Design of a Materials Museum

Diploma Project

Submitted in partial fulfilment of the requirements
for the post graduate diploma in Industrial Design

by

Vinod Gupta

Industrial Design Centre
Indian Institute of Technology
Bombay

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Guide

Kirti Trivedi

Co-guide

U. A. Athavankar

APPROVAL SHEET

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Shri Kirti Trivedi
Shri Athavankar
Shri Rajan and his workshop staff
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Introduction

INTRODUCTION

Selection of a material for a specific application is almost always a thorough, lengthy and expensive investigation. Almost always more than one material is a possible candidate, and the final selection is a compromise that weighs the relative advantages and disadvantages of all candidates. Service requirements such as toughness, adquate strength, dimensional stability, scratch resistance, heat resistance, non toxicity, corrosion resistance etc; manufacturing requirements like formability, mouldability, machinability etc. and various economic and market requirements should be met before finally choosing a material.

Selection of a material should be there in its own right and not merely as a cheap substitute; for it may be fulfiling other necessary requirements, it may not display the "right feeling"— the overall form, the texture, the balance, the clarity or the opacity of colour or any other of these elusive factors of esteem value. Even a subtle change in any of these might disturb the richness of the appearance.

For an intelligent judgement or compromise in finally selecting a material, a thorough understanding of all materials and its various properties is required. No doubt there are thousands of books written on individual materials, processes and their properties but going through all of them for a quick reference in order to find out a right material becomes a tedious and time consuming process.

This project was envisaged as a quick reference medium and as a tool to widen the perspective of designer and help him comprehend material-form-function relationship in true sense; to make him understand the basic nature of the materials in general and the peculiar 'personality' of each of them; to show him what is available and where; thus broadening the scope of design and application.

On the following pages, there is a brief description of the approach made to achieve the objective. First part of this discusses the first phase of the project viz. information collection which consists of data required for fixing up design approach and design criteria. Second part is analysis and formulation of design hypothesis and third and last one is the design description phase which discusses the final design and various features of the design.

Problem Statement

PROBLEM STATEMENT

To design a materials museum - a quick reference, information display and storage system; with an emphasis on unambiguity in information retrieval, and ergonomical factors.

SCOPE OF THE PROBLEM

1. Museum is intended for industrial designers.

2. Available area is 9.25 m x 9.25 m (30' x 30')

1.1.1 Information required about a material could be in the following forms :

a. material itself (Samples)
b. charts and diagrams
c. recordings - slides, microfilms, disc and tapes
d. books and magazines
e. manufacturers catalogues, price lists
f. patents and standards
g. pamphlets and other pictorial material

1.1.2 Analysis

A sample - material itself, in various forms; can exhibit best, information about itself. By looking at it only one comes to know of various aspects of it. But their storage and grouping presents a number of problems of an unfamiliar nature. Samples must always be ready to hand and yet, according to their nature, they need protection from such dangers such as damp, dust, heat, deterioration, friction, unauthorised or too frequent handling and even routine cleaning. Ideally all samples should be visible and accessible without delay.

Various properties of a material and its design, processing data can be displayed in form of charts and diagrams or can be stored in forms of slides, micro-films etc. and the information then can be retrieved at will. Data of this type generally is quite vast and display of properties alone would occupy a lot of space if shown in forms of charts and diagrams. While on the other hand slides, microfilms etc. occupy very little storage space. However, a slide viewer or a microfilm reader is necessary for enlargement of the miniaturized information.

Collection of patent and standard specifications are enormous and needs a huge storage space even if miniaturised. A

simple way is to have a kind of index system of a catalogue of relevant specifications, which are collected by public & institute libraries. Same can be done about the books on materials and processes, if some further information is needed.

Of quite importance are manufacturers catalogues. They are most up-to-date and informative encyclopedias. Nearly every firm prefers to issue its catalogues and trade information in the form of specialized sections, and to follow up their basic material with a continuous stream of brightly-coloured pamphlets and leaflets of varying sizes. Every detail in a trade catalogue is of some importance - illustrations, technical names and descriptions, trade names and marks, manufacturers' details of organization, prices, delivery terms etc. - andadded to similar publications from other manufacturers, very useful comparative information can be obtained concerning the relative advantages and disadvantages and costs of products in the same classification.

1.2 This part of information collection is mainly intended to work out the sizes of exhibition units, its orientations, fixing heights etc. Information in this regard can again be subdivided into two categories. One - type of materials, their form and standard sizes in which they are available or can be formed, and two - human factors.

1.2.1 STUDY OF POSSIBLE TYPES OF SAMPLES
(FORM IN WHICH THEY ARE COMMERCIALLY AVAILABLE OR CAN BE FORMED FOR INDUSTRIAL AND OTHER USES)

A. METALS (FERROUS AND NON FERROUS)

i) ingots (Blocks)
ii) sheet and plate
iii) bars, wire and rod
iv) different extruded sections
v) tubes
vi) filings - powder, paste
vii) foils
viii) structural shapes - rolled, forged etc
ix) Castings

B. WOOD

i) blocks, logs (longs) - solid or sawn
ii) sleepers
iii) shorts, strips or short strips
iv) plywood sheets (bent and straight)
v) particle board, hard board, block board
vi) thin sheets - balsa, veneers
vii) cork
viii) saw dust

C. PLASTICS (THERMOPLASTICS AND THERMOSETS)

i) granules, beads, flakes
ii) moulding powder
iii) liquid, paste (resins, plastisol)
iv) sheets
v) rods and different extrusions
vi) thin films
vii) fibres, strands etc.
viii) foam
ix) castings and mouldings

D. GLASS AND CERAMICS

i) powder (different types of clays and plasters)
ii) glazes, transfer sheets
iii) crystals
Iv) paste, liquid
v) fibre
vi) wool/mat
vii) sheets
viii) castings and mouldings
ix) thrown and blown forms

E. FIBRES

1. Natural Form

a. bamboo, cane - tubular, sticks
b. strands
c. flakes

2. Finished Form

a. yarn, cord
b. prepared cloth (thin sheets)
c. mats

F. PAPER

i) pulp
ii) papiermeche mouldings
iii) different types of thin sheets
iv) card board / soft board

G. RUBBER

i) liquid — latex, solutions
ii) paste
iii) sheets
iv) mouldings
v) blocks

H. LEATHER AND SKINS

i) sheets

I. COMPOSITES

i) sheets of various thicknesses
ii)

J. PAINTS AND VARNISHES

i) liquid (oils, thinners, dyes)
ii) paste
iii) powder

PASTE

PIPES: TUBES

THIN SHEETS

BLOCKS AND STRIPS

CASTINGS

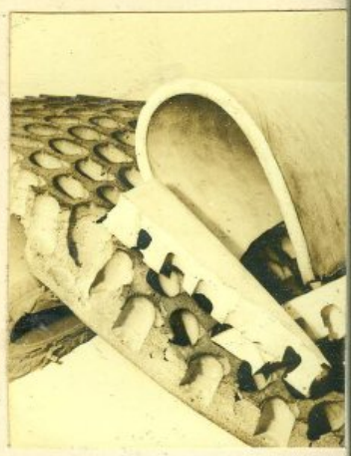
DIE CASTING (WITH FLESH)

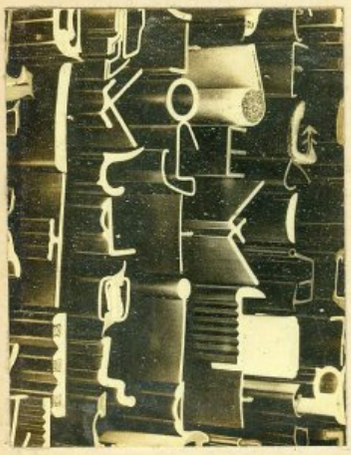
LIQUID

FIBRES

INGOTS

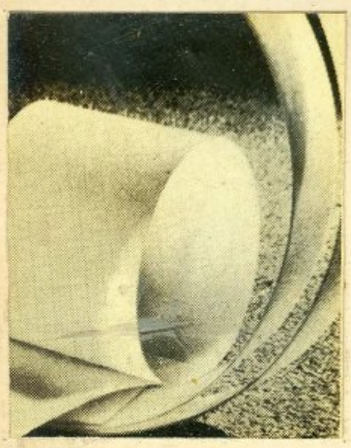
FOAM





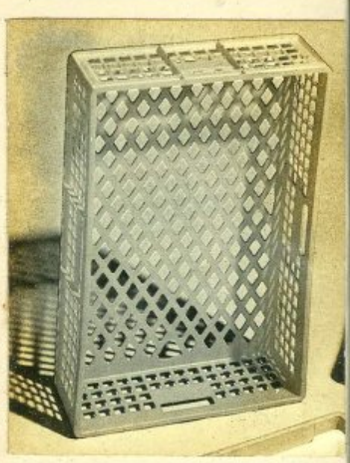
EXTRUSIONS

PELLETS & GRANULES



THIN FOILS

MOULDING



LOGS

FLEXIBLE SHEET

1.2.2 CLASSIFICATION OF TYPES OF EXHIBITS

i) solid blocks
ii) sheets - stiff - various thicknesses
iii) sheets - flexible - thin (foils etc)
iv) rods and bars - various diameters
v) pipes - various diameters
vii) various types of extruded sections
viii) powder, bead, granules
viii) liquid, paste
ix) strands, flakes (loose)
x) special (mouldings, or castings, fasteners)

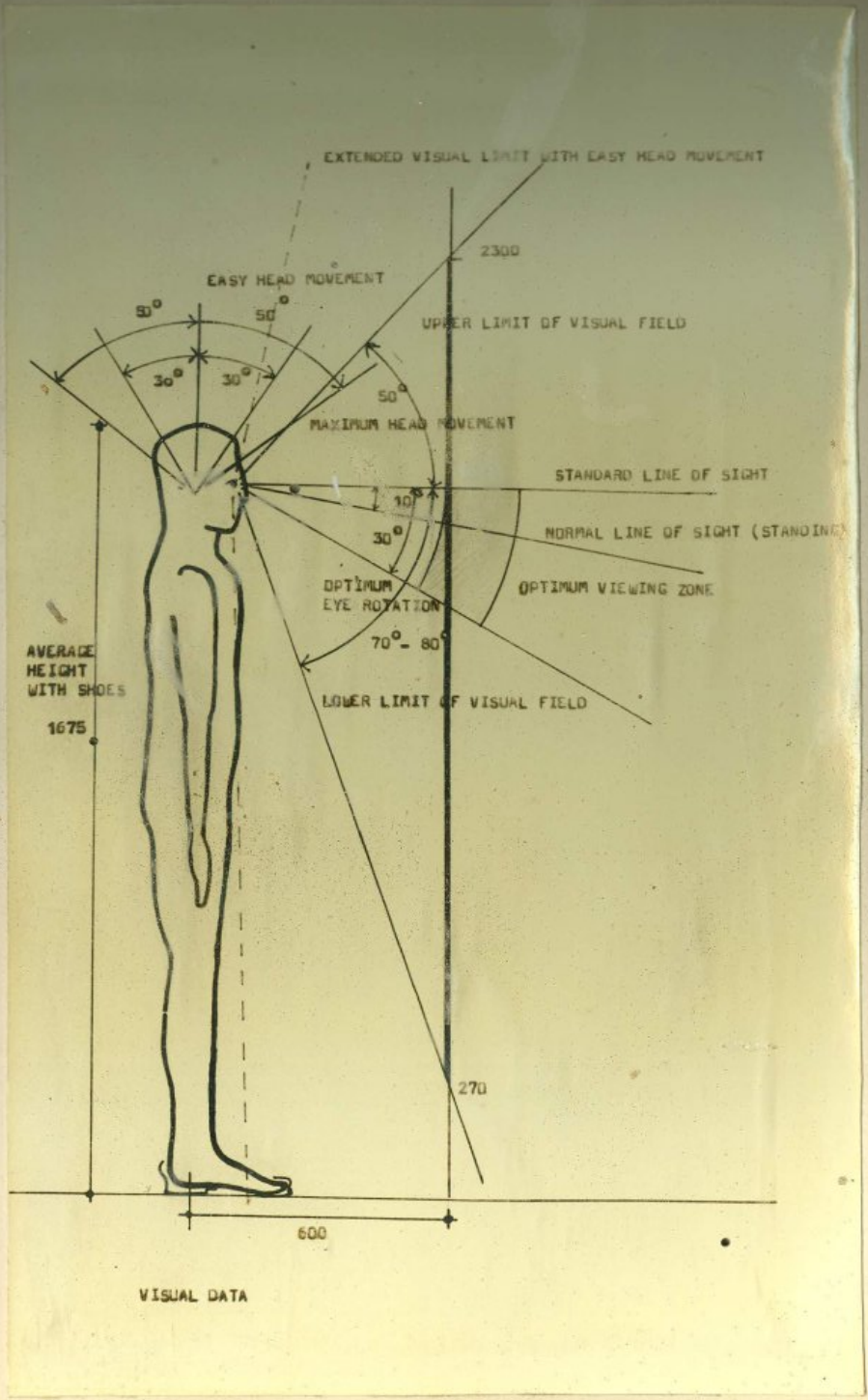
1.2.3 Standard sizes in which materials are available vary in sizes - areas, lenghts etc. from material to material and from manufacturer to manufacturer. Some manufacturers supply samples of their materials, but they also vary in sizes.

