CONTENTS

CHAPTER - I

INTRODUCTION

Food is a basic and most important component of economic life, not only from the point of view of the subsistence and health, but also it forms a large part of the wage goods, thereby affecting the availability of already meager income of the large populace for meeting the other ingredients of economic life. Food products of animal origin have played a key role as suppliers of human calories and proteins in virtually all parts of the world since the beginning of recorded history. Many research findings have pointed towards structural changes in food consumption patterns that are occurring throughout the developing world in recent past in terms of increasing importance of Livestock Food Products (LFP's) in the diets of the people. India is aspiring to become a developed nation by 2020. In this context, it becomes pertinent to deliberate on the quality of life that people of the country would have by 2020. One of the basic and most important parameter of determining quality of life is the status of nutritional security of the nation. Growth rate in total consumption of different livestock food products in India is higher than in developed countries. The highest consumption growth rate in India is found in case of poultry products. The increased consumption of Livestock Food Products comes from changes in the diets of billions of people fuelled by urbanization, population and income growth and India is not an exception to course of these events. The accompanying increased production of Livestock Food Products to match the demand would not be without problems, in terms of environmental sustainability, nutritional and public health concerns, industrialization of livestock production at the cost of small holder livestock farmers, etc. would be major challenges to resolve.

There are about 3,894 licensed slaughter houses and 25,754 unregistered slaughterhouses in the country[1]. There are 42 export-oriented, modern, integrated abattoirs cum meat processing plants registered with the Agricultural and Processed Food Export Development Authority (APEDA). There are also 32 meat processing and packaging units, which receive dressed carcasses from approved municipal slaughter houses for the export of meat. It is likely that other export plants will be developed in the future given India's export focus on meat[2].

India's exports of Animal Products was Rs. 20,130.90 Crores in 2012-13, which include the major products like Buffalo Meat (Rs. 17400.60 Crores), Sheep/ Goat Meat (Rs. 425.66 Crores), Poultry Products (Rs. 494.14 Crores), Dairy Products (Rs. 1412.10 Crores), Animal Casing (Rs. 18.37 Crores), Processed Meat (Rs. 21.56 Crores), Swine Meat (Rs. 2.15 Crores), and Natural Honey (Rs. 356.32 Crore)[3].

The demand for Indian buffalo meat in international market has sparked a sudden increase in the meat exports. Buffalo meat dominated the exports with a contribution of over 86%. The product registered 27% growth in export during the financial year 2012-13 as compare to the same period of last year. The main markets for Indian buffalo meat and other animal products are Vietnam Republic, Malaysia, Thailand, Saudi Arabia, Egypt Arab Republic and UAE[4].

[1] Report of the working group on Animal Husbandry and Dairying 12th Five Year Plan (2012-2017) page 72, para 12.1.3
[2] APEDA's website http://apeda.gov.in/apedawebsite/Announcements (July 2013)
[3] http://www.apeda.gov.in/apedawebsite/six_head_product/animal.htm(July 2013)
[4] http://www.apeda.gov.in/apedawebsite/six_head_product/animal.htm(July 2013)

Government Notifications

In order to ensure wholesome **hygienic** meat and meat products to the citizens and to avoid undue cruelty to animals and use **human methods** of transport and slaughtering as well as to **avoid pollution**, Government of India has issued several notifications framing the rules and regulations in exercise of the powers conferred by subsections (1) and (2) of Section 38 of the Prevention of Cruelty to Animals Act, 1960 (59 of 1960) regarding the transport [S.O. 268 (E) and S.O.269 (E)] and slaughter house [S.O. 270 (E)]. These rules on one hand checks cruelty to animals and inhumane killing of animals during slaughter on the other, it ensures supply of hygienic, safe, clean and quality meat and meat products and avoid water, air and environmental pollution hazards to public. In consequence, based on several public litigations, the Supreme Court of India has issued directions to Municipal Corporations and other Local Bodies to check unauthorized, unorganized, inhumane, un-hygienic and unrecognized slaughtering of animals in order to establish modern slaughter houses to produce safe and hygienic meat and meat products.

The Ministry of Food Processing Industries has launched a scheme of modernization of abattoirs during 2008-09 to set up 10 abattoirs. This is a comprehensive scheme, which includes modernization of existing abattoirs/ establishment of modern abattoirs. The scheme has been scaled up during the 12th Five Year Plan to cover setting up of 25 new and modernization of 25 existing abattoirs for first two years of the 12th Five Year Plan i.e. 2012-13 and 2013-14. The scheme will be implemented preferably under PPP mode with the involvement of local bodies (Municipal Corporations and Panchayats)/ Public Sector Undertakings/ Co-operatives/ Boards under Government and will have flexibility for involvement of private investors/ exporters on a Build-Operate – Own (BOO)/ Build- Operate-Transfer (BOT)/ Joint Venture (JV) basis. Regulatory functions will continue to be discharged through local bodies.

The details of the scheme have been given at the end of this DPR document.

Brief Background of the Project

Bareilly is presently running two slaughterhouses one for Buffalo at Mohanpur Thiria village, and the other at Shahdana. Both do not have any modern facility. The animals are being slaughtered on the cemented floor in the primitive way. Dehiding is done on the floor. All the abdominal materials, intestines etc. are taken out from the body and the head and the hooves are cut. Blood and floor wash are drained directly in the drain. Edible portion of Carcass are cut into four pieces. Butchers charge their slaughtering fees from those who bring the animals for slaughtering. All the non-edible offal materials are being dumped by Municipal Corporation in the pit with the help of contractor. An employee of the Municipal Corporation collects the slaughtering fees. There is no Effluent Treatment Plant or Rendering Plant for processing the slaughterhouse waste.

The existing Slaughter Houses at Bareilly are not only highly unhygienic and creating environmental pollution, but also make the unlawful situation for the Municipal Corporation.

Government of Uttar Pradesh has decided to establish Modern Slaughterhouses at seven cities in addition to Meerut, where the project is already being implemented. Bareilly is one among the seven. All the eight Slaughterhouses are proposed to be built on Public-Private –Partnership mode. Nagar Nigam, Bareilly has decided to establish a modern slaughterhouse to be constructed on the same land where the existing buffalo slaughterhouse is located at Mohanpur Thiria village, about 8 kms from Bareilly on the Bareilly- Shahjahanpur road. The site is well connected on the pacca road and is located on the bank of a ***Nalah***. Nagar Nigam proposes to establish the new slaughterhouse with facilities for slaughter of 275 sheep and Goats and 100 Buffaloes per shift of 8 hours to produce wholesome meat for the residents of

Bareilly. This abattoir will have facilities of an Effluent Treatment Plant and Rendering Plant. The Rendering Plant Cum Carcass Utilization will render slaughter house waste generated from the abattoir for rendering.

Nagar Nigam Bareilly has given the responsibility of preparation of Detailed Project Report of the Modern Slaughter House to M/s Abacus Legal Group, New Delhi, which in turn has given the work to Centre for Integrated Animal Husbandry & Dairy Development, Noida (U.P).

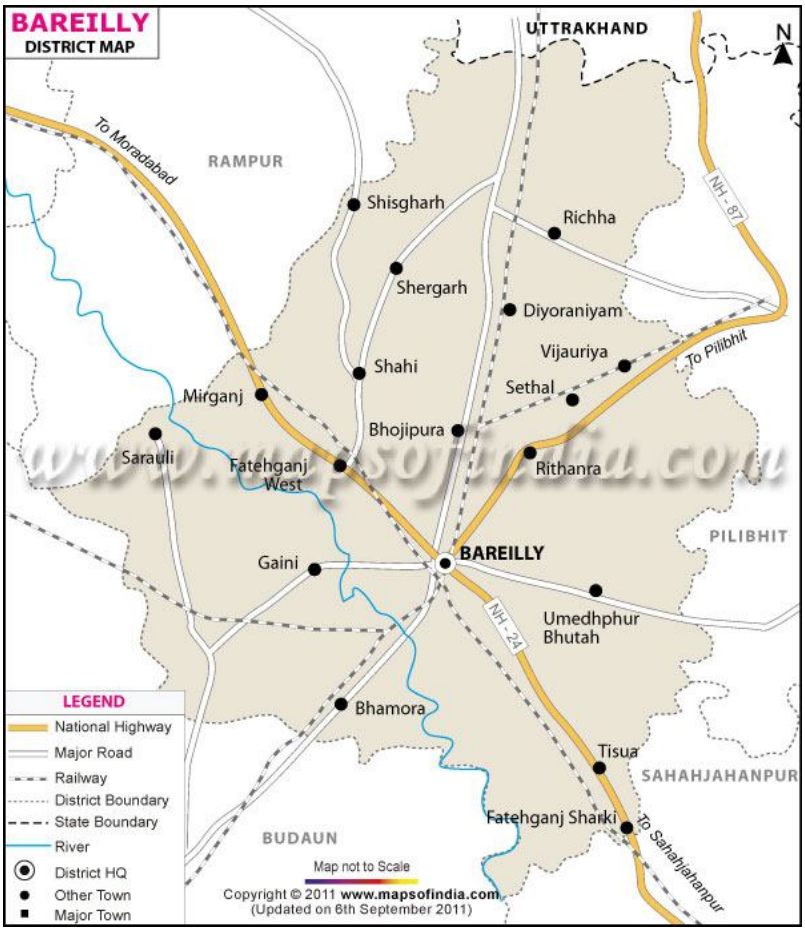
CHAPTER – II

PROFILE OF BAREILLY DISTRICT

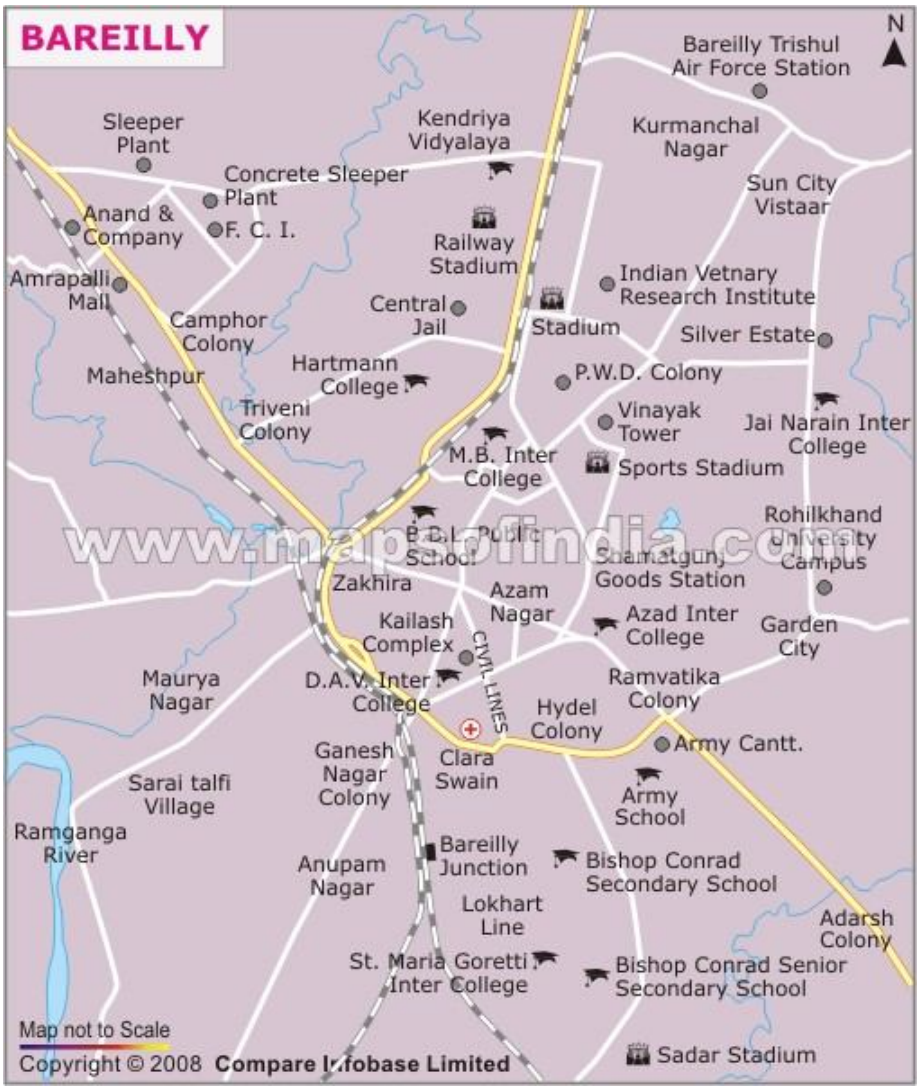
Bareilly pronunciation (Hindi: cjsyh, Urdu: ىلیبــار) is a metro city in Bareilly district in the northern Indian state of Uttar Pradesh. Standing on the Ramganga river, it is the capital of Rohilkhand Division and is a center for the manufacture of furniture and for trade in cotton, grain, and sugar. The city's population in 2011 was 9,79,933. Geographically it forms the outer gateway to enter Uttarakhand State. Bareilly is the 4th city of Uttar Pradesh which has CNG fuel stations, after Lucknow, Kanpur and Agra. Bareilly is the 7th largest metropolitan city of Uttar Pradesh and 50th largest metropolitan city of India.This fast-growing city is also known as Bans-Bareilly, due to its big bamboo market. Bareilly is also known as the counter-magnet city because it is equidistant from New Delhi and Lucknow and has a lot of potential for setting up industries to attract people to settle. It is major city on the trade route from Amritsar to Kolkata and most livestock is moved from Punjab to many towns of U.P. and Bareilly is one of the central town which exports buffalo carcass to major processing centres enroute. It is one of the biggest city of Uttar Pradesh state. Historically it was the part of the ancient kingdom of Panchal. In the Medieval period it was under the Rohillas. The modern city's foundation was laid by Mukrand Rai in 1657.

Source : www.bareilly.nic.in

MAP OF BAREILLY DISTRICT



MAP OF BAREILLY CITY



Bareilly Overview

As per data released by Govt. of India for Census 2011, Bareilly is an Urban Agglomeration coming under category of Class I UAs/Towns. Bareilly city is governed by Municipal Corporation. The total population of Bareilly UA/Metropolitan is 979,933. The male population of which is 522,385 while female population is 457,548. The literacy rate of Bareilly city is 70.97% which is lower than National Urban average of 85 %. Literacy rate for male and female for Bareilly stood at 75.09 % and 66.25 % respectively. Total literates in Bareilly UA were 621,228 of which males were 350,726 and remaining 270,502 were females.

Description

Urban Agglomeration	**Bareilly**
Government	**Urban Agglomeration**
UA Type	**Class I UAs/Towns**
State	**Uttar Pradesh**

Bareilly UA	Total	Male	Female
Population	**979,933**	522,385	457,548
Literates	**621,228**	350,726	270,502
Children (0-6)	**104,560**	55,307	49,253
Average Literacy (%)	**70.97**	75.09	66.25
Sexratio	**876**		
Child Sexratio	**891**		

Source: http://www.census2011.co.in/census/metropolitan/88-bareilly.html

CHAPTER – III

OBJECTIVES AND BENEFITS

Introduction

In order to meet the requirement of meat in the city, the Nagar Nigam Bareilly has decided to establish a modern slaughter house at revenue village Mohanpur Thiria under tehsil Bareilly. The area of identified land is 1.7 ha and the capacity will be to slaughter 550 sheep/goat and 200 buffaloes per day in two shifts in a humane manner, under most hygienic conditions of global public health standards using OIE global protocols and FDA parameters of USA to produce wholesome meat bringing the pollution standards to zero.

Objectives of the Scheme

The Modern Slaughterhouse Project has the **major objective: to provide wholesome hygienic meat to the citizens of Bareilly following the highest Public Health Standards** (OIE/FDA/WHO/FAO). The subsidiary objectives being:

(i) To avoid environnemental pollution (pollution zero);
(ii) To avoid wastage of byproducts.
(iii) To avoid undue cruelty to animals and use humane methods of slaughter.
(iv) To utilize edible and in-edible byproduct of the animals.
(v) To provide employment in the catchment area.
(vi) To provide safe passage to aircrafts of airforce at Izatnagar air base from bird hits due to open slaughterhouse and carcass disposal in the villages surrounding the airfield.

With the above objectives in view modernization of the slaughterhouse is absolutely essential has now been initiated on priority.

Benefits from the Project

Public health benefits: The citizens/consumers of Bareilly in general and national and international tourists in particular, will get clean, wholesome and hygienic meat and meat products. The risk due to meat borne infections and infestations will drastically be reduced.

Traceability: The system will ensure that records of the origin of the animal which came to slaughterhouse and then parentage and health status are available and open to inspection.

Environmental benefits: The water pollution will be reduced to desirable standards and there will be no air pollution.

Social Benefits: All the stakeholders of the chain of events for production of hygienic meat will be benefited directly or indirectly as under.

a) **Livestock farmers**:

- ❖ They will be directly benefited since they are raw material producers and will get an assured market, which will raise their economic conditions and will give boost to agriculture and animal husbandry in the state.
- ❖ Exploitation of the livestock farmers by middlemen will be reduced.
- ❖ It enables farmer to adopt modern animal production programmes consistent with market.
- ❖ A healthy competition amongst farmers is created to produce better quality livestock by use of available technology particularly by small and marginal farmers of the district.

b) **Butcher Community**

- ❖ The working condition of the butchers will be upgraded.
- ❖ There will be drastic reduction in the animals/ meat associated zoonotic disease to the butcher community.
- ❖ There will be assured and higher income for the professionally trained butchers.

c) **Livestock Traders**

- ❖ Market for trading of the animals will have better facilities thereby improving their working conditions.

d) **Meat merchants**

- ❖ They will have a better confidence of the consumer and the business will increase.
- ❖ They will be able to satisfy variety of costumers thereby their business turnover will increase.
- ❖ They will have no risk of being challaned / penalized by the Municipal Authorities for selling unauthorized meat and their products.

e) **Consumer**

- ❖ He will get safe & wholesome, hygienic meat and meat products.
- ❖ The cost of meat products is likely to decrease because the wastage of the bye-products will be avoided.
- ❖ He is assured of the quality product being purchased.
- ❖ He will have minimum risk due to meat and meat products being infected and if at all some outbreak is found the culprits/material can be traced back to its origin and preventive measures can be taken.

f) **General public**

- ❖ Will be protected from the meat borne diseases.
- ❖ More employment opportunity for different class of people will be created.

g) **Industry**

- ❖ Meat industry will grow in quality and quantity.
- ❖ Better handling of skin and hides will help the tannery industry.
- ❖ Scientific utilization of animal byproducts will help soap industry, pharmaceutical industry, poultry feed industry etc.
- ❖ Export of meat and meat industry will be boosted.

h) **Economic benefits**

- ❖ All the stake holder of the meat food production chain will be benefited economically.
- ❖ Economic benefit from the meat sector including byproduct sectors will reach the weakest section of the society.

i) **Ethical benefits**

- ❖ The animal cruelty during the transportation, marketing, lairaging and slaughtering will be drastically reduced.
- ❖ All the slaughter operations will be performed under the closed halls; therefore, the modern slaughter house complex will not hurt the feelings of persons against killing in public view.
- ❖ The transportation of fresh meat / carcasses open to public view will be stopped giving a great relief to kind hearted persons, children, ladies etc.

j) **Legal benefits**

- ❖ It will ensure compliance of Municipal Health Law / Act / Rules etc. in relation to public health.
- ❖ This will avoid or eliminate illegal slaughtering of animals and there by avoiding unnecessary public interest litigation against the local authorities.
- ❖ The various directions of the Supreme Court of India in various cases related to treatment of effluent of the slaughterhouse and cruelty against animals in the traditional slaughter house will be implemented in letter and spirit thereby avoiding the contempt of court.

k) **Academic benefit:**

- ❖ The availability of proper records of the animal rearing, slaughtering processes, sale of meat to the consumer and in respect of economic parameters will provide useful information for various research projects on meat and processing and their cost benefit analysis.
- ❖ The research findings of the slaughterhouse can be used for the future improvement and growth of industry and also for the benefit of consumers.

l) Bareilly slaughterhouse has to be upgraded due to nearness of the major Air force base, and in view of this it is necessary that no carcasses should be allowed with the air corridor of flying aircraft. It will be one of the major assets to the Air force as a safe base for operations.

CHAPTER - IV

ESTIMATED REQUIREMENT OF MEAT FOR BAREILLY

Assuming that 50% of Hindus and 90% of other religions, except Jains are non-vegetarian and overall 70% population is non-vegetarian the estimated non-vegetarian population can be worked out as follows based on above assumptions.

Sl No.	Bareilly (Urban Agglomeration)	**Vegetarian**	**Non-vegetarian population**
1	**979,933**	293,980	685,953

Meat requirements

Assumptions

1. All Muslims and Christians consume buffalo meat.
2. All Hindus, Sikhs, Buddhists and others consume meat from sheep, goats, pigs, chicken and fish.
3. Those at number 1 also consume meat from species given at number 2 except that Muslims do not consume pig meat
4. That on an average every non-vegetarian consumes about 100 gms of meat per day.
5. That a live buffalo weighing about 250 kg will produce about 110 kg of meat and 140 kgs of bone, fat, offals, etc.
6. A sheep and goat carcass produces 10 kg of meat with a 20 kg live weight.

On the basis of these assumptions, the following estimates for per day consumption of meat and the number of animals for slaughter have been worked out:

Table 4.1 Daily requirement of meat in Bareilly district - 2013

Particulars	**Buffalo** (40gms/day/person)	**Goat/sheep** (20gms/day/person)
Requirement of meat in tons	28	14
No. of animals required per day for slaughter	250	1372

All the required livestock should normally be produced in the district of Bareilly and adjoining districts like Badaun, Pilibhit, Shahjhanpur of Uttar Pradesh or should come out of this area and to be transported to Bareilly where facilities will be created for the slaughter, processing and distribution. As these are labour intensive, it will employ lot of labour force to handle this large product category from the farm gate to the consumers.

The entire chain, as it presently exists, needs to be studied in detail and in depth and based on that a vision has to be developed for the Bareilly district; its growth pattern and how the government proposes to generate the range of food for the current population as well as growth of the population for the coming 30 years. The range of employment generation and kind of growth rate in terms of food security and availability of these products to the consumers need also to be considered including milk and milk products. The preventive measures for pollution control and downgrading polluting industries like hide and skin processing and several other pollutants generated in the process of meat and meat production systems has to be taken care of.

Present Slaughtering in Bareilly

The following slaughtering has been reported by Municipal Corporation Bareilly in respect of buffaloes and goat/sheep

Present Status of Slaughtering

S. No.	Species	No. of Slaughterhouses			No. of Animals being slaughtered per day		
		Authorised	Unauthorised	Total	Authorised	Unauthorised	Total
1	Buffalo	1	20	21	100	300	400
2	Goat/ sheep	1	30	31	100	350	450

The above reported slaughtering includes an estimation of slaughtering at unauthorized sites at Bareilly due to its strategic location in Uttar Pradesh. The difference between the meat requirement and actual slaughtering in case of buffalo indicates that the buffalo meat is being exported from Bareilly. The above slaughtering however cannot be included as a base for domestic consumption but it is indicative for the purpose of understanding the basic marketing structure..

Keeping in view various factors and parameters, like present slaughtering, present slaughtering practice specially in rural areas and its linkage, future projected requirement, availability of raw materials and viability of the plant vis-avis its cost, etc. Municipal Corporation has decided to establish the modern slaughterhouse with the following proposed capacity vide their letter No. **146/ST/NoA/2013-14, dt: 31-5-2013**

Proposed Capacity of Modern Slaughterhouse

S.No.	Species	Proposed Capacity		
		Per Shift	Per day	Per annum
1	Buffalo	100	200	60000
2	Goat/ sheep(Halal)	175	350	105000
3	Goat/ sheep (Jhatka)	100	200	60000

It is proposed that the Slaughterhouse will run in two shifts of 8 hours each. The first shift of 100 buffaloes and 275 goat/ sheep will be meant for the service of the public for the consumption in Bareilly and in nearby towns while the second shift of same number of buffaloes and goat/ sheep will be used by the Private Party (Entrepreneur)/ P.P. Partner for its commercial purpose, so that the establishment of Modern Slaughterhouse is an economically viable proposition.

