

OPERATIONAL SYSTEM IN A
COMMERCIAL HOTEL KITCHEN

INVESTIGATION REPORT
CHARLES AMUTSAMA
YEAR FIVE
SESSION 1978 / 1979

CONTENTS

PREFACE

GENERAL

- (i) Customer Influences
- (ii) Sections of the Operational System
- (iii) Space Requirements
- (iv) Grouping of Equipment.

SECTIONS OF THE KITCHEN

- (i) Goods Receiving Area
- (ii) Food Storage
- (iii) Food Preparation
- (iv) Food Cooking
- (v) Servery.

ANALYSIS OF KENYA UTALII HOTEL KITCHEN SYSTEM

- (i) Flow Routes
- (ii) Activities and Equipment
- (iii) Finishes

PREFACE

The idea in carrying out investigation on operational system in a commercial hotel kitchen has been basically to understand more about what goes on practically in the kitchen as a central food production unit from the time food ingredients enter the system until the final assembly of food ready for service. The investigation has further aimed at establishing as a consequence, the requirements within the operation in terms of space, equipment and finishes.

I wish to give most gratitude to Mr. H. Graedel (Head of Engineering Department) and his colleague Mr. Gerard M. Rossier (consultant on kitchens), both of Kenya Utalii College, for their cooperation in making it possible to get practical information.

Supplementary information came from kitchen tours of :-

- (1) Serena Hotel Nairobi
- (2) Pana Afric Hotel Nairobi
- (3) Intercontinental Hotel Nairobi
- (4) Kenya Utalii Hotel Nairobi
- (5) Sunset Hotel Kisumu

and also from reference books, particularly Hotels, Restaurants, Mortels and condon^{mi}iums by Lawson and Principles of Hotel catering by Lawson.

GENERAL INFORMATION

Kitchen operational system or food production process in a hotel kitchen is subject to the following customer influences

(a) Eating habits:-

Brought about mainly by pressure on time under which most customers choose self service or bar service rather than waiting at table. These situation necessitates shorter and less formal meals, quicker service and greater flexibility in meal times.

Equipment is chosen for speed and convenience in use and is based on grilling, frying and microwave processes of accelerated cooking and mounted as back-bar units within or adjacent to the dining area in order to save space and time in service.

Examples:- Small bain - marie, griddle plate, griller or toaster, a deep fat fryer, microwave oven, refrigerator for perishable food and a sink with hot and cold water.

(b) Flexibility of Use:-

Due to reduced use of dining room facility by residents at lunch and dinner, many city centre hotels find it necessary to attract outside custom and this is to some extent achieved by introduction of speciality restaurants, buttery bars, coffee shops and small dining areas with associated service kitchens in addition to the central food production unit.

SECTIONS OF THE OPERATIONAL SYSTEM IN CENTRAL FOOD PRODUCTION UNIT

Flow Routes:-

Meal production is a production process with the food passing through a series of stages described as flow routes which follow in sequence from the supply of raw ingredients to the final assembly and service of meals:-

Careful planning of flow routes is necessary:-

- (a) to ensure that correct facilities are available in their appropriate places and
- (b) to reduce the risk of congestion and obstruction by avoiding routes crossing each other.

Secondary Circulation: Involves disposal of waste, collection, washing and reuse of utensils.

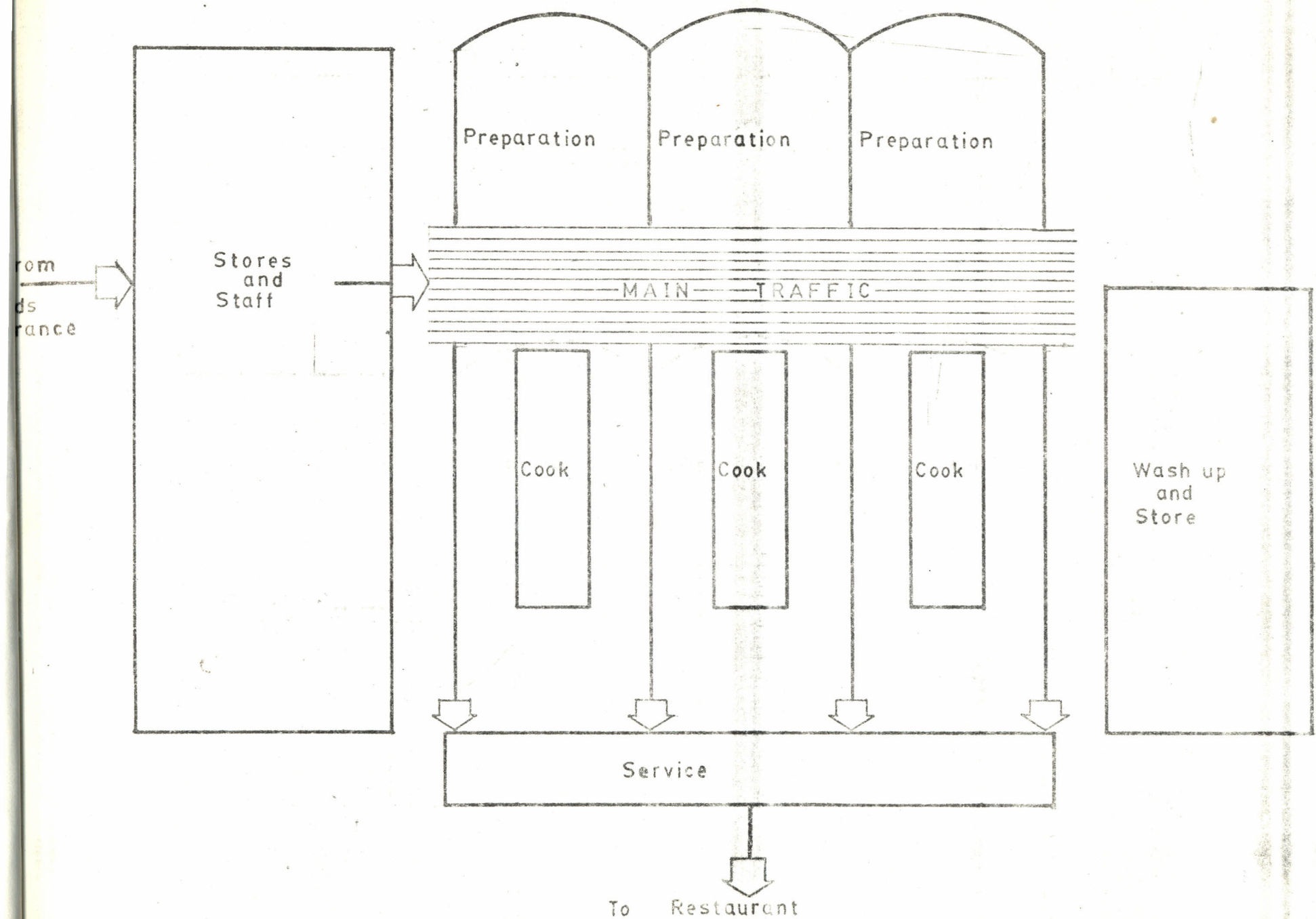
Waste and refuse are generally taken out through the goods entrance in an opposite direction to the flow of food.

Food Utensils are in two groups:-

Kitchen utensils - for preparation, cooking and serving Pan wash.