1.2.4 ERGONOMICAL FACTORS

Ergonomical factors which are referred here, are the visual data, and reach of an average adult.

Though easy reach, as has been found out is from 0.6 m to 1.84 m, it is clearly seen that units arranged one above the other can tentatively be placed from 0.5 m to 2 m.

Horizontal distance between the two units should be at least 1.2 m, to ensure easy movement.



VISUAL DATA

1.3 GENERAL INFORMATION ABOUT A MATERIAL

1. GENERAL PROPERTIES

A. PHYSICAL

Nature and composition
Density
Melting Point
Boiling Point

B. MECHANICAL

Tensile Strength
Compressive Strength
Impact Strength
Flexural yield strength
Creep
Dimensional Stability
Strength to weight ratio
Change in strength when alloyed or reinforced - with other materials.
Wear and tear for moving parts
elasticity

C. THERMAL

Thermal expansion
Change in properties in very hot and very cold conditions
Change in properties with change in temperature
Temperature-strength relationship
Coeff. of thermal conductivity / insulation
Fire and flame retardance
Mould Shrinkage

C. ELECTRICAL AND MAGNETIC

Electrical conductivity / Resistance
Arc resistance
Tracking
Diaelectric constant
Dissipation factor

D. CHEMICAL

Resistance to various chemicals
Solubility

E. SURFACE CHARACTERICSTICS

Hardness / Softness
Surface tension
Friction
Resistance to Abrasion

F. OPTICAL

Opacity / Transluscence / transmittance
Refractive index
Reflection / Absorption

G. WEATHERING CHARACTERISTICS

Ageing
Corrosion resistance
Resistance to radiation
Moisture resistance
Stain resistance
Bio degradation

H. OTHER PROPERTIES

Formation of Fungi, germs etc.

Toxicity

Sound, Noise, vibration absorption

Permeability

2. PROCESSING, FABRICATION, FINISHES

Possible shapes in which it can be made
Possible processes through which it can undergo
Machining
Adaptability with other materials
Availability in different grades suiting particular properties, processes and form.
Joining of two parts
Surface treatments
Surface finishes and colours

3. ECONOMIC FACTORS

Cost
Easy availability
Manufacturers / Distributors / Retailers
Obsolescence
Disposability
Re-saleability
Re-cyclability

4. SOCIAL, RELIGIOUS, CULTURAL FACTORS

Prejudices against some materials
Associations with some materials
Reaction to new materials.

1.3 Considering the limited availability of time, it was felt that collecting elaborate information about all materials, would consume a lot of time. Hence scope was made restricted to one material only. Same approach can be followed for other materials for final commissioning of the museum.

Aluminium was chosen for study as it is available in numerous forms and has uses in diverse fields; hence an ideal choice, to offer a good deal of information.

Following information has been made restricted in magnitude and has been presented only to show various aspects of the material. An indepth study can be done on these lines while actually commissioning the museum.

ALUMINIUM

GENERAL

The historian who would trace the story of Aluminium has a comparatively easy task. It is not referred to in the writings of the 'ancients', nor in classical records. Aluminium is a product of the present age.

From the first moment that aluminium was isolated and its properties determined, there was no doubt in the minds of the early scientists that it was a material of significant potential value. The advantageous characteristics of aluminium are partly inherent in the material, and are partly the result of extensive research and development work in industry-laboratories.

One of its chief advantages is lightness; others include resistance to corrosion, non toxicity, workability (it can be fabricated by more different methods than any other metals), high strength to weight ratio in alloys, attractive appearance, susceptibility to an almost infinite range of finishes, high electrical conductivity, high conductivity for heat, effieient reflection of light and heat, non magnetism, and availability in a wide range of basic forms.

In addition to having favourable properties, aluminium has experienced a remarkably stable price history from the time it was first made commercially available.

1.3.2 COMMERCIAL FORMS OF ALUMINIUM ALLOYS

1. INGOT

Unalloyed ingot
rich alloy ingot
casting alloy ingot
extrusion ingot
forging ingot
sheet and wire bar ingot

2. CASTINGS

die castings
permanent mould castings
sand castings
Other cast forms (Direct chill casting, shell mould casting, plaster mould casting, investment casting etc)

3. SHEET AND PLATE

Sheet is 0.006 to 0.249 in. thick
Aluminium more than 0.25 in. thick is classified as plate.
Available as flat rolled or in coils
Available in various sizes and tolerances
Available in various type of finishes such as
Mill finish
Skin quality finish
Standard bright finish
Controlled finish
Uniform mill finish

Specialty Products (Sheet and Plate)

Anodizing sheet
Prepainted sheet
Reflector sheet
Lighting sheet
Recording sheet circles
Brazing sheet
Litho sheet
Patterned sheet
Vinyl coated sheet
Procelain enameling sheet
Roofing sheet
Armour plate
Tread plate
Stainless clad aluminium
Tooling plate
Traffic and Street sign Blanks
Tube in sheet
Tapered sheet and plate
Decorative panelsheet
Roll-Bandevaporative sheet

4. FOILS

Ranges in thickness from 0.00017 to 0.0059 in. and in width from 0.250 to 61 in.

Produced with
two sides bright
one side bright and one satin finished

5. WIRE, ROD AND BAR

Wire is generally round, but it may be square, rectangular or hexagonal in section. It is by definition less than 3/8 inch in diameter.
Wire is furnished straightened and cut to length as well as in coils or spools.

Rod and Bar

More than 3/8 inch in diamter. Rod and Bar usually are supplied in straight lengths usually 12' long.

6. EXTRUSIONS

Available in various types of extruded shapes with a factor which specifies average 'thickness' of the extruded shape. Supplied in straight lengths usually 12' long.

7. STRUCTURAL SHAPES

Angles and I beams (ranging in size from - $\frac{3}{4}$" x $\frac{3}{4}$" angles to 12" I beams)

8. TUBE AND PIPE

Drawn tube
Extruded tube
Welded aluminium tube
Hooker tube (impact extruded)
Tube in coiled form (Small diameter)

9. FORGINGS AND PRESSINGS

Die forgings
Hand forgings
Rolled ring forgings

10. IMPACT EXTRUSIONS

Reverse impact extrusions
Forward impact extrusions

11. PARTICLES, POWDER AND PASTE

Coarse Particles (granulated ingot, grained ingot and shot)
granulated ingot - 0.20" to 0.56" ø
grained ingot - 5 mesh and finer
shot - 4 to 14 mesh

Fine Powder and Paste

(-12 to -325 mesh); Paste - (-325 mesh)

Dyes aluminium flake powders

1.3.3 PROCESSES THROUGH WHICH ALUMINIUM CAN UNDERGO

1. CASTING

Die casting
Permanent Mould casting
Sand Casting
Plaster Mould casting
Premium Quality Casting
Supplementary Operations (trimming, impregnating and welding)

2. EXTRUSION

3. IMPACT EXTRUSION

4. FORGING

5. FORMING

a. Forming Plate, Sheet and Foil
Blanking, cutting, piercing
Press-Brake bending and forming
Drawing and Deep Drawing
Spinning
Embossing, Coining and Stamping
Hammer forming
Roll forming
Rubber Die forming
Stretch forming
Supplementary forming Processes (Expanding, Contracting, Bending, Hole Flanging, Ribbing)

Other Forming Processes (Explosive forming, Electromagnetic forming, Electrospark forming, Pneumatic forming, Air forming of foil etc.)

b. Forming Bar, Tube, Shapes and Wire

Draw Bending
Compression Bending
Ram and Press Bending
Roll Bending
Stretch or Tension Bending
Hand Bending
Rotary Swaging
Expanding and Flaring of Hollow shapes
Cold Heading

6. MACHINING

Machinability
Cutting and tool characteristics
Drilling
Milling
Grinding , Honing and Lapping
Reaming
Tapping and Die Threading
Broaching
Sawing, Shearing, Routing and Filing
Machine Finishes (Knurling, Turning)
Chemical filling
Cutting Fluids and Lubricants

7. HEAT TREATING

Preheating, Homogenising
Annealing
Solution heat treatment
Natural Aging

1.3.4 FABRICATION

1. RIVETING AND OTHER MECHANICAL FASTENING

Riveting
Threaded Fastners
Nailing
Stitching or Stapling
Special Fasteners and Techniques

2. WELDING

Arc Welding
Resistance Welding (Spot Welding, Cross Wire Welding, Seam welding, Flash butt welding, Percussion Welding)

Other welding methods (Unshielded arc welding, inert gas tungston are capacitor welding, Induction Seam welding, Electron beam welding, Ultrasonic welding etc.)

Welding Aluminium to other metals
Welding strength, characteristics and performance

3. BRAZING

Torch Brazing
Furnace brazing
Dip Brazing
Brazing Aluminium to other metals
Brazing characteristics and performance

4. SOLDERING

Iron Soldering
Flame soldering
Ultrasonic soldering
Abrasion soldering
Furnace soldering
Reaction flux soldering

Soldering performance

5. ADHESIVE BONDING

Adhesive classifications
Thermoplastic resins
Elastomeric polymers
Thermosetting resins

Surface treatment for bonding
Comparison with other joining methods
Types of bonding (Solvent-free and in presence of solvent)

Bond characteristics

1.3.5 FINISHES

1. MECHANICAL FINISHING

Grinding
Polishing
Buffing
Satin Finishing
Barrel Finishing
Abrasive Blast Finishing
Lapping and Honing
Nomenclature of Finishes

2. CHEMICAL PRETREATING AND FINISHING

Cleaning
Oxide and Slut removing
Chemical Etching
Chemical conversion coatings
Chemically produced metallic coatings
(Immersion coatings of Zn, Sn, Pb, Ag,
Electroless plating)

3. CHEMICAL BRIGHTENING AND ELECTROBRIGHTENING

4. ANODIZING

Sulphuric Acid Anodizing (Hard anodic coating)
Chromic Acid Anodizing
Other Anodizing Processes
Colouring
Sealing

5. ELECTROPLATING

6. PAINTING AND OTHER ORGANIC COATINGS

Primer coatings
Finish coats
Plastic coats
Temporary protective coatings.

7. PORCELAIN ENAMELLING

8. CLEANING AND MAINTENANCE OF SURFACES

Mild, Moderate and Heavy duty cleaners
Handling and Storage

1.3.6 USES OF ALUMINIUM IN VARIOUS FIELDS

1. BUILDING CONSTRUCTION AND ARCHITECTURE

Aluminium in the form of plain sheet, corrugated sheet, toughed sheet, decking profiles and other shapes is extensively used in the building and construction industry on account of its light weight, resistance to atmospheric corrosion and the ease with which various visual effects can be obtained by combining thd differing profiles with varying surface finishes.