Proposed Capacity of:

Meat Processing - Nil

Chilling Capacity - 20 tons

Freezing Capacity - 6 tons

Packaging Capacity - 6 tons

Cold Storage Capacity - 10 tons

CHAPTER - V

BACKWARD LINKAGES OF THE PROJECT

Introduction

The main objective of modern slaughterhouse is to produce wholesome and hygienic meat, which can further be converted into value added products for utilization by consumers. Since the raw materials for the slaughterhouse are live animals, therefore, in order to achieve the target of providing quality meat and meat products to the consumers, the monitoring of raw material (live animals) has to be started at farm level. In the present Indian scenario, majority of meat animals (sheep/goat/buffalo) are reared by small and marginal farmers in the rural areas. These animals are purchased by small traders (middlemen), who in turn sell these animals to big traders (middlemen). The live animals so collected by these traders are generally transported on trucks for sale at animal markets (livestock market) in bigger cities where the slaughterhouses are located. In the livestock market, the commission agents / brokers (other middlemen) strike a deal between seller (trader/farmer) and meat merchants. These animals are slaughtered in the Municipal slaughterhouses of the cities and the carcasses are sold in their retail outlets. Part of the meat so produced goes for further processing for preparation of value added food products, which are consumed over a period of week to months.

With the introduction of new food habits and the incoming of multi-national food giants, which provide variety of non-vegetarian food products, the risk of contacting the food borne infections and intoxication have increased considerably. Whenever there is an outbreak of meat borne pathogens due to any of the food products, it is not possible to trace back the infection at source level because the place of origin of animals from which the meat product was prepared cannot be traced to the source under the present conditions. Therefore, the control measure at the animal rearing level needs to be introduced. In the coming time, the risk due to these infections and intoxications is likely to increase further.

It is therefore, necessary that wherever the slaughterhouse of Municipalities are being modernized, the catchment area which provides the live meat animals to the concerned slaughterhouse should also be adopted for starting a well defined scheme of contract farming of the meat animals by the rural population. In this way, the farmers will also get the regular source of income and the consumer of meat and meat products will get safe food at reasonable prices by eliminating the three stages of middlemen in the marketing channel.

Out of 3,894 Municipal Slaughter houses (Report of working group on Animal Husbandry and Dairying, 12th Five Year Plan, Planning Commission, 2012), 80% have the facility to slaughter sheep/goat, the rest have the provision of slaughtering buffalo/cattle in addition to sheep/goat depending upon the area.

Integrated Project on Slaughterhouse (From Farm to the Consumer)

According to Bhat *et al* (2003) under "a Concept Paper on Satellite Farming for milk and meat production", several models have been suggested. The basic concept provides for **(i) cooperative structure** which had some limited success in milk production, **(ii) a corporate structure** which involves privately owned enterprises, which will start with village level farmers, provide them services and goods and in return purchase products (milk, meat, wool etc.) and process them in slaughterhouses / milk plants, wool factory and sell them to consumers. This model has succeeded in poultry and in dairying. It can easily succeed in meat production also. This model has an added advantage of meeting the WTO regulations on

traceability and WHO's regulations on health standards for meat and meat products. **(iii) Semi corporate model**: This involves a corporate identity which will take into its fold all the current stakeholders in the chain (the farmer or livestock growers, livestock collectors and middlemen who sell to traders, who intern sell to stock brokers and finally to the retailers). This model takes note of the weaknesses of the system and brings all the stakeholders in an organized manner to operate on corporate principles based on supply and demand. This also includes hide and skin processing systems. It would be necessary to develop a major system to develop a data-base to effectively study each of these models on the cost benefit ratio basis.

Semi Corporate model

The modern slaughterhouse should become the nucleus for implementation of this scheme. An agency will be established / registered by the Municipal Corporation having the members from the management of abattoir, Department of Animal Husbandry, Department of Rural Development / Panchayati Raj and members from the local village societies. This agency will be responsible for modifying the scheme of contract farming as per the practical feasibilities of the area with the consent of administration and various stake-holders. The stake-holders in the present scheme can be of three stages:

1. Primary stake-holders (those who are directly involved), which includes promoters, employee of the unit, animal rearing societies and farmers.
2. Secondary stake-holders (those who are indirectly involved), which includes consumers, hotelier, traders and transporters.
3. Key stake-holders (those who can influence the success of the project), which includes Government agencies, financial institutions, etc.

The implementation of the scheme to be decided by the Agency in consultation with various stake-holders will be as under:

1. The agency will provide marginal money (share capital) as its own contribution of the 10% of the cost of the project through the farmer's society.
2. The Government Department of Animal Husbandry & Dairying, Ministry of Agriculture & Ministry of Rural Development will provide 33.33% as subsidy for the implementation of the scheme in the phased manner.
3. A loan of balance 56.67% amount will be arranged through the financial institutions (NABARD) at reasonable rate of interest to the farmers.

The agency will provide technical details for establishment of sheds for buffalo, sheep/goat rearing for a unit as per feasibility in the situation. The beneficiary of the scheme will be trained by the agency by upgrading the existing knowledge of the farmers about feeding/breeding and health care of animals. The management aspects will be taught thoroughly and practical training will be provided to the beneficiaries.

The agency will also provide veterinary health care services including regular vaccination and preventive medication to control normally prevalent diseases to the meat animals on the payment of fixed service charge and will assure purchase of marketable stock from the beneficiary on live weight basis. The agency will develop a system of grading about the quality of meat animals and the beneficiary will get bonus at market price for the better quality animals. The village level society will inform the federation, well in advance, about the availability of animals ready for slaughtering and the federation will arrange the collection of these animals from the farmers' rearing unit. All the livestock and the fixed structures of the unit will be insured through national insurance agencies. The scheme will be useful for area development programme and also for creation of disease free zones.

The corporative model involves participation at several levels and becomes complex when the literary standard of participating farmers are almost zero and therefore, the officers appointed by them, become only managers and accountability become causality. The model of contract farming on the other hand, envisages a private entrepreneur or corporate identity that will use a corporate business model in that enterprise. It is envisaged that it will provide services and goods to the farmers at cost so that the farmer is able to receive a minimum monthly income of Rs.6,000/- from the enterprise. These will be funded by financial institutions like NABARD with technology underwriting by the entrepreneur such that the technology described in the annexure generates a monthly income to the farmer from the marketable surplus in his products i.e. live animals for meat and other products like dung, wool, etc.

Both these models, the cooperatives and the corporate, can be concurrently run converting the livestock farmers, who are at present financially non viable, into entrepreneur through assistance either from cooperative structure or corporate identity (agency). While underwriting technology and convert the farmers into entrepreneurs, it will be necessary for the entrepreneur / cooperative units to have support of training. The training institution should be created where training in management of resources given to the farmers, particularly women, who operate livestock enterprise.

Anticipated Animal Requirements

Anticipated demand of meat has been calculated on the basis of population and their estimated consumption of meat. Demand, however, has been calculated only for Bareilly. The demand could be manifold if the modern slaughter house produces quality and hygienic meat and is willing to supply to other adjoining districts. The demand could further be increased if efforts are made to export the meat

Keeping in view of the present consumption, present slaughtering of animals by traditional methods, viability of Modern Slaughterhouse in the city, opportunity for export and the future prospects, Bareilly Municipal Corporation has decided to fix the following capacity of the proposed Modern Slaughterhouse at Bareilly vide their letter no. **vide letter no: 146/ST/NoA/2013-14, dt: 31-5-2013**

Proposed capacity of slaughter house at Bareilly

S.No.	Species	Proposed Capacity		
		Per Shift	**Per day**	**Per annum** (300 days)
1	Buffalo	100	200	60000
2	Goat/ sheep	275	550	165000

Estimated Breedable Animals to produce required Raw Materials

Catchment Area: Districts viz., Bareilly Badaun, Pilibhit and Shahjahanpur would be the major catchment area which could provide raw material (animals) for the proposed modern slaughter house. The population of buffalo, sheep / goats of these districts as per Livestock Census 2007 is given below:

Population of buffalo, sheep/goats (2007)

S. No	Districts	Buffalo		Goat		Sheep	
		Total Population	Breedable Female	Total Population	Breedable Female	Total Population	Breedable Female
1	Badaun	753405	366980	245102	16017	10910	3577
2	Bareilly	578563	286184	172112	95269	1339	346
3	Pilibhit	264822	122856	99735	55150	941	248
4	Shahjahanpur	316802	164847	274754	168432	3199	1876
	Total	1913592		791703		16389	
	Total Breedable		**940867**		**334868**		**6047**

Assumptions

- A breedable female buffalo can produce one male calf for slaughtering in three years. In addition one tenth of female buffaloes will be available for slaughtering every year.
- A breedable female goat/sheep can produce three kids in 12 to18 months, 50% of which could be males available for slaughtering. In addition, one tenth of female goats also be available for slaughtering.

The required number of breedable animals therefore would be:

Sl. No.	Animals	Required Number of animals for slaughtering		Required Number of Breedable Animals	Available Breedable Animals in four districts
		Per Day	Per Annum		
1.	Buffalo	200	60,000	2,70,000	9,40,867
2.	Goat/sheep	550	1,65,000	11,00,00	3,40,915

The slaughter house will encourage livestock owners to raise the animals on commercial lines, which would vary from species to species. In case of buffaloes, farmers may be encouraged to raise **Male calves for fattening** and supplying to slaughterhouse. In case of sheep/goat, the farmers will be encouraged to raise the animals on commercial lines following scientific practices.

This will increase the employment opportunities in Bareilly and other adjoining districts. The Bareilly Municipal Corporation will take this project as a commercial viable project leading to a regular income source not only for the Corporation but also for the farmers and animal producers. Goat production needs to be promoted in the area to meet the demand of slaughter house. The large number of goat / sheep will have to be brought from goat production areas like Rajasthan till its production is increased through promotional activities.

Backward Linkage Scheme:

Under the proposed scheme, the modern slaughterhouse will establish strong backward linkage with producers of the animals. This will on one hand ensure the quality and hygienic raw material availability as well as it will encourage and promote livestock owners to produce the animals by providing easy access for sale and better prices for their animals. The livestock owners normally raise 1 or 2 buffaloes, 5 to 10 goats/sheep backyard system. Efforts may be made to fix up an optimum minimum size of enterprise to provide at least Rs.6,000/- per month as profit to become a viable unit.

The smaller size of units such as less than 50 goats/sheep cannot be a viable and cannot fetch an income of Rs.6,000/- per month. But, the project has to take care of egalitarian aspect wherein even the poorest person with his little resources and limited capacities can be included to participate and get an additional income along with his other livelihood enterprises as compensation. The farmer who grows crops, fruits and vegetables may also keep few animals with very little additional expenditure and efforts can add their income substantially.

Keeping in view of this, the project must include the smaller units also which may not be exclusively viable but will definitely be supportive to other enterprises under mixed farming system.

Methodology

The model suggested in the beginning which is based on contract farming with the creation of Agency, could arrange the requirement of good breed of animals. The Agency will register the selected entrepreneurs/farmers to establish the suitable size of animal units (Buffalo, Goat/sheep). The projects will be prepared for each selected entrepreneurs on participatory approach involving all the incumbents by the Agency. The projects could be financed by NABARD through banks and subsidized by government department of Animal Husbandry, Rural Development or Panchayati Raj.

The entrepreneurs/farmers will be trained in the related enterprise by the Federation and the technology will be made available to them. The programme has to be monitored intensively for technology underwriting where support from the related incumbents and agencies will be sought. Inputs and services could be made available to the farmers by the Agency on cost basis which could be subsidized and facilitated by Government Departments under the existing schemes. The Agency may also make the credit available to the farmers from the slaughter house to be adjusted against cost of animal purchased.

The Agency will have to maintain accessibility to each of the incumbents / entrepreneur for which a cell or section will be created at the slaughter house with suitable vehicle and infrastructure for information storage, processing and retrieval. The cell will coordinate all the activities from planning, training, supply of inputs, supply of technologies and services and up to the marketing. Private entrepreneurs and agencies would be involved in purchasing the animals directly from the doors of the farmers and transporting them to the slaughter house turn by turn to meet the daily requirement of raw material for the plant.

A separate Detailed Project Report for the Establishment of Backward Linkage may be prepared, which could be a profitable and viable proposition for entrepreneurs.

Infrastructure requirements for backward linkage

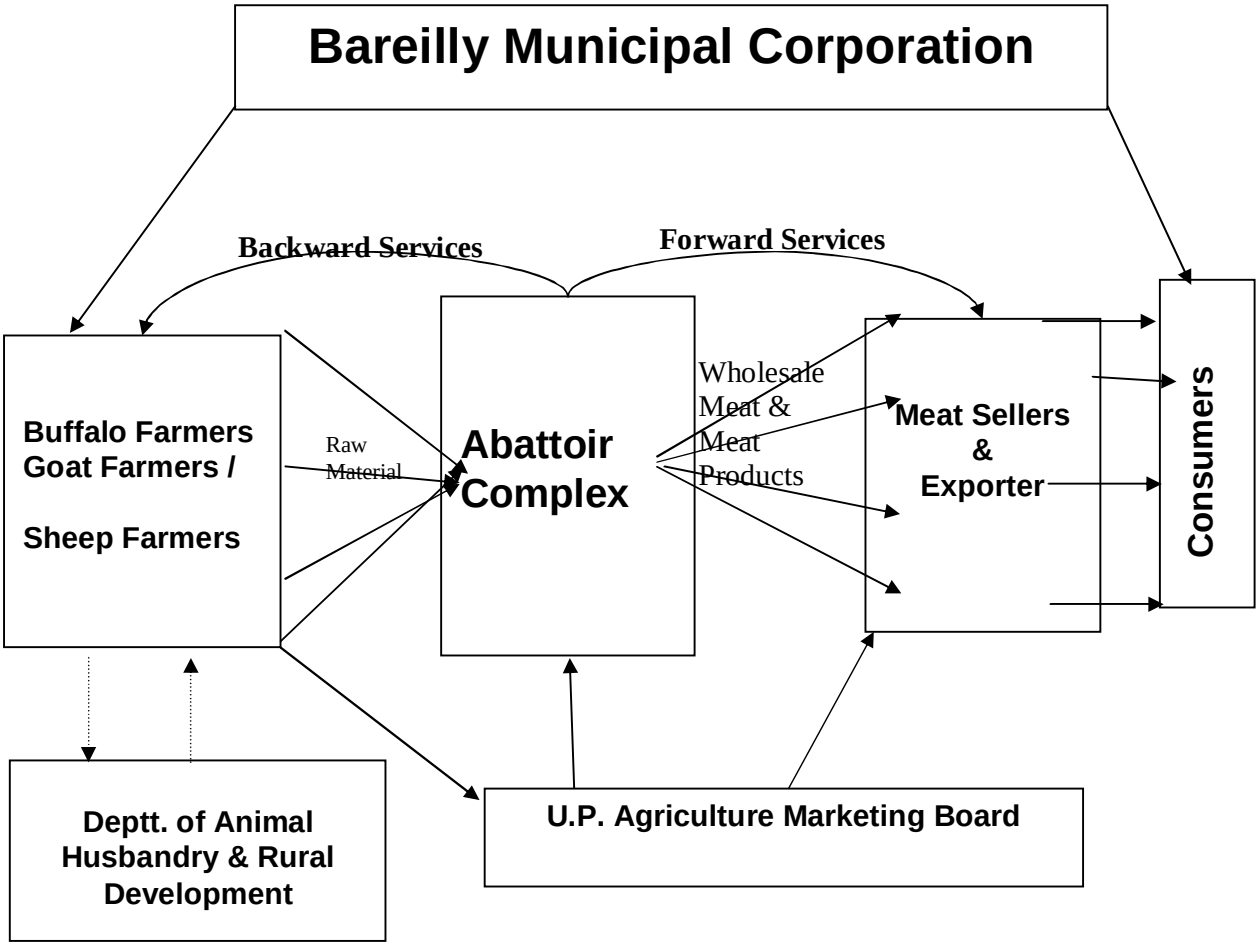
	Staff:	
1.	Project Coordinator	One
2.	Project Associate	Four
3.	Veterinary Officers	Six
4.	Stockman	Six
5.	Programmers	Two
6.	Driver	Four
7.	Peon	Ten
	Vehicle	
1.	Small Vehicle for Veterinary Officers	Four
2.	Vehicle for transport of animals	Four

Equipments

1 Office equipment: Computers with all IT facilities, Xerox Machine, Fax Machine, etc.

2. Laboratory Equipments: As required for veterinary officers

Backward and Forward Linkages



Annexure 5.1

Buffalo Meat Production

India has the largest livestock populations. India's share in total buffalo meat production of the world is the largest, i. e. 42.8% as is indicated in the following table:

International Production of Buffalo Meat (2011)

S No.	Country	Production (MT)	Share (%)
1	India	15,02,820	42.80
2	Pakistan	7,75,000	22.07
3	Egypt Arab Republic	3,95,801	11.27
4	China P Rp	3,08,432	8.78
5	Nepal	1,67,868	4.78
6	Philippines	1,05,600	3.01
7	Vietnam Social Republic	99,330	2.83
8	Indonesia	37,500	1.07
9	Myanmar	34,322	0.98
10	Thailand	23,235	0.66
11	Laos	19,470	0.55
12	Italy	10,644	0.30
13	Cambodia	9,792	0.28
14	Bangladesh	5,960	0.17
15	Sri Lanka	4,746	0.14
16	Malaysia	3,991	0.11
17	Iran	3,010	0.09
18	Turkey	1,615	0.05

Source: Food and Agriculture Organization.
http://agriexchange.apeda.gov.in/product_profile/International_Production.aspx?categorycode=0402

Production of Quality meat

The objective of meat quality is to offer to the consumer wholesome, tasty and safe meat at a reasonable price. This is possible to achieve if one can understand the simple meat science and the safety levels. A quality meat production involves:

1. Raw material
2. Selection and care of animal
3. Slaughtering and processing
4. Preservation, cold store and transport
5. Consumption, shelf life.

Other Quality Contributing Factors are:

- A good maintenance of the plant hygiene and sanitation, both inside and outside the premises, is utmost important to produce quality meat. This applies to transport vehicles and retail outlets also along with the tools and the equipment associated.
- Selection of correct packing material i.e., Polyethylene, is crucial to retain the quality of meat and sustain the freezing and handling pressure throughout the shelf life period.
- Correct packing method for better and longer shelf life like MAP (Modified Atmospheric Pack), vacuum, tin packing, tetra packing or simple polyethylene packing (Grade I).

Disease Management: Parasitic diseases in calves: The increasing export of frozen buffalo meat to various Middle East countries confirms the scope for increasing meat production through systematic rearing of Male Buffalo calves for meat production. It has almost 3-4 fold cost advantage over goat of chicken meat. About 10 million male buffalo calves are born annually. Considering a mortality rate of about 10%, surviving calves will be about 9 million, and about 10% of these calves may be retained for draught and breeding purpose for some time but ultimately these animals too will be used for meat production.

Due to costly affair and due to lack of the use of early weaning system, a larger number of calves are intensely killed within 3-5 weeks of age through starvation in urban and sub-urban areas. Young calves are highly susceptible for round worm infection which mostly terminates before 3 month of age. Some of other diseases also make the calves vulnerable.

A major handicap in the effective development of buffalo husbandry appears to be the high figures of calf mortality due to toxocariosis, pneumonia and salmonellosis.

Diseases of Buffalo calves: The buffalo-calves of less than three month-old have more infection of the ascaris than the older calves. The calves of more than 2 month-old age had more infection of strongyles than T. Vitulorum. The severely infected animals may die of the disease because of toximia. The other nematode parasites, which infect very young calves is S. papillosus. Being percutaneous route the most common way of transmission, wet conditions with low levels of hygiene may cause strongyloidosis. It can be controlled by provision of a basic level of hygiene.

Fasciolosis: Fasciolosis caused by Fasciola gigantica, is a disease of domestic ruminants in India. They cause changes in the haemogram marked with reduced total erythrocytic counts, haemoglobin and packed cell volume, which are indicative of effects on haemopoietic system of infected animals. A normochromic normocytic type of anaemia also occurred from this infection.

Coccidiosis: Eimeria zurnii is the most pathogenic species and is responsible for causing bloody diarrhoea which is foul smelling and fluidy. The animal becomes anaemic and goes off feed resulting into further emaciation and weakness. The young calves of 3 wks to 8 months-old, are infected.

Mange: Sarcoptes scabei and Psoroptes bovis, affects the horns of the buffaloes in India (Sen and Fletcher, 1962). Mites attach at the root of the horn and make their way towards its tips burrowing and building nests between the core and the horny appendage. The later becomes brittle and is ultimately reduced to powder. It becomes detached exposing the sensitive core. The irritation may cause the animal to strike its head against the manger / wall / hard objects continuously.

Costs in Meat Production: India is the leader in buffalo meat export. The meat available is mostly from old and culled animals, which is dark, less tender and has a strong odour. However, when buffalo calves are reared under scientific feeding conditions, their meat is lean, tender and highly palatable.

Live weight of buffalo calf is generally about 30 Kgs at birth under village (farm level) feeding conditions, the weight increase to 55 Kg at the age of 3 months and 80 Kgs when the calf is of 6 months age. The weight of an average buffalo/male or female at the age of 36 months is around 360 Kg. The dressed weight varies from 50 percent to 55 percent depending upon the age of the animal. When slaughtered, the by-products like skin and bones etc. are sold at the rate ranging from Rs. 50 to Rs. 250 depending upon the age of the animal. The net cost of meat production is high, when the calf is young i.e. about 3 months or 6 months, but as the age increases, the weight of the animal also increases and the meat from buffalo calf was found to

be Rs.120/- at the age of 36 month. Hence it is suggested that the calves reared upto the age it goes on gaining weight and then should be sold to be slaughtered.

Feeding Strategies for Different Categories of Buffaloes

- Since calf rearing is a costly affair and due to lack of the use of early weaning system, a larger number of calves (mostly of better germ plasm) are intensely killed within 3-5 weeks of age through starvation in urban and sub-urban areas. Young calves are highly susceptible for round worm (Neoascaris vitulorm and strongyloides papillosus) infestation, which mostly terminates before 3 mouth of age. This is a great loss to the country although there are markets of buffalo meat. Thus, there in an urgent need of evolving economical and remunerative feeding system for the production of buffalo veal for which there is no socio-cultural inhibition in the country.
- A large number of spent buffaloes find their fate in abattoirs. The meat available from such animals is more coarse and of poor quality. Some improvement can be made in the meat quality of such spent animals by short duration adequate feeding. There is need for the development of suitable diets, feeding system and feeding duration for the improvement of the meat of such animals.

Slaughter Houses: There are about 3,894 licensed slaughter houses and 25,754 unregistered slaughter houses in the country[5].

Objective of a Slaughter House: Meat and meat products are important sources of nourishment for mankind. The developed countries since long have realized the financial and sanitary advantage of full use of animal - meat from slaughtered animal and also condemned carcass / slaughter house edible and inedible waste.

The objective of a Slaughter House:

- To provide proper remuneration to the farmers of the area for live / dead animals and also to keep the area clean from environmental pollution.
- To create hygienic conditions to produce good quality meat and also to put to use the offals etc. to make it into offal meal and other products of use.
- To make available a facility whereby good quality meat can be made available to the consumers.
- As a welfare activity to prevent zoonotic infections and spread of animal diseases.
- To reduce environmental pollution from slaughter house waste.
- To reduce risks for bird hazards to civil and military aviation.
- To achieve material benefit by production of high quality end-products.

Opportunities: The carcasses from the slaughter house will be able to feed the domestic market and also to some extent the export market by way of providing a facility to slaughter the animal in hygienic conditions, as per the requirements of the buyers.

It can help in making good quality end products as under:

- Hides and skins can be used to make good quality shoe / uppers. Demand exists in the local market as well as for exports.
- Tallow can be used for making candles, inexpensive soap and also as source of Energy in the Poultry Diets.
- Meat-cum-bone meal can provide the much needed protein to the livestock sector for better production from the animals.

[5] Report of the working group on Animal Husbandry and Dairying 12th Five Year Plan (2012-2017) page 72, para 12.1.3

Organised Meat Processing Sector: There are about 42 modern meat processing plants/ abattoirs, which provide adequate hygienic conditions. These plants have chilling, deboning, freezing and packaging facilities and mostly cater to the export demand.

Now, a few modern mechanised abattoirs-cum-meat processing plants have come up, meeting EEC and USDA phyto-sanitary conditions. Modern state-owned meat processing complex have been set up in Delhi, Goa, Durgapur (West Bengal), Hyderabad, Bangalore, Chennai and near Ambala in Haryana. There are plans to set up modern abattoirs in , Kolkata, Jammu, Srinagar and other important cities.

Processing of Buffalo Meat: For efficient utilization of fibrous and tough meat from spent animals, a great deal of research work has been carried out to develop appropriate technologies for improving the physico-chemical and functional properties and palatability of market buffalo meat and its use in convenience and value added processed meat products.

