

DESIGN OF COOKING PLATFORM

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1974

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DIPLOMA PROJECT

COOKING PLATFORM

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Design of Cooking Platform .

Diploma Project

Submitted in partial fulfilment of the
requirements for the postgraduate diploma
in Industrial Design.

by

Sulakshana Oke

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Approval Sheet

Diploma project entitled "Design of Kitchen Platform" by Sulakshana Oke, is approved for the postgraduate diploma in Industrial Design.

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My acknowledgements

Architects from Bombay

Asbestos Cement Products Ltd

Prof: S. Nadkarni

Shri U.A. Athavankar

Shri A.G. Rao

Shri M. Chattopadhyay

Shri M.S.G. Rajan

All staff members of I.D.C.

and

My friends

Guide:

Shri U.A. Athavankar

Co-guide:

Prof. S. Nadkarni

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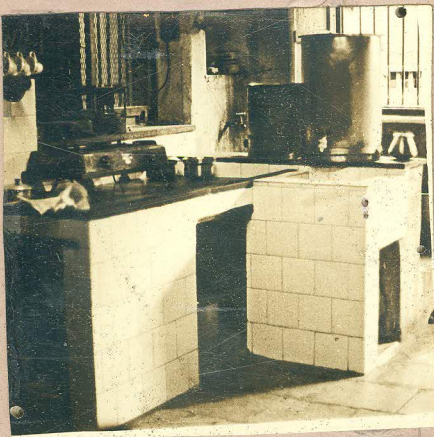
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1. PROBLEM STATEMENT

To design Cooking Platform
for middle class houses

2. INTRODUCTION

The standing cooking platform is not a very new concept in India today. Though it has become very common in upper class people and new housing projects do plan a standing work top, the old style of cooking is as common as before in the lower middle class.



The standing cooking platform has very many advantages. The main advantage is safety. There was a survey carried out by a hospital group in Bombay, few years back to find out the causes of accidents in the kitchen. The results showed that majority of accidents occur where there are no cooking platforms but cooking is done on the ground.

Cooking on ground is not safe for the housewife who has to bend, reach over the stove for shelves. On the other hand it is not safe for young children also.

Besides safety the standing type kitchen platform is found more convenient, the movements are faster and easier. It does not occupy large space which is very important in a city like Bombay where the houses are far too over crowded.

3. INFORMATION

The unit which is to be designed is to be used by the people and families of middle income group having an income of Rs.150/- to 200/- per person per month. The information is collected from such families having strength of 5 to 10 persons.

The important fact to be considered is the availability of the space for such families. In cities like Bombay there is shortage of space and sizes of rooms are very small. The areas specified by the Bombay Municipal Corporation are 80 sq.ft. for Kitchen plus dining and 60 sq.ft. for kitchen where separate dining is provided. Now in these cases where the number of rooms is small and the area of the room is limited, the user likes to make the use such space to its maximum. The small room serves as kitchen and dining in day time and some-times at night the same is used as bed room.

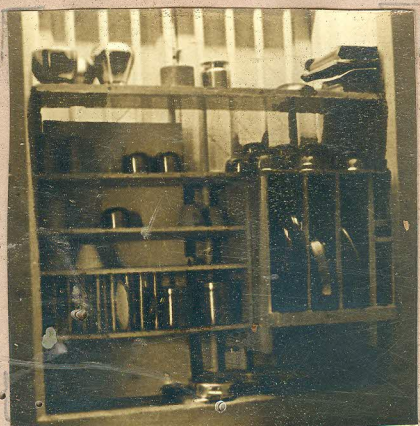
The users are mainly from the following catagories.

1. The dwellers of old chawls. They are provided with a kitchen and one room for each family, and common toilets and baths.

Till now all the platforms are built by individual owners or designers for a particular house only. So the designing and construction becomes very costly.

The above mentioned points show a need for standardized kitchen platform which will be suitable for old as well as new buildings and as it will be made in a factory on large scale and will reduce quite a lot of site work. Also it will be convenient to move, rearrange and transport.

Such a kitchen platform design will find a good place in the middle class houses and provide them an opportunity to have a safe, clean, cheap, modern kitchen.



3.1.3 Washing

A mori or a sink is provided in the kitchen and sometimes both are found.

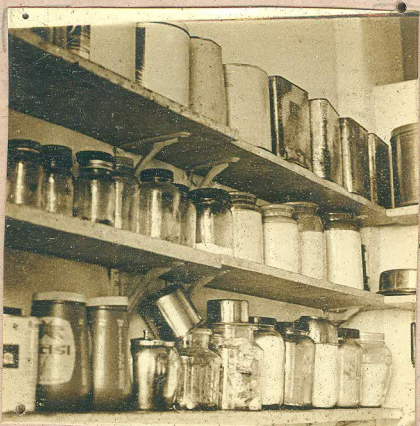
3.1.4 Storage

3.1.4.1 Space for storing utensils, thalies, plates and spoons etc.

3.1.4.2 Containers of eatables, masalas, grain etc.

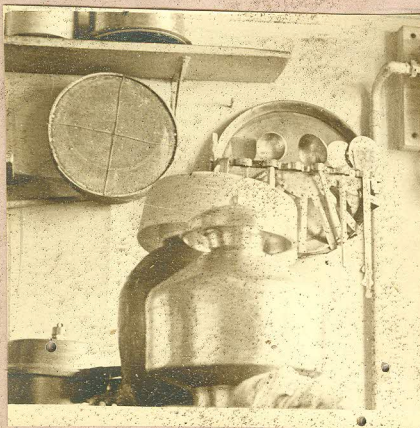
3.1.4.3 Water containers for drinking purposes.

3.1.4.4 Various articles involved in preparation such as graters, sill-batta, cutters, etc.



3.1.5 Reaction of the user to presently available kitchen platforms.

The present units provide a worktop at a height of 70 to 75 cm from the floor level. The width provided is 70 to 75 cm and the space below the worktop is used for storing purposes. There are more shelves and cupboards provided by the owner according to his needs.



In most of the cases it was found that the kitchens are combinations of the new and old style. The actual cooking is done on the platform but all other preparation work is done in conventional fashion on the ground.

2. Housing board colonies
3. Low income group family houses
4. Co-operative housing societies

3.1

In all of the kitchens the room has to accommodate the following activities that are involved with food preparation.



3.1.1 Cooking

3.1.2 Preparation - prior to cooking

3.1.3 Washing

3.1.4 Storage

For all these different types of uses, provision is to be made in the kitchen at convenient places.



