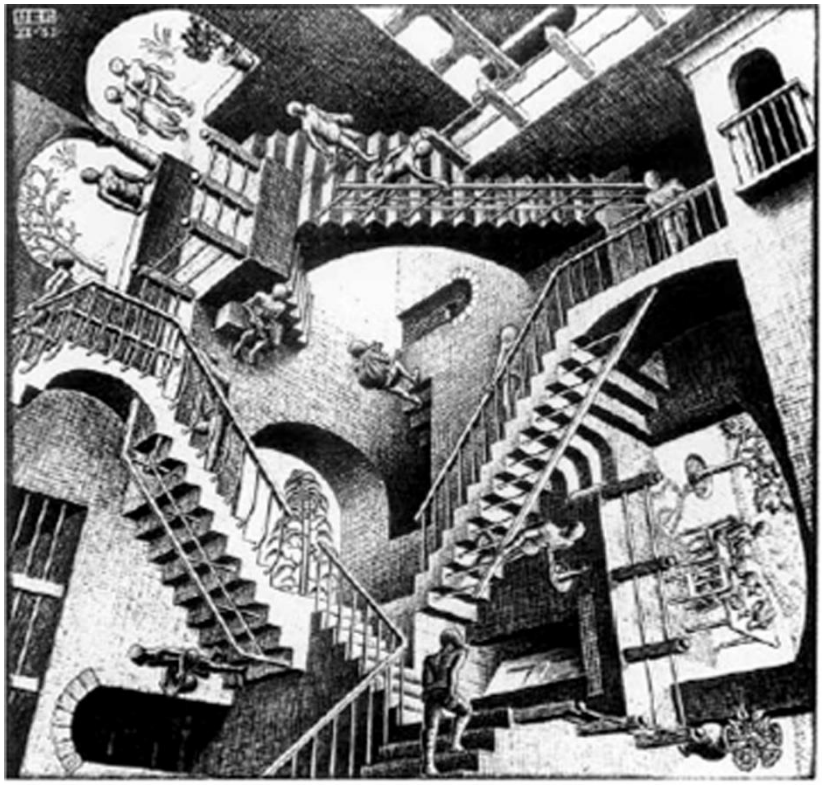

Figure 9.
An endless stair of vertigo. M. C. Escher, *Relativity,* lithograph, 1953. (Ernst, Bruno, *The Magic Mirror of M. C. Escher.* New York: Ballantine Books, 1976) *(Pallasmaa 2000, p. 13)*

Figure 10.
Sculpture by Louise Bourgeois for Tate Modern opening 2000 *(Alan & Blanc 2001, p. 200)*

Figure 11.
Jitish Kallat, preliminary design of Public Notice 3, May 2009, showing the sequencing of the text of Swami Vivekananda's speech up the flights of the Grand Staircase of the Art Institute of Chicago. *(Ghose 2011, p. 23)*

Advancement in technology coupled with the present style of architecture has redefined expressions of the staircase as light, floating, transparent and minimal. Even now significant civic architecture has steps as an iconic device. With the invention and innovation of new building materials staircases have become aspects of identity and structures of prominence. For example, the glass stairs with exposed structural elements in the Apple store have become the visual ambassadors of that brand across the globe (Erickstad 2012). Staircases are probably one of the few building elements that have the potential of maximizing the idea of display and identity. This is evident from the fact that the staircases are the fulcrum of interiors in many multi storied commercial centers. There is no exaggeration in assuming the role of stairs as perpetual, but their significance appears in new forms subjected to the changing dynamics of technology and perception.