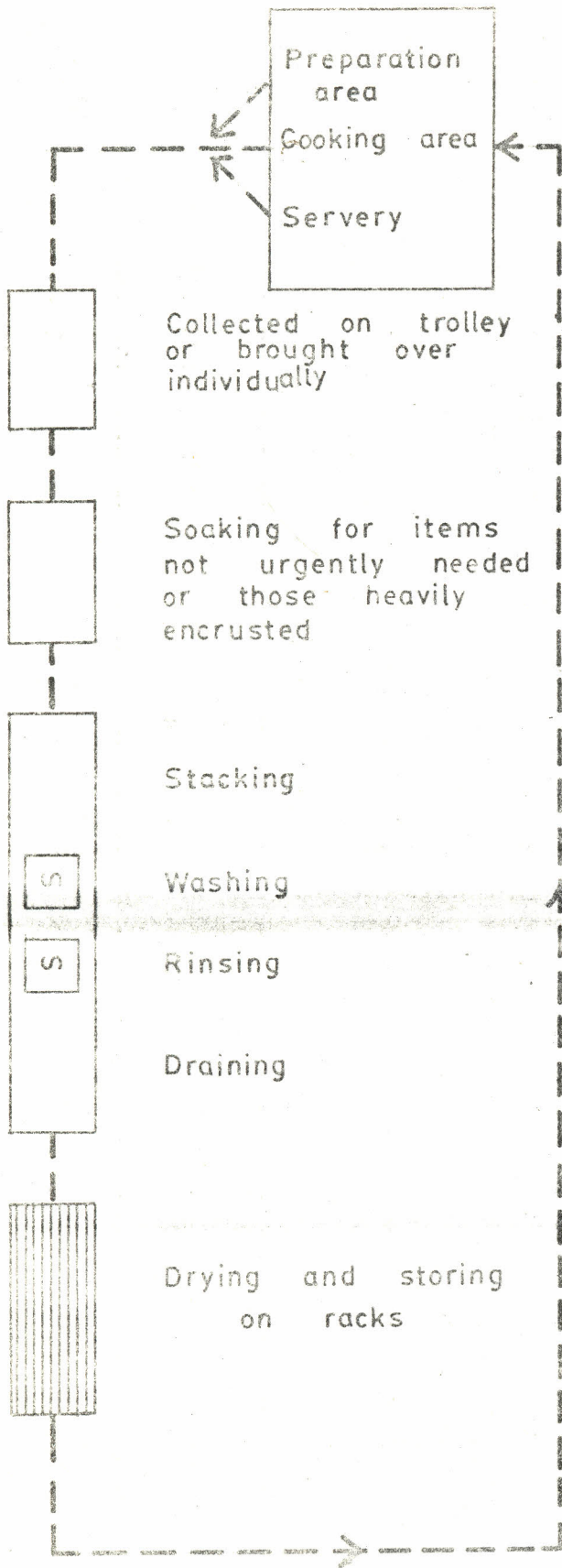
Dining room crockery and cutlery -

In each case, utensils are stored at the place where they are to be used.

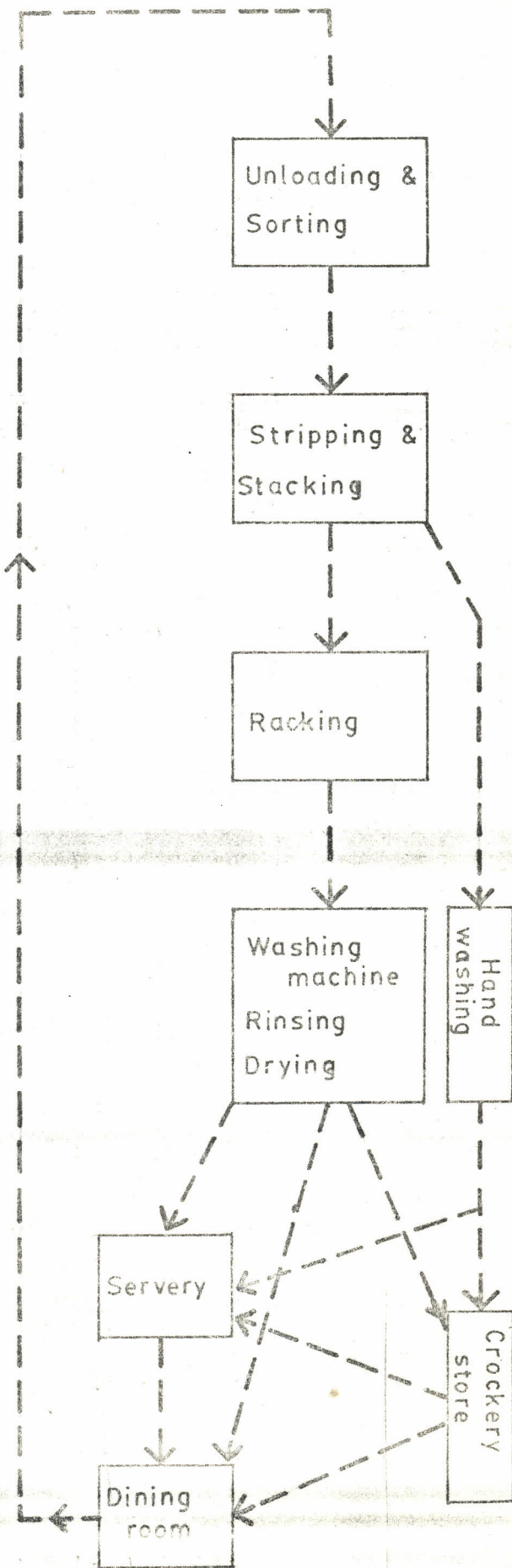


KITCHEN LAYOUT SHOWING MAIN TRAFFIC ROUTES

SEQUENCE OF POT-WASH ACTIVITIES



SEQUENCE OF WASH-UP ACTIVITIES



The independent processes occurring in different sections require different amounts of work and take different times to complete and therefore equipment is required not only for preparation but also for accumulating and temporarily holding food in separate stages of preparation. The equipment and facilities used for related operations at each stage in the preparation of a meal are grouped together into "work centres" designed to provide most convenient, compact and economical arrangement possible so that the minimum amount of effort and time is expended by the employees working in that area.

(3) SPACE REQUIREMENTS:-

Two main demands for space:-

- (1) Equipment and utensils:- size of space depending largely on the amount of equipment installed. Overcrowding and congestion may arise from overgenerous provision of equipment, retention of equipment which is obsolete or under utilized, or from additions to the equipment for which space was not originally allocated.
- (2) Workers:- Require space for movement, working, using utensils and operating machines.

Too small space for the output generates

- (1) Problems of ventilation and temperature
- (2) Difficulty of maintaining standards of orderliness and hygiene
- (3) Accidents.

Over generous

- (1) Waste of time and energy in walking and carrying items over long distances.
- (2) Difficult supervision due to extended lines of communication.
- (3) Increased costs of cleaning, lighting and maintenance.

Determinants of kitchen area

- (1) Maximum number of meals to be produced at any one time, preferably mid-day meal period.

- (2) Number of courses offered, i.e. 1 or 2 courses without choice requiring less equipment and fewer staff and hence less space than say 3 or 4 courses offering a wide selection of dishes

- (3) Planning of Spaces

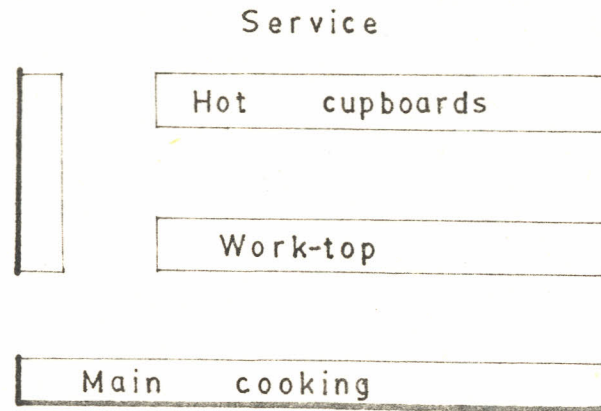
- (4) Degree of performances and capacity of equipment. Higher capacity and performances allow fewer equipment and hence less space.