3.1.1 Cooking

3.1.1.1 area for keeping burner or stove or sigdi.

3.1.1.2 working area in front of the stove

3.1.1.3 space for the person to stand and move comfortably.

3.1.2 Preparation - following activities are involved in preparation.

3.1.2.1 Cutting vegetables

3.1.2.2 Making paste on ragda or sill-batta

3.1.2.3 Making powder

3.1.2.4 Grating

3.1.2.5 Making butter milk

3.1.2.6 Seiving





The example is of cutting vegetable by wili. The knife is not always used for cutting, but the cutting blade with a wooden plank, on which the person sits is used. Other example is of making paste on a ragda or sill-batta. It may be because that the standing platform provides ease of operation and safety, but the old style gadgets remains same and so also the way of using them.

This combination of the old and new style leads to various problems. The house wife does many things simultaneously like in the morning which is most busy time for her, she does preparations like cutting vegetables, preparing for cooker as well as making tea and breakfast etc. At the same time she has to take care of the work on the platform as well as work on the ground.

All the storage is situated at a height from the floor and cannot be reached by sitting on ground. So, it would be easier for her if all activities could be done in a standing position which will also add to the safety. Certain lengthy activities like making chapaties are better done conveniently in sitting position.



4. ANALYSIS

Introduction

There are various types of platforms found in the kitchens, but analysis is done of the most common types.

4.1 Structural analysis

4.1.1 Main frame structure

The main support of the working top is built in brick work in cement mortar usually 7 to 10 cm thick and built at 1 to 1.5 meters centre to centre. These walls are finished with cement sand plaster with smooth finish and painted either with washable distemper or just white washed.

In few cases the front of the wall is faced with white glazed tiles.

4.1.2 The work top

Most commonly the concrete slab is casted in situ over the supports and finished with various types of material. The terrazzo finish is used for a slightly higher income group people but plain slate tiles and shahabad tiles are cheaper and common. For a very low cost type Indian patent stone finish is laid over the concrete. But it has a very short life and not suitable as the surface becomes very rough with use and is difficult to repair.



Readymade slabs are also available and they are 5 cm thick and of terrazzo finish with a sink casted with the work top. It does not require continuous slab support, but is supported directly on the brick walls.

4.1.3 Washing and drain board

On old chawls a mori is provided in each kitchen at floor level and one side is flanked by a brick wall of height 75 to 90 cm. It is built in a corner and the fourth side is kept open with a small brick wall 10 to 15 cm in height. It is provided with a nahani trap.

All the dado and floor finish is of either sahabad tiles or white glazed tiles.

Where the sinks are built in kitchen they are casted in situ with the work top and finished with tiles.

Porcelene sinks are also used which are supported on M.S. brackets fixed to walls.

A nahani trap is always provided under the sink. The floor level under the sink is made 3 cm lower than rest of the floor.

No special drain boards are provided in case of mori and in case of a sink the work top itself acts as drain board.

4.1.4 Cupboards

Storage of utensils and containers.

This is provided by shelves made from wooden planks 1.5 to 2.5 cms thick and 25 to 30 cms wide. They are supported on wooden or M.S. brackets fixed to the wall. Mostly no shutters are provided for storage space.



One small compartment with well ventilated shutter is required in each house. Metal grill is fixed to the wooden frame of the shutter to provide ventilation.

The M.S. angles and slotted angles are also used for forming shelves which are readily available. In such cases, the height of the shelves is adjustable.

Storage of water.

There are various types of containers used in the kitchen. They are of brass, copper, aluminium, plastic or earthenware pots etc. They are kept near the sink of mori and some are provided with a water tap.



4.2 Functional analysis

4.2.1 The brick support

The main function of brick supporting wall is to provide height for the working top and transfer the loads from worktop to the main floor.

Subsidiary function - to provide support for shelves below the worktop and also for the shutter, (if any) frame of the shelves.

4.2.2 Work space

Function:

Provide sufficient area for working to the house wife for day-to-day cooking. It provides a clean, smooth surface which can be washed every day and is long lasting. It provides space for burners or stove, preparation and acts as a multipurpose area at various times.



4.2.3 Sink and Mori

A sink or a mori provide a place where washing in the kitchen work is done.

Washing of utensils

Washing of grain and vegetable

Washing hands

The water from worktop is drained into it. It also provides space for used utensils before they are washed.

Though the sink and mori both provide for same function, the mori has sometimes additional purpose, particularly in chawl system. It is used as a bath room in many cases where bath rooms are not provided for each tenament.

The short wall enclosing the mori functions as a space for storage of water utensils. Both mori and sink provide a smooth clean surface which is easily washable.



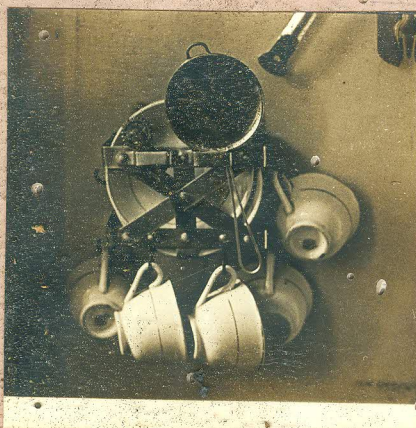
4.2.4 Capboards

The function of the storage space is to provide the area for various articles used in the kitchen. They are -
storage of utensils, spoons, thalies
storage of various size containers
storage of vegetable
storage of readymade food
storage of water container, etc.



4.2.5 Dado

The function of dado is to provide an easily cleanable and washable surface behind the stove. It protects the plastered wall from oil stains etc. and give a clean appearance.



4.3 Ergonomical analysis

4.3.1

The worktop of a platform is found many times not at a correct height and the working at such heights lead to awkward postures and many times it is difficult to work on them.

4.3.2

The usual width of the platform provided is 70 to 75 cms. The stove or gas is kept near the wall and many times when the operations are continuous for a long period like stirring, frying etc. This leads to pain in arms and it becomes difficult for the women to see the preparation.

4.3.3

The shelves provided below the platform are at a very low level and it is difficult to bend and reach for the articles without sitting on the ground.

4.3.4

The depth of the shelves below is not easily accessible and many times to reach it is very difficult for the house wife.

4.3.5

Sometimes shelves are provided above the gas and to reach it is not easy and also not safe.

4.3.6

Many times many activities are done sitting on the ground. But for the other purposes house wife has to stand and work like reaching for storage etc. So, the sitting and getting up is very unnecessary and tiresome. Besides, each activity has its own problems like cutting operation on a wili. The person has to sit on the ground and has to bend too much to carry out the operation.