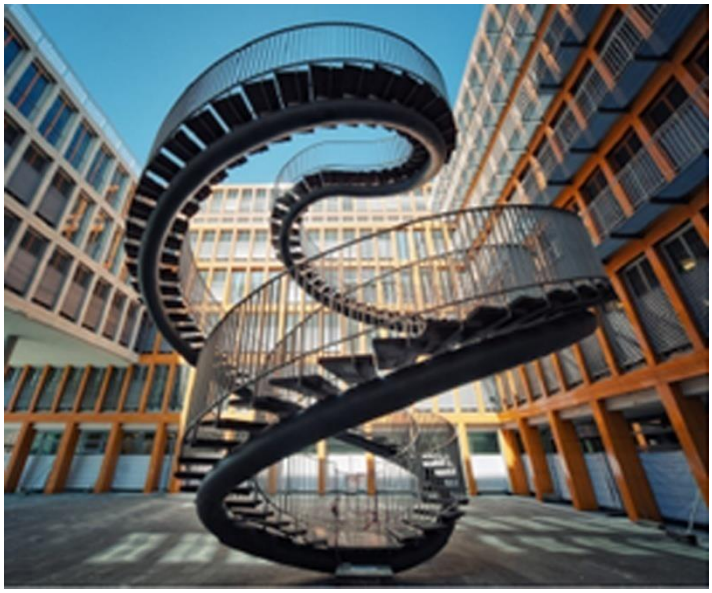

Figure 12.
Olafur Eliasson – Rewriting, Munich, Germany *(Erickstad 2012, p. 67)*

Figure 13.
Apple Store – Fifth Avenue, New York (2006) *(Erickstad 2012, p. 77)*

DISCUSSION

Built forms relate people and the world in many different ways. They redefine the being both in terms of space and time (Pallasmaa 2000). The stepped arrangement or the stepped pattern is the only way to watch an event by a multitude of people at the same time. Even though the satellites can transmit live events across the globe with minor time differences, it is the stepped pattern that makes people to experience an event in real time and space. The stepped platforms allow performers to be seen, as well as creating tiered seating for spectators. It is the reason till date the auditoriums or stadiums or open air theatres are functioning and many new ones are being built. Surprisingly, even the present forms of the stadia and auditoriums are influenced by ancient Roman amphitheatres, because they exemplifying the basic design principles for maximum seating and maximum visibility (Erickstad 2012).

Steps are a universal symbol with multiple interpretations. They are the most generally used similes in art, philosophy and psychology. The mental significance and symbolic connotations of steps are deeply rooted. The feeling of safety in a stepped street is based on the subconscious fact that they are only for pedestrians (Pallasmaa 2000). Stairs convey a subtle feeling that they are not only for the physical connections but they also serve in elevating the human spirit. Templer (cited in Erickstad 2012) states that, staircases evoke a sequential experience by their very nature and each of its elements contribute in shaping the experience. For example, the size of the step controls user pace and behavior and landings create chances for interaction, contemplation, or an opportunity to observe (Erickstad 2012). Even though the stars are simple in their principle, they continue to occupy the imagination of architects, precisely because they should not only enhance the space, but also satisfy the intricate necessities of safety and comfort (eds Campbell & Tutton 2014). According to Scott (2005) the growing physical size of the younger population should be considered in deciding the

minimum tread and riser dimensions. He states that, even with the number of detailed studies on stairway accidents, there is a dearth of credible information regarding the use of stairways by different age groups (Scott 2005). The issues involved with age based capabilities demand a certain design approach that satisfies the sensitive relation between built environments and building elements.

The mono functional approach to staircases in high-rise buildings, especially as the means of escape in emergency situations, indicates that the design of staircases as multi functional element is still under the confines of design explorations. Instead of proscribing the fixed usability, elements of architecture should cater to the needs of multiple functions and changing lifestyles (Sharr 2007). The advancement in technology has displaced the role of stairs into an inconsequential means of emergency escape. But the importance of physical activity in the rising sedentary lifestyle has revitalized the concept of stairs as an active building component. This has not only revived the waning value of stairs, but also enhanced its symbolic significance as an inspiration for physical well being.

CONCLUSION

The concept of vertical accessibility in the form of tread and riser arrangement makes stairs functionally a timeless phenomenon. The pattern of stairs is dependent on the type of materials and other related design considerations. Stairs occupy a unique status in the built environment because they not only convey people, but also symbolizes the psychological, spiritual and artistic aspects of human nature. The approach to multi utility architectural elements stretches beyond physical functions and should integrate the various dimensions of space making and society. In this regard stairs are a pioneering entity that has a potential to relate to many spheres of human thinking. It is clearly evident that stairs are not bound within the confines of architecture. Their origin, utility and design have far more influential qualities that travel beyond the realms of function and symbolism.

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