(4)

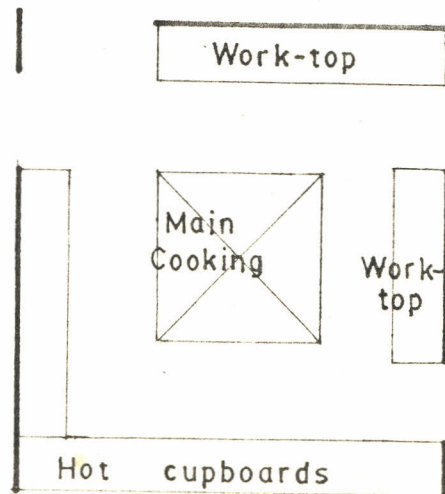
GROUPING OF EQUIPMENT

Two types are possible:-

Wall Siting:- Cooking equipment is arranged around the perimeter of walls and work tables placed in the centre of the kitchen.



Island Grouping:- Large cooking equipment is in the centre of the room with the work benches and other equipment adjacent to the walls.



Sketch

Wall grouping

- (1) Engineering services are cheaper to install, simpler and easier to maintain. Thus water pipes may run along the walls instead of over the ceiling or under the floor; waste pipes and channels can be kept short and discharge directly to outside gulleys through adjacent external walls and windows, convenient outlets for steam and fumes can be provided, as well as ventilators, enabling internal temperatures to be more easily controlled.
- (2) The kitchen is less obstructed by canopies and pipes.

Island Grouping

- (1) Suitable in catering for larger numbers the wall is very long for wall grouping.
- (2) Economy in floor space and convenient arrangement of work centres around the equipment.
- (3) Access for cleaning and maintenance is easier.
- (4) Allows positioning of work benches along perimeter wall enabling natural light, ventilation and view through window to improve working environment.
- (5) Mechanical ventilation is essential including some form of canopy and ducting to confine and remove the steam and fumes, adding costs and obstructing light and view, in addition to extra cleaning difficulties within duct on outside of exposed surfaces.
- (6) Water services and waste pipe or channels are also extended further across the room, requiring more attention for cleaning and maintenance.

Flexibility in Planning:- Is due to varying nature of kitchen work as different food materials are used. Equipment in food preparation is made flexible in arrangement by being moveable and mobile:- tables are fitted with wheels and locking brakes, preparation equipment and machines mounted on trolleys or wheel bases, mobile racks used for containers and utensils to allow easier storage and storage when items are not in use leading to economy in floor areas, facilitating cleaning and avoidance of unnecessary handling and carrying of food from one section to another.

Food Preparation Areas:- Grouped in four sections due to:-

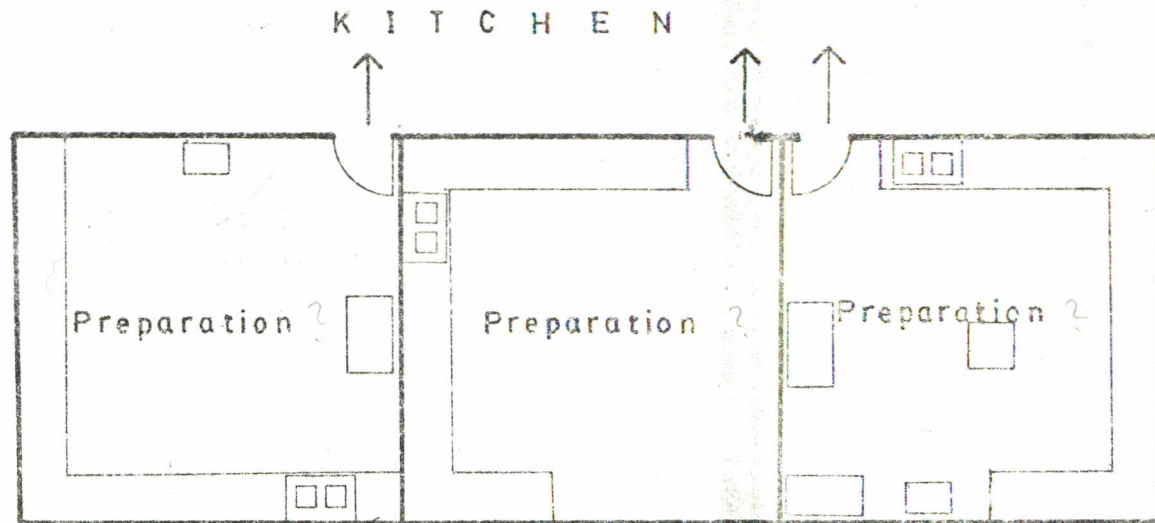
- (1) Different nature of foods and different types of preparations required.
- (2) Facilitation of the use of specialist equipment and staff.

The four sections are:-

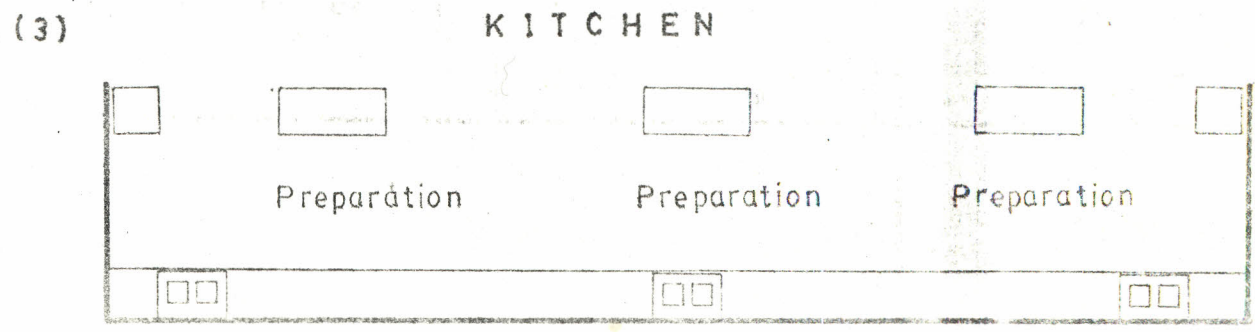
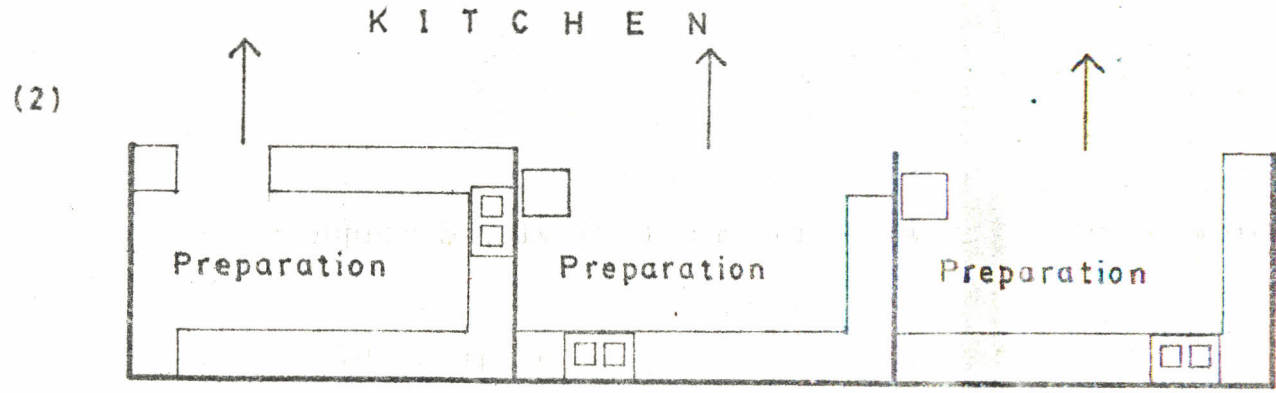
- (1) Vegetable and fruits preparation
- (2) Meat and fish preparation
- (3) Pastry preparation
- (4) General preparation

The means of division

- (1) Separate rooms adjoining the main kitchen



- (2) Low walls approximately 12 00 mm high between the areas which are otherwise open to the kitchen.
- (3) Arrangement of equipment and benches into specialist section within the main kitchen.



