EMINENCE OF MATERIAL UNDERSTANDING IN DESIGN

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ABSTRACT

The world is alarmed with climate change emergency and its consequences on the quality of life. The concern of its effect, on the coming generations are also rising. The external change is attributed to the environmental imbalance, while the internal environment has other parameters with equal concerns for a healthy environment within the closed walls. Internal environment can be described as an enclosure of a building that captures its volume. Interior is related to psychologically being in that space. In addition to the spatial design of the space, supportive tangible elements as color, texture, material play their respective roles in giving an experiential feeling.

The article tries to take a focused look into the use of material in interior space. In, influential context of the quote— ‘role of material palette is to execute safe, healthy, productive and enjoyable environments’ stated by NCIDQ. (National Council for Interior Design Qualification). The study supports physical incidences, where the use of material may have been a concern, for a larger gamut of disaster.

The paper tries to understand material as a culture, identity and not merely a denotation of technological context only. Vernacular designs are tailored by local material, which is geologically available. The materials can be put as resources to get new material. But, in the process, there are chemicals used to transform into making it ‘new’ material.

These might be one of the reasons for ‘Sick Building Syndrome’ (SBS), a medical condition where people in a building suffer from symptoms of illness or feel unwell for no apparent reason—this is defined by WHO. (world health organization)[Sick building syndrome [Journal] / auth. Europe World Health Organization Regional Office for // Textos Competos]

The conclusion, make ‘material thinking’ an essential part of design after extruding its physical and chemical properties, before its application, as it affects human being in the place.
1. INTRODUCTION

Material application in interior has become a “one-size-fits-all” attitude. The emerging practice evolving a myth of fascination by designers (professionals) and clients (end users), can be said as a classic shift in material relevance. Materials are synthesized by reactions and change in its chemical properties which formulates the making of a new material. This we term as paints, wall coverings, carpets, composite flooring, countertops, etc. Products as furniture, light element and many more are also manufactured. New material has been constantly shaping our environment and interior spaces for centuries. The modern interior is trying to expresses a new technical and cultural atmosphere, with which the transformation of matter is taking place[1]

Material technology is an important strategy in the search for new materials as it offers market differentiation that would lead to potential financial revenue in sales. Novelty, innovation and progress have all been factors in relentless shifts in technology, and each has had a sociological impact and affected our logic of place. As stated by George Basalla-novelty is to be found wherever there are human beings. If this were not the case, strict imitation would be the rule, and that every newly made thing would be an exact replica of something existing artifact. In such a world technology would not evolve[2]

Here, a glimpse has been taken into disasters, which reasons to its use or application of the material in the space, not in any context of aesthetics but merely from safety point. Death distress is the last, one can here of… and somewhere if interior space and material application adds to the perilous out-put, then we really need to question the materiality of space.

Two case-studies, where causalities happening due to material applications, are put-down.

**Case-1:** On 24th May 2019, in a commercial complex in Surat, Gujarat, major outbreak of fire occurred where, 22 students died and others were injured in an academic coaching centre located on the building’s terrace.[3] The fire was started by a short circuit on the ground floor; the students in the coaching centre were trapped, as the vertical mode of transportation was a Wooden Staircase, which caught fire and students were in no position to run down, but, were merely trapped in fire. ([https://rlshumancare.com/surat-fire-incident-case-study/](https://rlshumancare.com/surat-fire-incident-case-study/))

**Case-2:** On 26th July 2019, on 5th floor of residential apartment in Gota, Ahmedabad, Gujarat, which again due to short circuit in AC, caught fire. According to the primary investigation by AFES(Ahmedabad Fire Emergency Services) the apartment had heavy furnishings with plywood, on ceiling, floors, and walls. This is one of the reasons that fire started spreading faster towards the next 6th floor. This gain gave clear access to catch fire faster. ([https://www.dnaindia.com/ahmedabad/report-ahmedabad-fire-in-gota-building-kills-one-injures-eight-2776194](https://www.dnaindia.com/ahmedabad/report-ahmedabad-fire-in-gota-building-kills-one-injures-eight-2776194))

Inferring, the importance of material which often is taken as an aesthetic approach, has been questioned here. The cases of fire are mere reflection to support that materials do play a role in a safe environment. Novelty and change by the huge commercial pressures is driving a rush to modernization. This commercial approach is giving a shift in market strategy. The polarity of approach to material use, often is focused only on clauses as cost, long-lasting, rapid application, earlier completion of project etc. In this whole approach, a miss-out clause
as ‘scientific transformation’ of the new applied material is to be cross checked. This is in concern with safety and health for end-users of the spaces.