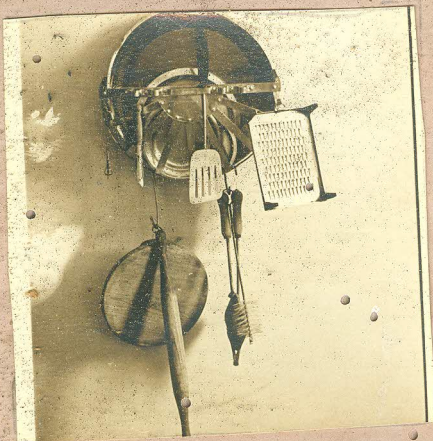
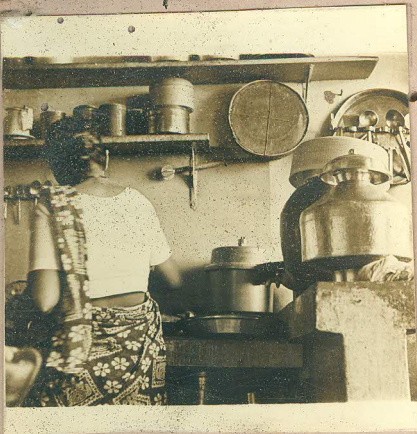
Similarly, grinding operation on sil-batta is better done in a standing position than sitting on the ground as the person has to bend. Sil-batta is very heavy and is to be moved every time from its storage space and to the washing place.

4.4 Formal analysis

In any of the present kitchens very little thought is given to the total appearance and relation of various units to each other. The shelves appear on any of the wall surfaces, wherever there is space available on the wall. They are not of uniform height, length or width and there is no uniformity of the material. Cupboards are placed anywhere near the wall surfaces and they are of any size, shape and material. There are wooden cupboards as well as one might find open steel shelves. Some are provided with shutters while some are left open.

The cooking platform is just a worktop with open shelves below. Sometimes shutters are provided for certain parts and they have no relation to other units in the kitchen.

The display of various things add to more visual confusion. There are various types of articles in the kitchen, of metals, plastic, stone, steel, wood, etc. They are displayed by open shelves. Nails and hooks are put anywhere on the walls, shelves etc. to hang various articles and so the total kitchen is the exhibition of complete disorder.



The total appearance of the kitchen is not clean and pleasant. It always looks in formal disorder and confusion.

There is hardly any thought given to the choice and relation of various colours, textures and material as well as form. So, the kitchen looks rather unpleasant and untidy.

4.5 Economical analysis

The design particularly has to serve a middle income group of people, where income per person is Rs.150/- to 200/- per month and the design cost shall be such that it is within their reach.

The architects provide Rs.200/- to 250/- for the construction of kitchen platform in new buildings. It consists of a slab with tile finish and shelves below. A sink is provided along with it. The usual length of the platform is 2 to 3 meters.

Extra storage facilities and shutters for shelves below the worktop are to be provided by the owner himself and he has to spend another Rs.200/- to 300/- for such items. So the total cost of the kitchen platform plus cupboards is Rs.400/- to 600/-.

So, the cost of new design should not exceed Rs.600/-. Though the figure seems to be some what higher, it is justifiable because of its better appearance and extra facilities.

4.6 Sociological analysis

At all times the kitchen is a very important place in any house. Though the main purpose of the kitchen is to provide area for food preparation and cooking, there are various other activities taking place in kitchen. Various changes were observed in the types of activities at different times.

Few years back there used to be very large families and so the houses used to be very large with the totally different outlook in planning than today. The work the lady used to do was limited to the kitchen only. In fact, kitchen used to be a common room, a retiring room for the ladies. There used to be many women working in one kitchen. So, the size of kitchen was very large.

But today as we see the old joint family system is completely broken and the houses shrank in sizes. There was now no need for the kitchens to be large. The work sphere of the women increased and there was no need for them to limit themselves to the kitchens only. The complete house took a new appearance and there are now special bed rooms for retirement and ladies are not limited to the kitchen only.

The style of kitchen work is also changed from old times. The sigdi and chulla are outdated and their space is taken by new pressure stoves, gas burners etc. Before all the work was done on the ground while today people find advantages in standing kitchen platform.

Though the appearance of the kitchen has changed considerably from old kitchens, certain activities are not changed. Certain new activities connected to new products are introduced in kitchen. In cities like Bombay, dwellings are becoming small in sizes, and the use of one room is made differently at different times. The kitchen itself provides area for dining, washing, storage also. At some places like chawls in Bombay, it is also used for sleeping at night. There are no separate bath rooms provided, so the mori in the kitchen become a bath room. It also becomes a sitting room for ladies, guests.

In fact, the kitchen has become an important place in the house. It is also an area which ladies like to keep clean and neat. A well designed and modern kitchen become a prestige point in the house.

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5. HYPOTHESIS

5.1

The cooking is to be done in standing position, and for this purpose worktop should be provided at a correct height for comfortable posture during the work.

5.2

The worktop should accommodate the stove or gas burner and it should provide a working area in front of the burner.

5.3

The surface should be smooth and should be easily washable. It has to sustain the stains of oil, acid etc. and it should resist the heat without affecting the surface finish.

5.4

Work surface should withstand a uniform load as well as certain impact loads.

5.5

There should be dado provided at the back to protect the wall from oil stains. It should also be easily cleanable.

5.6

Space for preparation articles used in kitchen and working space around them should be provided.

5.7

All preparation activities should be made in standing position.

5.8

Storage cupboards - storage depth below the cooking platform should not be very deep. It should be easily accessible.

5.9

The storage accommodation should be flexible to accommodate the containers of various sizes.

5.10

No storage should be provided above the burner where the person has to bend over the burner to reach it.

5.11

A small sink is to be provided in case there is no mori provided in the kitchen.

5.12

The whole system should provide the flexibility of arrangement to suit various layouts of the kitchens.

5.13

The system should provide a clean, neat hygienic appearance and it should appear as one integrated unit in the kitchen.

6. SYNTHESIS

6.1 Height of the cooking platform.

For ease of working correct height of the platform is very important. The average comfortable height found for the Indian women is 70 to 75 cms. The worktop is to be at the level of elbows so that arms remain at comfortable position and women can work for a long time without fatigue.

6.2 Width of the platform.

When a house wife works in a kitchen, most of the work is associated with the stove or gas burner. So, the width provided can be such which accommodates the stove and leaves space in front of it for working.