2. PACKAGING

Aluminium in following forms is extensively used in packaging

i) Collapsible and rigid tubes made from impact extruded aluminium slugs
ii) Container sheet and vial cap strips
iii) Aluminium foils
iv) Cans and barrels

Main properties being used in this case are non toxicity, heat conductivity and reflectivity and availability in various decorative finishes.

3. TRANSPORT

Aluminium and its special alloys have found their extensive use in almost all forms of transport - road, Air, Rail and Marine.

Main structural members are made from extrusions or forgings, sometimes of very large size, in one or other of the high strength alloys, while the skinning is done from thin clad sheets in similar alloys.

Main properties being used in this case are high strength to weight ratio, corrosion resistance and non-magnetism.

4. FURNITURE AND OTHER DECORATIVE USES

In form of tubes, bars and foils, Aluminium finds many uses in furniture industry and other decorative uses such as costume jewellery, lamp shades etc.

5. ELECTRICAL

Owing to its excellent electrical conductivity and lower cost than copper, it is extensively used in electrical industry for making bus bars, overhead conductors, cables etc.

6. OTHER FIELDS OF APPLICATION

There is virtually no field where aluminium has not reached. Utensils, light reflectors, road signs and various other products find extensive use of aluminium and its alloys.

Design Hypothesis

2.0 DESIGN HYPOTHESIS

2.01 Type of information about a material which is of day to day use to a designer is of following nature :

a. various general properties of the material
b. form in which it is available
c. processes through which it can undergo
d. fabrication methods
e. availability and cost breakup
f. application of the material in various fields

....and should be exhibited in different sections to avoid mixing up of information, so that if one reaches for some particular information, he should be able to get it without any ambiguity and search around.

2.02 Material in sample form represents itself at its best and helps designer to comprehend various aspects (listed above) with thorough visualization. Therefore, most of the information should be provided by exhibiting different types of samples.

All samples should be visible and accessible without delay.

Follow up information such as design data, techniques etc. should be provided in miniaturized form, making it possible to store maximum possible information.

Catalogue of patents, standard specifications and various books on the subject should also be kept.

2.03 Since area provided for the museum is very small comparing to its scope; maximum use of space should be made.

2.04 Information regarding materials vary depending upon the type of material. In some cases scope of application is vast while in some cases it is quite small. Therefore design should be flexible enough to incorporate more number of units to display more information and delete few units to avoid wastage, in case of materials where relevant information is very small.

2.05 Human proportions and limitations should be considered while designing the system. As per ergonomical data exhibition units should be arranged within 0.5 m to 2 m height above ground level.

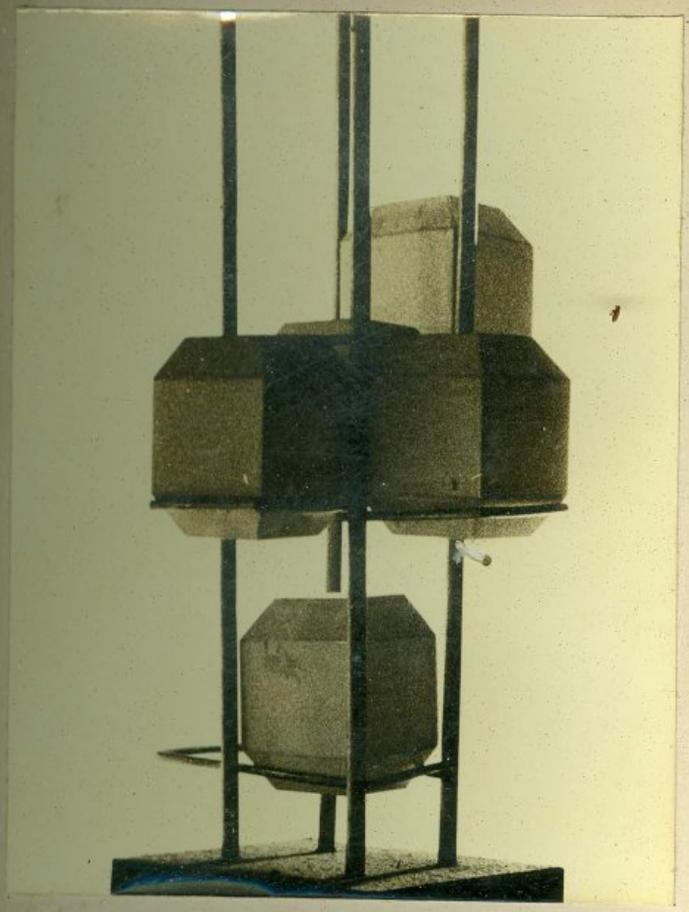
2.06 Fabrication of different units should be easy and time saving.

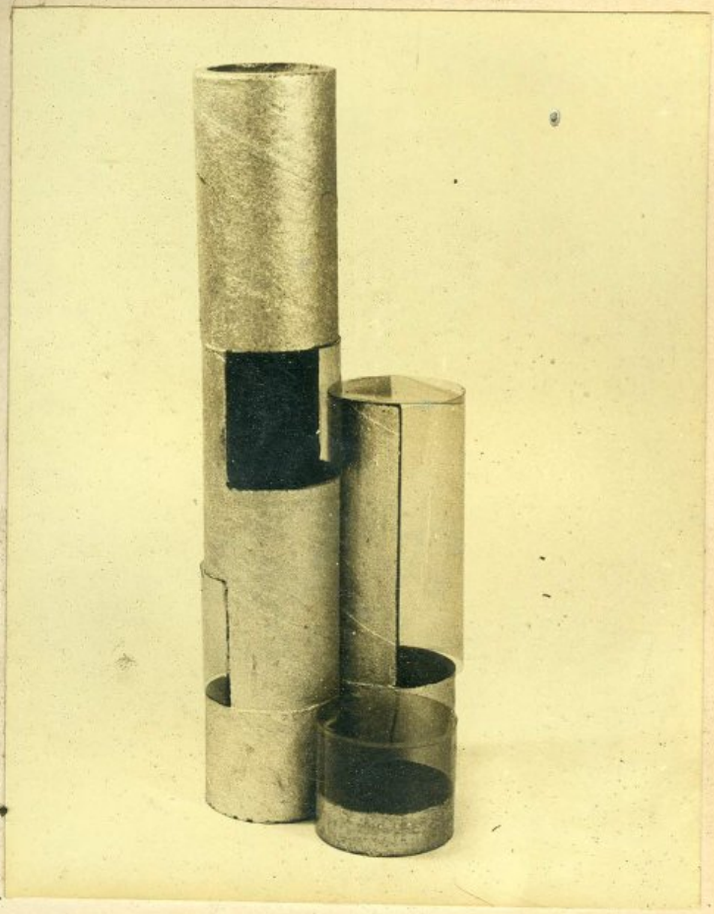
2.07 Since available material vary in lengths and sizes, sample size should be cut down and standardized, so as to accommodate more types of samples. Sample size should be sufficiently big to explain whatever aspect it is representing.

2.08 It should be possible to use same exhibition units for displaying some other exhibits.

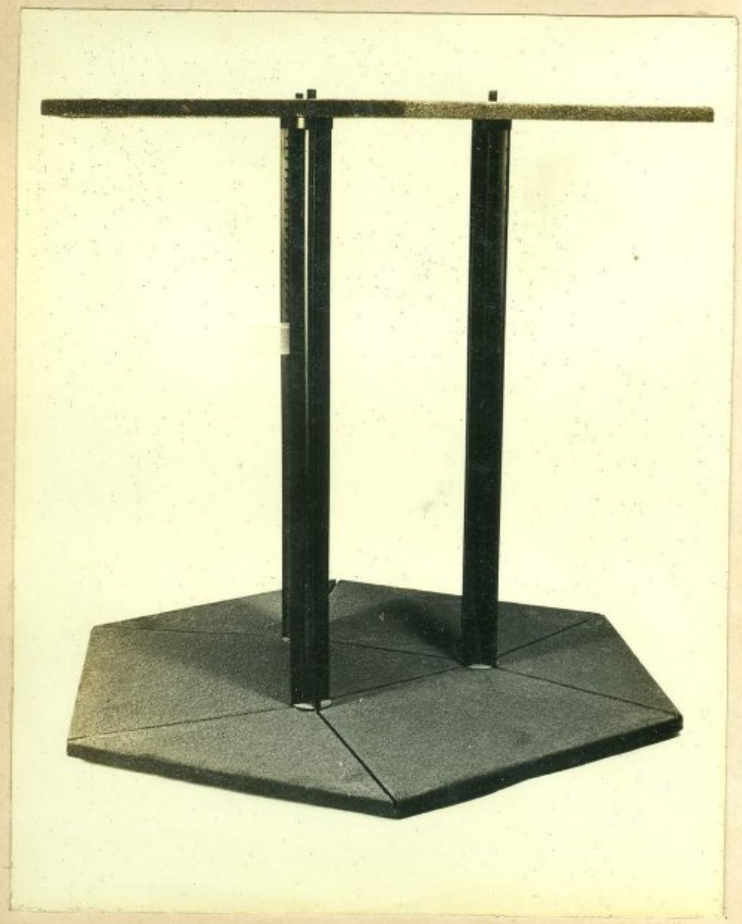
2.09 Design should be simple enough to be made in IDC workshops