Open planning in (2) and (3) .

- (1) Allows easier supervision and communication
- (2) Requires less total floor area and enables all the cooking equipment to be grouped together in a central area of the kitchen. However, pastry section is frequently kept separate due to delicate nature of the work and specialist equipment used.

Where low walls are used (2) cost of construction is increased in the walls and complication in the floor drainage, extra costs in cleaning and maintenance. The walls are however, useful as support for shelving, tool racks and appliances and help to confine spillage to each area. Physical separation of preparation section is warranted in large scale catering where a high specialization is involved. In this case the cooking area is also divided into distinct sections.

SECTIONS OF THE KITCHEN SYSTEM

(1) GOODS RECEIVING AREA:- Is adjacent to goods entrance and big enough to accommodate goods accumulations.

Activities undertaken:- (a) Preparation of accounts and orders of goods.

(b) Checking of both weight and quality of deliveries.

Requirements:- Receiving office, weighing scales and free space for accumulation of goods.

Floor:- Durable, impervious, cleansable and non-slip surface. Granolithic concrete finished with carbonundum surface or quarry tiles are suitable.

Walls:- Smooth, non-absorbent, easily cleansable and resistant to impact and scraping damage. Glazed tiles or glazed bricks are ideal but expensive and difficult to replace, hence cement rendered and painted walls.

No steps between goods entrance and stores nor between the stores and preparation areas. Changes in level are however accommodated by ramps of $\nabla 10^{\circ}$ slope. Food commodities may also be transported vertically by lifts and conveyors.

(2) FOOD STORAGE

Division of food is essential due to

- (a) Odour contamination from fish, onion, potatoes, herbs and citrus fruits, smoke, fuels, offensive refuse and drains and various cleaning materials. The foods liable to absorb odours are meat, eggs, milk, butter, cheese and fats and to a lesser extent, flour and other dried commodities.
- (b) Variation in food storage conditions.

VEGETABLE AND FRUITS STORES.

For vegetables and fruits but excluding frozen items.

Siting:- (1) Near to goods entrance for deliveries to be taken directly to stores without passing through other areas.

(2) Positioned to have direct access to vegetable preparation area.

Fittings:- (1) Shelves supported by racks increase storage capacity by allowing vertical stacking.

(2) Slatted shelves for packaged items and wire mesh racks or metal bins for loose vegetables and fruits.

Bins and shelves supported clear of the floor to facilitate cleaning, ventilation and to reduce rat and mice harbourage.

Floor:- Durable, impervious, and non-slip surface. Granolithic screeds are suitable.

Walls:- Cement rendered and painted is adequate

Ceiling:- Cement plaster painted is adequate.

DRY GOODS STORE

For dehydrated, dried, packaged, canned, bottled and miscellaneous food commodities. These include flour, sugar, cereals, dried fruit, for instance
The store is for bulk purchases and reserves stocks of dry goods.

siting:- Near goods entrance.

Quantities of various foods required for day to day use are weighed and measured in the store prior to issue.

To avoid dampness and contamination, most packaged items are accommodated on shelves and dry goods in large quantities such as flour, sugar, cereals and dry fruits are better kept in stainless or vitreous enamelled steel, anodised aluminium or plastic bins fitted with wheel bases or castors for easy movement in out

Equipment:--(1) Work bench or table and weighing scales for sorting, dividing and weighing of food for use.

(2) A tool rack with wire cutters, a lever and hammer for opening containers.

Work surfaces are made impervious, non-tainting and easily cleaned. Stainless steel is most satisfactory. Hard laminated plastic surfaces and marble slabs are also used.

Walls :- Cement rendered and painted

Floor:- Granolithic screeds

Ceiling:- Cement plaster and painted.

INVESTIGATION REPORT.

STORAGE OF PERISHABLE FOODS.

Is limited to about 1-4 days, since chemical changes resulting from enzymes present in the food cause loss of condition and flavour. However for a long term of storage over 6 months or more without deterioration of food, deep freezer is used.

- (a) Meat store is kept at about 0.5 to 3.0°C and relative humidity of 85%. Has direct access to the butchery section of the preparation room. Equipment provided are hanging rails and racks.
- (b) Fish storage:- Kept at 0° to 2.0°C and provided with drainage of melting water.
Equipment:- Special cabinets with deep metal drawers for wet fish bedded in ice. Salted and smoked fish kept in separate section.
- (c) Dairy Storage:- Milk and milk-products, eggs, fats are liable to be tainted by strongly odoriferous foods such as fruits, spices and vegetables. The storage is kept at $2.0 - 5.0^{\circ}\text{C}$ and 85% R.H.
Equipment:- Shelves and cabinets.
- (d) Frozen foods storage:- Are heavily insulated deep freeze cabinets and cold rooms. Deep freeze section is usually entered through a cold store at a higher chilling temperature. This minimizes refrigerator loading and temperature fluctuations and also serves as an interlock, for precooling food prior to freezing and for thawing out food prior to use.
Equipment:- shelves cabinets, hanging rails.
- (e) Larders:- Frequently used in small kitchens
 - (a) to cool cooked foods before they are placed in the refrigerator.
 - (b) for prepared food waiting to be served cold but not chilled.
 - (c) for food returned unused from the service until needed.

The larder is sited away from cooking equipment and hot surroundings.

Equipment:- Shelves and racks are demountable and light weight for easy cleaning. Interior fittings made non-absorbent hence usually made of stainless steel.

Storage of Cleaning materials:-

Soap, detergent and cloths in cupboard or shelf adjacent to sink or washing machine. Cupboards with shelves are made impermeable by use of laminated plastic or stainless steel as materials.

Reserves of cleaning materials are in lockable room or cupboard kept apart from food and food utensils due to contamination. Storage includes two bins for soap powders and shelves for cans of liquid detergents, block soap, scourers, bleaches, cloths.

Servery Store:-

For crockery cutlery and utensils returning in circulation, portable trolleys are used. Clean table items placed on shelves and trolleys. Reserves of glassware and flatware kept in cupboards in or adjacent to the clean section of the wash up area. Larger reserves are kept in a separate locked room.

(3)

FOOD PREPARATION

(a) VEGETABLE AND SALAD PREPARATION:- This involves

- peeling or paring
- cleaning and removing of "eyes" and spots.
- trimming, cutting, shredding , dicing.

Equipment:- Sinks and work benches, waste disposal units, mobile equipment and machines for potato peeling, chipping, mashing, shredding, dicing and slicing of vegetables. Work surfaces in the form of draining boards on both sides of sinks.