6.3 Surface finish

The smooth easily cleanable surface is a must in the kitchen platform. There can be various materials used to get a smooth, clean and long lasting surface. Various types of natural stone slabs can be used. Other finishes like in-situ mosaic finish can be given. Other new plastic materials like fibre glass can also be used which is also light in weight. There are other materials like asbestos cement sheets with vitrious enamel finish can also be used with many advantages.

6.4 Qualities of surface finish.

The surface should take various types of loads and should not crack or give away its surface qualities. Stone slabs are very strong and so they can be safe to us. Other materials like mosaic can also provide the required strength. All the natural stones have one quality in common. They resist heat very effectively in normal kitchen and are fire-proof. They do not get cracked and are easy to clean. But they are quite heavy and requires strong supports. Fibreglass can be used which is very light and has good moulding qualities and good surface finish, but is quite costly. Asbestos cement can also fulfil the requirements of the surface finish of the worktop.

6.5 Dado

The surface of the wall behind the stove is to be protected from the oil stains etc. upto a certain height. This can be obtained by giving a similar treatment as the worktop to the wall behind. Tiles like white glazed or slate can provide a good dado, but is to be constructed on the side. Dado can be moulded along with worktop in material like fibreglass and asbestos cement and given same finish.

6.6 Storage cupboards

The depth of the storage cupboards can be reduced so that all of the shelves are easily accessible and the space can be saved if their depth is limited to 45 cm only.

Various arrangements for various types of articles can be provided in these cupboards to accommodate them in a particular way like stacking of thalies etc. or hanging of various articles.

Shutters can be used very effectively if they are designed to accommodate lighter and smaller articles. Shutters can also provide effective cover for the storage area to avoid display of articles and protect them from dust and dirt. The shelves of the cupboards can be made adjustable so that various types and sizes of containers are stored properly and the user can adjust them according to his needs.

6.7 Construction of platform.

Uptill now the kitchen platforms are built on the site itself and they are designed individually. Though every house has different needs of the kitchen platform there are certain common factors or one can say that there are certain minimum requirements of all the kitchens which are to be fulfilled.

One can think of making the kitchen platforms in a factory which can be just installed in the kitchens. They can be made of lighter materials and certain parts can be made in standard sections and assembled on the site or otherwise they can be completely assembled and produced in factory and installed in the houses like furniture pieces.

There is no uniformity in the planning of kitchens. Each kitchen is different in size and shape than the other. So the design can be made in such a way that various arrangements of working area, storage cupboards etc. are made possible. The user can have the choice of planning his own kitchen to certain extent according to his requirements.

The requirements of one user also cannot remain same at all the times. When need of more storage area or working area is felt, it can be fulfilled by having facilities of its growth without affecting the total appearance and uniformity of the design. The growth of the kitchen can be systematically planned without hampering the total appearance of the kitchen.

6.8 Transportation of kitchen platform.

Though the idea seems to be quite new, it can be made possible for people to carry the platform to one place to other when they change their residences. This can be just like transporting furniture which is moved and rearranged in the new residence in a different way. This can be useful for the people who have to change the houses quite often. It is not always that facilities are provided for individuals in all the kitchens. But if the platform can be moved from one place to other the needs of the family can be fulfilled at all the times and as the design has flexibility of arrangement, it can be accommodated in almost any size and shape of the kitchen plant.

6.9 Cost factor

The platform can be made cheaper by choosing correct material which will fulfil all the needs as well as be cheap in initial cost as well as assembling. The mass production of the platforms can reduce the cost to certain extent and also the design cost can be reduced by standardising certain factors. The cost can also be reduced by using standard, easily available sizes and shapes of material.

The supervision and construction cost on the site can be reduced if the production is made on large scale in the factory.

6.10 Quality of product

Quality of kitchen platform can be maintained and checked if they are made in factory.

This can result in lesser maintenance cost to the customer at later stage.

7. DESIGN SOLUTION

7.1 Size of kitchen platform.

Height: The most convenient average height of the platform is considered for the design. The height of the worktop is decided to be 75 cms from floor level.

Length: The kitchen platform is made in smaller length units which can be joined together to get required length. Each unit has a length of 75 cms because normally one dimension of kitchen room is found 300 cms. So four units can fit into the kitchen along the wall.

Width: Each unit occupies 45 cms width on the floor. Extra 30 cms width of worktop is obtained by pulling out a flat drawer which gives a total effective width of 75 cms to the worktop.

The depth of the shelves below the worktop is automatically reduced to 45 cms only. The shelves can be adjusted into height very easily as required.

Dado: 30 cms high dado is provided behind the worktop which is of the same material. The dado is of same length as the unit.



7.2 Materials

7.2.1

Worktop: Asbestos cement sheets 1.5 cm thick which are specially moulded are chosen for the worktop. Dado is also moulded with it. The surface is treated with vitrious enamel finish which gives a smooth surface to asbestos. This finish is to be sprayed on the asbestos cement surface and then fused in a furnace at high temperature. This leaves a thin film of enamel on asbestos cement surface making it smooth, impervious to water, acid, oil and alkaliproof as well as scrachproof. The pullout worktop is also made from same material and finish.

Asbestos cement is comparatively cheap and light material than stone or laid in situ work surfaces. As the size of each unit is 45 x 75 cms the worktop can be easily handled by one person.

7.2.2

Structure: The material chosen for structure is M.S. sections which are readily available. The main frame structure is built up of angle irons, welded to join together.

7.2.3

Shelves: Shelves are made from M.S. grill, which is readily available and ends are welded to angle iron frame.

This shelf is to be dip coated with P.V.C. making it rustproof.

Shelves attached to door frames are made from M.S. press sheets fixed to angle iron frame which is then fixed to shutter frame.

Arrangement of hooks is also made behind the shutter.

7.2.4

Shutters of the cupboard: Shutter frames are made from M.S. angles and asbestos cement sheets 5 mm thick are fixed to them.

7.2.5

Finish: The worktop is finished with vitrious enamel.

The angle iron frames are painted with oil paint.

The shutters are painted with oil paint or distemper.

7.3 Main features of the design.

7.3.1

The design of the platform consists of various units. They are

cooking unit

preparation unit

sink unit

storage unit

Each of the unit is independently built up.

All the units have M.S. angle frame and glazed A.C. worktop fixed to the frame. These units can be joined together to form a continuous worktop. Various arrangements like 'L' shape, 'U' shape or straight are possible.