Ground Meat: In ground meat products, meat and other components are not only minced but other ingredients are added to improve the processing quality and palatability. Further, mincing and emulsification facilitate the moulding of meat into several types of meat products thus adding to variety and convenience that can be offered to the consumers. Processing of ground meat into processed meat products offer wide scope for fabricated products of desired composition / quality such as health foods, low cost formulation and specialty products besides blending meats from different species for synergistic effect.

Indigenous Products: The demand for traditional meat products is bound to increase further in the coming years due to rapid urbanization and rising living standards. Buffalo meat is also consumed in the form of conventional preparations or as processed products. Traditional meat products like "seekh kabab", "Shammi kabab", "Tikka" and "kofta" are popular. The future development of these nutritious foods has great potential, but its realization will depend upon raising their production and quality improvement.

Comminuted Meat Products: Addition of fat enhances juiciness and palatability of the products, but incorporation of buffalo fat in the products formulations caused mouth coating and / or after taste problems thus lowering palatability of emulsion based buffalo meat products. Processing techniques have been developed for convenience, value added and highly acceptable buffalo meat sausages, patties, blocks, loaves, nuggets, rolls, etc.

Cured and Smoked Products: Cured and smoked products are being relished for their attractive colour and flavour. Nitrite level of 150 ppm in product formulations was found necessary for producing smoked buffalo meat chunks for better colour and flavour. Curing and smoking improved the storage stability of the products. Smoked buffalo meat is being made commercially. Tumbling and vacuum tumbling processing schedules have been developed to facilitate uniform distribution of curing mixture and hasten the curing process in order to obtain cured and smoked products of high sensory quality.

Restructured Products: Restructuring of meat offers several benefits. Meat from the calves (about a year) is found to be suitable for production of restructured blocks, nuggets and rolls. However, restructured products made from the meat of market/adult buffaloes will be relatively less palatable. Intermittent vacuum tumbling of 18 hrs has significantly improved the yield, cohesiveness and sensory attributes of restructured meat blocks.

Future strategies: India is having vast resources and cheap labour; therefore, the figure may just be doubled if the potentiality of male buffalo calves for meat production could be harvested optimally. Following strategies may help to fulfill the target.

- **Awareness for rearing male calves for fattening:** Underfed male buffalo calves after weaning are either starved to death or pushed to slaughter house. These calves, if reared on

high energy diets up to a live body weight of 350 kg., may yield 180 kg meat of good quality.

- **Techno-economic feasibility:** There is a need to work out economical feeding schedule for growth production which may be remunerative to yield profit to the farmer.
- **Consciousness for quality meat:** Meat of the buffaloes reared specifically on well balanced fattening ration, must get preference over the meat obtained from malnourished calves and get bonus price as per quality.
- **Health measures:** Animal Husbandry Departments in collaboration with meat industry must enforce disease control aspects to the animal rearer and hygienic control in the abattoir as well as meat handling factories. Modernization of State Govt. slaughter houses and infrastructure of meat factories will boost country's livestock product export.
- **Market facilities:** Involvement of middleman to be reduced by organised market facilities. Introduction of grading among the live animals/carcasses is necessary for uniform trade practices for home consumption or for export. Quality control norms should be framed and adhered strictly.

Annexure 5.2

Buffalo Production

Dairying is an important source of subsidiary income particularly to small/marginal farmers and agricultural labourers. Apart from milk, the manure from animals provides a good source of organic matter for improving soil fertility and crop yields. The gober gas from the dung is used as fuel for domestic purposes as also for running engines for drawing water from well. The surplus fodder and agricultural by-products are gainfully utilized for feeding the animals. Buffalo males are good source of meat apart from draught power. Since agriculture is mostly seasonal, there is a possibility of finding employment throughout the year for many persons through dairy farming. Apart from milk production the male calves of buffalo are raised and used for meat production. Thus, buffalo provides employment throughout the year. The main beneficiaries of dairy programmes are small/marginal farmers and landless labourers.

Buffalo produces male calves which fetch a substantial income to the farmer and the raw material for buffalo slaughter house, buffalo calves, otherwise are not required for the farmer. Though scientific buffalo production leads primarily to cost effective milk production, but it also gives buffalo male calves for meat production. In view of the above this section provides model scheme for buffalo production primarily for dairy purpose for the farmers, where male calves will be produced as by-products.

It is proposed to conduct an asset inventory of small and marginal farms, medium and large farms so that 100-200 livestock entrepreneurship, which is financially viable, can be created in an area of 50 Km around the Slaughterhouse. The cost benefit analysis for the following unit have been given as a model at the end of this section. Their viability analysis is given at the end of this section. The figures in the tables may be outdated but gives a general picture of profitability,

1. Unit for 6 buffaloes with adequate land for fodder production.
2. Unit for 10 buffaloes with adequate land for fodder production.
3. Unit for 50 buffaloes with adequate land for fodder production

Financial Assistance Available from Banks / NABARD for Dairy Farming: NABARD is an apex institution for all matters relating to policy, planning and operation in the field of agricultural credit. It serves as an apex refinancing agency for the institutions providing investment and production credit. It promotes development through formulation and appraisal of projects through a well organized Technical Services Department at the Head Office and Technical Cells at each of the Regional Offices.

Loan from banks with re-finance facility from NABARD is available for starting dairy farming. For obtaining bank loan, the farmers should apply to the nearest branch of a commercial or co-operative Bank in their area in the prescribed application form which is available in the branches of financing banks. The Technical Officer attached to or the Manager of the bank can help/give guidance to the farmers in preparing the project report to obtain bank loan.

For dairy schemes with very large outlays, detailed reports will have to be prepared. The items of finance would include capital asset items such as purchase of milch animals, construction of sheds, purchase of equipments etc. The feeding cost during the initial period of one/two months is capitalized and given as term loan. Facilities such as cost of land development, fencing, digging of well, commissioning of diesel engine/ pump set, electricity connections, essential servants' quarters, godown, transport vehicle, milk processing facilities etc. can be considered for loan. Cost of land is not considered for loan. However, if land is purchased for

setting up a dairy farm, its cost can be treated as party's margin up to 10% of the total cost of project.

Scheme Formulation for bank loan: A Scheme can be prepared by a beneficiary after consulting local technical persons of State animal husbandry department, DRDA, SLPP, dairy co-operative society/union/federation/commercial dairy farmers etc. If possible, the beneficiaries should also visit progressive dairy farmers and government/military/ agricultural university dairy farm in the vicinity and discuss the profitability of dairy farming. A good practical training and experience in dairy farming will be highly desirable. The dairy co-operative societies established in the villages as a result of efforts by the Dairy Development Department of State Government and National Dairy Development Board would provide all supporting facilities particularly marketing of fluid milk. Nearness of dairy farm to such a society, veterinary aid centre, artificial insemination centre should be ensured. There is a good demand for milk, if the dairy farm is located near urban centre.

The scheme should include information on land, livestock markets, availability of water, feeds, fodders, veterinary aid, breeding facilities, marketing aspects, training facilities, experience of the farmer and the type of assistance available from State Government, dairy society/union/federation.

The scheme should also include information on the number and types of animals to be purchased, their breeds, production performance, cost and other relevant input and output costs with their description. Based on this, the total cost of the project, margin money to be provided by the beneficiary, requirement of bank loan, estimated annual expenditure, income, profit and loss statement, repayment period, etc. can be worked out and shown in the Project report.

Scrutiny of Schemes by banks: The scheme so formulated should be submitted to the nearest branch of bank. The bank's officers can assist in preparation of the scheme for filling in the prescribed application form. The bank will then examine the scheme for its technical feasibility and economic viability.

(A) Technical Feasibility – this would briefly include :

1. Nearness of the selected area to veterinary, breeding and milk collection centre and the financing bank's branch.
2. Availability of good quality animals in nearby livestock market.
3. Availability of training facilities.
4. Availability of good grazing ground/lands.
5. Green/dry fodder, concentrate feed, medicines etc.

(B) Economic Viability – this would briefly include:

1. Input cost for feeds and fodders, veterinary aid, breeding of animals, insurance, labour and other overheads.
2. Output costs i.e. sale price of milk, manure, gunny bags, male/female calves, other miscellaneous items etc.
3. Income-expenditure statement and annual gross surplus.
4. Cash flow analysis.
5. Repayment schedule (i.e. repayment of principal loan amount and interest).

Other documents such as loan application forms, security aspects, margin money requirements etc. are also examined. A field visit to the scheme area is undertaken for conducting a techno-economic feasibility study for appraisal of the scheme. Model economics for a 6-buffalo unit to 500- buffalo unit are given in the following pages.

Sanction of Bank Loan and its disbursement: After ensuring technical feasibility and economic viability, the scheme is sanctioned by the bank. The loan is disbursed in kind in 2 to 3 stages against creation of specific assets such as construction of sheds, purchase of

equipments and machinery, purchase of animals and recurring cost on purchase of feeds/fodders for the initial period of one/two months. The end use of the fund is verified and constant follow-up is done by the bank.

Lending Terms – General

Unit Cost: Each Regional Office (RO) of NABARD has constituted a State Level Unit Cost Committee under the Chairmanship of RO-in-charges and with the members from developmental agencies, commercial banks and cooperative banks to review the unit cost of various investments once in six months. The same is circulated among the banks for their guidance. These costs are only indicative in nature and banks are free to finance any amount depending upon the availability of assets.

Margin Money: NABARD had defined farmers into three different categories and where subsidy is not available the minimum down payment as shown below is collected from the beneficiaries.

S.No.	Category of Farmer	Level of pre-development return to resources	Beneficiary's Contribution
(a)	Small Farmers	Upto Rs.11000	5%
(b)	Medium Farmers	Rs.11001 – Rs.19250	10%
I	Large Farmers	Above Rs.19251	15%

Interest Rate: As per the RBI guidelines the present rate of interest to the ultimate beneficiary financed by various agencies are as under:

No.	Loan Amount	CB's and RRB's	SLDB/SCB
(a)	Upto and inclusive of Rs.25,000	12%	As determined by SCB/SLDB subject to minimum 12%
(b)	Over Rs. 25000 and upto Rs.2.0 lakhs	13.5%	-do-
I	Over Rs. 2.0 lakhs	As determined by the banks	-do-

Security: Security will be as per NABARD/RBI guidelines issued from time to time.

Repayment Period of Loan: Repayment period depends upon the gross surplus in the scheme. The loans will be repaid in suitable monthly/quarterly installments usually within a period of about 5 years. In case of commercial schemes it may be extended up to 6-7 years depending on cash flow analysis.

Insurance: The animals may be insured annually or on long term master policy, whichever is applicable. The present rate of insurance premium for scheme and non scheme animals are 2.25% and 4.0% respectively.

Viability analysis of buffalo production units:

The viability analysis of buffalo production is given below for different size of units. Economics of buffalo production units have been calculated as illustration and not as actual. The updated and actual economics can be developed while preparing a separate DPR for the Backward Linkage Scheme to be implemented along with the Modern abattoir Project.

1. Unit for 6 buffaloes with adequate land for fodder production.
2. Unit for 10 buffaloes with adequate land for fodder production.
3. Unit for 50 buffaloes with adequate land for fodder production

1. Dairy unit for 6 buffaloes with adequate land for fodder production

Sr. No.	Item Description	6 Buffaloes Amount in (Rs)
A. Capital Investment		
1.	Cost of buffaloes 8 litres/day @ Rs.25,000/-	1,50,000.00
2.	Buildings	
	i) Covered area for buffaloes 30 sq.ft/buffalo @Rs.300/ sq.ft.	54,000.00
	ii) Open area for buffaloes 20 sq.ft/buffalo @Rs.50/ sq.ft.	6,000.00
	iii) Cost of calf-shed	2,500.00
3.	Cost of small tank and hand pump	5,000.00
4.	Cost of equipment (buckets, can, measuring jar etc.)	2,000.00
5.	Miscellaneous	1,000.00
Total Capital Investment		**2,20,500.00**
B. Working Cost (Variable Costs)		
1.	Feed and fodder	
	a) Green fodder @ 25 kg/day/buffalo @ Rs.100/q when purchased	54,750.00
	b) @ Rs.50/q when fodder is grown	(27,374)*
2.	Treated Straw @ 4 kg/day/buffalo (@ Rs.2.00/kg)	17,520.00
3.	Concentrates @ 3.5 kg/day/buffalo(@Rs12.50 per kg)	95,812.50
4.	Labour cost @ Rs.3000/month	36,000.00
5.	Mineral mixture, salt etc.	1,000.00
6.	Veterinary aid @ Rs.1000/buffalo/annum	10,000.00
7.	Technology aid @Rs.1500 for confirm pregnancy	10,000.00
Total Variable Cost		**2,25,082.50**
C. Working Cost : Fixed Costs		
1.	Insurance on cost of buffaloes @ Rs.2.25%	3,375.00
2.	Depreciation @ 10% on (a) cost of buffaloes, (b) cost of equipment and (c) cost of shed	22,050.00
Total Fixed costs		**25,425.00**
D. Income		
1.	By sale of milk @ Rs.30.00 per litre	5,25,600.00
2.	By sale of manure 6 ton per buffalo @ Rs.600/ton	21,600.00
Total Income		**5,47,200.00**
E. Bank Loan Required		
1.	Farmer's Equity @ 25% of capital investment	56,125.00
2.	Working capital needed for a period of 3 months	56,270.62
3.	Amount required as loan (capital investment – Farmer's Equity + 3 months working capital/unit)	2,76,770.00
4.	Interest Rate (% per annum)	10%
	Total	1,12,395.62

F. Birth & death Register:

	Item Description	I Year	II Year	III Year	IV Year	V Year	VI Year
1.	Female buffalo at hoof	06					
2.	Births						
	i) Male		03	03	03	03	03
	ii) Female	06	03	03	03	03	03
3.	Heifers						
4.	Pregnant Heifers			06	03	03	03
5.	She Buffalo						
6.	Disposal						
	i) Male @5,000/calf		03	03	03	03	03
	ii) Female						
7.	Heifers						
8.	Pregnant Heifers for sale @ 20,000/animal			06	03	03	03
i)	Income by selling of pregnant heifer & male calf		15000	135000	75000	75000	75000
ii)	Income by selling of manure of pregnant heifers			12000	5000	5000	5000
	INCOME YEAR WISE		**15000**	**147000**	**80000**	**80000**	**80000**
iii)	Cost in raising a calf up to pregnant heifer is assumed to be 30% of variable cost per buffalo (30% = 6356)	-	-	67747.50	33873.75	33873.75	33873.75
	Extra Total income (year wise)		15000	79252.50	46126.25	46126.25	46126.25

G. Profitability:

1.	Gross income = income – (fixed costs + variable cost)	1,01,617.50
2.	Repayment of Loan+interest (1/5 annually)	28,000.00
3.	Employment (man months) when fodder is purchased	24
4.	Employment (man months) when fodder is grown	48
5.	Time to pay back loan	5 years

Note: *Figures in the brackets indicate when fodder is grown by the farmer*

H. Cash flow statement for a unit of 6 buffaloes:

Item Description	I Year	II Year	III Year	IV Year	V Year	VI Year
Net Income	1,01,617	1,16,617	1,80,869	1,47,743	1,47,743	1,47,743
Loan outstanding	2,76,770	2,29,447	1,77,392	1,20,131	57,144	-
Interest	27,677	22,945	17,739	12,013	5,714	-
Loan installment	75,000	75,000	75,000	75,000	62,858	-
Net Surplus	26,617	41617	1,05,869	72,743	84,885	1,47,743
Net income/month	2,218	3,468	8,822	6,062	7,074	12,312

2. Dairy unit for 10 buffaloes with adequate land for fodder production

Sr. No.	Item Description	10 Buffaloes Amount in (Rs)
A. Capital Investment		
1.	Cost of buffaloes 8 litres/day @ Rs.25,000/-	2,50,000.00
2.	Buildings	
	i) Covered area for buffaloes 30 sq.ft/buffalo @Rs.300/ sq.ft.	90,000.00
	ii) Open area for buffaloes 20 sq.ft/buffalo @Rs.50/ sq.ft.	10,000.00
	iii) Cost of calf-shed	4,500.00
3.	Cost of small tank and hand pump	5,000.00
4.	Cost of equipment (buckets, can, measuring jar etc.)	3,000.00
5.	Miscellaneous	1,000.00
Total Capital Investment		**3,63,500.00**
B. Working Cost (Variable Costs)		
1.	Feed and fodder	
a)	Green fodder @25 kg/day/buffalo @Rs.100/q when purchased	91,250.00
b)	@ Rs.25/q when fodder is grown	(22,812)*
2.	Treated Straw @ 4 kg/day/buffalo (@ Rs.2.00/kg)	29,200.00
3.	Concentrates @ 3.5 kg/day/buffalo(@Rs12.50 per kg)	1,59,687.50
4.	Labour cost @ Rs.3,000/month	36,000.00
5.	Mineral mixture, salt etc.	1,200.00
6.	Veterinary aid @ Rs.1000 /buffalo/annum	10,000.00
7.	Technology aid @Rs.1500 for confirm pregnancy	15,000.00
Total Variable Cost		**3,42,337.50**
C. Working Cost : Fixed Costs		
1.	Insurance on cost of buffaloes @ Rs.2.25%	5,625.00
2.	Depreciation @ 10% on (a) cost of buffaloes, (b) cost of equipment and (c) cost of shed	36,350.00
Total Fixed costs		**41,975.00**
D. Income		
1.	By sale of milk @ Rs.30.00 per litre	8,76,000.00
2.	By sale of manure 6 ton per buffalo @ Rs.600/ton	36,000.00
Total Income		**9,12,000.00**

E. Bank Loan Required		
1.	Farmer's Equity @ 25% of capital investment	90,875.00
2.	Bank loan needed =75% of capital investment + 3 months working capital/unit	3,58,210.00
3.	Interest Rate (% per annum)= 10%	35,821.00
	Installment	85,000.00

F. Birth & Death Register:

	Item Description	I Year	II Year	III Year	IV Year	V Year	VI Year
1.	Female buffalo at hoof	10					
2.	Births						
	i) Male		5	5	5	5	5
	ii) Female	10	5	5	5	5	5
3.	Heifers						
4.	Pregnant Heifers			10	5	5	5

5.	She Buffalo						
6.	Disposal						
	i) Male@ 5000/-		5	5	5	5	5
	ii) Female						
7.	Heifers						
8.	Pregnant Heifers @ 20000/-			10	5	5	5
i)	Income by selling of pregnant heifer & male calf	-	25000	225000	125000	125000	125000
ii)	Income by selling of manure of pregnant heifers (4 tons upto pregnancy @ Rs.600/ton)	-	-	24000	12000	12000	12000
iii)	Cost in raising a calf up to pregnant heifer is assume to be 30% of variable cost per buffalo (30% = 17117)	-	-	171170	85585	85585	85585
	Net surplus income (year wise)	-	25000	77830	51415	51415	51415

G. Profitability		
1.	Gross income = income – (fixed costs + variable cost)	2,06,163.00
2.	Repayment of Loan (1/5 annually) of Rs.198,000/-	39,600.00
3.	Employment (man months) when fodder is purchased	24
4.	Employment (man months) when fodder is grown	60
5.	Time to pay back loan	5 years

Note: Figures in the brackets indicate when fodder is grown by the farmer

H. Cash flow statement for a unit of 10 buffaloes:

Item Description	**I Year**	**II Year**	**III Year**	**IV Year**	**V Year**	**VI Year**
Gross Income	206163	231163	198812	167788	167788	167788
Loan outstanding	358210	304031	244434	178877	106765	-
Interest	35821	30403	24443	17888	10677	-
Loan installment	90000	90000	90000	90000	117442	-
Net Surplus	116163	81323	108812	77788	50346	167788
Net income/month	9680	6776	9068	6482	4196	13982

3. Dairy unit for 50 buffaloes with adequate land for fodder production

Sl. No.	Item Description	50 Buffaloes Amount in (Rs)
A. Capital Investment		
1.	Cost of 50 buffaloes 8 litres/day @ Rs.25,000/-	12,50,000.00
2.	Buildings	
	i) Covered area for buffaloes (30 sq.ft / buffalo @ Rs.300 / sq.ft.)	4,50,000.00
	ii) Open area for buffaloes (20 sq.ft / buffalo @ Rs.50 / sq.ft.)	50,000.00
	iii) Cost of calf-shed	25,000.00
3.	Cost of small tank and hand pump	10,000.00
4.	Cost of equipment (buckets, can, measuring jar etc.)	10,000.00
5.	Miscellaneous	5,000.00
Total Capital Investment		**18,00,000.00**
B. Working Cost (Variable Costs)		
1.	Feed and fodder	
	a) Green fodder @ 25 kg/day/buffalo @ Rs.100/q when purchased	4,56,250.00
	b) @ Rs.25/q when fodder is grown	(2,28,124)*
2.	Treated Straw @ 4 kg/day/buffalo (@ Rs.2.00/kg)	1,46,000.00
3.	Concentrates @ 3.5 kg/day/buffalo(@Rs12.50 per kg)	7,98,437.50
4.	Labour cost @ Rs.3000/month	1,80,000.00
5.	Mineral mixture, salt etc.	6,000.00
6.	Veterinary aid @ Rs.1000 /buffalo/annum	50,000.00
7.	Technology aid @Rs.1500 for confirm pregnancy	75,000.00
Total Variable Cost		**17,11,687.50**
C. Working Cost : Fixed Costs		
1.	Insurance on cost of buffaloes @ Rs.2.25%	28,125.00
2.	Depreciation @ 10% on (a) cost of buffaloes, (b) cost of equipment and (c) cost of shed	1,80,000.00
Total Fixed costs		**18,28,125.00**
D. Income		
1.	By sale of milk @ Rs.30.00 per litre	43,80,000.00
2.	By sale of manure 6 ton per buffalo @ Rs.600/ton	1,80,000.00
Total Income		**45,60,000.00**

E. Bank Loan Required		
1.	Farmer's equity @ 25% of capital investment	4,50,000.00
2.	Working capital needed for a period of 3 months	4,27,922.00
3.	Bank loan needed = 75% of capital investment + 3 months working capital/unit	17,77,922.00
4.	Interest Rate (% per annum)	10%
	Total Interest	8,88,960.00
	Total Loan	**26,66,882.00**
	Installment of Repayment	5,33,376.00

F. Birth & Death Register

	ITEM DESCRIPTION	I Year	II Year	III Year	IV Year	V Year	VI Year
1.	Female buffalo at hoof	50					
2.	Births						
	i) Male		25	25	25	25	25
	ii) Female	50	25	25	25	25	25
3.	Heifers						

4.	Pregnant Heifers			50	25	25	25
5.	She Buffalo						
6.	Disposal						
	i) Male @ Rs. 5000/-		25	25	25	25	25
	ii) Female						
7.	Heifers						
8.	Pregnant Heifers @ Rs. 20000/-			50	25	25	25
	Income surplus						
i)	Income by selling of pregnant heifer & male calf	-	125000	1125000	625000	625000	625000
ii)	Income by selling of manure of pregnant heifers	-	-	150000	70000	70000	70000
iii)	Cost in raising a calf up to pregnant heifer is assume to be 30% of variable cost per buffalo (30% = 5995)	-	-	513506	256753	256753	256753
	Net surplus income (year wise)	-	125000	761494	438247	438247	438247

G. Profitability:

1.	Gross income = income – (fixed costs + variable cost)	10,20,188.00
2.	Repayment of Loan (1/5 annually)	5,33,376.00
3.	Employment (man months) when fodder is purchased	120
4.	Employment (man months) when fodder is grown	300
5.	Time to pay back loan	5 years

Note: Figures in the brackets indicate when fodder is grown by the farmer

H. Cash flow statement for a unit of 50 buffaloes:

Item Description	**I Year**	**II Year**	**III Year**	**IV Year**	**V Year**	**VI Year**
Gross Income	1020188	1145188	1781682	1458435	1458435	1458435
Loan outstanding	1777922	1422338	1031196	600940	127658	-
Interest	177792	142234	103120	60094	12766	-
Loan installment	533376	533376	533376	533376	140424	-
Net Surplus	486812	611812	1248306	925059	1318011	1458435
Net income/month	40568	50984	104025	77088	109834	121536

Annexure 5.3

GOAT REARING

Goat is a multi functional animal and plays a significant role in the economy and nutrition of landless, small and marginal farmers in the country. Goat rearing is an enterprise which has been practiced by a large section of population in rural areas. Goats can efficiently survive on available shrubs and trees in adverse harsh environment in low fertility lands where no other crop can be grown. In pastoral and agricultural subsistence societies in India, goats are kept as a source of additional income and as an insurance against disaster. Goats are also used in ceremonial feastings and for the payment of social dues. In addition to this, goat has religious and ritualistic importance in many societies. The advantages of goat rearing are:

- The initial investment needed for goat farming is low.
- Due to small body size and docile nature, housing requirements and managemental problems with goats are less.
- Goats are friendly animals and enjoy being with the people.
- Goats are prolific breeders and achieve sexual maturity at the age of 10-12 months, gestation period in goats is short and at the age of 16-17 months it starts giving milk. Twinning is very common and triplets and quadruplets are rare.
- In drought prone areas risk of goat farming is very much less as compared to other livestock species.
- Unlike large animals in commercial farm conditions both male and female goats have equal value.
- Goats are ideal for mixed species grazing. The animal can thrive well on wide variety of thorny bushes, weeds, crop residues, agricultural by-products unsuitable for human consumption.
- Under proper management, goats can improve and maintain grazing land and reduce bush encroachment (biological control) without causing harm to the environment.
- No religious taboo against goat slaughter and meat consumption prevalent in the country.
- Slaughter and dressing operation and meat disposal can be carried without much environmental problems.
- The goat meat is more lean (low cholesterol) and relatively good for people who prefer low energy diet especially in summer and sometimes goat meat (chevon) is preferred over mutton because of its "chewability".
- Goat milk is easy to digest than cow milk because of small fat globules and is naturally homogenized. Goat milk is said to play a role in improving appetite and digestive efficiency. Goat milk is non allergic as compared to cow milk and it has anti-fungal and anti bacterial properties and can be used for treating uro-genital diseases of fungal origin.
- Goats are 2.5 times more economical than sheep on free range grazing under semi arid conditions.
- Goat creates employment to the rural poor besides effectively utilizing unpaid family labour. There is ample scope for establishing cottage industries based on goat meat and milk products and value addition to skin and fibre.
- Goat is termed as walking refrigerator for the storage of milk and can be milked number of times in a day.