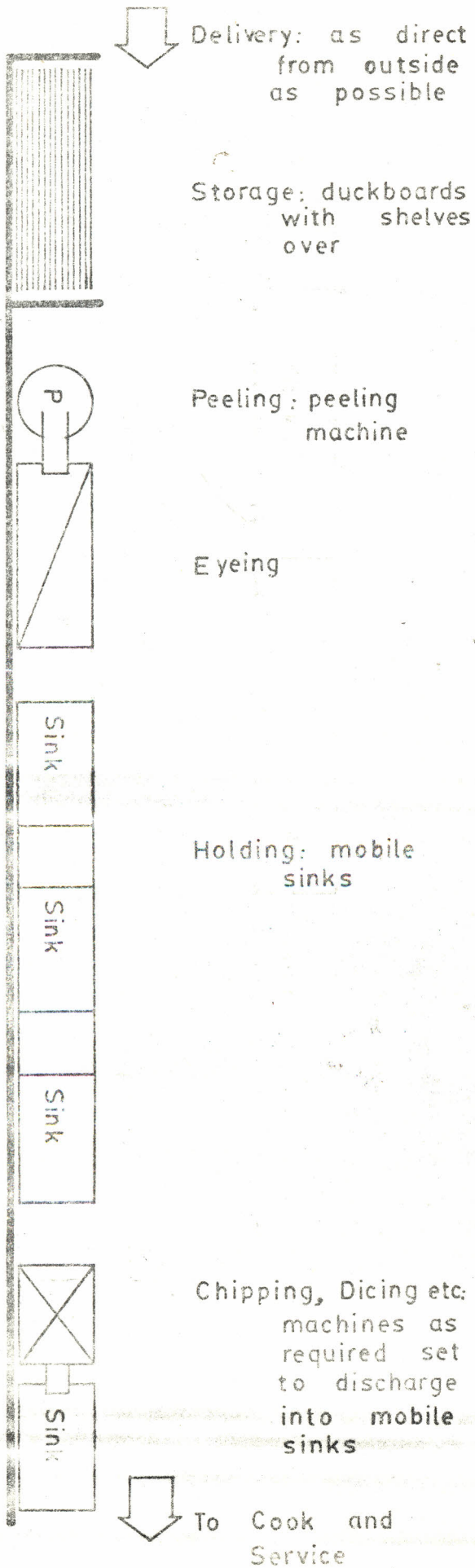
Siting:- Root vegetables eg. potatoes are normally covered in soil and peeling, mashing and trimming as essentially "wet" processes which produce large quantities of waste, hence the preparation space is adjacent to vegetable store and in convenient position for disposal of refuse.

Walls:- Smooth cement - rendered or ceramic tiled up - to at least 1800 mm and all corners and junctions rounded or covered for easy cleaning.

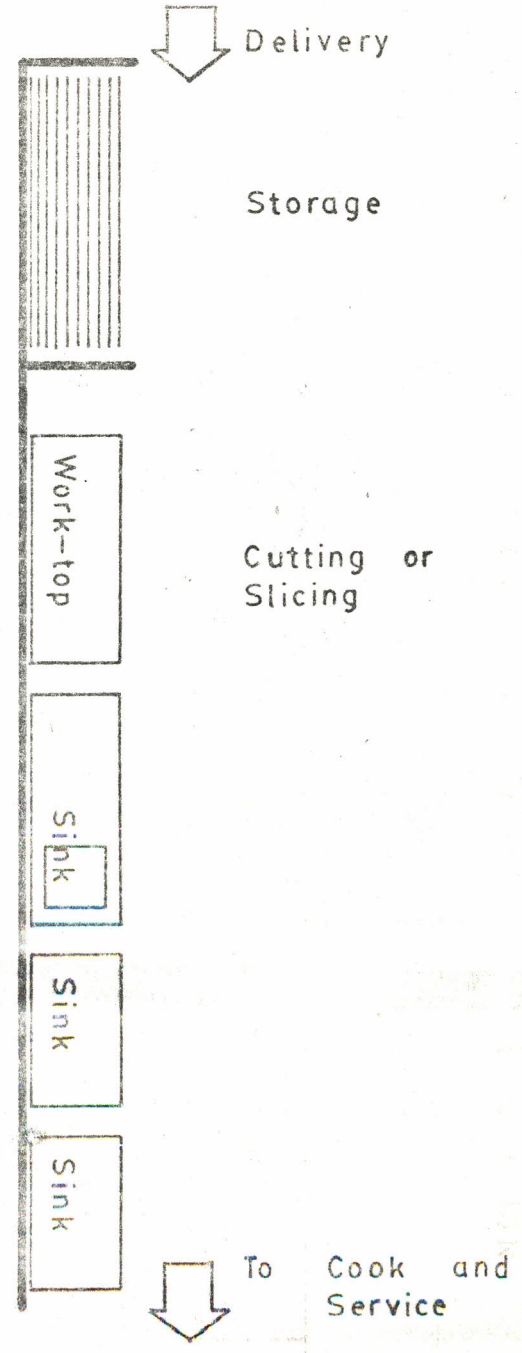
Floors:- Impervious and laid to falls to drain water which may spill on the floor or used in cleaning to a grating - covered channel or trapped gulley. Drainage is accessible for cleaning and have silt traps to retain soil and debris.

Most durable materials for finish are quarry tiles set to an impervious base and painted with acid-resisting cement mortar joints to avoid dislodgement.

SEQUENCE OF ROOT VEGETABLE PREPARATION



SEQUENCE OF FRUIT AND GREEN VEGETABLE PREPARATION



(b) PASTRY PREPARATION :- Involves the preparation of hot sweets, cold sweets, pastry work, bakery items, finishing and post cooking e.g icing and decoration.

Arrangement and Siting:-

(1) In a section of the kitchen with use of general cooking area, where the preparation area is located near to appropriate cooking equipment. Day to day requirements of food ingredients are normally kept in or adjacent.

In this case the relative position of the dry goods store is not important.

(2) Self contained unit with its own storage, preparation, cooking and perhaps, wash up facilities. Here the unit may be operated independently and be sited some distance from the main kitchen with proper arrangements for transporting supplies and products e.g by lifts, conveyors or trolleys.

Storage:- Cupboards and bins within preparation section or in kitchen store room adjacent. Wall cupboards are provided at about eye level 1500 mm high with shelves for flavourings, colourings and spices.

Storage for perishable food is normally centralized in cold room or larder with refrigerated storage in the preparation area.

Fittings and Equipment :- Tables and benches, sinks weighing scales, machines for mixing, rolling and dividing pastry and dough and tray racks, pastory ovens and boiling rings.

Areas for pastry preparation

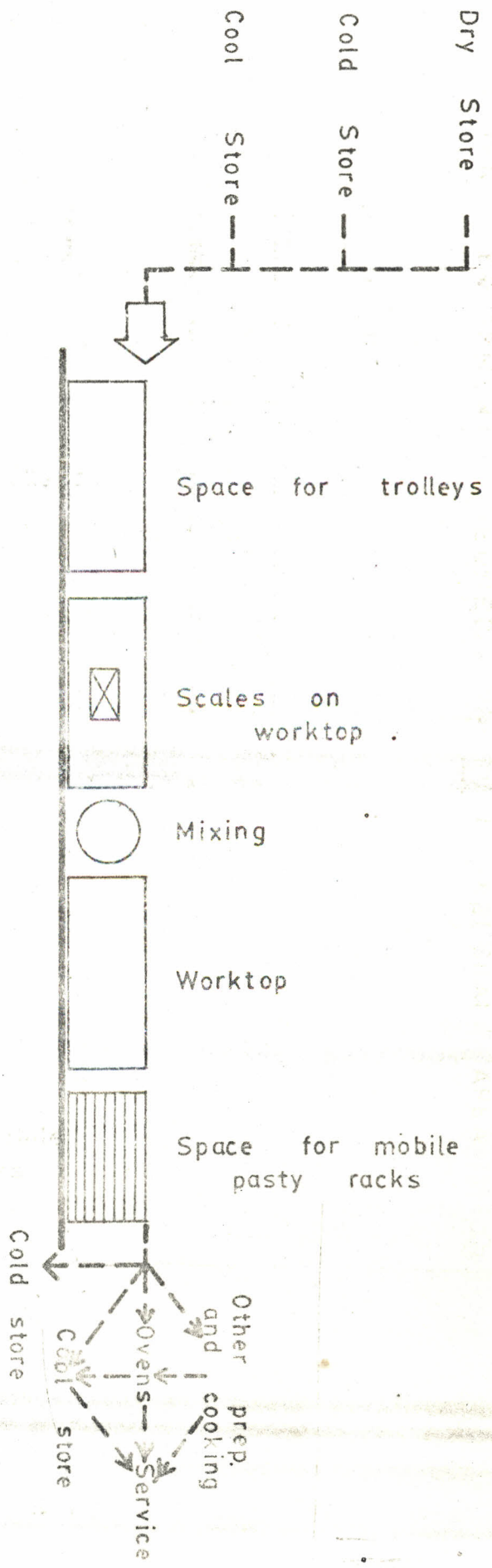
<u>No. of meals served per day</u>	<u>Approximate Area of space M²</u>
Up to 100	2.8
" 200	3.7
" 400	9.3
" 600	11.2
" 800	13.0
" 1000	14.9