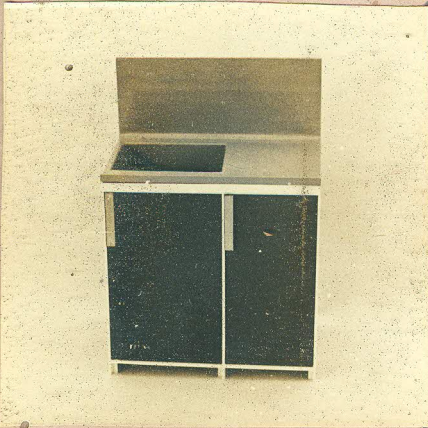
The customer can choose the units and arrange them in the kitchen. They provide flexibility of arrangement and are suitable for any size and shape of the kitchen.

7.3.2

Each unit is 75 cms in length and 45 cms in width. There are pullout worktops provided for cooking, preparation and storage units which provide 30 cms of extra width whenever necessary.

7.3.3

The arrangement of pullout worktop reduces the floor space occupied by the platform to 45 cms only.

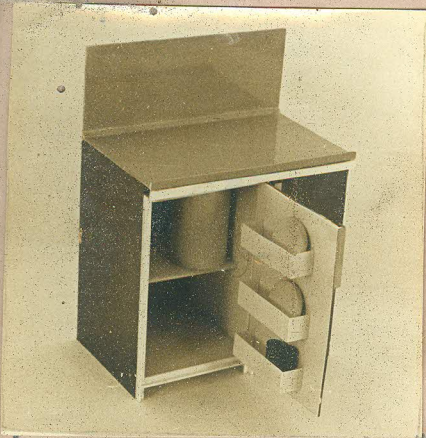


7.3.4

The width is only 45 cms, so the depth of shelves below the worktop is reduced and now it is easily accessible.

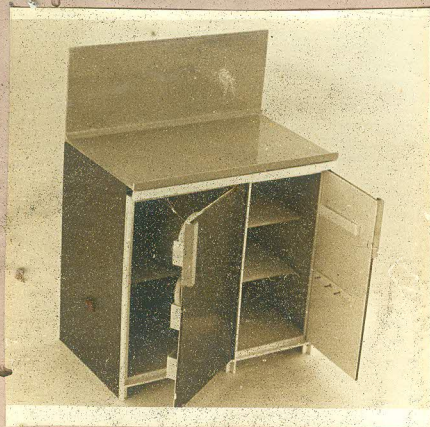
7.3.5

Shutters are provided for all the compartments below the worktop. So, all the articles stored in them remain closed and saved from dust collection.



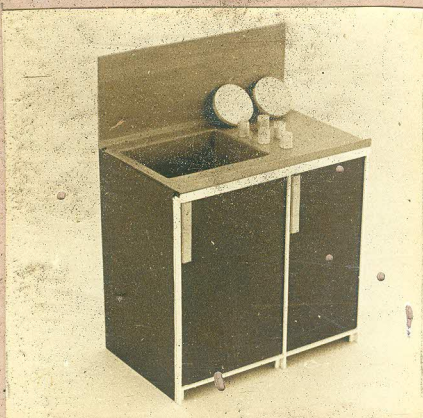
7.3.6

Inside the shutters, various attachments are provided, so articles can be hooked, thalies can be stored as well as smaller and lighter containers can be fitted into them.



7.3.7

Worktop is made up of 1.5 cm thick A.C. with a back dado of 30 cms height. It is treated with vitrious enamel finish which makes the surface smooth, clean and easily washable. It is free from oil and acid stains. The material is comparatively light in weight than any other material and also cheap.



7.3.8

The sink is also moulded in A.C. and treated similarly. This provides uniformity of the surface. Various colours can be given to the worktop.

7.3.9

The A.C. surface treated with vitrious enamel is heat resistant, fireproof and impervious to water. It doesn't scrach and so is long lasting.

7.3.10

The frame is of M.S. angles which occupies minimum of space and is not visible. The whole structure is light in weight and strong.

7.3.11

The shelves can be arranged to required heights according to customers' choice.

7.3.12

Customer need not buy all the units at one time, but he can buy them in stages according to his convenience, still maintaining the character and uniformity in kitchen.

7.3.13

The whole system is very safe as the materials like M.S. and A.C. make it fireproof.

7.3.14

The shutters provided for the cupboards give a neat and better appearance and hides the articles.

7.3.15

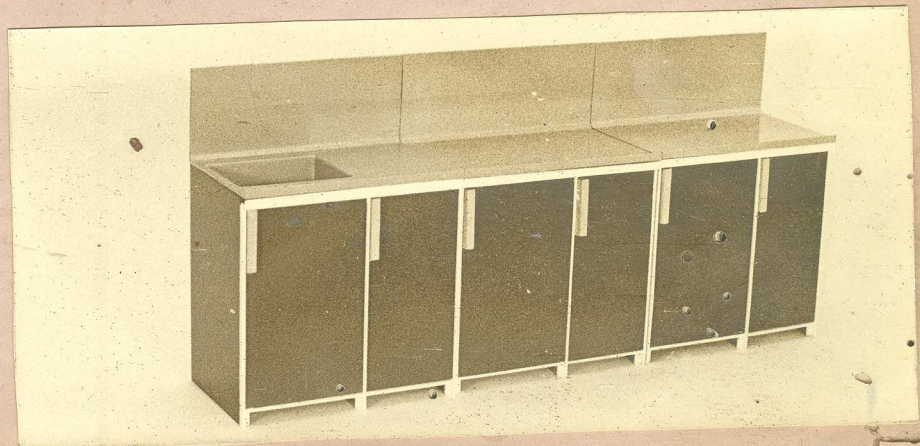
Simplicity of the structure is an important feature of the design. Design is based on modular system. It is simple to install, remove and rearrange. All the units are of standardised sections, so the manufacturing is also simple.

7.3.16

As the design is made for mass production, the standard shapes and sizes reduce the cost of designing and manufacturing. Material used are also cheap still they provide various extra advantages. The customer needs no skilled worker to install it, but he himself can install the platform like any other furniture pieces.