Scope for goat rearing and its national importance: The country had 124.36 million goats as per 2003 livestock census, had increased to 140.54 million in 2007 livestock census[6]. As per Government of India estimates goat meat production has increased from 773,280 MT in 2007-08 to 846,000 MT during 2010-11. Goat has also produced 4.59 million tones of milk[7].

[6] Livestock census 2007, Govt. of India
[7] Basic Animal Husbandry Statistics, 2012, Department of Animal Husbandry

Goat makes a valuable contribution to the livelihood of economically weaker sections of the society. Amongst the livestock owners goat rearers are the poorest of the lot.

Realizing the importance of goat in the agrarian economy of the country, various developmental activities have been taken up by Government of India. The Central Government had established Central Institute for Research on Goats at Makhdoom, Farah, Mathura District, Uttar Pradesh.

Financial assistance available from banks/NABARD for Goat rearing: NABARD is an apex institution for all matters relating to policy, planning and operation in the field of agricultural credit. It serves as refinancing agency for the institutions providing investment and production credit for agriculture and rural development. It promotes development through a well organised Technical Services Department at the head office and Technical Cells at each of the Regional Offices.

Loan from banks with refinance facility from NABARD is available for starting Goat farming. For obtaining bank loan, the farmers should apply to the nearest branch of a Commercial or Co-operative or Regional Rural Bank in their area in the prescribed application form which is available in the branches of financing bank. The Technical Officer attached to or the Manager of the bank can also help / give guidance to the farmers in preparing the project report to obtain bank loan.

For goat rearing schemes with very large outlays, detailed project reports will have to be prepared. The items of finance would include costs of assets like Development of land, construction of sheds, purchase of equipments, purchase of breeding stock, rearing cost of animals etc. till it generates income. The cost of land is not considered for loan. However, if land is purchased for setting up a goat farm, its cost can be treated as party's margin as per the norms.

Scheme formulation: A scheme can be prepared by a beneficiary after consulting local technical persons of State animal husbandry department, commercial farmers etc. If possible the beneficiaries should also visit progressive goat raisers and government / military / agricultural university farms in the vicinity and discuss the profitability of goat rearing. A good practical training and experience in goat rearing will be highly desirable. Nearness of the Goat farm to a veterinary aid centre and breeding centre should be ensured.

The scheme should include information about land, livestock markets, availability of water, feed, fodders, veterinary aid, breeding facilities, marketing aspects, training facilities, experience of the farmer and the type of assistance available from State Government.

The scheme should also include information on number and types of animals to be purchased, their breeds, production performance, cost and other relevant input and output costs with their description. Based on this, the total cost of the project, margin money to be provided by the beneficiary, requirement of the bank loan, estimated annual expenditure, income, profit and loss statement, repayment period etc, can be worked out and included in the scheme.

Requirements of a Good Project: A format developed for formulation of Goat rearing schemes is available at the financing institutions. The scheme so formulated should be submitted to the nearest branch of bank. The bank's officers can assist in preparation of the scheme or filling in the prescribed application form. The bank will then examine the scheme for its technical feasibility and economic viability.

A) Technical Feasibility - This would briefly include:

- Nearness of the selected area to veterinary dispensary, goat breeding centre, marketing outlets for fattened kids/meat and the financing bank's branch.

- Availability of good quality animals in nearby livestock markets. The distribution of goat breeds in India is given in **Table 5.3.1** and meat & milk production parameters of breeds are given in **Table 5.3.2** & **5.3**.3
- Availability of training facilities.
- Availability of good grazing ground/lands.
- Availability of green/dry fodder, concentrate feed, medicines etc.
- Availability of veterinary aid/breeding centers and marketing facilities near the same area.

B) Economic Viability - This would briefly include:

- Unit cost of animals
- Input cost for feeds and fodders, veterinary aid, insurance charges, etc.
- Output costs i.e. sale price of live animals, manure/penning charges, etc.
- The average unit cost (indicative only) of goat rearing units is assumed for calculating project cost.
- Income-expenditure statement and annual gross surplus.
- Cash flow analysis.
- Repayment schedule (i.e. repayment of principal loan amount and interest).

Other documents such as loan application forms, security aspects, margin money requirements etc. are also examined. A field visit to the scheme area is undertaken for conducting a techno-economic feasibility study for appraisal of the same. The model economics of goat rearing unit of 50+2 under semi intensive system is given in **Table 5.3.4**.

The analysis made in **Table 5.3.4** indicate that a unit of 50+2 provides a monthly income of Rs.10,000/- to Rs.19,000/- in addition to creation of assets of more than Rs.1,50,000/- with the farmer. Hence, this goat farming alone is highly viable.

Sanction of Bank Loan and its Disbursement: After ensuring technical feasibility and financial viability, the scheme is sanctioned by the Bank. The loan is disbursed in stages against creation of specific assets, purchase of equipments and animals. The end use of the loan is verified and constant follow-up is done by the bank.

Unit cost: Each Regional Office of NABARD has constituted a State Level Unit Cost Committee under the chairmanship of RO-in-charge and with the members from developmental agencies, commercial banks and co-operative banks to review the unit cost of various investments once in six months. The same is circulated among the banks for their guidance.

Margin Money: NABARD has defined farmers into three different categories and where subsidy is not available the minimum down payment as shown below is collected from the beneficiaries.

S.No.	Category of Farmer	Beneficiary's contribution
(a)	Small farmer	5%
(b)	Medium farmers	10%
(c)	Large farmers	15%

Interest Rate for ultimate borrowers : Banks are free to decide the rate of interest within the overall RBI guidelines. However, for working out the financing viability and bankability of the model project, we have assumed the rate of interest as 12% p.a.

Security: Security will be as per NABARD/RBI guidelines issued from time to time.

Repayment Period of Loan: Repayment period depends upon the gross surplus in the scheme. The loans will be repaid in suitable half yearly / annual installments usually within a period of about 5-6 years with a grace period of one year.

Insurance: The animals may be insured annually or on long term master policy, where ever it is applicable. The present rate of insurance premium for non IRDP schemes is 4% per annum.

Package of Common Management Practices Recommended for Goat rearing: Modern and well established scientific principles, practices and skills should be used to obtain maximum economic benefits from goat rearing. Some of the recommended practices are given here under:

Housing management:

- Construct shed on dry and properly raised ground.
- Avoid water-logged, marshy areas.
- In low lying and heavy rainfall areas, the floors should be preferably elevated.
- In temperate Himalayan region the floor may be made of wood.
- The shed should be of 10 ft. high and should have good ventilation.
- Bucks should be housed in individual pens.
- Doe can be housed in groups upto 60 per pen.
- Provide proper shade and cool drinking water in summer.
- Dispose off dung and urine properly.
- Give adequate space for the animals. The housing space required for goats of various age groups is given in **Table 5.3.5**
- Avoid over stocking or over crowding

Selection of breeding stock and its management:

- Immediately after release of the loan, purchase the stock from reliable breeders or from nearest livestock market.
- Animals in good health and having good physical features must be purchased in consultation with Veterinarian / Bank's technical officer.
- Purchase animals which are ready to breed and in prime stage of production.
- Identify the newly purchased animals by suitable identification mark.
- Vaccinate the newly purchased animals against the diseases
- Keep the newly purchased animals under observation for about 15 days and then mix with the general flock.
- Unproductive animals should be culled promptly and should be replaced by the newly purchased animals or farm born one.
- Animals are to be bred at the interval of 8-9 months for maximum productivity.
- Cull the old animals at the age of 6 years and above.
- Avoid kidding during peak periods of summer and winter.

Feeding management:

- Ensure Bushes/shrubs for browsing of animals
- As an alternative to above, supply of cultivated fodder from own farm or from surrounding farms may be ensured.
- Offer roughages adlib.
- As a thumb rule 2/3rds of the energy requirements should be met through roughages. Half of the roughages should be leguminous green fodders and rest half should be grasses/tender tree leaves.
- In the absence of good quality green fodders, concentrates must be considered to replace them.

- Kids should be fed colostrums upto 5 days of age. Later on they can be put on Kid starter rations.
- Green leguminous fodders should be offered adlib to kids from 15 days onwards.
- Provide salt and water to kids at all times
- Additional concentrates should be given to bucks and doe during breeding season
- Care should be taken to meet the nutrient requirements as recommended.

Protection against diseases:

- Be on the alert for signs of illness such as reduced feed intake, fever, abnormal discharge or unusual behaviour.
- Consult the nearest veterinary aid centre for help if illness is suspected.
- Protect the animals against common diseases.
- In case of outbreak of contagious diseases, immediately segregate the sick animals from healthy one and take necessary disease control measures.
- Deworm the animals regularly.
- Examine the faeces of adult animals to detect eggs of internal parasites and treat the animals with suitable drugs.
- Provide clean and uncontaminated feed and water for minimizing the health disorders.
- Strictly follow the recommended vaccine schedule.

Breeding care:

- It should be planned to obtain 3 kiddings in 2 year-period by adopting optimal management conditions.
- For every 25 doe one buck should be provided in one breeding season.
- Breed the animals 12 hours after the onset of the first symptoms of heat for maximum conception.
- Unbreedable animals must be examined thoroughly as directed by veterinary doctor for prompt elimination of causes for anoestrum or cull them if necessary.

Care during pregnancy: In advanced stage of pregnancy the doe must be transferred to either kidding pens or separately earmarked space for kidding within the main shed after thoroughly disinfecting it. After kidding, the doe should be provided with warm bran mash for two days.

Care of kids:

- Take care of new born kids by providing guard rails.
- Treat / disinfect the naval cord with tincture of iodine as soon as it is cut with a sharp knife.
- Protect the kids from extreme weather conditions, particularly during the first two months.
- Dehorn the kids during first two weeks of age
- Male kids should be castrated for better quality meat production.
- Vaccinate the kids as per the recommended schedule
- Wean the kids at the age of 8 weeks
- Proper selection of kids on the basis of initial body weight and weaning weight should be initiated by maintaining appropriate records for replacing the culled adult stock as breeders.
- Additional feed requirements of lactating doe must be ensured for proper nursing of all the kids born.

M**arketing:** The marketable products of goat farming include the fattened kids, manure, and culled animals. Marketing avenues for the above products are slaughter houses and individual meat consuming customers and agriculture farms. Therefore, availability of either slaughtering facilities or traders who will purchase live animals should be ensured to convert the fatteners into wholesome meat and meat products. Further, demand for manure from nearby agriculture farms must also be ensured.

Table 5.3.1 GOAT BREEDS OF INDIA AND THEIR DESCRIPTION

Region/breed	Utility	Body size	Adult Weight	Confirmation
1. Temperate				
Gaddi	Fibre	Medium	M 27.45± 0.41 F 24.72± 0.51	Coat colour is while but black and brown combination is also seen. Ears medium and drooping, nose convex, under small and round long white hairs
Changthangi	Fibre	Small	M 20.37± 0.24 F19.75± 0.15	Predominantly white but grey, brown or black also found. Large horns. Producing pashmina as under coat
Chegu	Fibre	Small	M 21.39±1.12 F 20.45 ±0.45	Coat is usually white mixed with greyish red producing pashmina as under coat
Shingari	Meat	Small	M 25.23 ± 0.56 F 20.35 ± 0.41	Coat colour vary from white to grey with black or tan patches
2. North- Western Region				
Jamunapari	Milk	Large	M 44.66 ± 1.89 F 38.03 ± 0.63	Predominantly white with brown patches on neck and face, long and pendulous ears, roman nose, tuff of hairs on buttocks, large and developed udder
Beetal	Milk	Large	M 59.07 ± 2.82 F 34.97 ± 0.52	Coat colour is black or brown with white patches. Face convex, long and flat ears, udder large and well set
3.Southern Region				
Osmanabadi	Milk & Meat	Medium	M 33.66 ± 0.55 F 32.36 ± 0.55	Coat colour variable-black, white or spotted, medium long ears, udder is small, round with short teats
3.Southern Region				
Malabari	Milk & Meat	Medium	M 38.96 ± 2.32 F 31.12 ± 0.90	Coat colour vary from complete white to complete black, small twisted horns, medium sized ears, udder small and round
Sangamneri	Meat	Medium	M 38.37 ± 2.44 F 28.97 ± 0.49	Body colour white, black or brown with spots. Ears are medium and drooping, udder small
4. Eastern Region				
Bengal	Meat	Small	M 32.37 ± 2.74 F 18.31 ± 1.67	Colour is black, brown or grey, short horns, both sexes have beard, udder very small
Ganjam	Meat	Medium	M 44.05± 0.13 F 31.87± 0.37	Tall, laggy, coat is black, white, brown or spotted, medium sized ears, straight long horns, udder poorly developed
Assam Hill	Meat	Small	M 25.45± 2.12 F 18.31± 1.67	Small body with short leg, coat colour vary from black to brown and spotted ears small and flat
Jakharana	Milk	Large	M 57.80 ± 3.50 F 44.48 ± 0.52	Coat is predominantly black with white spots on ears, narrow forehead, udder is large with conical teats.

Table 5.3.1 GOAT BREEDS OF INDIA AND THEIR DESCRIPTION(CONTD…)

Region/breed	Utility	Body size	Adult Weight	Confirmation
5. Western Region				
Sirohi	Milk & Meat	Large	M 50.37± 2.52 F 22.54± 0.17	Compact body, coat colour predominantly brown with light or dark patches, flat ears, udder medium sized and round
Barbari	Milk & Meat	Medium	M 30.8± 1.96 F 22.56± 0.17	Body compact, coat colour is white with brown patches, short erect ears, shining eyes, udder well set with small teats
Kutchi	Milk and Meat	Medium	M 43.50± 1.16 F 39.29± 0.38	Coat is predominantly black, few with brown or white spots, long hairs, long and drooping ears, udder well developed.
Marwari	Milk and Meat	Medium	M 33.18± 1.77 F 25.85± 0.29	Predominantly black coat with long hairs, few animals with white or brown patches, udder is round and small
Mehasana	Milk and Meat	Medium	M 37.14± 1.51 F 32.29± 0.38	The coat is black with white spots at the hase of the ears. Leaf like & drooping ears, twisted horns, developed udder.
Zalawadi	Milk and Meat	Medium	M 38.84± 1.46 F 32.99±- 0.32	Coat is black with long hairs, long and drooping ears, long twisted horns, large udder with conical teats.
Surti	Milk	Medium	M 29.50± 0.50 F 32.03 ± 1.31	White in colour, medium sized ears, small horns, very well developed udder

Source : CIRG, Makhdoom M – Male F-Female

TABLE 5.3.2 MEAT PRODUCTION PARAMETERS (TRAITS) OF IMPORTANT GOAT BREEDS

Breed	Body weight (kgs)				Slaughtered at 12 month		
	Birth	3 Months	6 Months	12 Months	Hot carcass wt(kg)	Dressing %	Meat : bone ratio
Jamunapari	3.06±0.06	10.94±0.22	14.06±0.70	26.86±0.70	10.39±0.42	46.16	80.48:19.52
Beetal	3.03±0.01	8.49±0.11	12.44±0.19	22.47±0.65	9.38±2.74	46.15	76.79:23.21
Barbari	1.74±0.03	7.13±0.11	10,86±0.23	18.84±0.34	10.55±0.31	49.88	83.08:16.92
Sirohi	2.74±0.02	9.78±0.11	13.49±0.15	21.02±0.17	--	--	--
Bengal	1.33±0.01	4.74±0.11	6.81±0.20	12.08±0.18	5.17±0.44	44.62	86.58:13.42
Jhakrana	2.56±0.05	6.93±0.24	10.74±0.47	18.01±0.30	--	--	--
Sangamneri	1.86±0.00	7.27±0.20	10.06±0.39	10.06±0.39	5.80±0.45	46.14	--

Source: CIRG, Makhdoom

Table 5.3.3 MILK PRODUCTION PARAMETERS (TRAITS) OF IMPORTANT GOAT BREEDS

S.No.	Breed	Lactation yield (Kg)	Lactation length (days)
1	Jamunapari	201.67±6.39	194
2	Beetal	173.90±1.27	182
3	Jakharana	121.80±8.82	115
4	Sirohi	113.62±2.43	194
5	Marwari	101.49±2.43	197
6	Kutchi	124.06±2.84	195
7	Barbari	95.60±2.78	152
8	Sangamneri	83.40±3.43	168
9	Malabari	90.02±4.10	178
10	Bengal	35.20±1.56	111

Source :CIRG, Makhdoom

TABLE 5.3.4 ECONOMICS OF GOAT FARMING – TECHNO-ECONOMIC PARAMETERS FOR 50+2 UNITS

Economics of goat farming with different size of units have been calculated as illustration and not as actual. The updated and actual economics can be developed while preparing a separate DPR for the Backward Linkage Scheme to be implemented along with the Modern abattoir Project.

		No. of Bucks	2
		No. of Doe	50
A.		**Production Traits**	
	i	Age at Maturity (Months)	10-12
	ii	Kidding interval (Months)	8
	iii	Kidding percentage	85
	iv	Twinning percentage	60
	v	No. of kiddings per year	1.5
	vi	Sex ratio	1:1
	vii	Mortality(%) Adults	5
		Kids	15
	viii	Saleable age of kids (months)	8-9
	ix	Culling of doe (% per year) from second year onwards	20
B.		**Expenditure norms**	
	i	Space requirement (st.per head)	
		Buck	20
		Doe	10
		Kids	4
	ii	Cost of construction (Rs.per sft)	70
	iii	Cost of equipment (Rs.per adult animal)	20
	iv	a) Cost of green fodder cultivation (Rs./acre/season)	2,500
		b) No. of acres	2
	v	Concentrate feed :	

		Adult does (one month before breeding and one month after kidding i.e. per kidding)	6.75 kg/month
		Bucks (two months per breeding season)	7.5 kg/ month
		Kids (for 30 days)	3.75 kg/ kid
	vi	Cost of conc. Feed (Rs./kg)	15
	vii	Labour (No.)	1
		Labour wages (Rs.per month)	2500
	viii	Insurance (as percentage of the cost of breeding stock)	4
	ix	Veterinary aid (Rs./adult/year)	50
	x	Water, electricity and other misc. expenses (Rs./adult)	20
C.		**Income norms :**	
	i	Sale price of Bucklings (Rs./kid)	3000
	ii	Sale price of Doelings (Rs./kid)	3000
	iii	Sale of culled doe (Rs./doe)	2000
	iv	Sale price of culled Buck (Rs./buck)	2500
	v	Sale value of male/female kids (Rs./kid)	1500
	vi	Income from manure is not assumed as it is used on the own farm	
	vii	Sale of gunny bags (Rs./bag) (13.3 bags / tonne)	20
D.		**Repayment norms:**	
	i	Repayment period (years)	6
	ii	Grace Period (years)	1
	iii	Interest rate(%)	10

COST OF THE PROJECT

S.No	Particulars	Total Cost (Rs.)
1.	Goat Stall: at 10 ft/does, 20 sft/buck and 4 sft/kids (maximum kid strength assumed 150)	1,20,000.00
2.	Goats: doe at Rs.3,500 and bucks at Rs.4,000 each	1,83,000.00
3.	Equipments: Feeder and water trays, chop cutter and grinder, cutters, mixers	9,360.00
4.	Fodder: - Fodder cultivation charges at Rs.2,500.00 per acre for 2.5 acre	6,250.00
5.	Feed: Concentrated feed	25,200.00
6.	Insurance Charges: @ 3% of animal cost	5,490.00
7.	Misc. charges Rs.25/- per animal	1,500.00
	Total	**3,50,800.00**

MEANS OF FINANCE

S. No.	Particulars	Total Cost(Rs.)
1.	Farmer's contribution (10%)	35,080.00
2.	Government Subsidy (33.33%)	116922.00
3.	Loan from the Financial Institutions (56.67%)	198798.00
	Total	**3,50,800.00**

ANNUAL TURNOVER

Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Annual Sale of:						
Kids	66	154	85	170	88	171
Culled buck	1	1	2	1	2	1
Culled Doe	6	14	36	21	39	19
Dead Animal	19	12	24	14	29	13
Manure (Adults)	52	52	52	52	52	52
Manure (Kids)	66	154	85	170	88	171
Milk(1 lit/doe/day)	7,500	7,500	7,500	7,500	7,500	7,500
Selling Price of:						
Kids	3,000	3,000	3,000	3,000	3,000	3,000
Culled buck	2,500	2,500	2,500	2,500	2,500	2,500
Culled Doe	2,500	2,500	2,500	2,500	2,500	2,500
Dead Animal	200	200	200	200	200	200
Manure (Adults)	6	6	6	6	6	6
Manure (Kids)	2	2	2	2	2	2
Milk(Rate per lit)	25	25	25	25	25	25
Annual Turnover:						
Kids	1,98,000	4,62,000	2,55,000	5,10,000	2,64,000	5,13,000
Culled buck	2,500	2,500	5,000	2,500	5,000	2,500
Culled Doe	15,000	35,000	90,000	52,500	97,500	47,500
Dead Animal	3,800	2,400	4,800	2,800	5,600	2,600
Manure (Adults)	312	312	312	312	312	312
Manure (Kids)	132	308	170	340	176	342
Milk	1,87,500	1,87,500	1,87,500	1,87,500	1,87,500	1,87,500
Total Turn Over	4,07,244	6,90,020	5,42,782	7,55,952	5,60,088	7,53,754

ANNUAL EXPENDITURE

Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Fodder cultivation charges Rs.5,000/- per acre for 2.50 acre	12,500	12,500	12,500	12,500	12,500	12,500
Cost of Concentrate: 200 gms per day per doe for 5 months before kidding @ Rs.15 per kg.	11,250	14,625	15,300	16425	15,750	15,750
Cost of Concentrate: 250 gms per day per buck for 12 months for breeding buck @ Rs.15 per kg.	1,350	2,025	2,025	2,025	2,025	2,025
Cost of Veterinary Expenses at Rs.100 per animal per annum	5,200	5,200	5,200	5,200	5,200	5,200
Insurance Charges @ 3% of animal cost	5,490	5,490	5,490	5,490	5,490	5,490
Total Expenditure	**35,790**	**39,840**	**40,515**	**41,640**	**40965**	**40965**

INTEREST CALCULATION AND REPAYMENT SCHEDULE

Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Term Loan						
Opening Balance	0.00	218678	163546	102901	36191	
Availed during the Year	198798	0.0	0.0	0.0	0.0	
Repayment during the Year	0.0	70000	70000	70000	36191	
Closing Balance	198798	148678	93546	32901	0.0	
Rate on Interest	0.10	0.10	0.10	0.10		
Interest	19880	14868	9355	3290		

ECONOMICS OF GOAT FARMING – INCOME TO THE FARMER

S.No	Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
1.	Net Income	336374	580180	432267	644312	482932	712789
2.	Monthly Income	28,031	48348	36022	53693	40244	59399