OTHER EQUIPMENT NEEDED IN THE GENERAL AREA



- Refrigerator
- Sink unit
- Small boiling top
- Proving oven for yeast goods production
- Hand wash basin

SEQUENCE OF PASTRY PREPARATION



c) MEAT AND FISH PREPARATION

- This involves:-
- Butchery and portioning of meat
 - Preparing poultry, game and offal
 - Slicing ham, bacon
 - Mincing and dicing meat
 - Meat processing, sausage making
 - Cold meat dishes preparation
 - Fish slicing, filleting
 - Preparing shell fish

Arrangement and siting

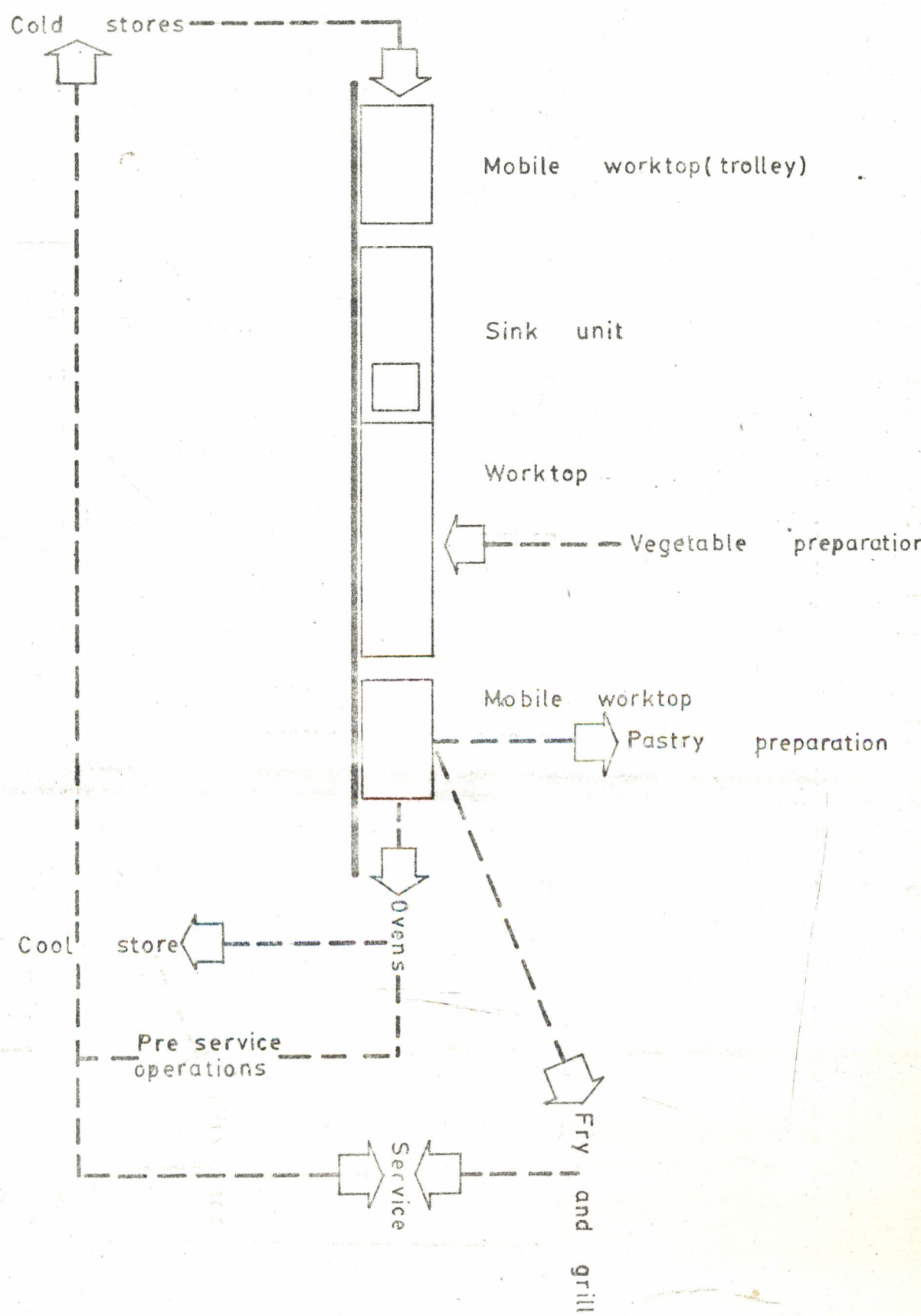
Preparation area is near cold stores and dry cooking area. To avoid risk of cross-contamination, separate tables are provided for dressing poultry and game; fish preparation, raw meat and butchery items; cooked meats and preparation of cold dishes.

Storage:-

- storage racks, drawers and cupboards for knives and hand tools.
- shelves or runners fitted under the benches or in portable racks for meat trays and dishes.
- mobile storage bins for meat scraps, waste fat and bones.
- Also meat-hanging rails, hooks and power saws are provided where extensive butchery work is involved about 500 meals per day.

Equipment:- Sinks for washing meat and fish and for cleaning equipment and utensils.
Mincing machine, slicing machine, meat tenderizers, dicing machines and bowl cutters, refrigerator for temporary storage of meat.

SEQUENCE OF MEAT AND FISH PREPARATION



Areas for Meat and Fish Preparation

<u>No. of meals per day</u>	<u>Approximate Area of Space m²</u>
Up to 100	.4.6
" 200	7.4
" 400	9.3
" 600	11.2
" 800	12.1
" 1000	13.0

(4)

FOOD COOKING

This involves boiling, frying, grilling, holding and beverage making,

Purpose for which Equipment is required:-

- To produce meals in sufficient quantity in a given time
- To provide an adequate variety of food.
- To ensure a suitable quality of food product
- To facilitate preparation and cooking within a reasonable time.
- To reduce costs of food production directly or by reducing labour force.

Equipment:-

- (1) Boiling Equipment: - Boiling pans for boiling of vegetables or cooking of thick liquids
- Stockpot stand which is a small boiling table having one high capacity burner or element for heating a large vessel for soup or stock production.
 - (2) Frying Equipment:- - Griddle for shallow fat frying
- Deep fat fryers
- Shallow tilting frypans (Bratt pans).
 - (3) Grilling Equipment:- Grillers and toasters
 - (4) Holding Units:- - Hot cupboards - these are cabinets used to keep food warm and to heat receptacles and plates prior to service .
- Mobile units used for convenient handling.
- (B) Beverage Making Equipment:- - Water boilers, urns, cafe sets and vending machines.

Kitchen Walls:-

The lower part up to a height of about 1800 mm made to withstand frequent splashing and cleaning with water, grease, alkalis, acids and scouring agents and remain easy to clean, scraping or impact and uneven heating and cooling due to the proximity of appliances and pipes.