7.3.17

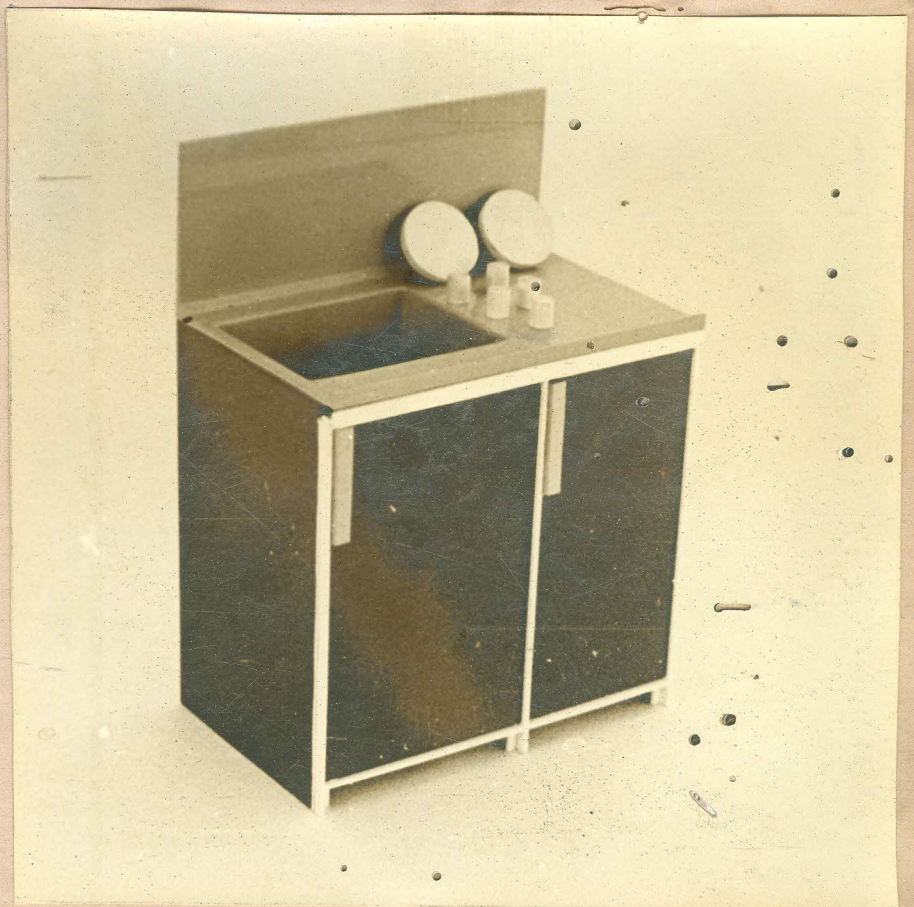
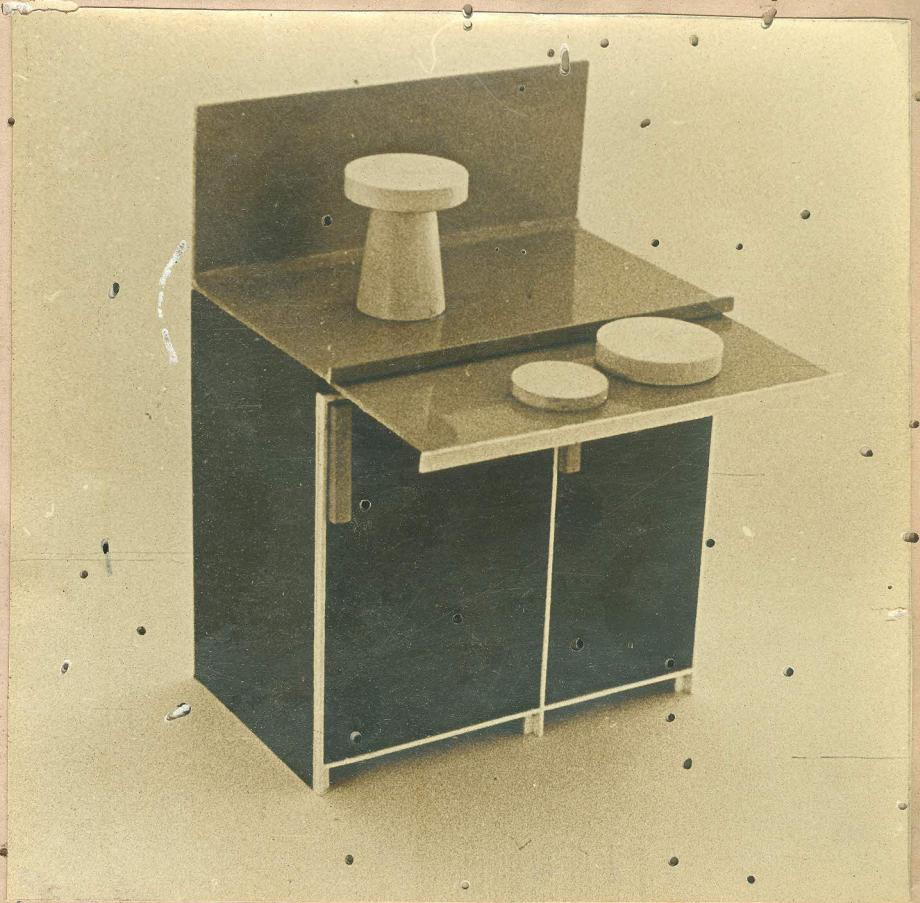
The use of M.S. and A.C. makes the design strong and durable.