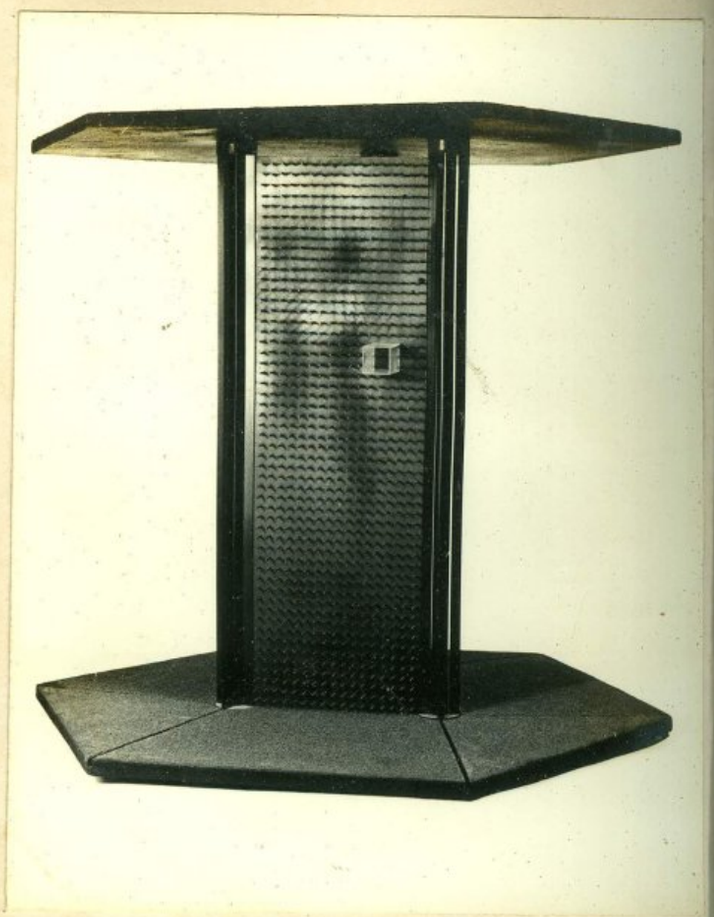
Design Approach





DESIGN APPROACH : PRELIMINARY MODELS





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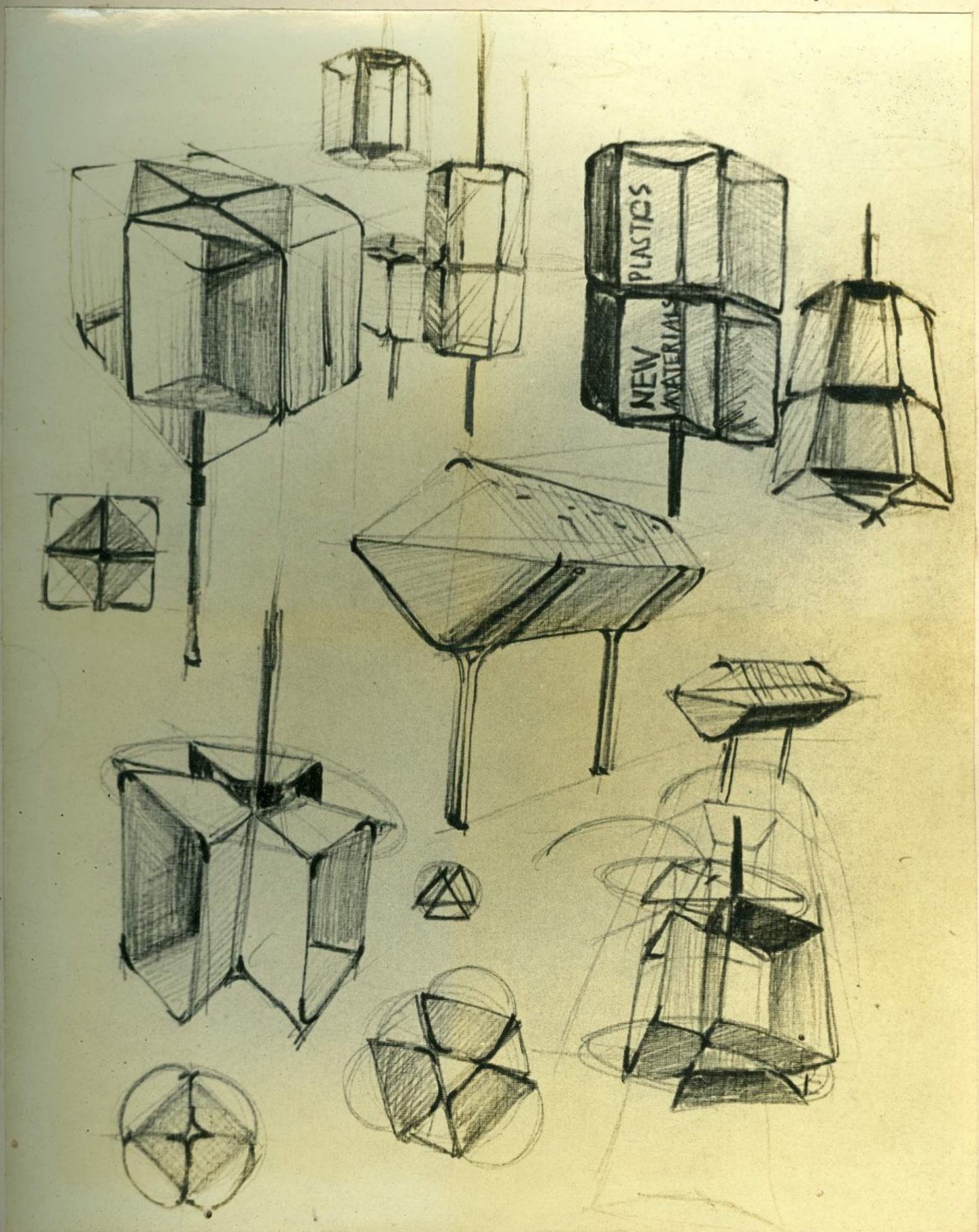
VARIOUS VIEWS OF THE
PLYWOOD - PROTOTYPE


PLASTICS
NEW
MATERIALS


indexes
DATA
STORAGE
UNIT
manufacturers'
catalogues
slides
photographs
EXHIBITION
UNIT
samples

2.1 DESIGN APPROACH

Following the design hypothesis, it was decided to divide the whole system into two parts, viz.

1. exhibition units - to display samples and information in form of photographs and text.
2. data storage units - to store information in form of slides, manufacturers catalogues and pamphlets and indexes of books, standards etc on the subject in various libraries.

It was also decided to have different exhibition units for different types of materials and a further sub-division of one unit to display various aspects of the material. Total number of exhibition units were calculated and rough area was worked out for each unit.

Next step was to design a suitable exhibition unit. Several ideas were tried with doodling or sketching on paper and then by making small cardboard and plastic sheet models, keeping in view the various requirements which were to be fulfilled. Out of these apparantly feasible and appealing solutions were picked up and analysed.

After weighing relative merits and demerits of each design, hexagonal unit with divisions shown was finally selected. Main advantage of this type of unit was : it had a multifaceted look and therefore each face or compartment could be used for showing a specific aspect of a material.

A full scale prototype was made with these compartments made by making slots on a hexagonal plyboard sheet and then sliding in hardboard and perspex sheets with photographs and text.

After making one unit it was realized that too much precision work was involved in making the unit and it would be a very difficult job to manufacture such units unless one opts for large scale methods of production viz. punching and extrusion etc - which was not justified.

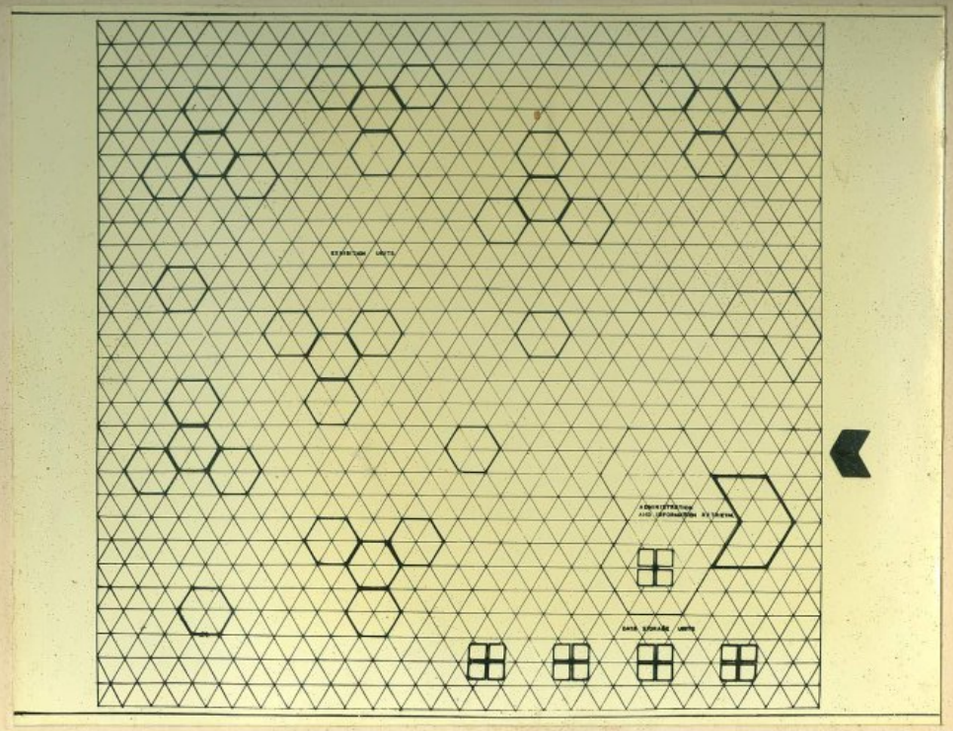
Another option was to standardize each type of compartment and make them separately which would not only provide a flexibility in joining compartments in various ways but would also enable these parts to be used as data storage units also.

This design was finally selected and joining and fabrication details were worked out.