TABLE 5.3.5 SPACE REQUIREMENT OF GOATS

S.No.	Type of goats	Space requirement Sq.mt.per head	Maximum No. of animals per pen
1	Adult doe	1.00	60
2	Milch doe	1.68	Individual pens
3	Buck	3.4	Individual pens
4	Kids	0.4	75

TABLE 5.3.6 NUTRIENT REQUIREMENTS OF GOATS IN PERCENTAGE OR AMOUNT PER KG OF DRY FEED

S.No	Type of animals	Body wt.(kg)	DCP (%)	TDN (%)	ME (%)	Ca (%)	P (%)
1	**Growing - finishing kids**						
	a) small breeds	5	12.8	70	2.52	0.23	0.21
		10	10	65	2.34	0.23	0.21
		15	7	65	2.34	0.21	0.2
		20	6	60	2.16	0.2	0.19
		25	5.5	60	2.16	0.2	0.19
	b) Large breeds	10	12	70	2.52	0.23	0.21
		15	10	65	2.34	0.21	0.2
		20	7	65	2.34	0.2	0.19
		25	6	60	2.16	0.2	0.19
		30	5.5	60	2.16	0.19	0.18
		35	5	55	1.98	0.19	0.18
2	**Non lactating pregnant doe**						
	a) first 15 weeks of gestation	25	4.5	50	1.8	0.3	0.23
		30	4	50	1.8	0.27	0.21
		40	4	50	1.8	0.27	0.21
		50	4	50	1.8	0.24	0.19
		60	4	50	1.8	0.22	0.17
	a) last 6 weeks of gestation	25	5	55	1.98	0.27	0.21
		30	5	55	1.98	0.24	0.2
		40	5	55	1.98	0.23	0.17
		50	4.5	53	1.91	0.22	0.16

TABLE 5.3.6 NUTRIENT REQUIREMENTS OF GOATS IN PERCENTAGE OR AMOUNT PER KG OF DRY FEEDB (CONTD…)

S.No	Type of animals	Body wt.(kg)	DCP (%)	TDN (%)	ME (%)	Ca (%)	P (%)
3	**Lactating doe**						
	a) First half of lactation	25	6	65	2.34	0.3	0.22
		30	6	62	2.23	0.29	0.21
		40	5	60	2.16	0.28	0.2
		50	5	60	2.16	0.27	0.2
		60	4.5	60	2.16	0.27	0.2
	a) Second half of lactation	25	5.5	60	2.16	0.3	0.22
		30	5.5	60	2.16	0.28	0.2
		40	5	55	1.98	0.27	0.19
		50	4.5	55	1.98	0.25	0.18
		60	4.5	55	1.98	0.24	0.17
		25	6.5	65	2.34	0.21	0.19
		30	6	65	2.34	0.2	0.18
		40	5	64	2.3	0.2	0.18
		50	5	60	2.16	0.18	0.16
		60	4.5	55	1.98	0.17	0.15
		70	4	50	1.8	0.16	0.13
		80	4	50	1.8	0.15	0.14

Figure basis : www.nabard.org – government sponsored subsidy schemes

Centrally Sponsored Scheme - Integrated Development of Small Ruminants and Rabbits

Annexure 5.4

SHEEP FARMING FOR MEAT AND WOOL

Why Sheep Farming?: Sheep with its multi-facet utility for wool, meat, milk, skins and manure form an important component of rural economy, particularly in the arid, semi-arid and mountainous areas of the country. It provides a dependable source of income to the shepherds through sale of wool and animals. The advantages of sheep farming are:

- Sheep do not need expensive buildings to house them and on the other hand require less labour than other kinds of livestock.
- The foundation stocks are relatively cheap and the flock can be multiplied rapidly.
- Sheep are economical converter of grass into meat and wool.
- Sheep will eat varied kinds of plants compared to other kind of livestock. This makes them excellent weed destroyer
- Unlike goats, sheep hardly damage any tree.
- The production of wool, meat and manure provides three different sources of income to the shepherd.
- The structure of their lips helps them to clean grains fallen or lost at harvest time and thus convert waste feed into profitable products.
- Mutton is one kind of meat towards, which there is no prejudice by any community in India and further development of superior breeds for mutton production will have a great scope in the developing economy of India.

Scope for Sheep Farming and its National Importance: The country had 61.47 million sheep as per 2003 livestock census which has increased to 71.56 million as per 2007 Livestock census. As per Government of India estimates, sheep meat production was 369000 MT during 2010-11[8].

Sheep make a valuable contribution to the livelihood of the economically weaker sections of the society. Amongst the livestock owners, the shepherds are the poorest of the lot.

Realising the importance of sheep in Agrarian economy the Central Government had established the Central Sheep and Wool Research Institute (CSWRI) at Avikanagar in Rajasthan. Number of sheep breeding farms was established during various plan periods throughout the country for evolving (i) new fine wool breeds for different agro-climatic regions capable of producing 2.5 kg. of greasy wool per annum. (ii) new mutton breeds capable of attaining 30 kg. live weight at 6 months of age under intensive feeding conditions. Sheep development activities were initiated under DPAP, MFAL and SFDA programmes. Intensive Sheep Development Projects (ISDPs) were introduced in many of the sheep rearing districts. Setting up of Wool Boards in important wool producing states was envisaged. States of Jammu & Kashmir and Karnataka have already set up these Boards. Some of the states have set up Wool Development Corporations / Federations. The states having such organisations are given in **Table 5.4.1**.

Financial assistance available from banks / NABARD for sheep farming: NABARD is an apex institution for all matters relating to policy, planning and operation in the field of agricultural credit. It serves as refinancing agency for the institutions providing investment and

[8] Basic Animal Husbandry Statistics,2012, Department of Animal Husbandry

production credit for agriculture and rural development. It promotes development through a well organised technical services department at the Head Office and technical cells at each of the Regional Offices.

Loan from banks with refinance facility from NABARD is available for starting sheep farming. For obtaining bank loan, the farmers should apply to the nearest branch of a Commercial, Co-operative or Regional Rural Bank in their area in the prescribed application form, which is available in the branches of financing bank. The Technical Officer attached to or the Manager of the bank can help / give guidance to the farmers in preparing the project report to obtain bank loan.

For sheep development schemes with very large outlays, detailed project reports will have to be prepared. The beneficiaries may utilise the services of NABARD Consultancy Services (nabcons) having good experience in developing livestock projects for preparation of the project report to avail the bank loan for the items such as purchase of breeding animals, construction of sheds, purchase of equipments etc. The cost of land is not considered for loan.

Scheme Formulation: A scheme can be prepared by a beneficiary after consulting local technical persons of State Animal Husbandry Department, DRDA, Sheep development Corporation, Sheep Co-operative society / union / federation and commercial farmers. If possible, the beneficiaries should also visit progressive sheep farmers and government / agricultural university sheep farms in the vicinity and discuss the profitability of sheep farming. A good practical training and experience in sheep farming will be highly desirable. The sheep co-operative societies established in the villages as a result of efforts by the Sheep Development Department of State Government / Sheep Development Board would provide all supporting facilities, particularly marketing of live animals and wool. Nearness of the sheep farm to such a society, veterinary aid and breeding centre should be ensured.

The scheme should include information on land, livestock markets, availability of water, feeds, fodder, veterinary aid, breeding facilities, marketing aspects, training facilities, experience of the farmer and the type of assistance available from State Government, Sheep society / union / federation.

The scheme should also include information on the number of and types of animals to be purchased, their breeds, production performance, cost and other relevant input and output costs with their description. Based on this, the total cost of the project, margin money to be provided by the beneficiary, requirement of bank loan, estimated annual expenditure, income, profit and loss statement, repayment period, etc. can be worked out and included in the scheme.

The scheme so formulated should be submitted to the nearest branch of bank. The bank's officers can assist in preparation of the scheme or filling in the prescribed application form. The bank will then examine the scheme for its technical feasibility and economic viability.

A) Technical Feasibility - This would briefly include

- Nearness of the selected area to veterinary aid, breeding and wool collection centre and the financing bank's branch.
- Availability of good quality animals in nearby livestock markets. The distribution of sheep breeds in India are given in the **Table 5.4.2**.
- Availability of good grazing ground / lands.
- Availability of green/dry fodder, concentrate feed, medicines etc.

B) Economic Viability - This would briefly include:

- Unit Cost - The average cost of Sheep units for some of the States is given in the Table.

- Input cost for feeds and fodders, veterinary aid, insurance, shearing etc
- Output costs i.e. sale price of animals, wool, penning etc.
- Income-expenditure statement and annual gross surplus.
- Cash flow analysis.
- Repayment schedule i.e. repayment of principal loan amount and interest.

Other documents such as loan application forms, security aspects, margin money requirements etc. are also examined. A field visit to the scheme area is undertaken for conducting a techno-economic feasibility study for appraisal of the scheme. The economics of sheep farming is given in the **Table 5.4.3**.

Sanction of Bank Loan and its Disbursement: After ensuring technical feasibility and economic viability, the scheme is sanctioned by the bank. The loan is disbursed in stages against creation of specific assets such as construction of sheds, purchase of equipments and animals. The end use of the loan is verified and constant follow-up is done by the bank.

Lending Terms – General

Unit cost: Each regional office (R.O.) of NABARD has constituted a State Level Unit Cost Committee under the chairmanship of RO-in-charge and with the members from developmental agencies, commercial banks and cooperative banks to review the unit cost of various investments once in six months. The same is circulated among the banks for their guidance.

Interest Rate for ultimate borrowers: Banks are free to decide the rate of interest within the overall RBI guidelines. However for working out financial viabilility and bankability of the model project we have assumed the rate of interest as 12% p.a.

Margin Money: NABARD has defined the farmers into three different categories and where subsidy is not available the minimum down payment to be contributed by the beneficiaries are given in the following table.

Sr.No.	Category of Farmer	Beneficiary's Contribution
A	Small farmers	5%
B	Medium farmers	10%
C	Large farmers	15%

Security: Security will be as per NABARD / RBI guidelines issued from time to time.

Repayment Period of Loan: Repayment period depends upon the gross surplus generated. The loans will be repaid in suitable half yearly / annual instalments usually within a period of about 5-6 years with a grace period of one year.

Package of Common Management Practices Recommended for Sheep Farmers: Modern and well established scientific principles, practices and skills should be used to obtain maximum economic benefits from sheep farming. Some of the major norms and recommended practices are given hereunder.

Selection and purchase of Animal: It is necessary to select suitable improved breed of sheep available in particular area.

- Crossbred sheep are available for purchase from state Government / Government of India sheep breeding farms.
- Ewes can be purchased in regular sheep markets or from breeders in villages, while male sheep (rams) of exotic / crossbred from Government farms.

- A purchase committee, consisting of the borrower, the financing bank's representative and a veterinary surgeon may be constituted or else cash payments could be done to borrower to select his own animals.
- It is desirable to purchase healthy animals of 12-18 months of age.
- A certificate regarding age and health of sheep is obtained from the veterinary surgeon.
- The animals purchased have to be identified by fixing ear tags.
- Sheep should be vaccinated for important diseases like sheep-pox and enterotoxaemia.
- The price of sheep depends on breed, age and health status.
- An entrepreneur should have a unit of 20-30 ewes and one ram.

Pregnant, Parturient and Lactating Ewes: Careful management of the pregnant, parturient and lactating ewes will have a marked influence on the percentage of lambs dropped and reared successfully. So, the following steps may be taken to afford proper attention to these animals.

- Do not handle the pregnant ewes too frequently.
- Separate the advanced pregnant ewes from the main flock and take effective care in their feeding and management.
- Extra feed during the later part of pregnancy (3-4 weeks before parturition) will be beneficial for the condition of the pre-parturient ewes which will help in improving milk production of ewes, birth weight and growth of lambs.
- Inadequate and poor nutrition during pregnancy may result in, toxaemia, abortions and premature births of weak lambs.
- Bring lambing ewes into lambing corals 4-6 days before parturition and provide maximum comfort. If possible, provide soft, clean bedding and individual lambing pens.
- Watch gestation length which ranges from 142 to over 150 days. Early maturing breeds have slightly shorter gestation period.
- Save parturient ewes from cold and chilly weather.

Care at Lambing / Parturition: A ewe about to lamb prefers to leave the flock. She is restless, the udder is often distended and external genitalia are in a flushed and flaccid condition. Generally in a healthy ewe parturition is normal. Still the following precautions may be taken during and after parturition.

- Keep a vigilant eye for dystokia or difficult birth.
- Maiden ewes in poor condition or small-framed ewes mated to big rams will generally have difficulty in parturition and will have to be assisted.
- Seek prompt veterinary aid and advice from an experienced shepherd or stockman in case of dystokia.
- Newborn lambs, after being licked by the mother generally stand on their legs and start seeking for teats and suckle milk. If they are not able to do so after sufficient time, provide help to them in suckling colostrums (the first milk) which is very essential for health and survivability of lambs.
- Save newborn lambs from cold, rain and winds.
- Resort to artificial milk feeding or arrange foster mothers to disowned or orphan lambs. Goats can serve as excellent foster mother but ewes which have lost their lamb early after birth may also be utilized.
- Ligate, sever and antiseptically dress the naval cord of the lamb.
- Give a teaspoonful of castor-oil or liquid paraffin to the lamb to facilitate defecation and passing out of meconium easily.
- Do not handle lambs too frequently immediately after birth and let the dams lick and recognize them properly.
- Allow newborn lambs to be with their mothers all the 24 hours for first week or so.

- Feed sufficient quantity of good-quality hay and concentrates (if possible) to the lactating ewes for meeting nutritional requirements for early lactation.
- Provide plenty of clean fresh drinking water as the lactating ewes drink surprisingly higher amount of water during lactation.

Care of Lambs: The lamb should be taken care of the maximum extent during early period of life. This will also ensure better survival. The following steps may be taken for ensuring better growth and survival.

- Ensure proper suckling of lambs. Examine udders for blindness of teats or mastitis.
- Take care of indifferent mothers and arrange suckling of lambs by restraining such type of ewes.
- Provide creep feed (good quality hay with or without concentrate mixture) to suckling lambs in addition to suckling of milk from tenth day to weaning age.
- If possible, make available green leguminous fodder or fresh tree leaves to lambs to nibble during suckling period.
- Lambs may be ear-tagged or tattooed on the ear for identification (tattooing forceps and ear-tagging forceps should also be cleaned and sterilized at the time of use). Tail docking and castration may also be done in first week or so by placing elastrator (strong rubber band) at the intervertebral space and not on the vertebra.
- Alternatively use sterilized and clean knife for castration and docking and resort to proper ligation and antiseptic dressing at the roof of scrotum with testicles before it.
- During castration keep the lambs on perfectly dry, clean and hygienic site so as to minimize the risks of losses from tetanus.

Weaning and Care of Weaners: The management of weaners plays an important part in good sheep husbandry. The following steps are important in proper care and management of weaners.

- Weaning should preferably be done at 90 days, although in breeds with low milk production or where re-breeding is desired, it can be done around 60 days.
- Supplementary feeding and good clean pastures for growing weaners should be provided. The nutrient requirements for growing lambs and adult ewes are given in table below.
- Weaned lambs should be drenched against gastro-intestinal parasites by first month; and vaccinated against enterotoxaemia and sheep-pox.
- Weaners should not be grazed on poor burry and thorny types of pasture since it could cause skin irritation, injury to the eyes and damage to wool.
- They should be protected against vagaries of climates and predation.

Housing and Shelter Management

- Normally sheep do not require elaborate housing facilities but minimum provisions will definitely increase productivity, especially protection against inclement weather conditions (sun, rain and winds) and predation. Shed could be provided with gunny bags or temporary or removable protections made of thatching material and bamboos. The roof of the shed should be made of the asbestos sheet supported by tubular or angular steel, but wooden rafters and thatching material could also be used.
- Exotics should be provided with 0.9-1.1 m^2 and native and crossbred sheep 0.8-0.9 m^2 space per head. Sheds measuring 18m x 6m can accommodate about 120 sheep.
- A chain link fencing or thorny bush enclosure of 12m x 6m can be provided for night paddocking of sheep on each side of the shed.

Culling: Culling of sheep is very important for the development of a good flock. It helps to remove undesirable animals and breeding from those which are most approximating the ideal

sheep. About 10-20 per cent culling should be practised annually to develop a good flock. The flock size should be maintained by replacing culled ewes by ewe lambs born in the flock.

Maintenance of Records: It is very essential to maintain the necessary records at an organised (experimental or commercial) sheep farm to know obout the inputs and outputs. This helps in working out the economy of sheep production per unit of area and per animal. The following records should be maintained: livestock strength, breeding, lambing, shearing, wool production, mortality, purchase of animal feeds, medicines, sale of animals and wool.

Identification: The shepherds commonly practice notching or punching holes in the ears for identification of lambs. Tattooing is also satisfactory but is more expensive. Metal or plastic ear-tags with stamped letters and numbers are most suitable although they are relatively expensive and heavy for the ears of the smaller native sheep. These ear-tags are applied with the help of a clincher.

Dipping: To control the ectoparasites, the sheep should be dipped a few weeks after shearing when they have grown sufficient new wool to hold the chemical substance. There are standard designs for sheep dips and there are many products effective against ectoparasites. A foot-bath may also be provided at the entrance of the farm to prevent the spread of contagious diseases like foot-and-mouth and foot rot.

Health Management: The health management calendar for vaccination against major diseases may be followed for better health of stock.

Shearing:

- Shearing is done mechanically either with clippers, a pair of scissors or by power-operated machines depending upon the size of operations.
- Most flocks are usually shorn twice a year, i.e. March-April after the winter and September-October after the rains. In some states like Jammu & Kashmir and Rajasthan sheep are shorn thrice a year.

Marketing of Wool and Animals

- The wool and meat sector in the country is small and widely scattered. This is the sector, where organized sector and decentralized sector run complimentary to each other towards meeting the requirements of all sections of the domestic market as well as export. The sector is very loosely knit and heterogeneous. Taking the due cognizance of these complexities in the wool sector the Government of India has constituted the Central Wool Development Board in the Ministry of Textiles for the overall growth and development of this sector. The State Governments have also set up Separate Corporation / federation to encourage the sector.
- Shepherds generally market wool and animals, through rural agents on the basis of rough estimates of weights. The animals are also sold in village weekly markets, where shepherds are exploited to a great extent.
- State Governments through Sheep Corporation, Board and Federation have also set up sheep co-operative societies which also purchase wool and animals on weight basis and shepherds are paid better prices.

Table 5.4.1 State Sheep and Wool Boards/ Federation/ Corporations

S.No	Name and Address
1	APCO Wool 3-5-770. Weavers Bhawan, Narayan Guda, Hyderabad - 500 029 (AP)
2.	Gujarat Sheep & Wool Development Corporation Limited "Shreekunj" Opp. Navarangpura Telephone Exchange Ellisbridge, Ahmedabad - 380 006 (Guj.)
3.	Himachal Pradesh State Co-operative Wool Procurement and Marketing Federation Limited, Pashudhan Bhawan, Boileuganj, Shimla - 171005 (HP)
4.	Jammu & Kashmir State Sheep & Sheep Products Development Board. Kartholi, Bari Brahmana, Jammu – 181 133 (J&K)
5.	Karnataka Sheep & Sheep Products Development Board No. 58, IInd Main Road, Vyalikaval, Bangalore - 560 003 (Karnataka)
6.	Maharashtra Mendhi Va Sheli VIkas Mahamandal Limited Mendhi Farm, Gokhale Nagar, Pune - 411 016 (Maha.)
7.	Rajasthan State Co-operative Sheep & Wool Marketing Federation Limited. Gandhi Nagar, Tonk Road, Jaipur (Raj.)
8.	Uttar Pradesh Poultry & Livestock Specialties Limited Directorate of Animal Husbandry, Badshah Baug, Gorakh Nath Road, Lucknow (U.P.)

Table 5.4.2 REGIONWISE DISTRIBUTION OF SHEEP BREEDS IN INDIA

North Western arid and semi-arid region	Southern peninsular region	Eastern region	Northern temperature region
Chokla	Deccani	Chottanagpuri	Gaddi
Nali	Bellary	Shahabadi	Rampur
Marwari	Nellore	Balangir	Bushair
Magra	Mandya	Ganjam	Bhakarwal
Jaisalmeri	Hassan	Tibetan	Poonchi
Pungal	Macheri	Bonpala	Gurez
Malpura	Kilakarsal		Kashmir Merino
Sonadi	Vembur		Changathangi
Pattanwadi	Coimbatore		
Muzzafarnagri	Nilgiri		
Jalauni	Ramnad white		
Hissardale	Madras red		
	Tiruchy black		
	Kenguri		

Source - CSWRI, Avikanagar.

TABLE 5.4.3 ECONOMICS OF SHEEP REARING

Economics of sheep farming with different size of units have been calculated as illustration and not as actual. The updated and actual economics can be developed while preparing a separate DPR for the Backward Linkage Scheme to be implemented along with the Modern Abattoir Project.

Economics of Sheep rearing (20 Ewes + 1 Ram)

A.	**Unit cost of Sheep Development for Meat and Wool**	**Amount in Rupees**
i.	Cost of 20 ewes @ Rs. 1200/-	24,000
ii.	Cost of 1 ram @ Rs. 1600/-	1,600
iii.	Cost of Shed, equipment and miscellaneous expenditure	3,000
iv.	**Total Cost**	**28,600**
v.	Margin at 15% of the Total Cost	4,300
vi.	Loan Amount	24,300
B	**Techno economic parameters**	
1.	The present unit cost of one year Ewes and ram is taken at Rs 1200 and Rs.1600 respectively.	
2.	Lambing interval is taken as 12 months with lambing percentage of 75 and sex ratio of 50:50.	
3.	Mortality is considered as 10 % and 5 % among lambs and adults.	
4.	All female lambs are retained in the flock and males are sold at 8 to 9 months of age.	
5.	The culling rate among ewes is 20 % and above from third year onwards	
6.	Grazing charges @ Rs 4/- per adult per year.	
7.	Cost of concentrate feed per pregnant Ewe for 30 days @ 250 gms/animal costing Rs 5.00/kg.	
8.	Insurance is 4 % per year and cost of veterinary aid is Rs 10 & 5 per adult and young animal per year.	
9.	Shearing will be done twice a year. The adult sheep will yield 1.2 kg wool per year and the lamb will yield 600 gm. per year. The shearing charges are Rs 2.00/kg and the price of wool is Rs 40 per kg.	
10.	Sale price is Rs. 800 per ram lamb, Rs.1000 per adult ewe and Rs. 1200 per adult ram. The sale value of closing stock is considered for working out cash flow analysis.	
11.	Penning charges are Rs 8 per adult animal per month for 6 months in a year.	
12.	The economics have been worked out basing on the opening stock.	

C. CASH FLOW ANALYSIS

SHEEP REARING – REPAYMENT SCHEDULE

Bank Loan Rs.24,300

	Particulars		YEARS					
			I	**II**	**III**	**IV**	**V**	**VI**
I.	**COSTS** :							
a)	Capital cost		28600					
b)	Purchase of ram		--	--	1600	--	1600	--
c)	Feed cost							
	i) Grazing		84	80	104	108	118	120
	ii) Concentrate		562	675	750	712	787	825
d)	Insurance cost		1024	928	1024	1022	1120	1168
e)	Veterinary aid		265	250	250	275	805	310
f)	Shearing charges		50	64	76	85	90	95
	Total cost		30585	1920	3804	2252	4048	2518
II	**BENEFITS :**							
a)	Sale of Wool		1512	1164	1668	1716	1716	1740
b)	Sale of ram lambs			4800	4800	6300	6400	8000
c)	Sale of culled animals		--	--	5200	5020	8200	8000
d)	penning charges		1008	960	1247	1295	1392	1440
e)	Closing stock value							50200
	Total benefits		2520	6924	12915	13145	17708	69300
	Nt Benefits		-28065	5004	9111	10893	13660	66862
III	**BCR,NPW and IRR**							
	NPV 15%							
	Costs	34937						
	Benefits	62233						
	NPW	27296						
	IRR %	40						

Interest Rate 12 %

IV	**REPAYMENT SCHEDULE**						
a)	Gross surplus	535	5004	9111	10893	13690	66862
b)	Loan amount	24300					
c)	Interest rate	12%					
d)	Interest	2916	3266	2880	2460	1800	960
e)	Principal	--	300	4000	5000	7000	8000
f)	Repayment	--	3566	6880	7400	8800	8960
	Balance *Principal		24000	20000	15000	8000	-
g)	Net surplus	--	1438	2231	3493	4890	58202

TABLE 5.4.4 NUTRIENT REQUIREMENT FOR GROWING LAMBS

Body wt (kg)	Rate of gain (g/day)	Dry matter intake (g)	DCP(g)	ME (k.cal)	Ca (g)	P(g)
10	50	400	35	0.86	2	1.5
	100	450	45	1	2.5	2.5
	150	500	55	1.15	3	2
15	50	500	45	1.08	2.8	2
	100	600	55	1.3	3.5	2.5
	150	700	65	1.62	4.5	3
20	50	700	50	1.44	3.5	2.5
	100	800	70	2.01	4.5	3
	150	1,000	80	2.3	5.5	3.5
25	50	800	65	1.8	4.5	3
	100	1,200	85	2.52	5	3.5
	150	1,400	100	2.88	6	4

1g = TDN = 3.6 k Cal

TABLE 5.4.5 NUTRIENT REQUIREMENT OF SHEEP* FOR MAINTENANCE.