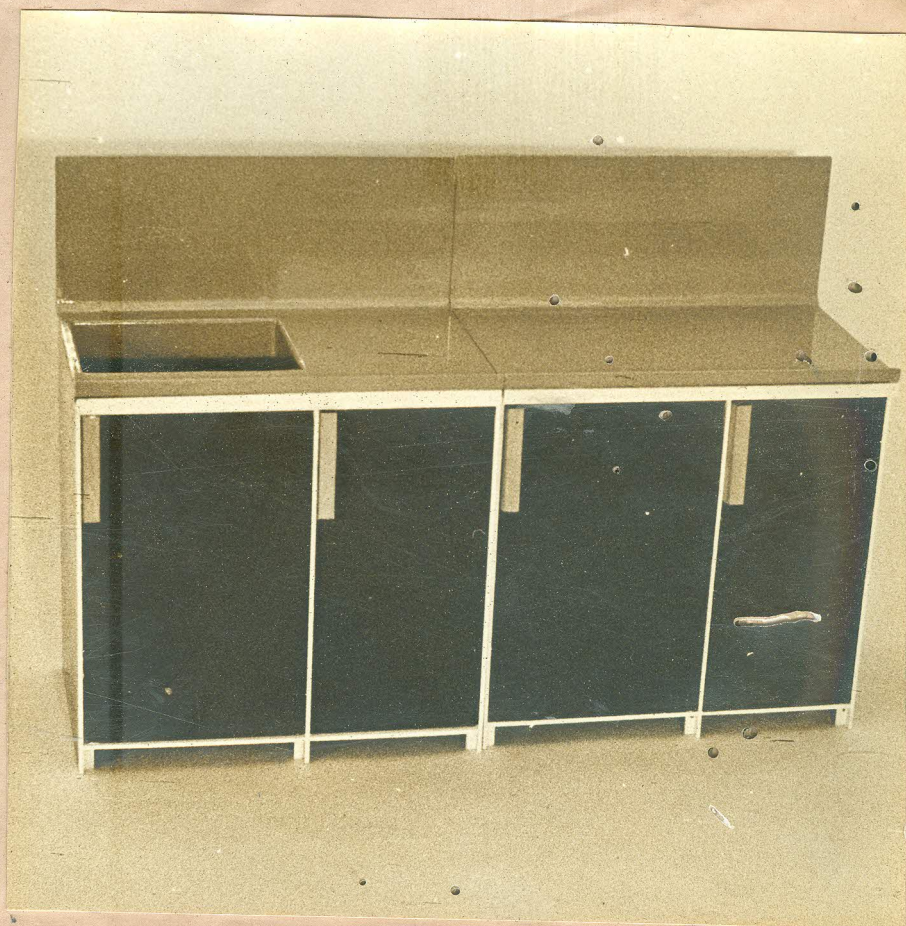
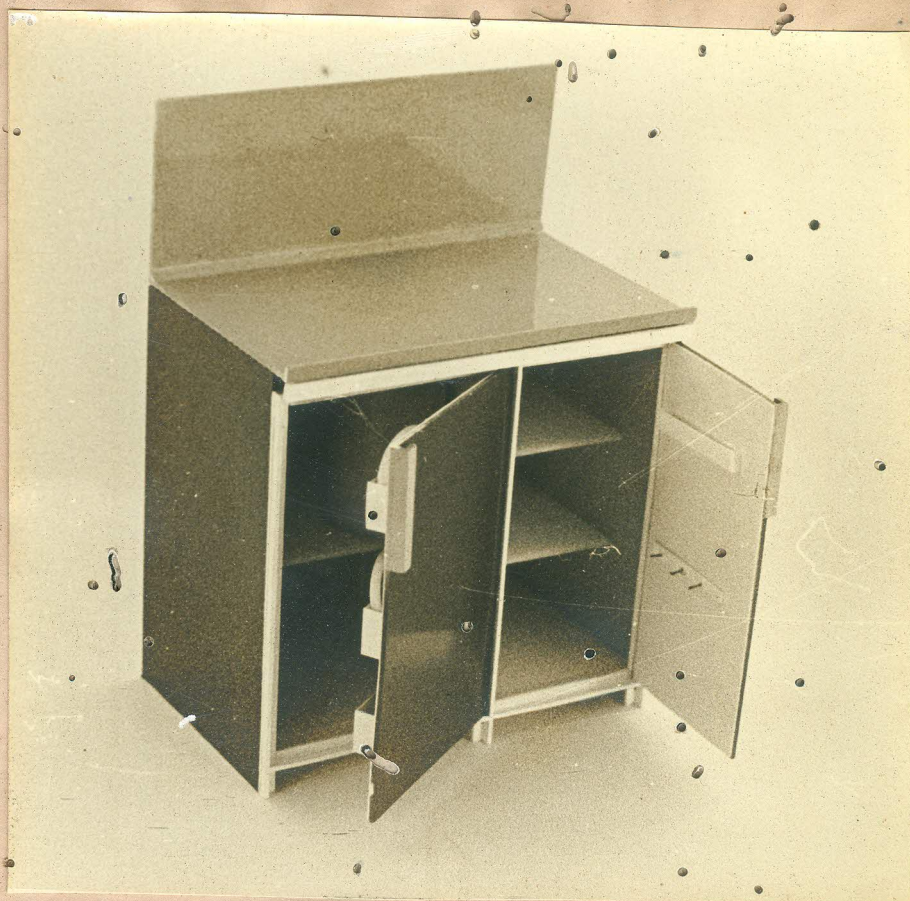