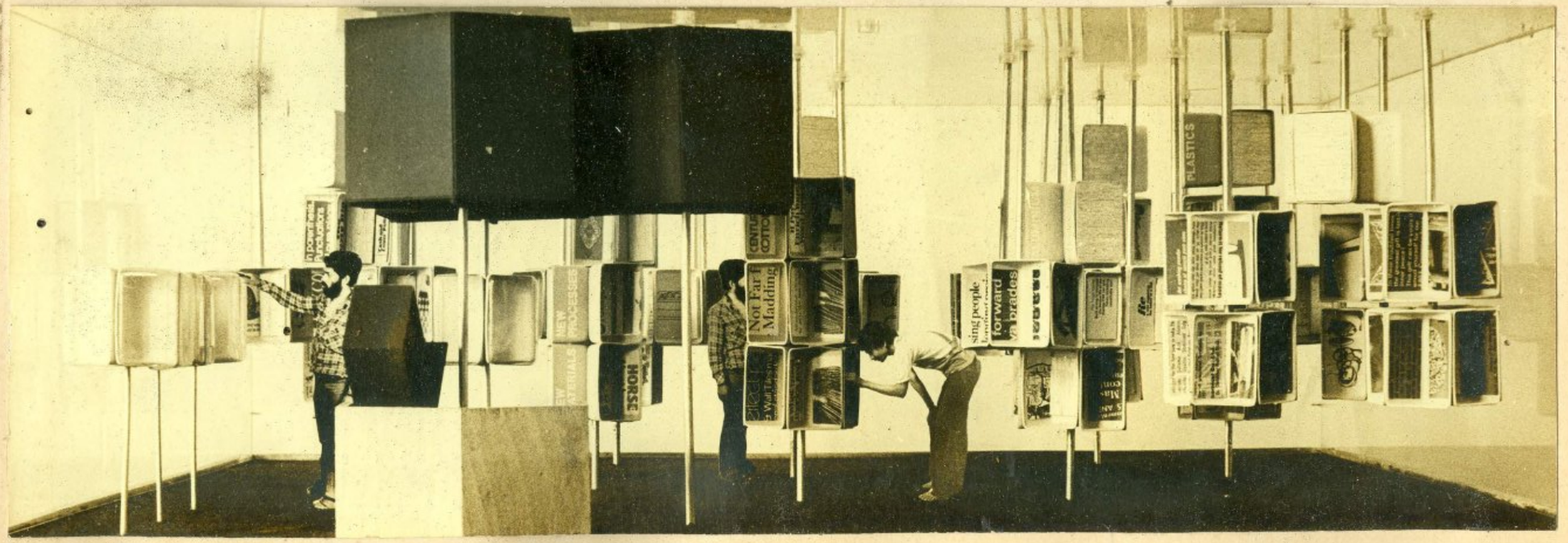
Design Description

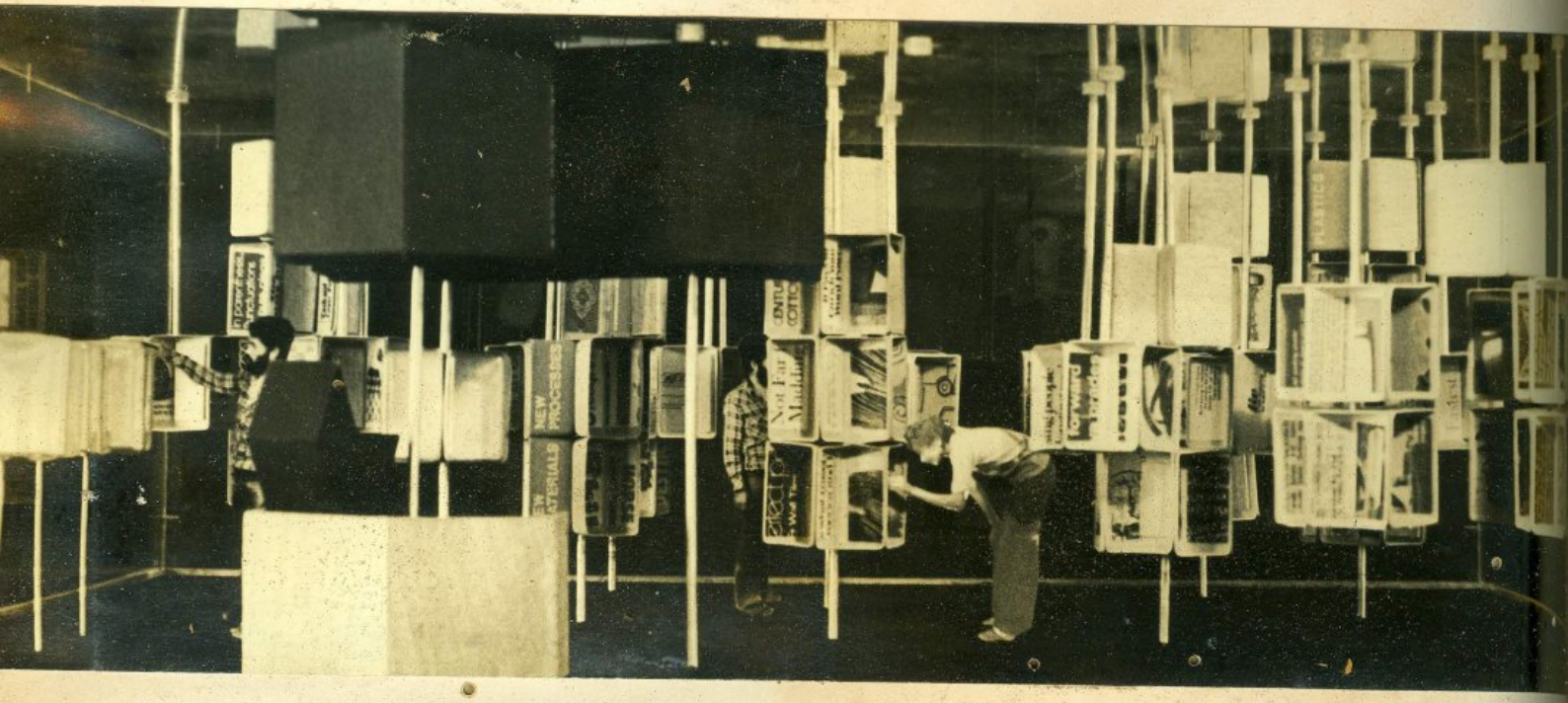
THE MUSEUM

SCHEMATIC LAYOUT



GENERAL VIEW




NEW MATERIALS NEW PROCESSES
PLASTICS

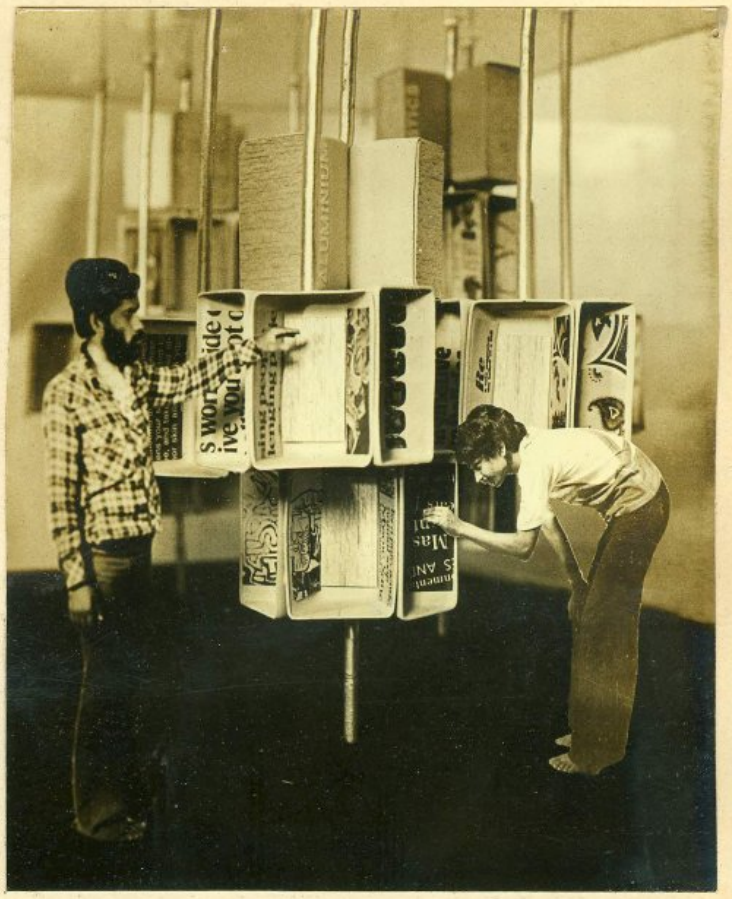
3.0 DESIGN DESCRIPTION

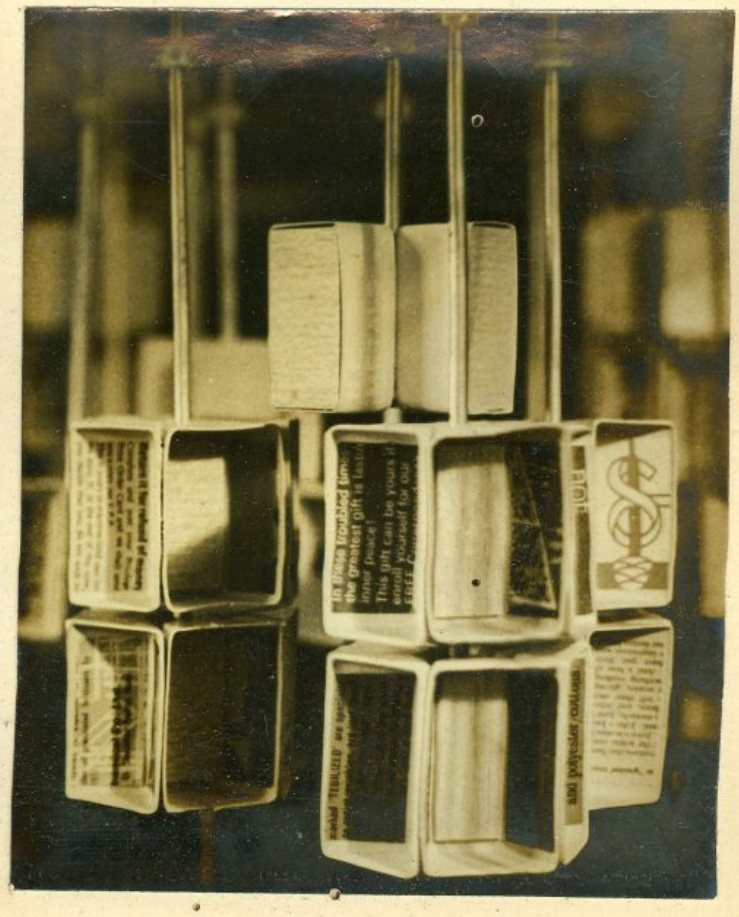
3.1 GENERAL - The system has been divided into two parts viz. exhibition units for displaying samples and information in photographic and written form, and data storage units for storing slides, manufacturers catalogues and pamphlets, and indexes etc. A small area has been provided for administration cum lounge where slide viewing facilities have also been provided. Mezzanine floor, of this area can be used for bulk storage of samples and for keeping all the samples and photographs-panels, in case the exhibition stands are used for some other purpose.

3.2 EXHIBITION UNIT - One unit has been provided for one material or one class of materials and consists of number of modules arranged at various heights. Each module consists of two types of compartments joined to form a hexagonal unit. For one module, there can be either size compartments (three trapezoidal and three triangular) or three trapezoidal compartments only. These modules, so formed can either be put on pedestrals or can be hung from the ceiling. Each compartment is made up of vaccum formed 4.0 mm thick polystyrene sheet. Three bent 12 mm ø M.S.pipes hold the compartments in place. These bent pipes in turn are joined together with a M.S. plate which is either brazed or screwed to the pipes. One central pipe passes through the Centre of the triangular plate which with a brazed bush rests on the other one screwed to the pipe. The whole module can be rotated around the central pipe.

Inside the boxes, photograph-panel or nail panels can be fixed with screws on the protruded 'run' at the top and bottom. Each compartment of a module can be further sub-divided into horizontal shelves for keeping small smaples

EXHIBITION UNITS :
VARIOUS ARRANGEMENTS



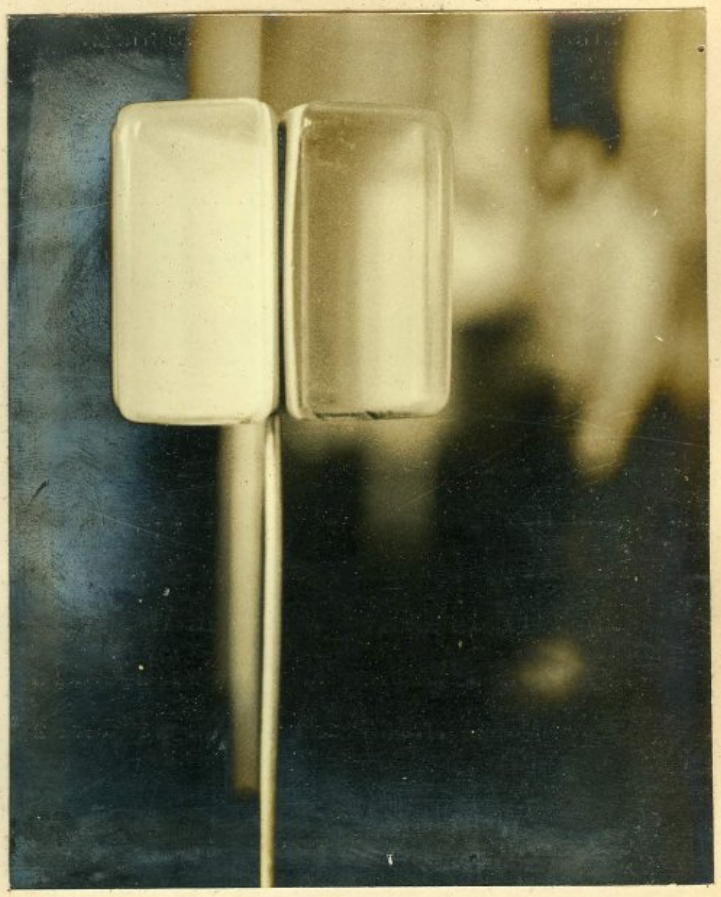


which cannot be put on nail panels. Each box (compartment) is covered by a perspex sheet door pivoted at one end of the box.

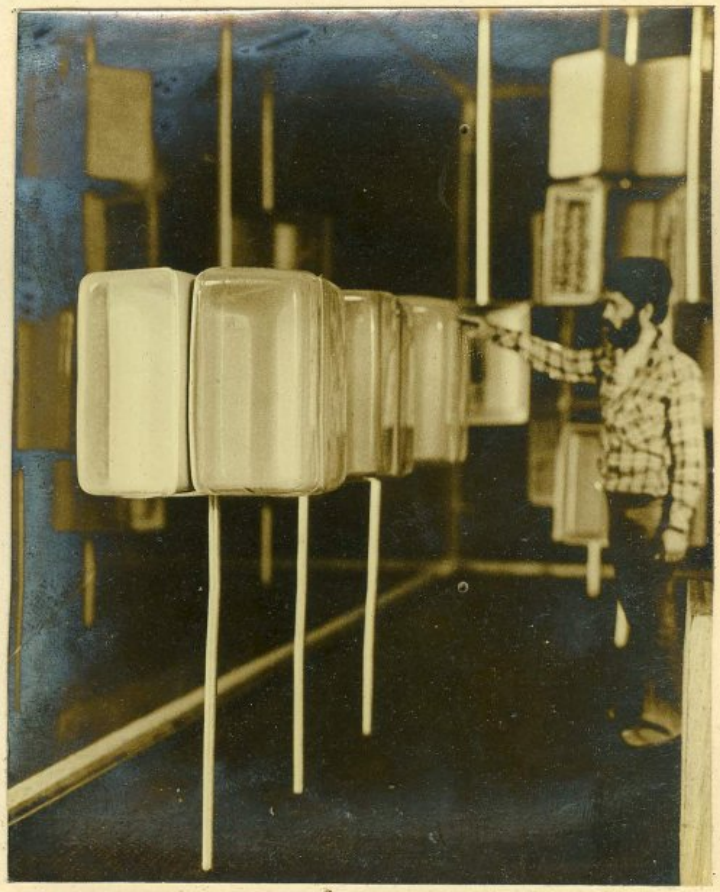
If needed each compartment can be fitted with one-foot fluoroscent tube-light fittings.