Body wt.	Dry matter intake (kg)	DCP (g)	ME (k.Cal)	Ca (g)	P(g)
20	0.56	25	1.03	1.7	1
25	0.7	31	1.27	2.1	1.6
30	0.83	37	1.52	2.4	1.9
35	0.95	42	1.72	2.6	2.1
40	1.06	47	1.93	2.9	2.3
45	1.17	51	2.09	3.2	2.5

Adult ewes which are non-lactating and are not over of 15 week of gestation period
Source - CSWRI, Avikanagar

ANNEXURE – 5.5

MODEL SCHEME ON LAMB FATTENING

http://www.nabard.org/modelbankprojects/animal_ramlamb.asp

Introduction

Sheep contributes to food production, rural employment and gross national product by converting roughages into meat, wool and skin. There is an increasing demand for mutton and scope for export of meat.

Under the existing small ruminant production system, the slaughter weight of lambs and kids in the country is lower and age at which usually achieved is much higher. The system of raising lambs for meat under grazing with supplementation, although is cost effective; the procedure has not been largely adopted by the farmers due to their poor economical background and age old traditional practices. Grazing with supplementation has potential for still higher production. The major advantage of this programme is that the sheep owner can rear the animals only for three months and not for the whole year. He will get handsome profits after three months, which is at par with the lambs reared for 8-9 months under extensive grazing system. This technology would help the farmers in reducing the time period of rearing from 8-9 months and getting almost same profit per animal in addition to avoiding the mortality risk and unnecessary rearing of lambs for the whole year.

Objectives: ***To rear the lambs with improved feeding for gaining desired body weight in a shorter period.***

- To avoid the risk of high mortality in lambs
- Weaning age can be reduced from 90 to 60 days

Technical Feasibility

Scheme Area: This programme can be implemented in States having large population of sheep like Himachal Pradesh, Rajasthan, Uttar Pradesh, Andhra Pradesh, Tamil Nadu, Karnataka and Maharashtra. The selected area should be nearer to veterinary aid, livestock market and bank branch.

Selection of lambs: Fat lamb production is a commercial programme. The profit earned after 3 months of rearing after weaning under intensive system is at par with or more than that earned after rearing lambs for 8-9 months under range condition. By selective breeding and intensive selection in some of the important indigenous sheep breeds of Malpura, Sonadi Muzafarnagari, Madras Red, Mandya, Nellori and Deccani, lamb fattening programme can be successfully implemented in these breed tracts and in the States having large sheep population.

Housing: Normally sheep do not require elaborate housing facility. They should be protected against inclement weather and predators. Shelter should be provided with gunny bags or temporary removable protections made of thatching material and bamboos.

Feeding: In India sheep are traditionally maintained on extensive range management with supplementation of top feed resources during lean season. Due to progressive shrinkage of grazing land and market requirement of quality meat for local consumers as well as export market, fattening lambs are to be maintained on grazing with supplementation of concentrate feed on 50:50 basis. Feed conversion ratio of 5.5: 1 is considered in the model scheme.

Management of lambs

- The lamb should be taken care of to a maximum extent for better survival during the early period of life.

- Weaning can be done at two months of age.
- Lambs may be ear tagged or tattooed on the ear for identification.
- Use sterilized and clean knife for castration and docking and resort to proper legation and antiseptic dressing.
- During castration, keep the lambs on perfectly dry, clean and hygienic site so as to minimize the risk of loss from tetanus.
- The lamb should be protected against ecto and endo parasites by first month and vaccinated against enterotoxaemia and sheep pox. They should be protected against the vagaries of climate and predators.
- Intensive application of flock health technology to be followed instead of treating individual lamb

Marketing: Shepherds generally market their animals through rural agents or village weekly markets on rough estimates of weight or the appearance of the animal. The lambs can be marketed through Sheep Cooperative Societies, Meat Development Corporations of the State Government on weight basis wherever they exist and a regular marketing channel has to be established where sheep farmer can not be exploited to maximum extent.

Model economics of lamb fattening unit:

- The economics at a glance for a unit of 20 lambs per month are given in **Table 5.5.1.**
- The cost of night shelter for lambs, number and cost of lambs and the expenditure on feed, medicines, vaccines and labour requirements are given under investment cost in **Table 5.5.2.**
- Cash flow statement along with gross surplus generated is given in the **Table 5.5.3 and 5.5.4.**
- The loan can be repaid over a period of 3 years including grace period of 6 months as per Repayment Schedule given in the **Table 5.5.5.**

TABLE 5.5.1 ECONOMICS AT A GLANCE - LAMB FATTENING

Economics of lamb fattening farms with different size have been calculated as illustration and not as actual. The updated and actual economics can be developed while preparing a separate DPR for the Backward Linkage Scheme to be implemented along with the Modern abattoir Project.

Unit size	20 lambs per month
System of rearing	Semi intensive system
State	Karnataka / Rajasthan
Unit cost	Rs. 62,000
Bank loan	Rs. 53,000
Margin money at 15%	Rs. 9,000
Repayment period	3 years
Grace period	6 months
Interest rate	13.50%
B.C.R at 15% DF	1.27 : 1
N P W at 15% DF (Rs.)	148,713
IRR (%)	> 50

TABLE 5.5.2 LAMB FATTENING - INVESTMENT COST

S. No	**Items**	**Specifications**	**Physical Units**	**Unit cost** (Rs./unit)	**Total** (Rs.)
1	Shed - Kutcha night shelter	5 Sqft / fattener for 80 fatteners	400 sft	20	8000
2	Cost of lambs	Ram lambs of 2 months age	80 lambs @20 per batch for 4 batches with interval of one month	400/lamb	32000
3	Insurance	@ 4%of value of animals	80 lambs	16/lamb	1280
4	Medicines & Vaccination	Including deworming	80 lambs	10/lamb	800
5	Feed	(kg / lamb to attain 25 kgs by 5 months of age)			
		Concentrate – 41kg	80 lambs	5/kg	16400
		Roughage – 41kg	80 lambs	1/kg	3280
6	Labour	Own labour			
7	Water, Electricity and other misc. expenses		80 lambs	5/lamb	400
	Total cost				62160
			Say		**62000**
	Margin Money	15%			9000
	Bank loan	85%			53000

TABLE 5.5.3 LAMB FATTENING - CASH FLOW ANALYSIS

Sr.No.	Item	I Year	II Year	III Year
A	**Benefits**			
1	Sale of lambs	126000	216000	216000
2	Sale of manure	1260	2160	2160
3	Depreciated value of shed	-	-	5600
4	Stock value	-	-	40000
	Total	**127260**	**218160**	**263760**
B	Cost			
1	Capital Cost	62160		
2	Recurring cost			
i.	Cost of lambs	48000	96000	96000
ii.	Insurance	1920	3840	3840
iii.	Cost of feed – Concentrate	24600	49200	49200
	Roughage	4920	9840	9840
iv.	Cost of Medicine	1200	2400	2400
v.	Miscellaneous exp.	600	1200	1200
	Total recurring expenditure	81240	162480	162480
	Total Cost	**143400**	**162480**	**162480**

TABLE 5.5.4 LAMB FATTENING - CASH FLOW ANALYSIS

Sr.No.	Item	I Year	II Year	III Year
C.	Gross Surplus	46020	55680	101280
D	DF at 15 %	0.87	0.756	0.658
E	Discounted cost at 15%	124758	122835	106912
F	Discounted benefits at 15%	110716	164929	173554
G	BCR at 15% DF	1.27	:1	
H	NPW at 15%	148713		
I	IRR	> 50%		

Note : Recurring expenditure during I year excluding the capitalized expenditure

TABLE 5.5.5 LAMB FATTENING - REPAYMENT SCHEDULE

Bank Loan : 53000 : Interest rate : 13.5%

(Rupees)

Years	Income	Expen-diture*	Gross	Repayment			Net	
			Surplus	Interest	Principal	Total	Surplus	Income per month**
I	127260	81240	46020	7155	20000	27155	18865	1572
II	218160	162480	55680	4455	20000	24455	31225	2602
III	218160	162480	55680	1755	13000	14755	40925	3410

* Expenditure during first year is other than capitalized amount

** this does not include assets of Rs.62160 with the farmer.

CHAPTER – VI

GENERAL GUIDELINES FOR MODERN SLAUGHTERHOUSE

General Guidelines/ Criteria for selection of site for Modern slaughterhouse:

1. Slaughtering or processing plants should be established in areas reasonably free of objectionable odors, smoke, flying ash, dust etc. that may be produced by oil refineries, city dumps, chemical plants, sewage disposal plants, dye works, paper pulp mills, saw mills, stone crushing units. etc.

2 The prevailing winds are also an important factor in site location because objectionable substances emanating from more distant sources may be a problem if the winds carry them to the plant site.

3 Easy road accessibility preferably highway to receive raw materials and dispatch finished products.

4 The establishment must be separated from any other plant or building

5 Persons other than working in the plant should not have access into the plant.

6 To permit future expansion adequate space should be provided in locating coolers, freezers, processing department's etc. that they could be enlarged without adversely affecting other departments.

7 In edible products departments and catch basins for waste recovery should be suitably located to avoid objectionable conditions affecting the preparation and handling of edible products. Flow of inedible and condemned products should not come into contact with edible product.

8 Water quality should be analyzed. Supply must be ample, potable and protected from pollution. Water from public water supply systems is usually acceptable. Water must be distributed throughout the plant under adequate pressure. Both hot and cold water must be provided. When non-potable water is required for the condensers of the refrigeration system or fire protection it must be kept separate from the potable supply. Non-potable water lines should be avoided in building where edible products departments are located.

9 Sewage disposal system must be efficiently designed and operated so as not to produce objectionable conditions and acceptable to pollution control agencies. Waste material such as gastrointestinal tract contents, blood, rumen digesta and other slaughterhouse waste must be disposed of without creating objectionable conditions.

10 All floor areas with wet operations should be well drained. One drainage inlet should be provided for each 400 sq. ft (36 sq.m) of floor space. A slope of about ¼ inch per foot to drainage inlets is usually required. In areas where a limited amount of water is used, the slope may be about 1/8 inch per foot. Floor drains are not required in freezer rooms and dry storage areas. Floor drainage valleys are essential under the dressing rails for pigs. They should be about 24 inches wide and should slope atleast 1/8 inch per foot to floor drains within the valleys. All drains should have effluent flow in the reverse direction from edible product flow. Drains must be equipped with a deep-seat trap. Drainage lines must be properly vented to the outside air and equipped with effective rodent screens. Trunk drainage lines must proportionately be larger so as to efficiently handle the drainage into it. Drainage lines from toilet bowls and urinals should not be connected

with other drainage into a waste (grease) catch basin. Such lines should be located so that if leakage develops, it will not affect product or equipment. Drains for pig stomach contents should be at least 6 inches in diameter. Such drains should not be connected to the regular plant drainage lines or to toilet lines. All other lines must have an inside diameter of at least 4 inches. Drainage lines within the plant must be constructed of cast iron, galvanized metal or other acceptable material.

11 The plot plan must show the entire premises and include location of all buildings, rail road sidings, roadways and alleys adjoining the plant, as well as all streams, catch basin, water wells, routing of sewer lines on premises and storage tanks. The floor plans should show locations of walls, partitions, posts, doorways, windows, floor drainage openings and gutters, rail systems for conveying carcasses, equipment's (including platforms, work benches, etc.) hot and cold water hose connections, hand washing facilities, work positions of plant employees pipelines for moving product or product ingredients, storage tanks for product or product ingredients, lockers and benches, toilets, urinals, shelves and racks, chutes, conveyors, ventilation fans, ramps and stairways.

12 Religious taboos and sentiments of the community to prevent objection of slaughter of any species of animals in the abattoir.

13 Should provide sufficient area of land not only for construction of Lairage, slaughter house, effluent treatment plant, rendering plant, utilities but also for greens, roads and expansion.

Plan

The plan prepared by Consultant envisages the following:

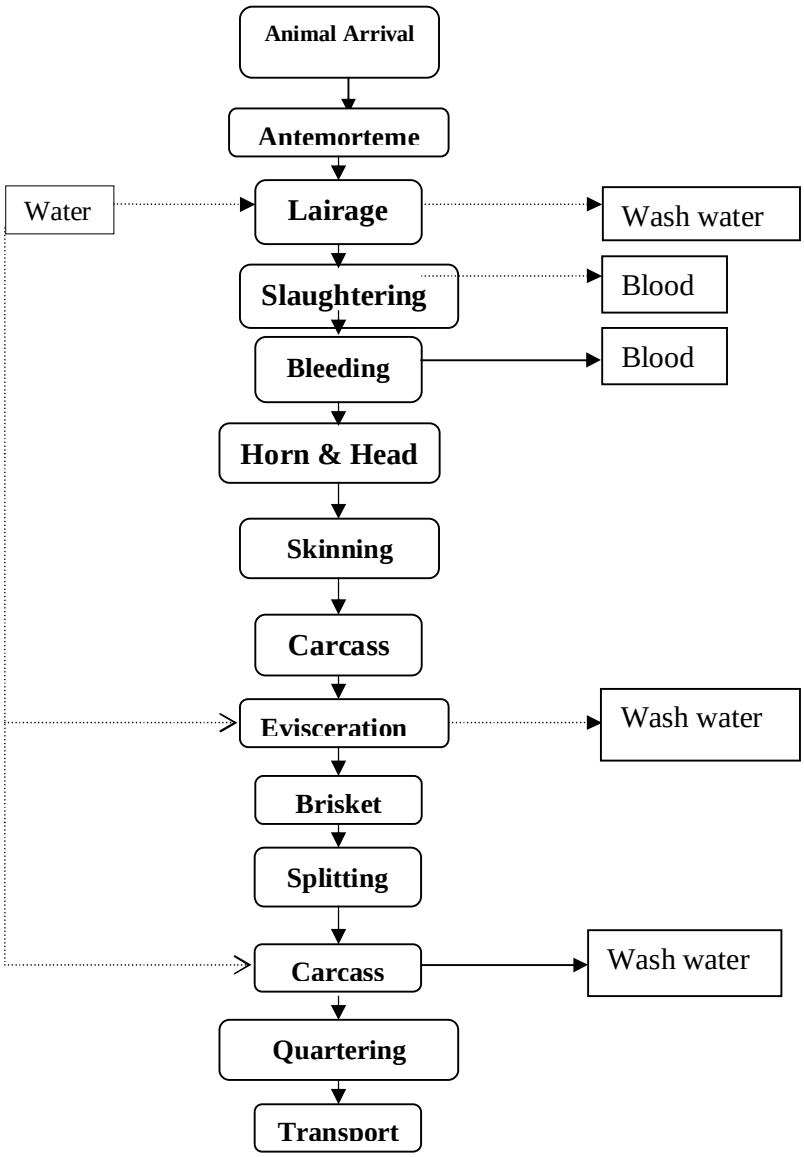
a) Well-equipped Lairages for two shifts. Buffalo 200 and goat/sheep 550, (Inflow for counting, resting and ante-mortem inspection of animals). The concept drawing of the lair rage is given in the figure.
b) Mechanized Slaughter halls one for Buffalo and two for sheep/goat (one for Halal and one for Jhatka).
c) Mechanized Slaughter Lines one for Buffalo and two for sheep/goat (one for Halal and one for Jhatka).
d) Fully automatic Dry Rendering Plant (5 MT per batch)
e) Effluent Treatment Plant (50 KLD).
f) Hot water generator and boiler.
g) Cold water supply with a pump house and an over head water tank – 50,000 litre capacity.
h) Compressed air system.
i) Water treatment plant to meet the BIS standard.
j) Electric power station/ Dg set for regular supply of required electricity.
k) Other block for social welfare, administration, laboratories and office, etc.

Process of Slaughtering

The various process of slaughtering of buffalo, sheep / goat is described in the following flow diagrams along with the consumption of water at various steps.

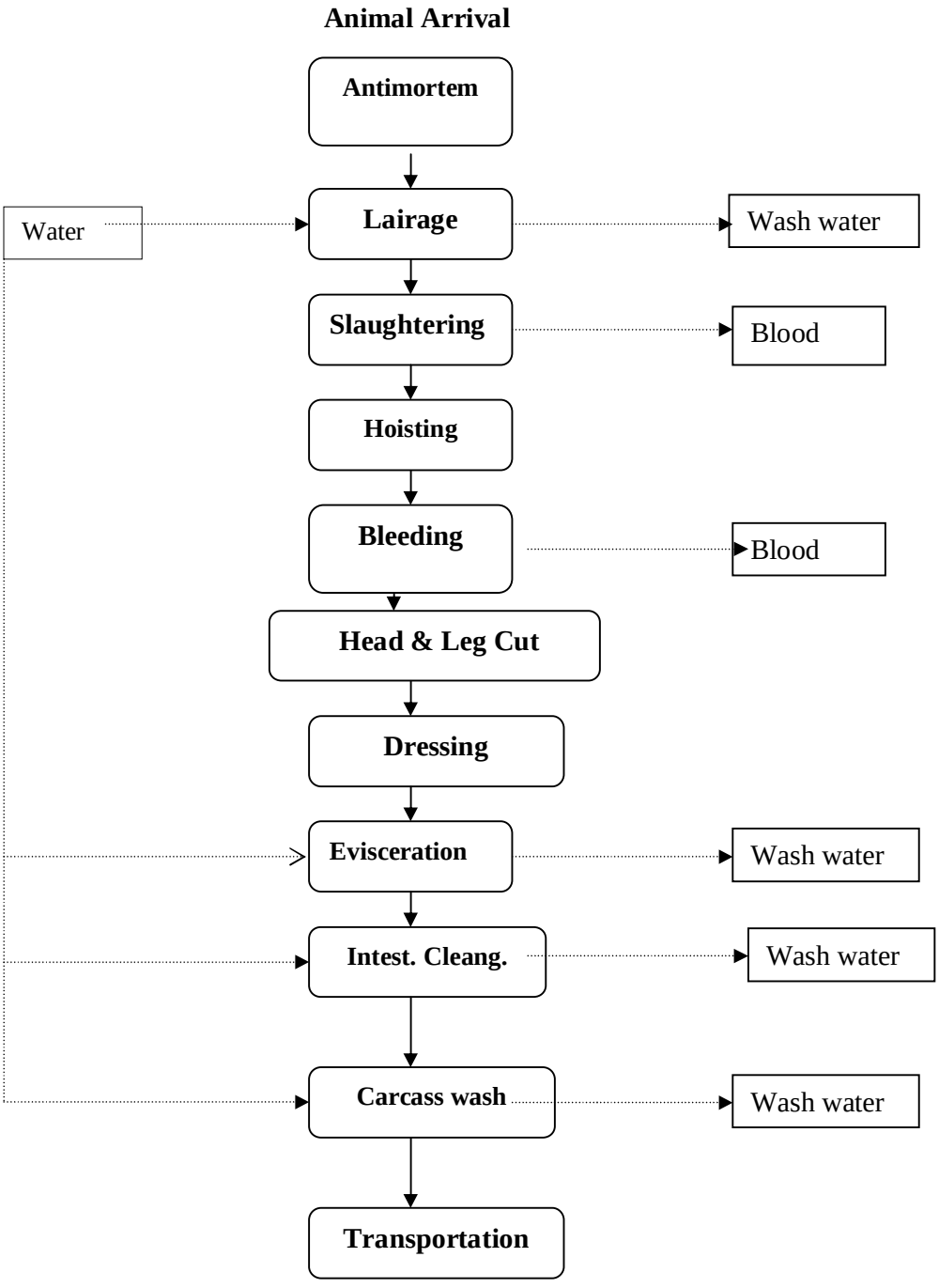
Figure – 6.1

Processing flow chart for Buffalo slaughtering



In addition wash water is generated from floor washing activities.

Figure – 6.2
Processing flow chart for Goat/ Sheep slaughtering



In addition wash water is generated from floor washing activities.

CHAPTER – VII

LAYOUT OF THE ABATTOIR COMPLEX

Location and Site Description of the Proposed Modern Slaughterhouse

In order to meet the requirement of meat in the city, the Nagar Nigam Bareilly has decided to establish a modern slaughter house at revenue village Mohanpur Thiria under tehsil Bareilly. The area of identified land is 1.7 ha and the capacity will be to slaughter 550 sheep/goat (350 Halal and 200 Jhatka) and 200 buffaloes per day in two shifts in a humane manner, under most hygienic conditions of global public health standards using OIE global protocols and FDA parameters of USA to produce wholesome meat bringing the pollution standards to zero.

Layout of the abattoir Complex

The proposed plant will have a slaughtering facility for 175 goats/sheep (Halal), 100 goats/sheep (Jhatka) and 100 buffaloes per shift. There will be three slaughter halls respectively. All the accessory facilities like effluent treatment plant (ETP), Rendering plant, Lairage, hot water, cold water, compressed air supply, tripary, to handle this capacity are integral part to the entire plant. The plant will have air cooling facility to lower down the temperature inside the slaughter hall and also proper ventilation. Layout plan has been given on a separate sheet at the end of this chapter.

The general layout of the modern abattoir at the proposed site is given on the next sheet. The detailed drawing will however be prepared by the bidder after finalization of bid document. There will be three slaughter lines one each for buffalo, goat/ sheep (Halal) and goat/ sheep (Jhatka) respectively with the trippery, head, legs, skin, and collection facility on the back side of each line. There will be separate building for utilities i.e. electricity, genset, compressed air, hot water, cold water etc. rendering plant will be in a separate block. The total complex of the slaughterhouse will be divided into clean and unclean operation areas. Rendering Plant and Effluent Treatment Plant (ETP) will be located separately.

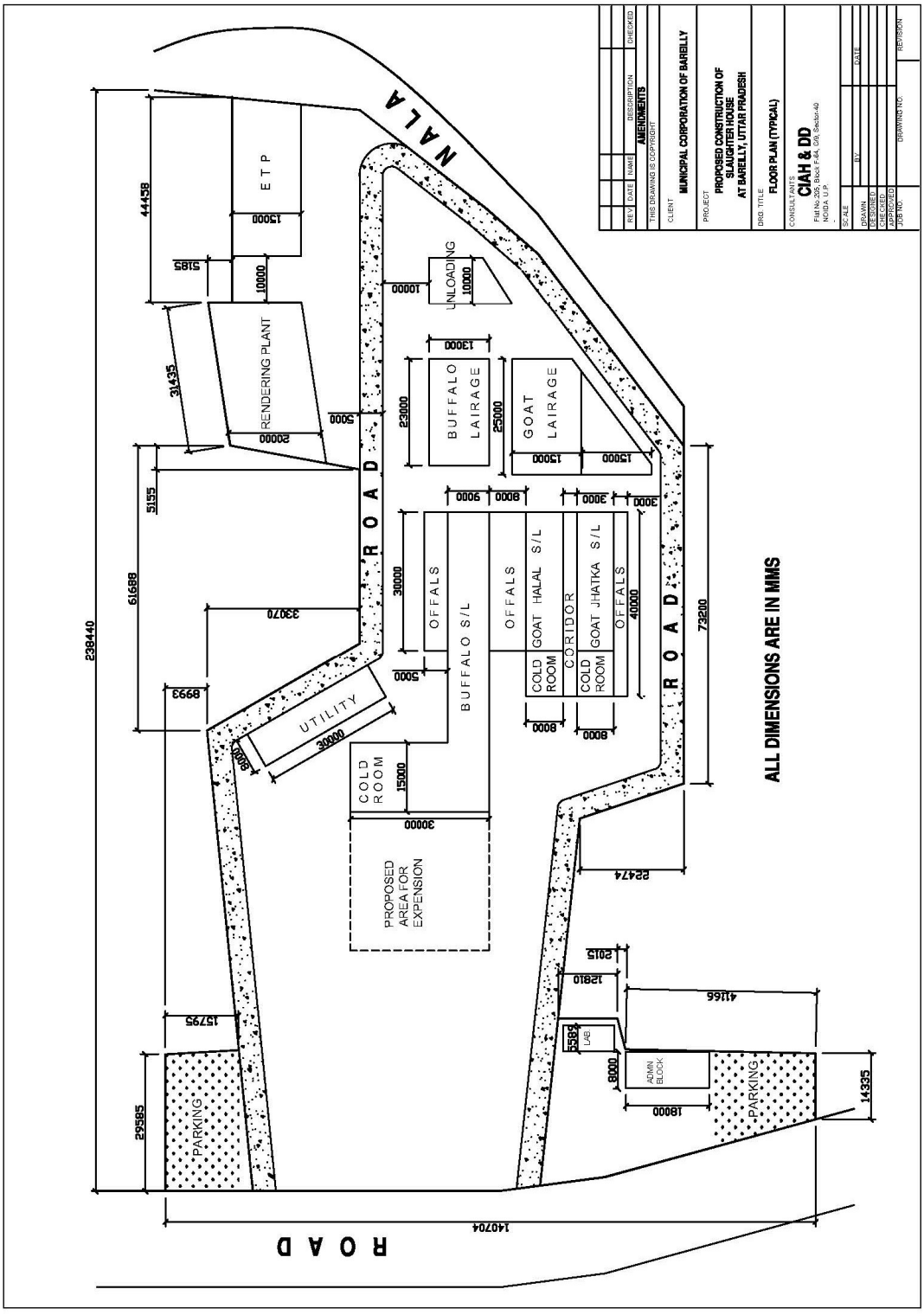
Lairage building block

The lairage building block will have facility to hold buffalo 200, goat/sheep 550. The concept drawing of lairage building has been given on separate sheet at the end of this chapter.