2. INDIGENOUS FORM TO NATURAL MATERIAL

Going back to the roots, trying to understand the material used in vernacular designs, will help to clarify the use of the same and its context. The Indigenous forms do not exist in inanity—they are built as part of people’s lives and culture. Illustrating a few examples of Vernacular Design were made because of the local resources available by geographic location. Translations of these materials with understanding of the structural strength created few of the illustrated forms, breaking the boundary of external or internal material, making it a homogenous mass. Vernacular designs responses ‘for the purpose’. The interiors are arranged in a similar manner, for the utilitarian needs of the dwellers. The manner in which similar basic materials such as - mud, stone, timber, bamboo, palm and reed can be employed for different purposes. Forms are expressed in whatever materials are close to hand. Therefore, parts of a house may be made out of almost anything: grass, thatch clay tiles, wooden shingles or corrugated iron. A glimpse into the four different geographic locations of India are studied. Each examples has different material locally available and is unique in its own language

2.1. Bhunga, Kachchh, Gujarat- Mud, Rammed Earth

The indigenous material used vastly in Katchchh, is a reflection of mud as a material for both inside and outside of a house. A homogenous form is evolved popularly and traditionally known as Bhunga, constructed on a mud plinth. It is hand-made, with all the basic necessities, without any fantasy of space making. It beautifully and efficiently manages to encompass all the utility needs. The cylindrical form is plastered in mud with and has niches carved out in interior which takes care of all the storage and embellishments. Mirror work is the only aesthetical persona

![Figure 1](https://www.priyashah.com/mig/manav7.jpg)

2.2. Garo House, Meghalaya, Assam

**Bamboo, Rammed earth** The plinth is generally on a raised platform, which are made of bamboo as the region is prone to floods. The play of material is explored where, walls are weaved by diagonal bracing for stability, the roof is made with bamboo loft for safe storage. Likewise, Bamboo, with its thermal properties, keeps the interiors cool with permeable floor. A translation of interior environment concern is justified within the limit of the material(bamboo) itself.

![Figure 2](https://researchgate.net)
2.3. Kath-Khuni House, Uttarakhand, Himachal Pradesh

Slate, wood, mud These vernacular house are two storey where, the lower level is for cattle and upper level for utilitarian functions. With slate as roof material, this helps to resist the Leeward winds which blow heavily. While mud flooring at lower-level is easy to refurnish in wear and tear. Wooden logs with intermediated and interlocking joinery become flooring at first level. A native material as wood and stone, alternatively stacked makes the basic wall frame structure.

2.4. Toda Huts, Southern India

Bamboo, Thatch. The curved roof of the beautiful half-barrel-shaped huts consisted of bundles of thin bamboo bent over bamboo poles. It is overlain by dense covering of thin bamboo canes running horizontally and topped by a thick thatch of swamp grass. There is a symbiotic relationship between the material and culture.

These materials as Mud, Wood, Stone, and Bamboo which are directly extruded from Nature are defined as Basic Material or Natural Material. These techniques, material and form
are somewhere less detrimental to the environment. These handmade homes offers answers that incite a profound link between the habitant, their environment, materials used and the wider community, as cities at large.

3. MAN - MADE MATERIAL

We in 21st century, are living in a world that has transformed dramatically with Political, Social, and Economical concerns. The speedy growth has somehow reflected on energy utilization with population growth as one of the factor, increasing pressure on natural resources and various environmental impacts. And these all have resulted in development of designs trying to satisfy the needs of the large. As said by author, activist, academician, researcher Yatin Pandya “...symbiosis of the natural and the manmade, and designer as the doctor of vital forces - bears the responsibility to maintain the equilibrium between the built and the natural environment. Firstly, every building implies an alteration to natural landscape...Every wooden log means a forest denuded, every stone boulder means a hill grounded and every brick block means top soil lost. In doing so, further, if we see the process or energy consumed in production, transportation, etc to make a new material, this process is called as “Embodied Energy”. This is the new added factor that comes when new material has to be described. The polarity of approaches for application of material from historical context to the transition of innovation of material has created a wide gap. Chemical ingredients are the backbone of a host of innovative products and materials used in interior design. But some designers may have concerns about the possible health effects of some chemical ingredients used in everyday products.
3.1. Health Concern