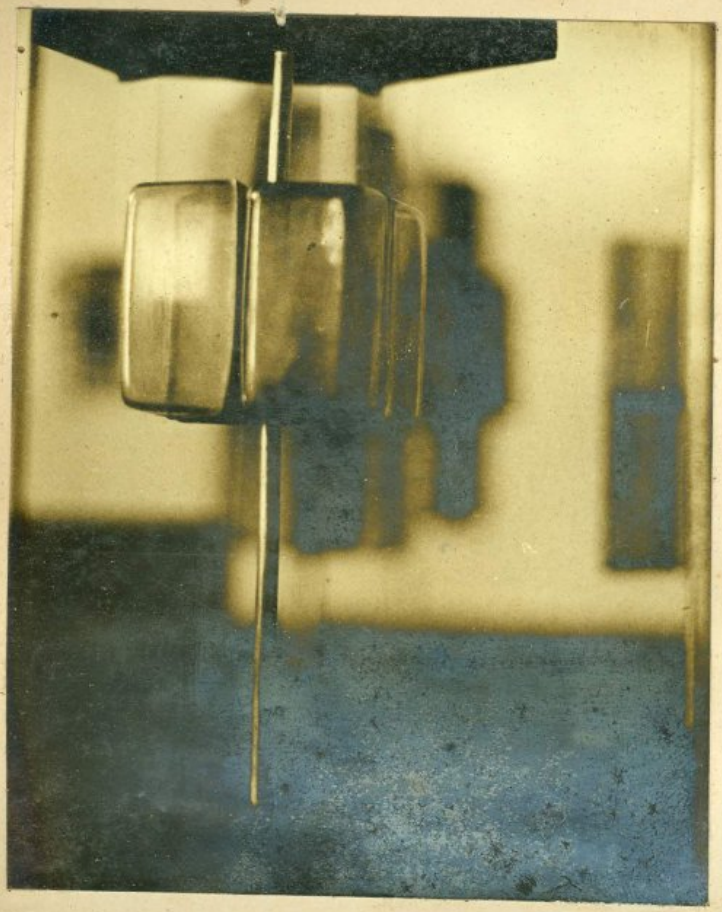
3.3 DATA STORAGE UNIT - This unit consists of four triangular type compartments with clear perspex doors of the same shape. Four pieces together form a square. A channel is fixed on both ends on protruded 'run' in which one small railing slides in and out. On this railing, slide carriers or pamphlets with clips can be hung. Thus similar units have been used for slide storage and pamphlet storage. However, there are separate units for both.

For heavy manuals and directories, a different type of arrangement has been used, where compartment itself acts like a shelf.



DATA STORAGE UNITS





DESIGN FEATURES (CLOCKWISE)

↑
MAIN CATALOGUE UNIT

↗
EXHIBITION UNIT FOR
NEW MATERIALS AND PROCESSES

→
ADMINISTRATION AND
INFORMATION RETRIEVAL AREA

BULK STORAGE SPACE
ON MEZZANINE FLOOR

3.4 DESIGN FEATURES

1. The whole system has been argonomically designed by putting all the units within an average person's reach. Each unit rotates around a vertical axis so as to provide access to all faces of the unit.

2. System has been classified in such a way that no ambiguity is faced while retrieving any kind of information.

3. All units have been given a different pastel tint so as to give each unit a different identity. Pastel values also give a light background against dark fore-ground of photographs and text.

4. A special unit for new materials and processes has also been provided where newly introduced materials can be kept. These can later be shifted to their appropriate places. Advertisement cuttings about new materials and processes can be pinned up on the panels of this unit.

5. Exhibition units can be arranged in various ways by grouping the constituent units in different manners. This gives a flexibility of enlarging or curtailing the size of exhibition-unit as per requirements.

6. Bulk storage space has been provided, which can also be used for keeping all samples and panels if necessity of using the same exhibition unit for some other purpose, arises.

7. These exhibition units can also be used as display stands for small and medium sized articles.

8. Basic constituent units can be made in IDC workshops out of inexpensive wooden moulds. Other fabrication part can also be carried out in IDC workshops.

9. A dymaxion grid (with divisions in form of equilateral triangles) has been suggested at beam level to support hanging units. This can also serve as a false ceiling.

Conclusion

CONCLUSION

Designers are creative persons - ideas men, and there is nothing so fragile as an idea. Yet often ideas amount to less than they could because of the lack of knowledge of suitable material to turn them into reality. This comprehensive materials museum with its wide range would no doubt give them great scope to let their ideas take shape.

A picture is worth thousand words, it is said; and if it is three dimensional it is worth million words. Therefore concept of furnishing information in pictorial and actual form for greater visualization of all aspects of a material gets justified.

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ii) Rattenbury Arnold
Exhibition Design - theory and practice
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Van Nostrand Reinhold Company, New York

B. ERGONOMICS

i) Dreyfuss Henry
Anthropometric charts

ii) Grandjean Etienne
Ergonomics of the home
Taylor and Francis Ltd. London

iii) McCormic E.J.
Human Factors Engineering
McGraw Hill Book Company, New York

C. MATERIALS

1. Catalogues on various materials of following manufacturers

i) ALCOA U.S.
ii) BACO U.K.
iii) HINDALCO; JINDAL India
iv) National Wood Council U.K.
v) LENNIG CHEMICALS U.S.

vi) NORYL (G.E.) U.K.

vii) HOECHST W. GERMANY

viii) I.C.I. U.K.

ix) I.P.C.L. INDIA

x) ASIAN PAINTS INDIA

2. BOOKS ON ALUMINIUM

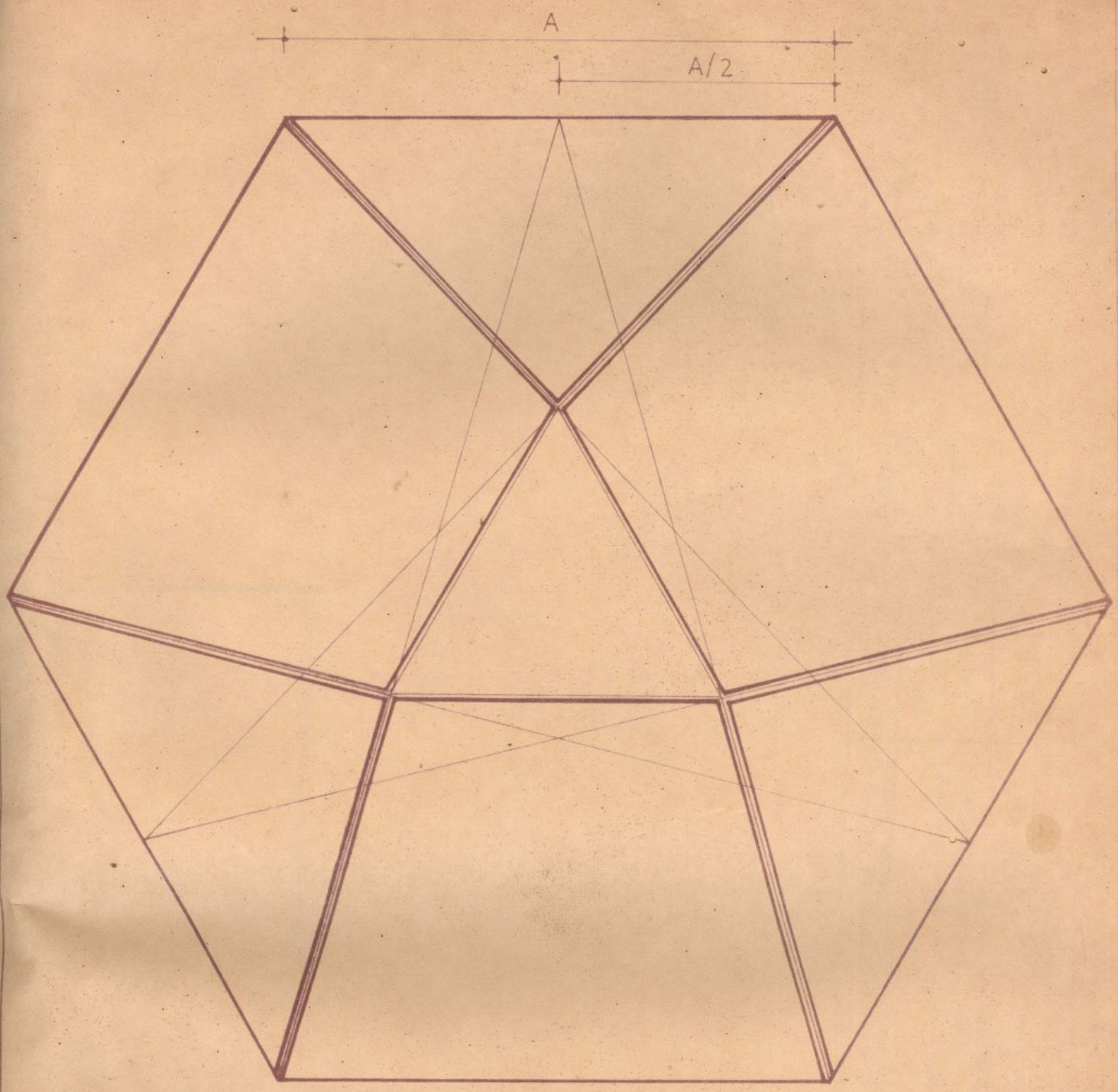
i) Budgen N.F.
Aluminium & its Alloys
Sir Issac Pitman & Sons London

ii) I.I.P.
Aluminium in Packaging
I.I.P. Bombay

iii) Van Horn K.R.
Aluminium (3 Vols.)
American Society for Metals, Ohio

iv) Varley P.C.
Technology of Aluminium & its Alloys
Newness - Butterworths, London