Slaughter halls

In principle, each hall will have an animal slaughter point where killing will take place (stunning point / ritual killing box), After killing, the animal will be hanged on elevated lines, where it will be moved by electric rail and butchers will be used for cutting of heads, hooves partial skinning and inside cleaning. Chlorine water spray will be used for inside cleaning of the carcass. Having finished these processes, the carcass will be moved mechanically into chillers on overhead lines. For delivery, the carcass will move by rail to the dispatch area from chillers. These will be dispatched in refrigerated containers to the market.

Layout Drawing of Modern Slaughterhouse at Bareilly



RESTING OF ANIMALS FOR 24 HOURS AT LAIRAGE

SLAUGHTERING OF BUFFALO BY HALAL METHOD

DEHIDING OF GOAT CARCASSES AFTER SLAUGHTER

POST MORTEM INSPECTION OF CARCASSES IN MODERN SLAUGHTERHOUSE

GOAT CARCASSES IN MODERN SLAUGHTERHOUSE

CHILLING OF CARCASSES AFTER POST MORTEM FOR 24 HOURS TO BRING Ph BELOW 6

CHAPTER – VIII
PLANT & MACHINERY FOR BUFFALO SLAUGHTERLINE
CAPACITY: 100 BUFFALOES / SHIFT

S. No.	Description
	Slaughter Equipment for Buffaloes
1.1	**Raceway with covering** According to drawings
1.2	**Ritual Killing Box** For ritual or traditional killing capacities Maximum of 40 heads/ hr for ritual killing Maximum 60 heads/hr for traditional stunning for local ritual blood trough Consisting of: 1 under frame with 4 rollers, 1 drive, 1 rotary box with 2 race rings, 1 drive-in gate with pneumatically operated sliding door, 1 lateral, pneumatically locked ejection door, 1 Pneumatically operated advance flap which pushes the animals to the front area of the box, 1pneumatically operated head carriage which holds the head of the animal during the killing, 1 operating flap for traditional slaughtering 1 Pneumatically adjustable lateral wall 1 floor plate, 1 ejection Plate, 1 operation panel, 1 control box and 1 head gripper All steel parts hot dip Galvanized. Functions:- 1. The animal enters the box the pneumatic entrance door is closed behind it. 2. The animal is then pushed to the front of the Box by a pneumatic pusher door. When the animal is at the front of the box, the Front neck arrestor frame clamps the animals neck, then the animals throat will be stretched by a pneumatic head lifter for cutting. 3. After arresting, the box can be rotated to turn the cattle either 90^{o} or complete on its back. Then the animals throat is cut. The ritual cut must be made in the direction of Mecca. That means the location and planning the layout of the stunning box has to be made according to ritual cut direction towards Mecca. 4. After the ritual killing the arrestor door opens, and the opposite pusher pushes the animal out of the box. The box then returns to the upright position for the next animal.
	Alternatively
1.2.1	**Stunning trap for traditional slaughtering.**
	Capacity: max 60/h Execution: steel parts galvanized For installation into a concrete construction. LxWxH = 2600x1000x2000mm.

	Trap in steel frame construct on for stunning from top with captive bolt stunner or pneumatic air gun Front side closed with forcible band support. Ejection as lifting door pneumatic operated. Entry door as lifting door pneumatic operated. With crossbar to prevent animals from going up.
1.03	**Landing grit** For buffalo to prevent them from laying on the ground while bleeding, Made in tubular construction, hot dip galvanized, with stainless steel blood chute.
1.04	**Blood collecting tank with pumping system.** Common for buffalo and sheep slaughterhouse. Slope on one side towards outlet. Pumping system with pipe line to transfer the blood to rendering plant with all fittings and accessories.
1.05	**Stainless steel blood collecting channel** According to layout Completely consisting of stainless steel, sealing in wall and tiling by customers including height adjustable feet and double drain for blood and water.
1.06	**Hoisting winch for de-bleeding** Functions: After the killing process the animal is hung on one hind leg to the hoisting winch. The roller shackle together with the looped chain is transferred to the bleeding conveyor.
1.07	**Bleeding Rail** Size as per the requirement of layout.
1.08	**Track Hanger**
1.09	**Bleeding conveyor**
1.10	**Bleeding roller shackles**
1.11	**Electric stimulating equipments**
	With the stimulating equipment it is possible to reach a better meat tenderness and quality in a very short time. The stimulated meat is ready for consumption in a time of 5-6 days which can be reached without stimulating only in 14 days. The pH value test should be done in the loin 1-2 hours after stimulation. The pH-value should be below 6,0. The stimulation equipment has to be clamped in the moment short after the cutting, due to the reason that at this moment the nerve system is already active. The stimulator stimulates the same frequency similar to the brain-signals and activates the nerve system. The muscles of the animal are contracted and in this way the remaining energy of the muscles is activated the remaining energy in a way that the pH-value will below 5.7. The stimulating equipment consists of a 5 voltage transformer and a sequence-generator for stimulating frequencies of 0,5-3 Hz. A parallel symmetry-change of the sequence currency without change of the frequency is possible. The stimulating equipment is specially developed for the use in slaughter lines. The 5 voltage currency is suitable for handling without any danger. The installed securing device reduces the power to 1,7A.
1.12	**Running rail**

	Length: 2000 mm For suspension and fixing of freund tongs and saws.
1.13	**Horn and feet cutting tongs**
1.14	**Horn and feet cutter tong sterilizer**
1.15	**Bleed shackle return rail** According to layout
1.16	**Transfer platform**
	For re-hanging
	Made of stainless steel.
1.17	**lowering device** To lower the transport rolls with the dry-bled buffalo from the bleeding conveyor to the dressing Conveyor. Lowering device with pneumatic Cylinder, foot switch and maintenance unit. Steel parts hot-dip galvanized.
1.18	**Static working platform** For close of rectum end and pre-dehiding, completely of stainless steel.
1.19	**Chutes** For transport of legs and udders installed between transfer platform and feet resp. udder inspection Table, completely of stainless steel.
1.20	**Inspection table for legs** Constructed in stainless steel, positioned close to transfer platform.
1.21	**Lifting platform for pre- dehiding** Platform size: Max. lift: 0.4 to 2.0 m above floor Completely made of stainless steel, including water drain column with stink trap for ceiling passage by customers, pneumatically operated. Platform surface antiskid corundum coated.
1.22	**Overhead rail system** For dressing conveyor, inspection, carcass Quartering and dispatch. Consisting of: Rail Track hanger Pneum. rail switches Tubular rail rotary switches Quartering elevator Horizontal infeed system
1.23	**Dressing conveyor** Consisting of: Driving station Tensioning station Deflection station Infeed station Spreading device Conveyor guide rail and chain Lubrication system Frequency converter

1.24	**Pneumatic dehiding knives**
1.25	**Roller Dehider BE 3**
1.26	**Lifting platform**
1.27	**Static working platform** For front feet shackling and breastbone opening. Tie-up device including catches to receive the foot chains, complete with platform, railing and stairs, made of stainless steel.
1.28	**Chain sterilizer** Completely of stainless steel description as item 1.14, but adjusted for the use of chains.
1.29	**Head washing cabinet** Size: 900 X 900 X 1400 mm. For washing buffalo heads after cutting-off the carcass and before placing them on to the offal conveyor. Made of stainless steel. Washing cabinet is equipped with a drain for direct connection to floor drain.
1.30	**Feet, offal and head inspection conveyor** Transport and procedure: The offal and head conveyor runs synchronous with the dressing conveyor. Feet, heads and red offals are transported along the inspection route from the suspension to the take-down places. Feet, heads and red offals are hanging at stainless steel hooks, which are rigidly fastened at the carriage of the chain, according to layout. Feet will be packed in plastic bags and suspended on one hook. Consisting of: Driving station Tensioning station Deflection station Conveyor guide rail and chain Stainless steel offal hook sets Autom. Lubrication system Frequency converter
1.31	**Dripping channel** Under inspection conveyor, completely of stainless steel.
1.32	**Shower cabin for offal hooks** Including floor vat with drain sleeve, completely of stainless steel.
1.33	**Collecting channel for confiscates** for the discharge of cut off parts during red offals and head inspection Completely consisting of stainless steel, sealing in wall and tiling by customers, including height adjustable feet.
1.34	**Running rail**
1.35	**Breast bone saw**
1.36	**Sterilizing cabin**
1.37	**Moving top inspection conveyor** For paunch removal and inspection, made of heavy duty perforate plastic material, with partitions for each paunch package conveyor with sterilizing device. Height inclination from paunch slide to tripery outlet, all steel parts completely of stainless steel.
1.38.	**Tilting table**

	Including pneumatic operated chute for separation of confiscates and released white organs including pneumatic tilting cylinder, slide for white organs to tripery, made of stainless steel.
1.39	**Paunch inspection chute** For inspection the paunches after receiving with platform, connected to the platform with paunch removal chute and into tripery
1.40	**Confiscate chute** Attached to the paunch inspection chute and connected to the pneumatic transport system, made of stainless steel
1.41	**Elevating platform for offal removal** With paunch removal chute including water dripping column completely of stainless steel
1.42	**Running rail** for suspension and fixing of tongs and saws
1.43	**Electric manual splitting saw**
1.44	**Built-in Disinfection system for bandsaw splitter**
1.45	**Protection screen** Completely of stainless steel as protection during cattle splitting, made of heavy plastic material with stainless steel frame, fixed at ceiling and floor.
1.46	**Lifting platform** For removal red organs and splitting including water dripping column completely of stainless steel. Platform size:
1.47	**Lifting platform for final inspection** Including water dripping column, completely of stainless steel Platform size:
1.48	**Stainless steel frame** For local made concrete inspection and weighing platform
1.49	**Stainless steel guide rail** For local made concrete inspection and trimming platform
1.50	**Overhead tubular rail scale** Weighing cells connected to a terminal system, constructive parts hot dip galvanized, consisting of: 1 tubular weighing rail 800 mm length construction for fixing of weighing cells, the system is equipped with connection to the computer system.
1.51	**Handwash/ knife sterilizing basin** Consists of: Handwash basin with pedal valves, knife sterilizer with connections for hot water supply, Fastening to rail, sterilizer with insulated double walls. The basins are installed in the required positions of the slaugher line, completely of stainless steel including knife sterlizer completely of stainless steel Knife sterilization basin: annexed to the apron wash cabin, isolated, flow regulator, overflow and knife holder for two knifes.
1.5.2	**Apron wash cabin Including knife sterilizer** ***Knife sterilization basin:***

	Annexed to the apron wash cabin, isolated, flow regulator, overflow and knife holder for two knifes.
1.53	**Hand shower** water connection 3/4", with instant closure, freezer guard and rubber coated shower plate, completely of plastic.
1.54	Buffalo - slaughter hooks
1.55	Knife sharpener 0.25 kW el. Motors, incl. Belt grinder and water cooling.
1.56	High pressure cleaner cum disinfection system with Booster Pump (multipump system), Hose, Mobile satellite station, with spare parts for Buffalo, Goat **Maintenance and spare part packet**
1.57	Standard meat carts
1.58	Bolt stunning system Including compressor
1.59	**Central electric control panel**
1.60	**Elastrator for Rodding**
1.61	**Sterilization pipe for elastrator**
	Completely of stainless steel for hot water connection
1.62	**Belt conveyor for hides** For transportation buffalo hides into hide storage room made of stainless steel with intralox band mat.
1.63	**Secondary steel construction**
1.64	**Suspension construction** For the connection of the secondary steel to the primary building beams. Made of tubular steel, round bar steel and steel bars, adjustable in height with fastening screws. Hot dip galvanized.
1.65	Running rail
1.66	Carcass Quartering Saw with Sterilizer
1.67	Boot Wash
1.68	Set of Knives with Belt & Sharpening Steel
1.69	Partition Rack
1.70	Glooves
1.71	Apron
1.72	Helmet
1.73	Gum Boot
1.74	Boot Stand
1.75	Blood Pumps
1.76	Air Curtains
1.77	Insect Killer
1.78	Set of Spares
1.79	Training of Technical Staff
1.80	Training of Butchers
1.81	Grating for open drain

1.82	M. S Angle for fixing the gratings
1.83	Specially designed S/S traps for connecting for open drains
1.84	**Carcass shower** For washing of carcasses before entering the cooling room made of stainless steel
1.85	Handwash/ knife sterilizing basin
1.86	Knife sharpener with polishing
1.87	Track hangers
1.88	Tabular Rail for carcass dispatches.
1.89	Loading & unloading elevator.
1.90	Slewable Telescopic Loading part.
1.91	Trolly with Electric Chain Hoist.
1.92	Tubular rail rotary switch. Made of special cast. With turning joints, shifting device, adjustable by chain pull. Stop for free tubular track ends included. Hot-dip galvanized.
1.93	**Elevator for quartering.** Driving station with driving wheel rotary current geared motor, tensioning station with tensioning wheel, conveyor frame, steel bolted bush roller.
1.94	**Red offal racks.**
1.95	**Trolleys for washing the hooks.**
1.96	**Low height trolleys with S.S. top.** For transporting the hide's packed/ offal in container up to dispatch area and same trolleys will be used for emergency slaughtering in buffalo section.
1.98	**Stainless Steel Round Bars.**
1.99	**Deboning knives and Table for meat processing** With Packing material
2.00	Chillers and Cold Room
2.01	Plate Freezer – 1 ton / day capacity
2.02	Blast Freezer - 5 tons / day capacity
2.03	Refrigerated Van – one

PLANT & MACHINERY - TRIPERY

S. No	QTY	DESCRIPTION
1		Machine for Defatting Paunches and manifolds, Capacity- 25 Paunches/h, **Model : GX – 15**
2		Machine for Paunch cleaning Capacity- 25 Paunches / h, **Model : DX – 15**
3		**DX 8 manual machine for defatting paunches** Technical specification These machine are produced entirely from stainless steel and are supplied complete with the following items; Thermostatic water mixing valves and thermometer Electrical control box with 24v control for two speed motor Capacity Paunches 2 x cycles of 10 minutes for capacity 200 paunches per hour Required energy: 400 volt triphased 50 hz

		Operating temperature of hot water: 65°C (mixing water with steam and cold water 15°C)
4		**GX 8 manual machine for cleaning paunches** These machine are produced entirely from stainless steel and are supplied complete with the following items; Electrical control box with 24v control Capacity see table of consumption herewith: Paunches 2 x cycles of 9 minutes for capacity 200 paunches per hour Required energy: 400 volt triphased 50 hz operating temperature of hot water: 85°C (steam)cold water for rinsing
5		**Manure and Mueus Stripper for (Buffalo)**
6		Bibles Manifolds & Splitting Machine
7		**Compressed Air Conveying System** for transport of slaughter house wastes out of the slaughtering hall Consisting of:
		pneum. Slide ND 300 Compressed air Conveyor In stainless steel, conten 300ltr Conveying pipe ND 150; stainless steel Grip clamps; stainless steel Curve stainless steel Air separator; stainless steel 1200mm diameter Control switchboard for compressed air gun Consisting of the switch cabinet of stainless steel with the necessary appliance for manual and automatic control of the plan and a control panel for the manual individual control including main switch and signal lamps The electric control via PLC is integrated in the main switch cabinet All compressed air valves etc. have to mounted in the cabinet at site, including all connection to the gun. Control compressed air and shoot compressed air are furnished separately. Size and position according to layout
8		**Misc. Items** Tables S/S Air Curtains Insect Killer Grating for open drain (500 x 1000) M. S. Angle for fixing the gratings G.I. Pipes work for cold water connection to various equipments M. S Pipe work for steam line M. S Pipe work for hot water wherever required Electrical connections of the plants and machinery M. S Pipe work for fat M. S pipe work for condensate

CHAPTER -IX

PLANT & MACHINERY FOR GOAT / SHEEP (HALAL) SLAUGHTERLINE
CAPACITY: 175 GOATS/SHEEP / SHIFT

S No.	DESCRIPTION
1.0	**Railings**
1.1	Railing for driving the animal up to stunning box.
2.0	**Stunning Area**
2.1	Stunning box.
2.2	Electrical Stunner
2.3	Hoist
2.4	Elevator arm (to lift the animal up to bleed rail)
3.0	**Bleeding Area**
3.1	Bleed conveyor.
3.2	Bleed rail shackles.
3.3	Blood catchment trough.
3.4	Blood pit.(ss)
3.5	Blood pump.
4.0	**Dressing Area**
4.1	Dressing conveyor.
4.2	Dressing Hooks .
4.3	De-Skinning machine.
4.4	Green offal turn table/Conveyor (motorized)
4.5	Carcass wash screen (ss)
4.6	Wash hand basin & knife sterilizer with Soap dispenser.
4.7	M S stand (stunning & dressing)
4.8	Knife sharpener
4.9	Set of knives (Belt, knife, holder& knife sharpening steel)
4.10	Waste product trucks (ss)
4.11	Appron wash.
4.12	Jet wash system for cleaning carcass.
4.13	Pressurized washing facilities with hot &cold water installed at two location in the hall.
4.14	Red offal racks.
4.15	Tagging gun & Ink.
4.16	S S chute.
4.17	S S packing table.
5.0	**Dispatch Area**
5.1	Dispatch rail.
5.2	Digital Weighing scale with printer
6.0	**Scrubbing Area**

6.1	Boot wash.(ss)
6.2	Boot stand.(ss)
6.3	Partitions rack.
7.0	**Steel Structure**
7.1	Secondary steel work.(galvanized) (Includes I-section, Channel-section, Flanges, nut & bolts etc.) (Drawings to be approved by CIAHDD before manufacturing
8.0	**Consumable for three years**
8.1	Aprons
8.2	Gum boots
8.3	Gloves
8.4	Helmets
8.5	Pack of tags
8.6	Printing papers
8.7	Ink
8.8	Spare parts (**Indian & Imported**)
8.9	Sanitizers
8.10	Disinfectants
8.11	Anti-Coagulants
9.0	**Miscellaneous work**
9.1	SS Drain Channel
9.2	M .S Bracket (galvanized) to support cold water, hot water & compressed air pipe lines.
9.3	'U' clamp with nuts & washers to clamp the pipe lines.(1 ¼",1", ½")
9.4	Valves and pipeline including all required fittings for blood pump and its system
9.5	For Blood Storage 500 Ltrs blood tank (ss).
9.6	Cable tray.(MS galvanized) (4")
10.0	**Water supply (Hot & Cold)**
10.1	G.I Pipe, B-class/PPR Pipe PN-16 - 1 ¼"" and its fittings (cold water for processing hall.)
10.2	G.I Pipe, B-class/PPR Pipe PN-16 - ½" and its fittings (cold water for equipments.)
10.3	SS Pipe Schedule 10, PPR/PN-16 – 1 ¼" and its fittings (hot water for processing hall.)
10.4	SS Pipe, Schedule 10, PPR/PN-16 - ½" and its fittings (hot water for equipments)
10.5	With Ball Valves, Gate Valves, Non Return Valves (Gun metal)& Fitting for pipelines i.e M.S&GI etc.
11.0	**Compressed air**
11.1	MS Pipe, C-Class/Seamless for processing Hall (1" & its fittings)
11.2	MS Pipe, C-Class/Seamless for Equipments (1/2" dia & its fittings)
11.3	F.R.L. Unit, Needle valve, pressure, flanges
11.3	Hose pipe .wp-25kgf/ cm sq, 25mm dia (For washing purpose)
12.0	**Electrical Works**
12.1	**Control Panel** The panel should be fitted with Simens/GE/ equivalent accessories , MCB, Starter, ON/OFF Switch for controlling the whole plant & machinery with all the Safety

	measures.
12.2	Electrical Junction Box (3-φ).Including all wires & fitings
13.0	**Lighting.**
13.1	Industrial Halogen/mercury Light fitting Vitreous enamel through reflector suitable for lamps.
13.2	Decorative tube Light fitting, of standard make, Luminaries suitable for fluorescent Lamps (2x40w)
13.3	Industrial Exhaust fans of standard make, operation on 240v, 50HZ
13.4	Ceiling fan. 1200 mm size with voltage regulator operational on 240v, 50Hz
13.5	Wall Fan (Almonard or equivalent.)
13.6	Lighting Distribution System.
	Electric distribution board, flush type indoor enclosure, hinged front cover, dust and vermin proof fabricated of mild steel sheets complete with switches, indicators etc.
13.7	Earthing & Lighting Protection
14.0	**Miscellaneous Items**
14.1	Insect killer including necessary fitting
14.2	Air curtains.
14.3	Material lifting system
14.4	Refrigerator vans (As per specification)
14.5	Butchers training at site -minimum 10 days till passing of the trade test.

CHAPTER -X

PLANT & MACHINERY FOR GOAT / SHEEP (JHATKA) SLAUGHTERLINE
CAPACITY: 100 GOATS/SHEEP / SHIFT

S No.	DESCRIPTION
1.0	**Railings**
1.1	Railing for driving the animal up to stunning box.
2.0	**Stunning Area**
2.1	Stunning box.
2.2	Electrical Stunner
2.3	Hoist
2.4	Elevator arm (to lift the animal up to bleed rail)
3.0	**Bleeding Area**
3.1	Bleed conveyor.
3.2	Bleed rail shackles.
3.3	Blood catchment trough.
3.4	Blood pit.(ss)
3.5	Blood pump.
4.0	**Dressing Area**
4.1	Dressing conveyor.
4.2	Dressing Hooks .
4.3	De-Skinning machine.
4.4	Green offal turn table/Conveyor (motorized)
4.5	Carcass wash screen (ss)
4.6	Wash hand basin & knife sterilizer with Soap dispenser.
4.7	M S stand (stunning & dressing)
4.8	Knife sharpener
4.9	Set of knives (Belt, knife, holder& knife sharpening steel)
4.10	Waste product trucks (ss)
4.11	Appron wash.
4.12	Jet wash system for cleaning carcass.
4.13	Pressurized washing facilities with hot &cold water installed at two location in the hall.
4.14	Red offal racks.
4.15	Tagging gun & Ink.
4.16	S S chute.
4.17	S S packing table.
5.0	**Dispatch Area**
5.1	Dispatch rail.
5.2	Digital Weighing scale with printer
6.0	**Scrubbing Area**

6.1	Boot wash.(ss)
6.2	Boot stand.(ss)
6.3	Partitions rack.
7.0	**Steel Structure**
7.1	Secondary steel work.(galvanized) (Includes I-section, Channel-section, Flanges, nut & bolts etc.) (Drawings to be approved by CIAHDD before manufacturing
8.0	**Consumable for three years**
8.1	Aprons
8.2	Gum boots
8.3	Gloves
8.4	Helmets
8.5	Pack of tags
8.6	Printing papers
8.7	Ink
8.8	Spare parts (**Indian & Imported**)
8.9	Sanitizers
8.10	Disinfectants
8.11	Anti-Coagulants
9.0	**Miscellaneous work**
9.1	SS Drain Channel
9.2	M .S Bracket (galvanized) to support cold water, hot water & compressed air pipe lines.
9.3	'U' clamp with nuts & washers to clamp the pipe lines.(1 ¼",1", ½")
9.4	Valves and pipeline including all required fittings for blood pump and its system
9.5	For Blood Storage 500 Ltrs blood tank (ss).
9.6	Cable tray.(MS galvanized) (4")
10.0	**Water supply (Hot & Cold)**
10.1	G.I Pipe, B-class/PPR Pipe PN-16 - 1 ¼"" and its fittings (cold water for processing hall.)
10.2	G.I Pipe, B-class/PPR Pipe PN-16 - ½" and its fittings (cold water for equipments.)
10.3	SS Pipe Schedule 10, PPR/PN-16 – 1 ¼" and its fittings (hot water for processing hall.)
10.4	SS Pipe, Schedule 10, PPR/PN-16 - ½" and its fittings (hot water for equipments)
10.5	With Ball Valves, Gate Valves, Non Return Valves (Gun metal)& Fitting for pipelines i.e M.S&GI etc.
11.0	**Compressed air**
11.1	MS Pipe, C-Class/Seamless for processing Hall (1" & its fittings)
11.2	MS Pipe, C-Class/Seamless for Equipments (1/2" dia & its fittings)
11.3	F.R.L. Unit, Needle valve, pressure, flanges
11.3	Hose pipe .wp-25kgf/ cm sq, 25mm dia (For washing purpose)
12.0	**Electrical Works**
12.1	**Control Panel** The panel should be fitted with Simens/GE/ equivalent accessories , MCB, Starter, ON/OFF Switch for controlling the whole plant & machinery with all the Safety

	measures.
12.2	Electrical Junction Box (3-φ).Including all wires & fitings
13.0	**Lighting.**
13.1	Industrial Halogen/mercury Light fitting Vitreous enamel through reflector suitable for lamps.
13.2	Decorative tube Light fitting, of standard make, Luminaries suitable for fluorescent Lamps (2x40w)
13.3	Industrial Exhaust fans of standard make, operation on 240v, 50HZ
13.4	Ceiling fan. 1200 mm size with voltage regulator operational on 240v, 50Hz
13.5	Wall Fan (Almonard or equivalent.)
13.6	Lighting Distribution System.
	Electric distribution board, flush type indoor enclosure, hinged front cover, dust and vermin proof fabricated of mild steel sheets complete with switches, indicators etc.
13.7	Earthing & Lighting Protection
14.0	**Miscellaneous Items**
14.1	Insect killer including necessary fitting
14.2	Air curtains.
14.3	Material lifting system
14.4	Refrigerator vans (As per specification)
14.5	Butchers training at site -minimum 10 days till passing of the trade test.