Health and Safety as an alarm is associated within the buildings, which is classified as: Sick Building Syndrome[6]

This terminology by World Health Organization(WHO), defines it as-’ a collection of nonspecific symptoms including eye, nose and throat irritation, manta fatigue, headaches, nausea, dizziness and skin irritations, which seem to be linked with occupancy of certain work places’(WHO 1983). As per an article in Architectural Science Review ISSN: 0003-8628, the study of SBS as a crucial role for healthy building has been reviewed. Building for health and well-being is the target focused. The study has been identified with set parameters in Table-1

Here, taking SBS as datum an understanding or a question has been provoked, for material use-may it be prime form of design, or as surface treatment for aesthetics have its defined characteristics. This has been illustrated as Table-2 with respect to only few materials commonly used in interiors.

In accordance to the Architectural Science Review,2018 vo.61,No.3,99-121 on topic of Sick Building syndrome: are we doing enough? A theoretical understanding has been structured in a matrix outline.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Matrix for Sick Building Syndromes</th>
</tr>
</thead>
</table>

**Sick building syndromes**

**Physical contributors**
- Temperature
- Humidity
- Ventilation
- Illuminance level
- Noise
- Air quality
- Electromagnetic radiation(ER)

**Biological contributors**
- Moulds
- Fungi
- Mites

**Chemical**
- Volatile organic compounds (VOC)
- Indoor painting
- Fine dust
- Organic solvents
- Formaldehyde in atmosphere

**Psychosocial**
- Anxiety
- Depression
- Environmental discomfort
- Job strain
- Reducing occupant's performance

**Individual**
- Humidity
- Crowdedness
- Temperature
- Relative & Absolute humidity

**Materials applications**
Limiting the study with materials, a reason to review the impacts of a healthy design approach is analyzed for any inconsistency from flora and fauna.

With all the clause the understanding for a derivative format is conceptualized in a tabular form which have following flow of study process described. making process for material’s fundamental transformation as ‘characteristics’

\[
\text{Risk Concern For Safe And Health Concern,} \\
\text{In Reflection Of Sick Building Syndromes} \\
\text{its ‘Applications’}
\]

### Table 2 A broad over look into its chemical amalgamation is checked out in the table below:

<table>
<thead>
<tr>
<th>Basic Material</th>
<th>Chemical</th>
<th>Material characteristics</th>
<th>Application</th>
<th>Risk Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>wood</td>
<td>Nil (natural material)</td>
<td>Natural and beautiful</td>
<td>All spaces, product, accessories, etc</td>
<td>Major environmental concern</td>
</tr>
<tr>
<td>Mud</td>
<td>Nil (natural material)</td>
<td>Gives a homogenous look cools down temperature</td>
<td>Modified version of mud as clay can be transformed to a variety of products and accessories</td>
<td>Lost in top soil</td>
</tr>
<tr>
<td>Stone</td>
<td>Nil (natural material)</td>
<td>hard, durable aesthetical appeal</td>
<td>Interior spaces &amp; Furniture</td>
<td>Grounding of surface, inviting natural calamities</td>
</tr>
<tr>
<td>Basic Material Man-made</td>
<td>Chemical</td>
<td>Material characteristics</td>
<td>Application</td>
<td>Risk Factor</td>
</tr>
<tr>
<td>Glass</td>
<td>Acid + Sand(Silicon dioxide), soda ash + limestone</td>
<td>Fragile as its aesthetic characteristic Recyclable Good insulator for electricity</td>
<td>Interior spaces &amp; Furniture</td>
<td>has the tendency of Heat Absorbent Generating more heat in hot and dry climate as in India, thus energy consumption is high Physical Contributor of SBS factor</td>
</tr>
<tr>
<td>Plywood</td>
<td>Urea formaldehyde (UF) used + resins</td>
<td>Gives a uniform structure Material loss is less as compared to wood Fast installation Easy to work</td>
<td>Interior spaces &amp; Furniture</td>
<td>Chemicals used are not considered very safe for use, and can also pollute the interior environment Physical and Chemical contributor of SBS</td>
</tr>
<tr>
<td>MDF (medium dentistry fiber)</td>
<td>wood fiber + urea formaldehyde + resin</td>
<td>Less expansion contraction Gives smooth finish Fast on-site working</td>
<td></td>
<td>release formaldehyde, which forms cancer cells Physical and Chemical contributor of SBS</td>
</tr>
<tr>
<td>Metal</td>
<td>Carbon emission during production</td>
<td>High strength &amp; flexibility Good conductor Good life span Recyclable</td>
<td>In its many variation as aluminum, steel, wrought iron, etc, is used in partitions, fenestrations, furniture product, etc.</td>
<td>If exposed to fire for a long period, it can be weakened by sustained high temperatures. Physical contributor To SBS</td>
</tr>
<tr>
<td>Basic Material Man-made</td>
<td>Chemical</td>
<td>Material characteristics</td>
<td>Application</td>
<td>Risk Factor</td>
</tr>
<tr>
<td>Plastic</td>
<td>composed of various elements such as carbon, hydrogen, oxygen, nitrogen, chlorine, and sulfur</td>
<td>Low cost Ease of manufacturing Versatility Immunity to water</td>
<td>Multitude of products</td>
<td>Major global warming Physical contributor To SBS</td>
</tr>
</tbody>
</table>
Eminence of Material Understanding in Design