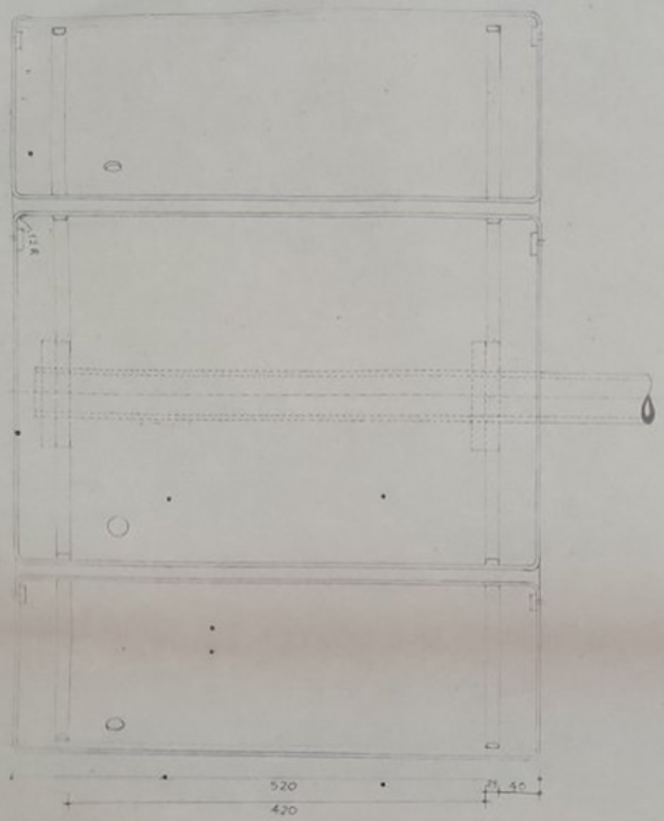
DRAWINGS

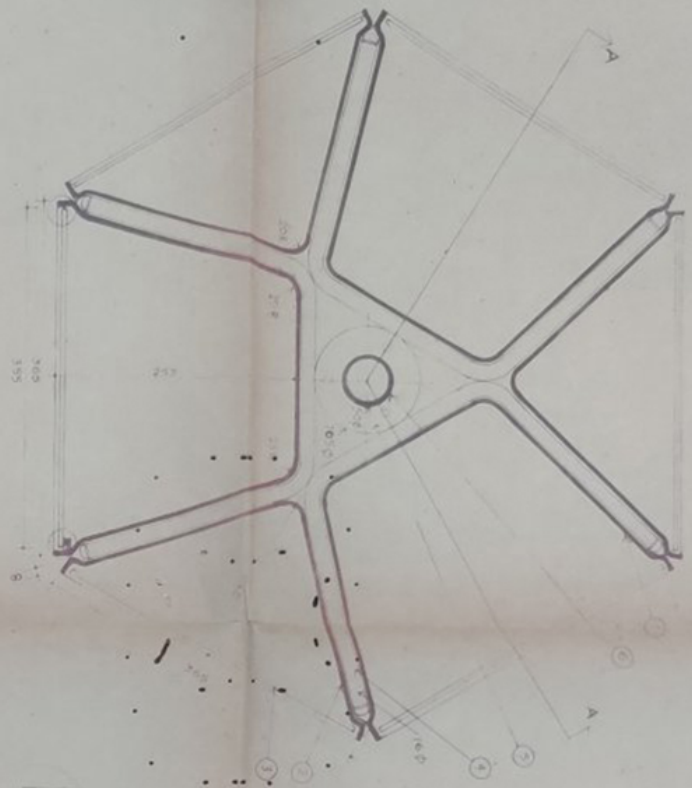


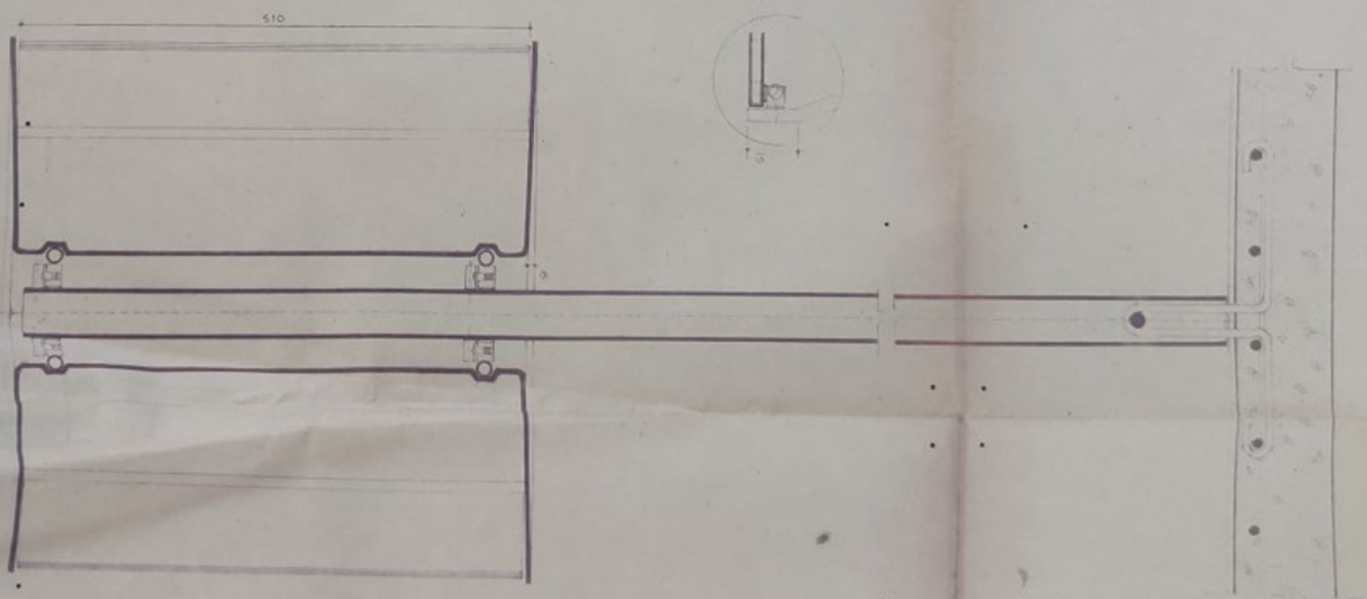
MATERIALS MUSEUM

DIVISION OF A MODULE	VINOD GUPTA	772703
SCALE 1:4		DRAWING 1

INDUSTRIAL DESIGN CENTRE IIT BOMBAY







NO	DESCRIPTION	MATERIAL	NO OFF	REMARKS
1	TRAPEZOIDAL COMPARTMENT	4 MM POLYSTYRENE, H.I. GRADE (PASTEL SHADES)	150 PIECES	VACUUM FORMED
2	TRIANGULAR COMPARTMENT	DO	150	DO
3	DOOR	3 MM CLEAR ACRYLIC SHEET	300	—
4	PIPE WITH P.V.C. CAPS	BLACK M.S. 16 MM (O.S.) Ø	300	AL PAINTED
5	BEARINGS	M.S. WITH STEEL BALLS	100	CUSTOM MADE
6	CENTRE-PIPE	M.S. BLACK 50 MM (O.S.) Ø	50	AL PAINTED

MATERIALS MUSEUM

EXHIBITION UNIT

VINOD GUPTA 772703

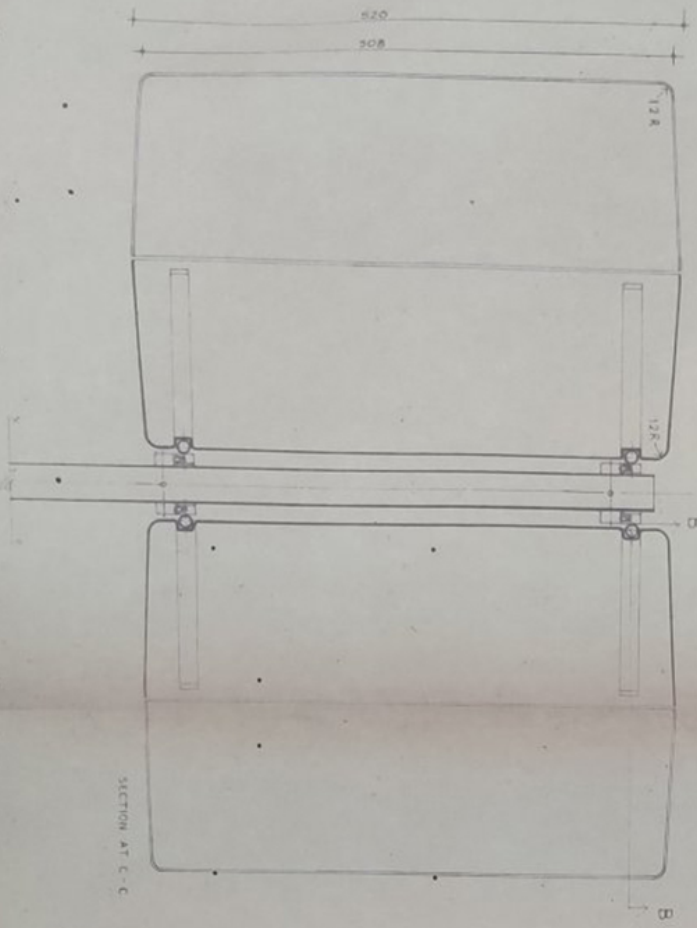
1978-79 VIII

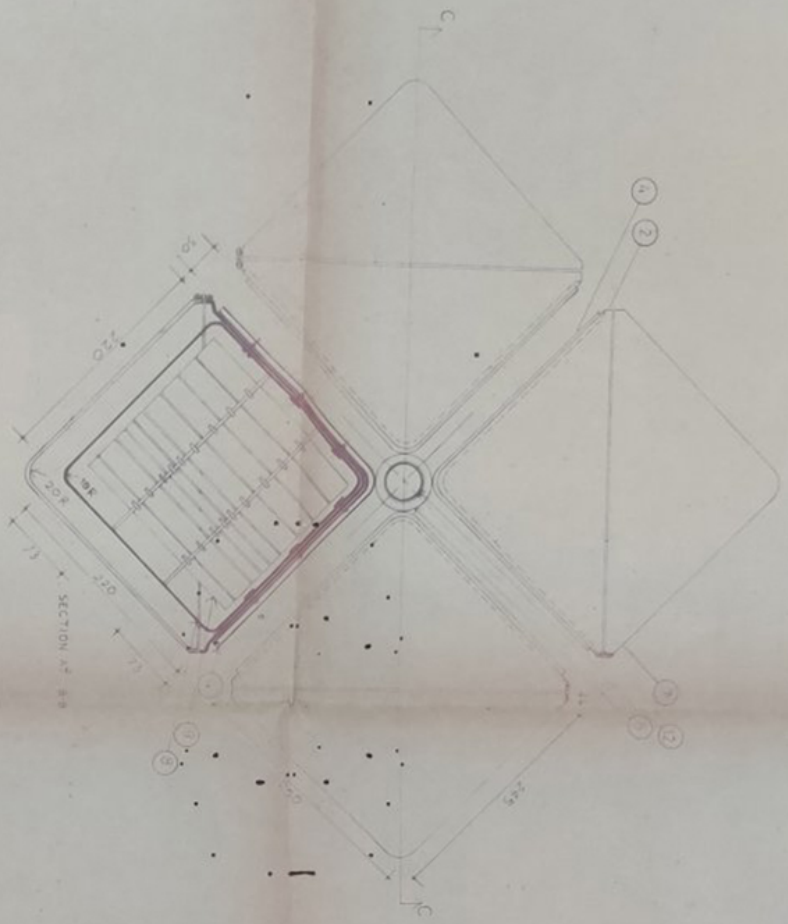
ALL DIMENSIONS IN MM

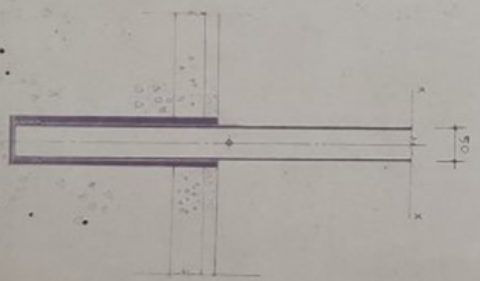
SCALE 1:5

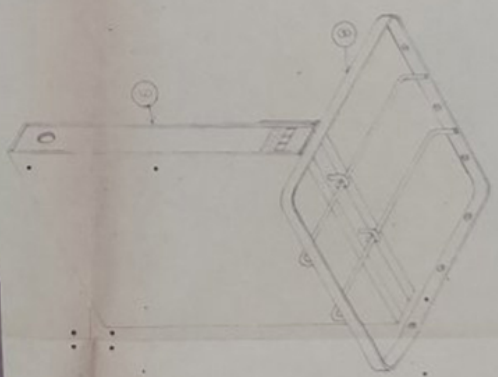
DRAWING 2

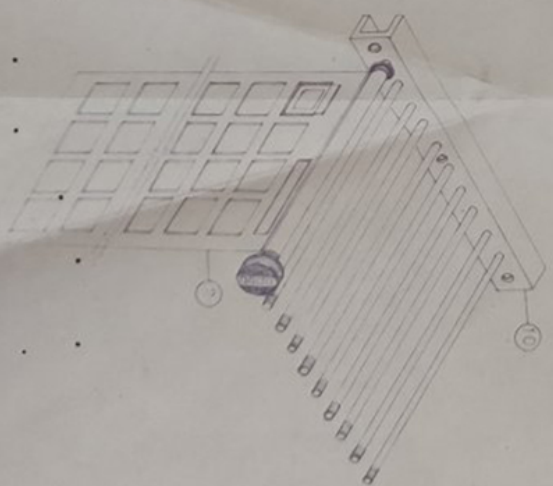
INDUSTRIAL DESIGN CENTRE IIT BOMBAY

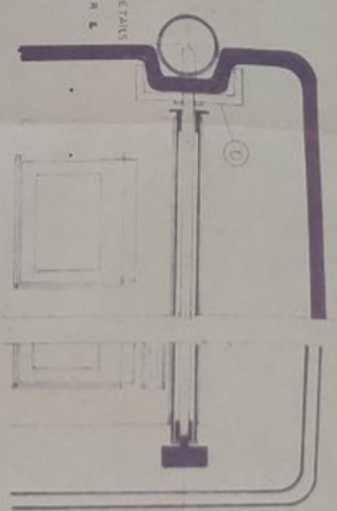












	DESCRIPTION	MATERIAL	NO OFF	REMARK
7	DOOR	CLEAR ACRYLIC 3MM	30	VACUUM FORMED
6	FILE CARRIER	M.S. (3MM STRIP)	8	PAINTED IN SAME COLOUR AS BOX
5	BOX FILE	CARDBOARD & CLOTH	40	
4	SLIDE CARRIER HOLDER	M.S.	12	RODS WELDED TO C
3	SLIDE CARRIER	L.D.P.	120	
2	PIPE	BLACK M.S. 50MM Ø (20 G)		AI PAINTED
1				