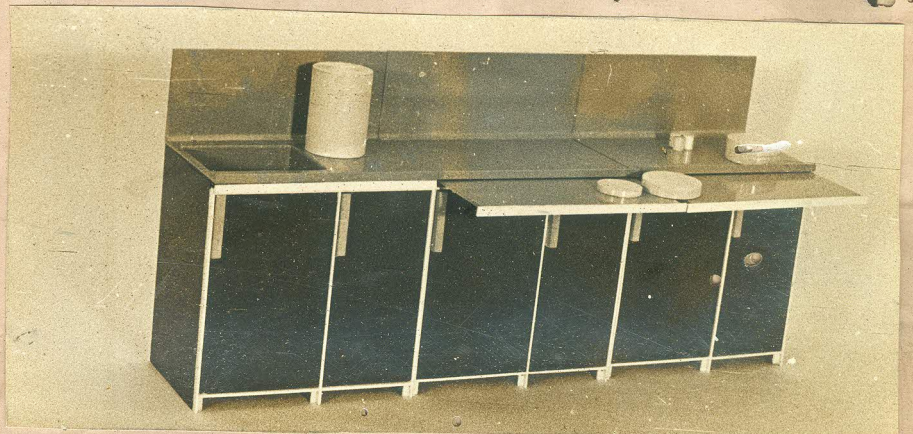
8. COMMUNICATION

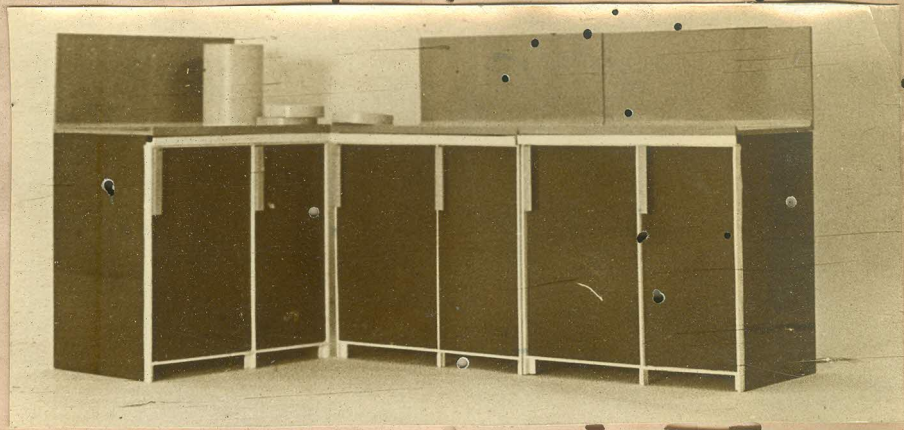
- Photographs

- Drawings









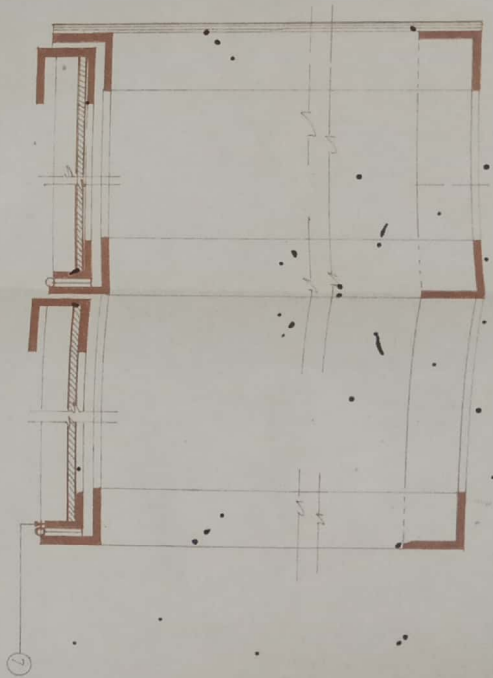


DIPLOMA PROJECT	COOKING PLATFORM
ASSEMBLY	SULAKSHANA OKE
ALL DIMENSIONS IN MM	S-9227 FOURTH BATCH
SCALE 1:10	
INDUSTRIAL DESIGN CENTRE	1,1.T. POWAI.

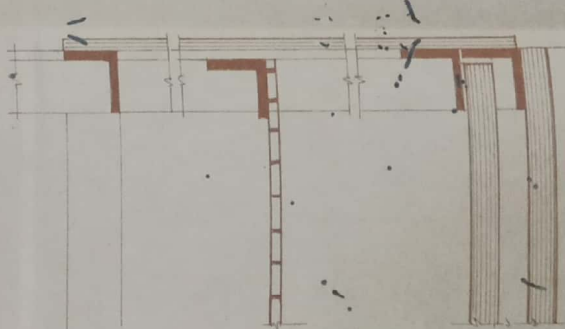
PLAN



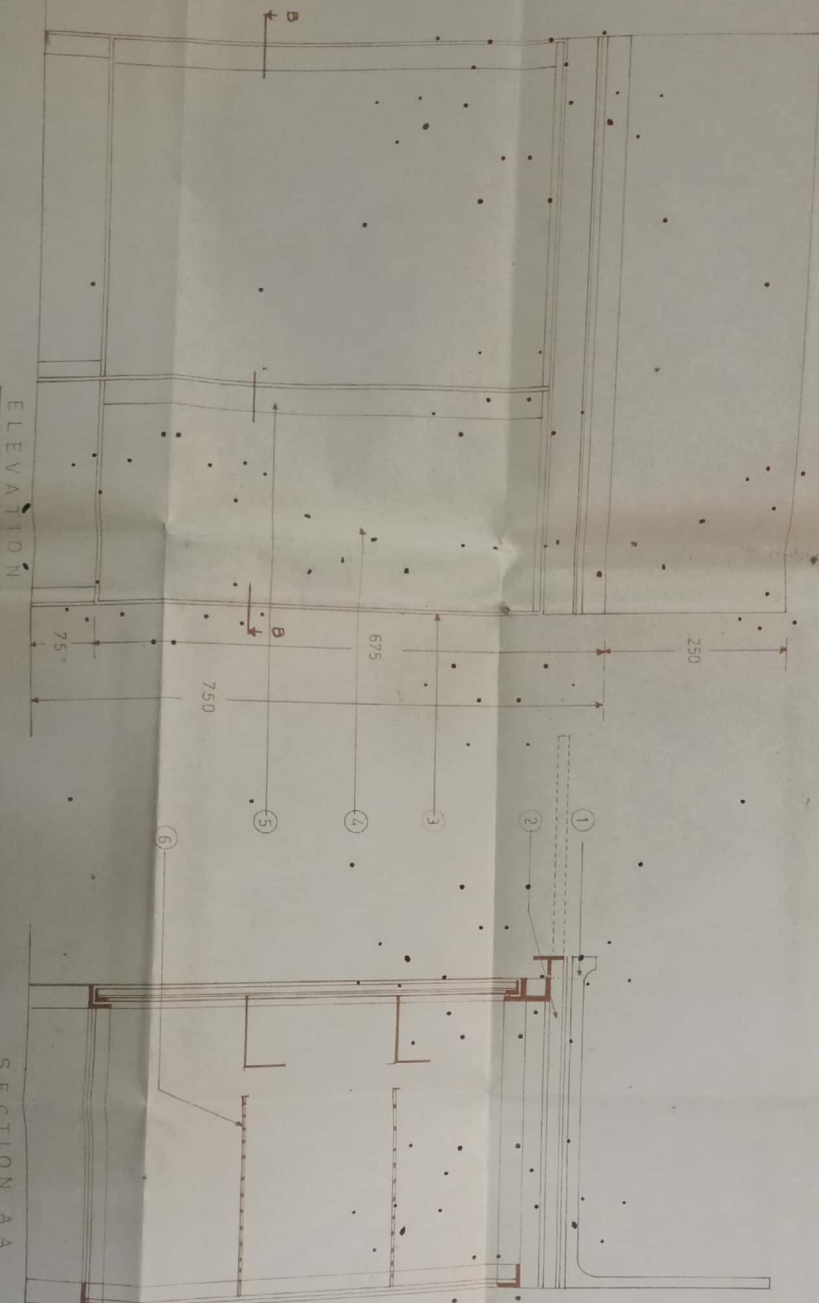
DETAIL SECTION B B



DETAIL SECTION C C



ELEVATION



SECTION A A

NO	DESCRIPTION	MATERIAL	FINISH
7	SHUTTER FRAME	M.S.	PAINTED
6	ADJUSTABLE SHELF	M.S. GRILL	P.V.C. COATED
5	HANDLE	M.S.	PAINTED
4	SHUTTER	A.C.	PAINTED
3	MAIN FRAME	M.S.	PAINTED
2	PULL OUT WORKTOP	ASBESTOS CEMENT	VITRIOUS ENAMEL
1	MOULDED A.C. WORKTOP	ASBESTOS CEMENT	VITRIOUS ENAMEL

DIPLOMA PROJECT COOKING PLATFORM

DETAIL : TYPICAL UNIT SULKASHANA OKE

SCALE 1:5 S - 927 FOURTH BATCH

ALL DIMENSIONS IN MM

INDUSTRIAL DESIGN CENTRE I.I.T. POWAI