Suitable finishes are glazed tiles with acid resisting joints or hard gloss paint applied on a dense, smooth rendered surface. However over a large area, a hard cement rendering is susceptible to cracking.

The upper part is less liable to damage and is therefore made only to prevent condensation and provide some degree of sound absorption.

Hence porous absorbent lining or plaster finish is vapour sealed with an impervious washable paint. In the interests of hygiene, light distribution and appearance, white or light colours are preferable.

Areas of walls behind sinks and wash basins and behind stoves and grillers are protected against water, steam, grease and heat. Alternatives to glazed tiles are stainless steel, enamelled steel or glass.

Kitchen Floor:-

Made easy to clean, resistant to hard wear, water, grease, oil, acids, alkalis, cleaning agents and variations in temperature. Desirable to be not cool to the feet and excessively hard and noisy.

Suitable floor finishes are unglazed quarry tiles and mosaic tiles laid in impervious acid resisting cement.

Terrazzo and granolithic screeds incorporating carbodundum surfaces are also used as alternatives.

Work surfaces:- Non- absorbent, durable and easily cleaned. Suitable materials are stainless steel and hard laminated plastic such as melamine. Cutting boards of plastic /rubber composition are provided to reduce damage to the surface and blunting of knives. Double sink units allow vegetables to be washed in one sink then transferred to the second to rinse and soak whilst awaiting use.

Waste disposal:- Discharged in drainage system in modern kitchen designs.

Storage:- For preparation tools.

To facilitate washing the floor is laid to fall 1 in 120 slope to drainage outlets in the form of channels or gulleys which are covered with removable gratings. Junctions between floors and walls are covered preferably in flooring material.

Kitchen Ceiling:- Finish not to harbour dirt nor be liable to cracking or flaking but must be easy to clean and redecorate. Surface is vapour sealed. Cement rendered smooth with an impervious paint film is satisfactory.

(5) **SERVERY:** Forms a line of demarcation between the kitchen and restaurant and involves disposal of dirty crockery, placing of new orders and collection of previous orders.

Equipment:- Service table which is usually incorporated in the holding units, i.e. hot cabinets.

KENYA UTALII HOTEL KITCHEN SYSTEM

FLOW ROUTES

EMPTIES (i)

From Bulk

Stores to Kitchen Stores:- The scattering of kitchen stores as shown in the drawing has caused long distances of travel through corridors before goods can reach them. This has resulted in expressions by the kitchen staff about wastage of effort and time and also risk of congestion in the corridors.

(ii)

From Kitchen

Stores To Preparation Areas:- Generally works all right. But still in some parts as shown in the following drawing, there is cross circulation; - increasing the risk of congestion and obstruction.

(iii)

From Preparation

To Cooking and servery:- The planning is successful in the sense of creating a very convenient flow of food.






(iv)

(iv)

Servery Area:-

The waiter's line of travel is not very successful. This is also shown in the drawing whereby he moves forward to still room and back to service area further to servery for cold food and back for pastry food on his way to the restaurant. This is causing obstruction in the service area.