MATERIALS MUSEUM

DATA STORAGE UNIT

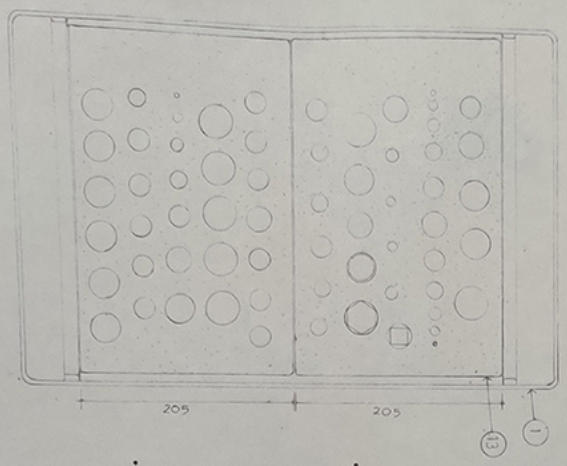
VINOD GUPTA 772703

1978-79 VIII

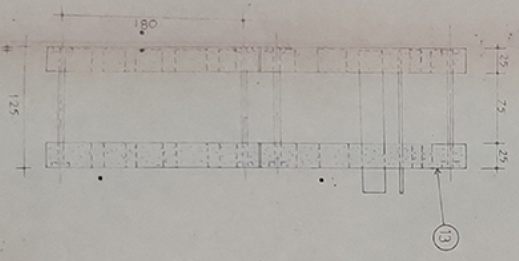
ALL DIMENSIONS IN MM SCALE 1:5

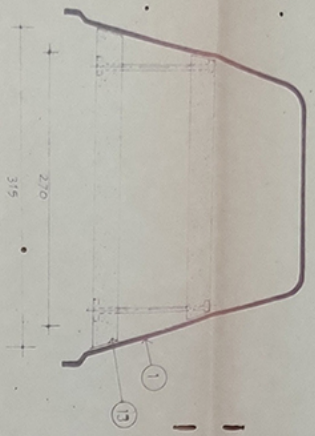
DRAWING 3

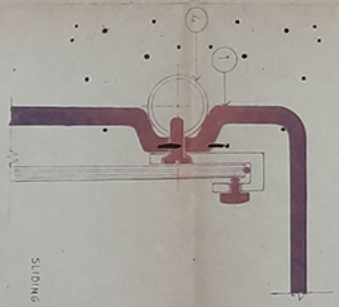
INDUSTRIAL DESIGN CENTRE IIT BOMBAY



BAR & EXTRUSION RACK

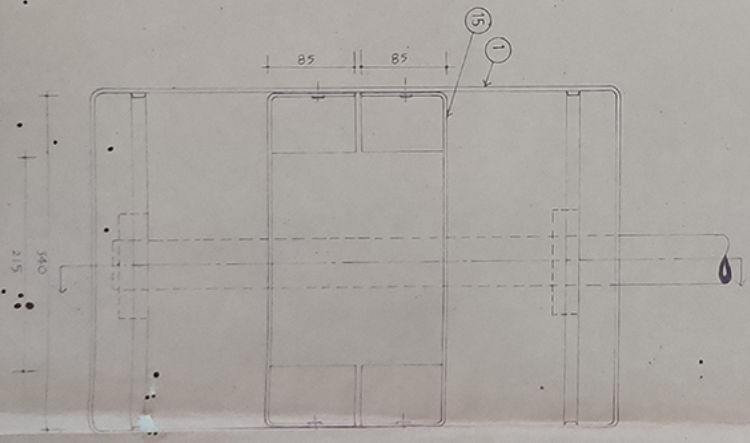


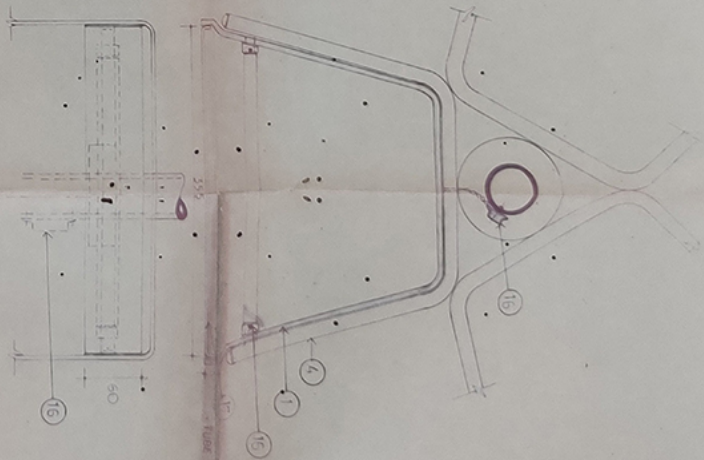


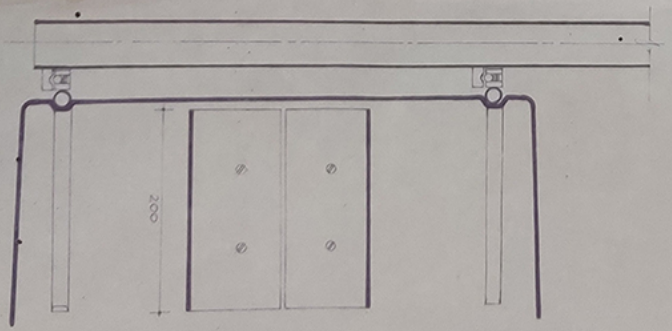


SLIDING PANEL

FIXED PANEL







SHELF FOR SMALL ARTICLES

SECTION AT E.E

NO	DESCRIPTION	MATERIAL	NO. OFF	REMARK
18	COMPRESSION SPRING (NOT SHOWN)	SPRING STEEL	10-15	FOR SHEET SAMPLES
17	TUBE LIGHT COVER PANEL	3 MM P.S.	30-35	USED AS TITLE PLATE
16	TUBE LIGHT FITTINGS			1', 220 V., 50 Hz
15	SHELF	4 MM P.S., H.I. GRADE	100	
14	PANEL	HARD BOARD	300	
13	BAR & EXTRUSION RACK	PLYWOOD (25 MM)	6	SAND FINISH

MATERIALS MUSEUM

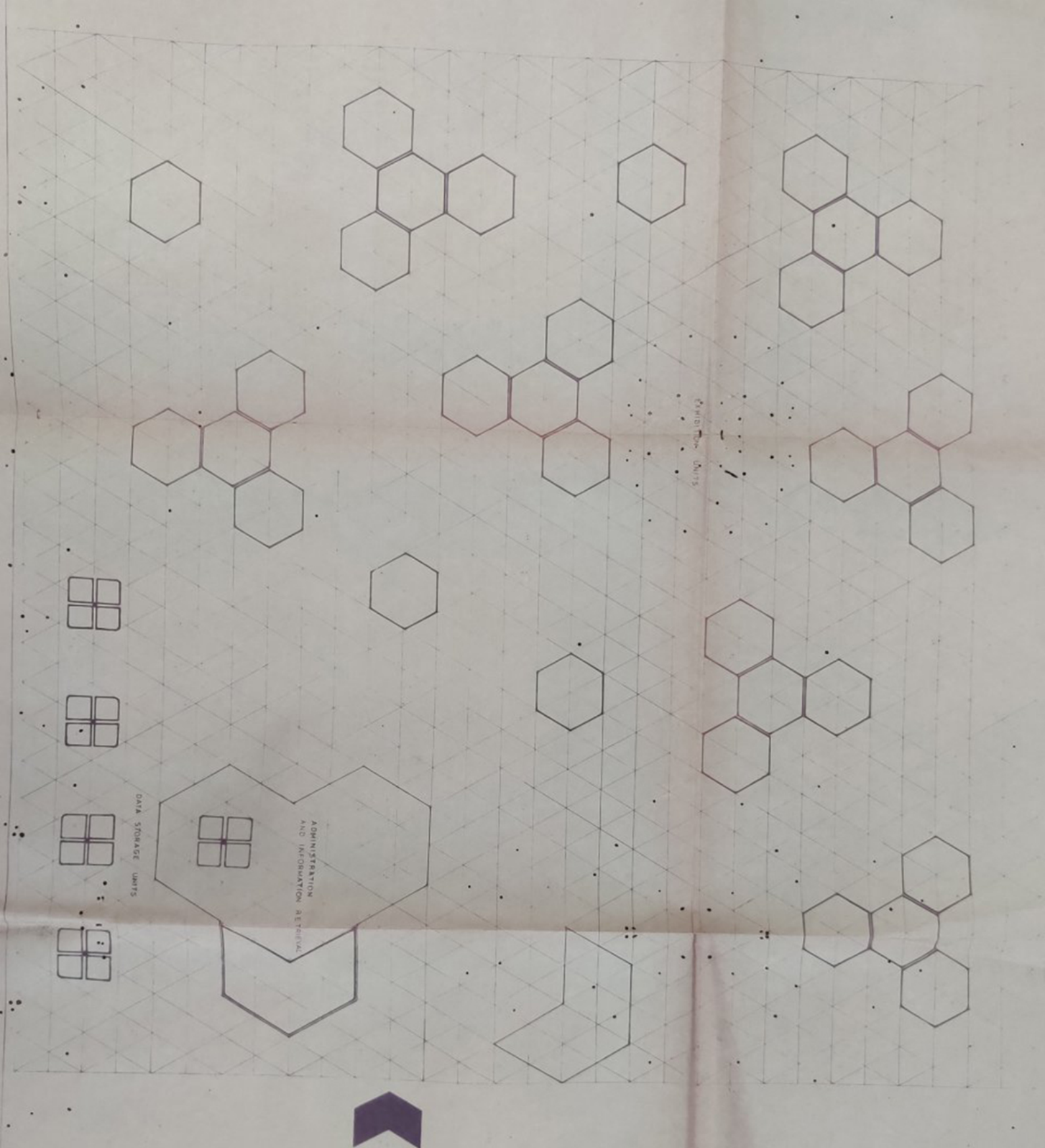
FIXTURES

ALL DIMENSIONS IN MM

SCALE 1:4

VINOD GUPTA	772703
1978-79	VIII
DRAWING 4	

INDUSTRIAL DESIGN CENTRE IIT BOMBAY



MATERIALS MUSEUM

SCHEMATIC	LAY OUT	VINOD GUPTA	772703
SCALE 1 24		DRAWING 5	

INDUSTRIAL DESIGN CENTRE IIT BOMBAY