<table>
<thead>
<tr>
<th>Material</th>
<th>Description</th>
<th>Properties</th>
<th>Recommended Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid Surface</td>
<td>Bauxite = acrylic polymer + alumina tri hydrate, Non-porous, Stain resistant.</td>
<td>Can be molded out on any base surface to get desired shape.</td>
<td>Recommended for Restaurants, Hospitals. It gives an edgeless surface helping to prevent bacterial formation, etc.</td>
</tr>
<tr>
<td>Carpets</td>
<td>Polymer based material during production, Helps in sound absorptions</td>
<td>Defines as an iconic element.</td>
<td>Can create biological SBS factors.</td>
</tr>
<tr>
<td>Paints</td>
<td>Resin - a polymer, volatile organic compounds (VOCs)</td>
<td>Surface elements</td>
<td>Can create chemical SBS factors.</td>
</tr>
</tbody>
</table>

4. CONCLUSION

Material education transpires within space and is stated as a part of technological understanding, where information about basic material properties and conventional approaches are stated. Material technology is an important strategy in the search for new materials as it offers market differentiation that would lead to potential financial inflow through sales, or distinctiveness in design aesthetics. Novelty, innovation and progress have all been factors in relentless shifts in technology, and each has had a sociological impact and affected our sense of place.

A logical application of these materials to synthesize space plays a major role. Concluding the system of design material it will be an important clause to think for the next generation. This can be initiated by making the application format of material use as- “Interior Rating System”.

Surface treatment on four basic surfaces of spaces as - wall, floor, ceiling, fenestrations, and its sub elements of the spaces as stairs, can follow a set code which can be graded with as

- Local or Geographical Material- this will reduce the transportation cost - thus saving on natural resources
- Low Emitting Material – Less gaseous material with minimal/no use of harmful chemical making the interior environment safe to be in for longer time
- Low Maintenance Cost- Easy maintains will keep it clean and hygiene
- Durable – Giving it a life cycle

Specific building projects should not only consider cost, aesthetics or performance, but also should look into environmental, health and safety information about a product and its ingredients, how the product is used in a specific application, its exposure and risk profile during use and its end-of-life characteristics.

It is the application of materials within a context that issues forth a new era in design. This new era must coincide with the implantations of new material for design and not solely as an aspect of fascinating outcomes.

KEYNOTES
1. (Manzini, 1989)
2. (Basallla, 1999)
3. (Zee news, 2019)
4. (Pandya, 2019)
REFERENCES


[16] https://en.wikipedia.org/wiki/Medium-density_fibreboard

[17] Figure-1: bhuga https://www.priyashah.com/mig/ludiya.htm


[19] Figure-3: kath khuni https://www.semanticscholar.org/paper/Assessment-of-the-seismic-performance-and-of-the-in-Zanden/999f7888c12adcd2ed02ded0c3b1254869b8b7d6

[20] Figure-4: south india https://www.worldhistory.biz/prehistory/90312-the-toda-india.html

[21] Figure-5: Self