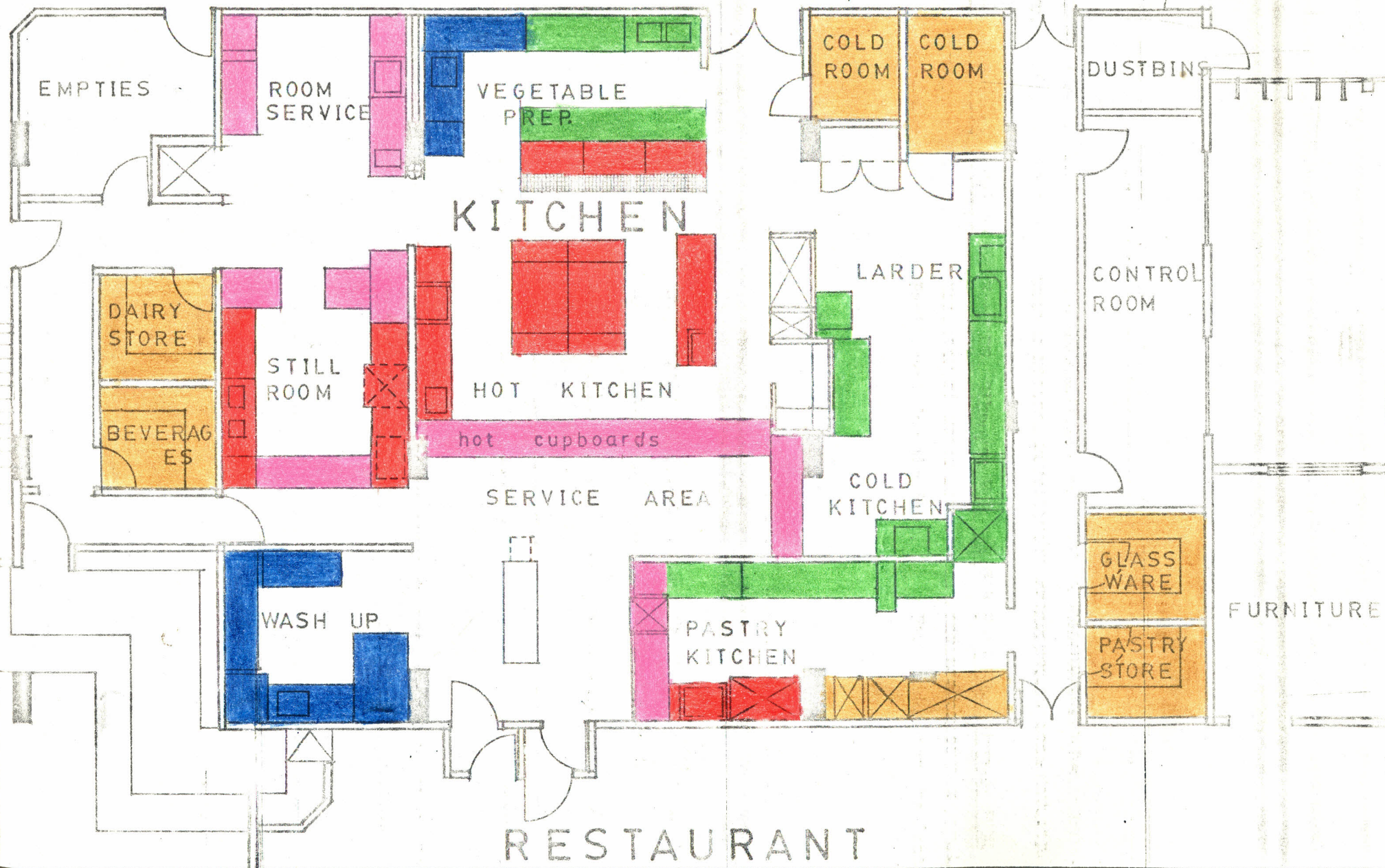
SECTIONS OF THE OPERATION

	Stores		Cooking		Wash-up
	Preparation		Servery		

UTALII HOTEL KITCHEN
SCALE 1:100

service corridor

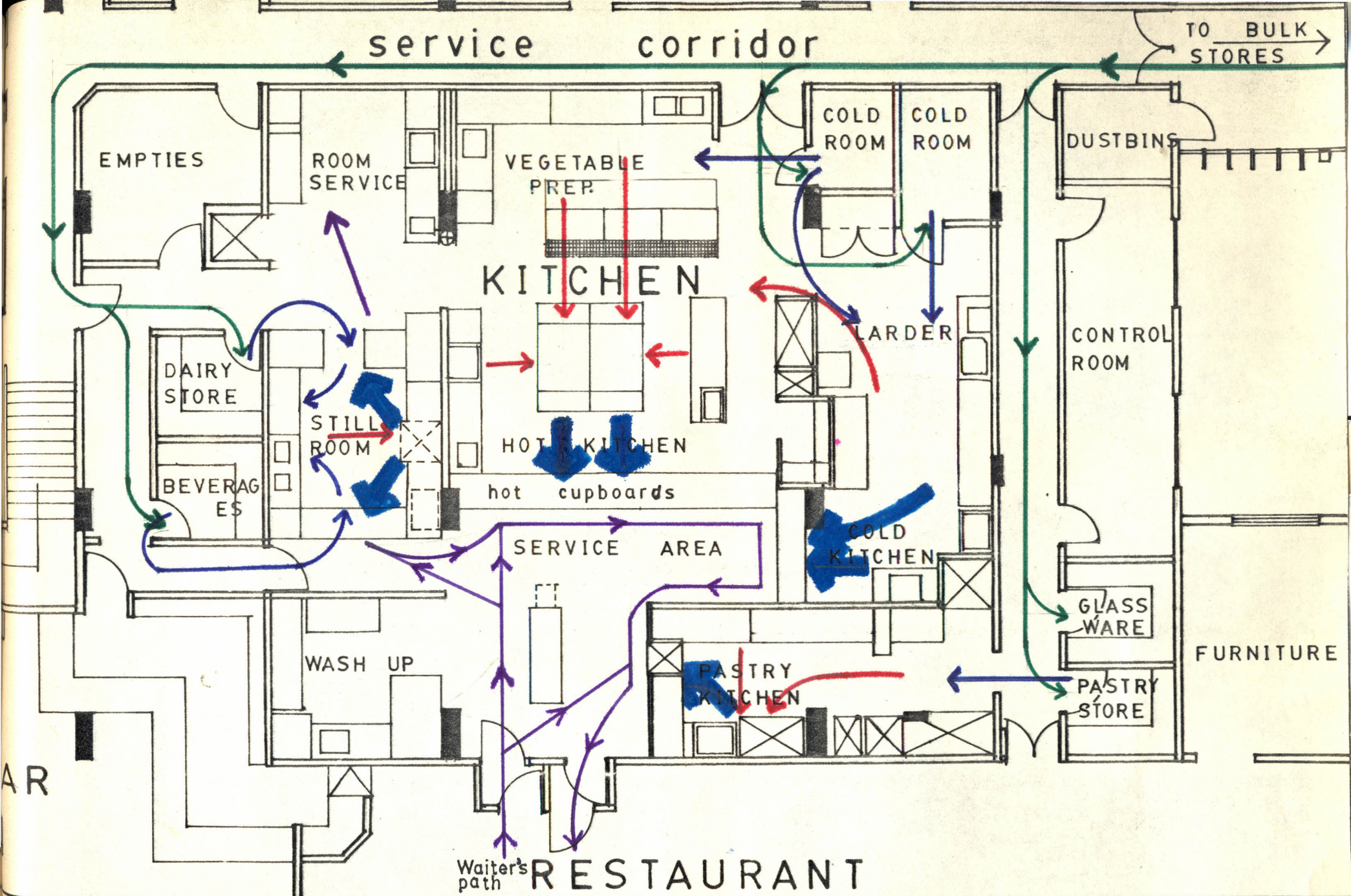
TO BULK STORES



SECTIONS OF THE OPERATION

- | | | | | | |
|--|-------------|---|---------|--|---------|
|  | Stores |  | Cooking |  | Wash-up |
|  | Preparation |  | Servery | | |

UTALII HOTEL KITCHEN
SCALE 1 : 100



FOOD FLOW ROUTES

- Bulk stores to kitchen stores
- Preparation to cooking
- Kitchen stores to preparation
- Cooking to service

UTALII HOTEL KITCHEN
SCALE 1 : 100



RECEIVING AREA



DRY STORE



DRY STORE



VEGETABLE STORE

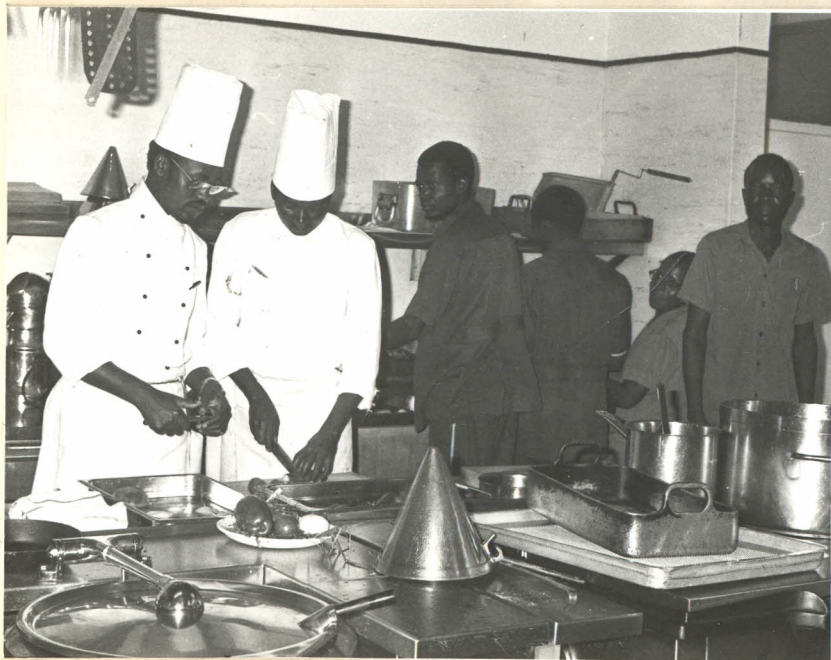
ACTIVITIES AND EQUIPMENT



MEAT STORE



DEEP FREEZE



VEGETABLE PREPARATION



MEAT PREPARATION

ACTIVITIES AND EQUIPMENT



STILL ROOM



PASTRY KITCHEN



HOT KITCHEN

ACTIVITIES AND



POT & PAN WASH

EQUIPMENT

INTERIOR FINISHES IN UTALII HOTEL KITCHEN

SPACE	FLOOR	WALL	CEILING
RECEIVING AREA	Granolithic screed:- performance is good.	Cement rendered and painted:- in good condition.	Cement rendered and painted white:- in good condition.
ALL FOOD STORES	Granolithic screed:- performance is all right.	Cement rendered and painted light yellow:- performance is all right	Cement rendered and painted white:
PREPARATION AREAS	Unglazed ceramic tiles with acid- resisting cement joints:- Performance is all right	Beyond 1.6 metres high:- Cement rendered and painted light yellow. Less than 1.6 metres high:- glazed ceramic tiles. Performance is all right.	Cement rendered and painted white:-Performance is all right.
COOKING AREAS	Unglazed ceramic tiles with acid - resisting cement joint:-	Beyond 1.6 metres high:- Cement rendered and painted light yellow. Performance is all right. Less than 1.6 metres high:- glazed ceramic tiles with acid resisting joins.Perform- ance is also good.	Cement rendered and painted white:- Performance is good.

INTERIOR FINISHES IN UTALII HOTEL KITCHEN

SPACE	FLOOR	WALL	CEILING
COOKING AREAS (cont.)	The floor laid to a fall towards stainless steel grating covered channel.		
WASH-UP AREAS	Unglazed ceramic tiles with acid resisting joints. The fall is towards stainless steel grating covered channel.	Beyond 1.6 metres high:- cement rendered and painted light yellow. Less than 1.6 metres:- glazed ceramic tiles with acid resisting joints. Performance is right.	Cement rendered and painted white. Performance is all right.