CHAPTER – XI

RENDERING PLANT

(CAPACITY : 20 Tonne /day)

Introduction

By-products utilization is of economic and public health importance. With increased thrust on pollution control their efficient disposal is essential. Modernization of slaughterhouses facilitates the development and production of meat animals with higher returns to the farmer. Setting up of carcass and by-products utilization plants would significantly reduce the spread of animal diseases and produce valuable protein rich meat cum bone-meal of high biological value for animal and pet foods. It also reduces the feed grounds for vultures and hence saves aircraft from bird hits.

Objectives of the Proposed Plant

The Developed countries since long have realized the financial and sanitary advantage of full use of slaughterhouse edible and inedible waste. The method of Utilization of even the smallest and cheapest part of the animal is relatively easy with adequately capitalized establishments dealing with vast through puts. Similarly in progressive countries a centrally situated by-products plant, making use of raw materials derived from several sources including those from slaughter house situated at relatively small distance from the plant, is not difficult to establish. Unfortunately, such favorable circumstances rarely occur in less developed countries particularly where climatic conditions are subtropical or tropical.

It is regrettable than in less developed countries the approach towards the processing of cadavers and of slaughter of animals is unimaginative, leading to wasteful losses of a whole range of valuable by-products. This leads to a paradoxical situation; e.g., practice of dumping of blood while importing blood meal, exporting bones and importing costly calcium licks and proteins etc. From the economic and sanitary point of view it is essential to make use of all raw materials present in the cadavers and in slaughter animals turning them into an extensive and valuable range of secondary products.

Objectives/Justification

1. The proposed project is expected to collect Slaughterhouses waste as well as poultry waste available from meat shops in the market.
2. The inedible byproducts from slaughter houses and meat shops which have hitherto been wasted will be converted into valuable products to generate income.
3. Provide sterilized protein and mineral rich feed supplement such as meat meal, bone meal and meat cum bone meal to support poultry, piggery and dairy farming.

Availability of Raw Material for Rendering Plant at Bareilly

No. of Animals per day	Average weight per animal (Kg.)	Total carcass weight (Kg.)	Availability of Raw Material for Rendering Plant	
			% of Carcass weight	Total weight (Kg.)
Buffaloes – 200	250	50,000	40	20,000
Goat/sheep – 550	20	11,000	3	330
			Total	**20,330**
			Approx.	**Or 20 tones / day**

Note: Poultry waste and dead animal will be included

DRY RENDERING PLANT

Dry Rendering method is to convert the carcasses and slaughterhouse inedible byproducts into meat cum bone meal and tallow. In this method yield is significantly high than wet rendering as water-soluble materials and valuable nutrients are not lost.

A dry render is a horizontal double walled steam jacket equipped with a set of agitators which keeps the charge in continuous motion for uniform heating and to prevent charring. The dry heat transmitted from steam jacket to the raw materials converts the moisture present in it into steam which gradually builds up internal pressure. This steam pressure combined with agitation disintegrates the materials and breaks down the fat cells. Carcasses, meat chunks and offals are cut into about 50×50 mm size pieces using pre-breaker and fed into dry renderer and steam pressure gradually raised. The drying process raises the raw materials temperature to 125°C. Sterilizing the raw materials at 133°C for 20 minutes at 3 bar and releasing of steam to settle and discharge door is opened. The fat meat and bone discharged into a heated percolator below the renderer door. With the agitator revolving, the solids fall into the percolator. The solid residues are known as cracklings and the fat is collected at the bottom of percolator. The residual fat in the cracklings can be further reduced by 20 mm depending on the materials and level of fat extraction required. The solids are pulverize and then packed and stored in a clean dry place. A cyclone and sacking unit facilitates the powder packaging direct from mill. The meat meal should not contain more than 8% moisture and 10% fat.

Fat settling tank is a vertical double walled steam jacket with a cone shaped bottom. Fat collected from percolator tank and screw press is pumped into the tank and heated. Fat is allowed to settle after adequate heating. Clear fat is discharged side outlet while sludge is removed from bottom outlet. Fat is treated with approved antioxidant to inhibit the development of rancidity.

PROCESS DESCRIPTION

Carcasses and meat offals are collected in the carcass reception area. Meat offal and small carcasses can be collected in the offal containers. Bigger carcasses such as goats, sheep, pigs, cattle, etc. are lifted to the pre-breaker. The Pre-breaker will crush the carcasses down to a particle size of approx. 60×60×60 mm. The pre-broken material is collected below the Pre-breaker in the offal containers. Meat offal and Pre-breaker carcasses are lifted in the containers to the cookers. The cooker can be loaded with max. 300 kg. The cooker can be loaded with either meat offal or carcasses. In the cooker, the waste is agitated and heated to melt the fats, drive off the moisture and sterilize the product. The moisture control will indicate when the process is finished. After processing the greaves are emptied into the percolating tank by reversing the rotation of the cooker agitator, and the cooker can immediately be loaded and start processing again. The percolating tank is equipped with sieve plates which allow free fat to drain off. The greaves are manually loaded into the centrifuge basket. The basket is fitted into the centrifuge. The centrifuge the meal and fat will be separated by means of centrifugal force. After separation, the basket containing the meal is lifted from the centrifuge to the cooling platform.

The defatted meal is manually fed into the milling unit. The hammer mill will reduce the size of the meat and bone particles to normal feed standards. After milling, the meal is collected in bags directly from the hammer mill.

The fat drained of from the percolating tank and the fat extracted in the centrifuge is pumped to the fat settling tanks by steam pressure. After settling, the fat can be filled into barrels for storage.

The evaporated water from the carcass/offal processing is cooled and subsequently condensed in the direct contact condenser. This is done in order to minimize the odour occurring from the cooking process.

QUALITY CONTROL AND PACKAGING

Quality requirements

The dry, defatted and high protein material which results from rendering may vary depending on raw materials used and on the processing method employed. Meat cum bone-meal should not contain hair, hoof, horn, manure and stomach contents except in such traces as might occur unavoidably in good factory practice. The typical composition of meat cum bone-meal used is furnished below:

Composition of meat cum bone meal

Parameter	50% meat meal	45% meat meal
Crude protein (%)	50	45
Moisture (%)	4-10	4-10
Pepsin digestible protein (% min of crude protein)	87	87
Available Lysine (%) (% min of crude protein)	71	71
Sodium Chloride (% max)	1	1
Calcium (%)	8-11	8-11
Phosphorus (%)	4-5.5	4.5-6.5
Sieving (% max) 2 mm mesh	5	5
Untreated hair/feathers (% max)	2	2
Fat (%)	8-11	8-11

Source: *Suter D., 1984. Meat meal. Cited from Ockerman, H.W. and Hansen, C.L. (1988) Animal by-product processing 68 P. Ellis Horwood, England.*

Apart from product composition other quality requirements for salable meat meal include:

Odour : There should be no odours of putrefaction. The predominated odour shall be that of cooked meat and tallow.

Temperature ambient : Storage temperatures should not be more than about 10^{o}C above.

Microbiological requirement : No detectable pathogenic organisms shall be present.

Infestation : Must be free from infestation by insects, rodents and their residues.

Protein quality : Digestibility and availability of amino acids is a critical factor. Not more than 13% of crude protein should be undigestible by pepsin(0.2%) after 16 hours at 45^{o}C.

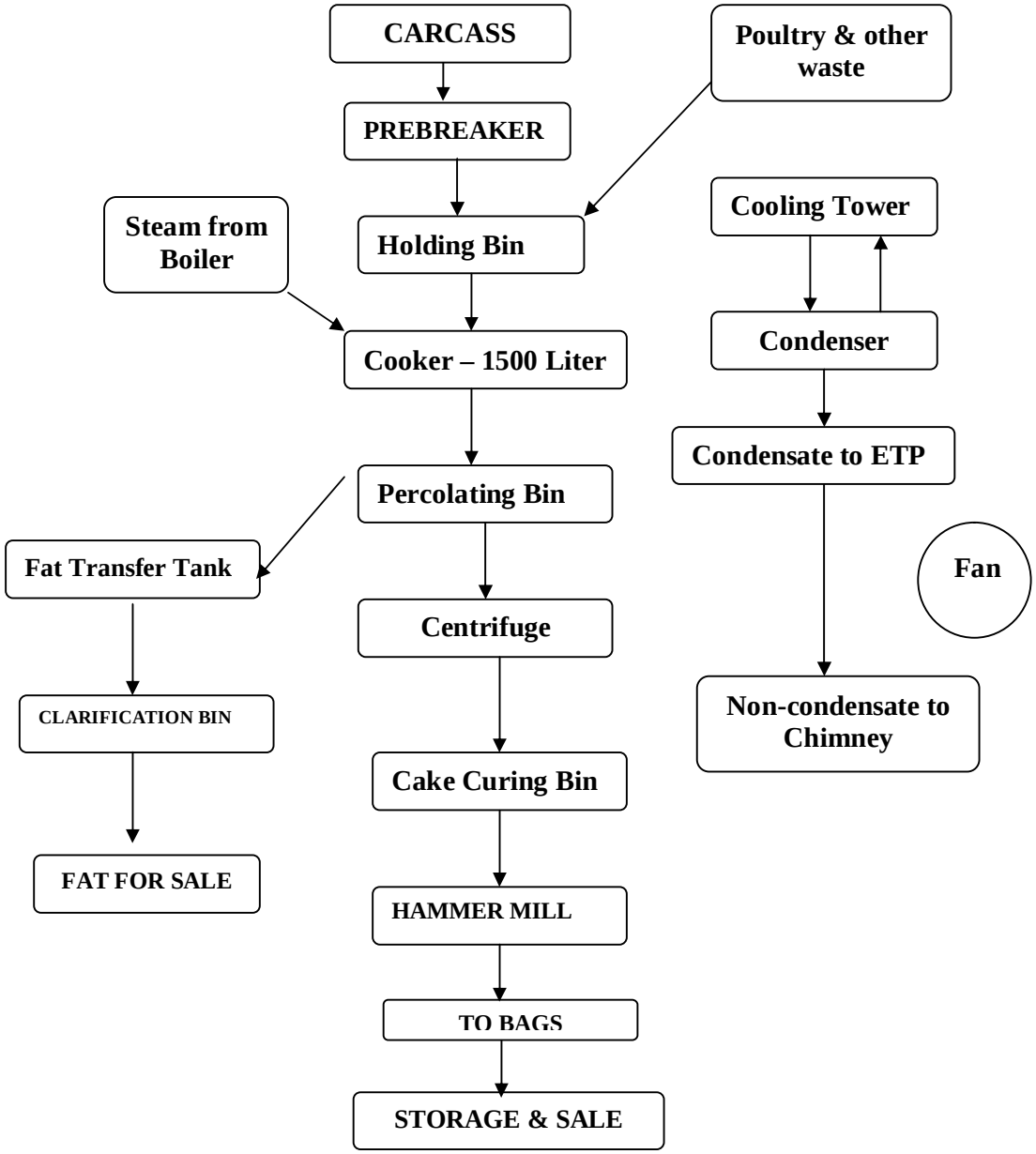
Inedible tallow : A major use of inedible tallow of animal origin is as a high energy additive to livestock and poultry feed. Tallow is usually stabilized with an approved antioxidant to prevent rancidity. It must also has good colour and odour.

EQUIPMENTS

1. Pre-Breaker
2. Screw Conveyor From Pre-breaker to Holding Bin
3. Holding Bin
4. Loading Conveyor
5. Cooker/Sterilizer (Capacity: 3 Tonne/Per batch)
6. Percolating Tank

7. Screw Conveyor from Percolating Tank Basket (Centrifuge)
8. Basket Centrifuge
9. Hoist Assembly (1 Ton) – 2 Nos.
10. Cooling Platform
11. Screw Conveyor from Cooling Platform to Hammer Mill
12. Hammer Mill Unit
13. Shell and Tube Condenser
14. Cooling Tower
15. Fat Transfer Tank with Gear Pump
16. Fat Settling Tank
17. Electric Control Panel
18. Steam Generator (Boiler)
19. Water Softening Plant
20. Diesel Generator Set
21. Moisture Meter
22. Inspection Platform
23. Bag Closing Machine
24. Set of Spares
25. Set of Knives

FLOW DIAGRAM OF THE RENDERING PROCESS



CHAPTER -XII

EFFLUENT TREATMENT PLANT

(Capacity – 250 KLD)

GENERAL PHILOSOPHY

Effluents and Disposal

Meat production centres release large quantities of effluents. Effluents also carry certain waste products if the by-products and paunch contents are not recovered effectively during animal slaughter. The effluents consist of faeces, urine, blood, washings from carcasses, floors, walls and equipment, paunch contents, tissues, trimmings and fat. These materials increase the concentrations of solids resulting in high BOD. The effluent discharge widely varies on the capacity of abattoirs and on the method of handling the by-products, paunch contents and the clean-up activities. If the blood is not recovered properly and if it is let out into the drains, it causes major problem of effluents. Blood has the highest BOD of any liquid material emanating from abattoir and increases the pollution load. Paunch contents (particularly solid waste) are troublesome primarily because it increases solid concentration in the effluents.

The effects of effluents are many and varied:

1. **Depletion of dissolved oxygen:** When the effluents are discharged into surface waters, depletion of dissolved oxygen takes place. The effluents from abattoirs contain all essential nutrients for bacterial life, and the temperature and pH of the effluents are ideal for bacterial growth. The rate of decomposition is high resulting in anaerobic conditions followed by bad odours and conditions suitable for fly and mosquito breeding.
2. **Pathogens**: Effluents from meat production centres carry a variety of pathogens such as Salmonella, S.aureus, Bacillus and Clostridium that cause human health hazards.
3. **Off-odours:** Effluents are known to be readily biodegradable and cause unpleasant odours.
4. **Environmental pollution:** Effluents pollute environment and affect human, animal and plant systems.

Effluent Disposal

Waste reduction is essential during processing of animals in the meat production centres. Waste reduction can be achieved by dry clean-up and recovery of blood, fat and paunch contents. Many different systems exist for the treatment of effluents. In general, there are two methods of treatments of effluents:

1. Primary treatment where physical methods are employed for removing solids, suspended solids and grease.
2. Secondary treatment where biological methods are adopted for the degradation of organic matter.

Primary treatment consists of (a) screening out solids and removing of fats by mechanical skimming and (b) sedimentation. Screening by rotary wire mesh screen removes coarse materials such as hair, flesh, paunch manure and floating solids. Sedimentation takes place in settling tanks. One to three hours detention period is sufficient in settling tanks.

Secondary treatment methods commonly used for treatment of effluents include: (a) catch bains; (b) air floation; (c) trickling filters; (d) lagoons (aerobic and anaerobic), (e)

activated sludge systems and (f) biological diseases. All these treatments are capable of providing complete treatments.

The selection of the suitable effluent treatment system would depend on the location of meat production centre, available space and slaughter rate.

In the proposed meat production centers, removal of blood, paunch contents and other solids is carried out by screening and effluents are treated with chlorine and let out into public drainage.

Protection of Environmental Degradation and Ecology

Protection of environmental degradation and ecology is vital when any food processing plant is established. Meat production centre is no exception in this. Meat production centres will generate effluents that endanger the environment and ecology as well. The effects of effluents on the environment are many, (a) case depletion of dissolved oxygen affect the bacterial life; (b) pathogens in the effluents cause health hazards; (c) effluents are known to be biodegradable and cause unpleasant odours and (d) effluents affect plant life, flora and fauna, humans and animals.

It is therefore essential to treat the effluents to protect environment and ecology. Effluents can be controlled in three ways (a) waste reduction; (b) processing of by-products responsible for effluent load and (c) treatment of effluents by aerobic and anerobic lagoon systems.

Waste Treatment

The disposal of packing house wastes is more important than ever. It no longer is merely a problem of trying to recover the last possible ounce of product – and with it the last possible cent. Many states and municipalities as well as the federal Environmental Protection Agency (EPA) now have limitations on the amounts of pollutants in industrial wastewater. The National Meat Packing Waste Management Research and Development Programme of the EPA has concluded that a 50% or more decrease in pollutants discharged to the treatment system can be accomplished by improvements in existing plants. The ultimate goal of the research program is to achieve a level of technology capable of no discharge of pollutants to public waters through a closed loop waste system; that is to say, all waste water will be recycled and reused in the plant. It thus behooves the meat packer to practice good housekeeping habits and utilize as many aids as possible in controlling his wastewater, from the point of view of both content and volume.

The best way to save money in the treatment of wastewater is to reduce the volume. A study of all points where water flows into sewers should be made to determine if the flow can be reduced or eliminated. Clean-up water can be reduced by the use of small diameter fixed nozzles on conventional hoses or by using high pressure, low volume systems. Care must be taken with high pressure systems to prevent damage to equipment and/or recontamination by splattering. Instruction of clean-up personnel in the importance of saving water and proper supervision during clean-up operations are necessary for maximum savings. Overflow of water into the sewers from tanks where canned meats are cooled, or from vacuum pump, air compressor and refrigeration compression jackets can be reduced or eliminated by recycling the water through cooling towers, or by thermostatically controlling and limiting flow volume. A survey of any plant will turn up many such locations where savings can be made.

In general, a good method of attacking the problem of wastes is to make studies of actual plant effluent over a period long enough to insure results that are truly representative. Positive action then can be taken to correct faulty conditions. The best solution to high solids

wastewater is to prevent materials, which should not be there from getting into the drains, and to improve the facilities for removing those materials, which unavoidably do get in.

Clean-up procedures should also be analyzed. For example, floors on which there are large numbers of particles should be swept before washing operations begin so that fat and meat particles are recovered earlier (for better inedible rendering yield), which solids contents in the effluent is reduced and hot water is saved (pushing debris with a hose is very inefficient).

In-Plant Waste Systems

Wastes should be separated into different systems at the point of origin; in USDA inspected plants this separation is mandatory. Thus, there are three, four and sometimes five drainage systems in an abattoir.

One system of lines is used for blood. This system originates in the bleed areas of the kill floor, where dual drains are utilized. One opening of this drain is the plant waste water system. During slaughtering, the blood drains through the opening connected to the bloodlines, while the second opening is kept closed. During clean up, the positions are reversed. The blood carrying pipes usually lead to surge tanks in that part of the by-product department where the blood is processed. Blood, which not only has a very high BOD (biochemical oxygen demand) but also a very intense colour, should be prevented from entering the plant drainage system. Blood should be squeezed to the blood drains before washing the floor.

An optional second system can be used for disposing of paunch contents – manure and corn and other feeds. These materials are drained to facilities for separating the liquid from the solids, such as vibrating screens or rotary sewage disposal screens. This method of handling paunch contents is common, but it is preferable to handle this material without using water, because water used for this purpose has a high BOD, as well as providing an additional volume that must be handled. Paunch contents should be dumped dry onto a screw or belt conveyor for transportation to a location from which they can be removed by truck from the plant premises for disposal.

The third system, which is connected to the municipal sewage system, drains those lines coming from shower rooms, toilets, etc.

The fourth system is the plant's waste water drainage system, to which all department floor drains should be connected. Floor drains specifically designed for packing houses should be used. These drains usually have a removable basket immediately below a removable grating so that any solids passing through the grating are caught in the basket. Since both cover and basket can be lifted out, periodic cleaning keeps such a drain open at all times.

Care must be used in the location of traps and sewers so they can be opened readily and cleaned whenever it is desirable to do so.

A fifth drainage system is frequently desirable for clean waters consisting of roof drainage and cooling water that does not come into contact with the product.

Components of Meat Packing Wastes

The major components present in meat packing wastes which have a pollution potential are solids (floating, suspended, settleable and dissolved), organic matter, nutrients, acids and alkalis. These various components affect the water quality of a body of water if they are introduced into it. Floating solids, including grease and scum, are unsightly and may prevent oxygen transfer and light penetration. Settleable solids may affect the organisms in the body of water by covering up the bottom and forming sludge blankets which will decompose, forming odours gases. Settle able solids may also prevent fish hatching on the bottom of a stream or

lake. Suspended solids give the water a turbid complexion and limit light penetration as well as increasing the requirements for treatment if the water is to be used for drinking purposes. Dissolved solids may be decomposable and exert an oxygen demand on the body of water.

Organic matter decomposes and depletes the dissolved oxygen supply in the water. If the amount of dissolved oxygen supply in the water. If the amount of dissolved oxygen gets too low, desirable species of fish such as trout and bass will disappear and be replaced by types like carp and bullheads which can survive in lower levels of dissolved oxygen. If the dissolved oxygen is reduced too far, there will be no fish life. Other animals and organisms living in the water will react in a similar manner to decreasing levels of oxygen.

The two major nutrients commonly found in packing house waste are nitrogen and phosphorous. Waste water flows that are rich in nutrients usually cause excessive algae growth. When heavy algae growths die, they cause an oxygen demand which in turn may cause fish kills, unpleasant odours and an undesirable taste to the water.

Temperature changes caused by packing house discharge into the water can cause a reduction of fish and other forms of aquatic life. All of those forms have preferred temperatures; when the temperature of the body of water deviates far enough from the preferred temperature, the organisms either will not flourish or may disappear entirely.

Acidity and alkalinity must be controlled so that the discharge into the receiving water is within the tolerable deviation from neutral.

To prevent the reduction of the quality of water resources, waste treatment must be practiced in some form. This may take the form of complete treatment at the plant or partial treatment prior to discharge into a municipal sewer system. The degree of treatment required depends upon federal and local requirements which establish effluent standards for discharge and water quality for a particular receiving body of water.

Primary Waste Treatment

Waste waters from the various departments, including those resulting from clean-up at night, require some sort of treatment before they can be discharged into the municipal sewer system or sent to the secondary treatment system for further processing. Typical slaughterhouse and packing house waste are generally high in **biochemical oxygen demand (BODs),** total suspended solids, floatable material and grease. Furthermore, the waste is generally at an elevated temperature and contains blood, bits of flesh, fat, manure and viscera. The primary treatment of these wastes consists of blood recovery, grease recovery, paunch manure handling and removal of separate solids. Blood recovery and paunch manure handling have been discussed above.

The most common method of removing grease and settle able solids is the settling or catch basin. A vessel is provided which is large enough to contain all the flow from the plant waster water drainage system for a period of time long enough to allow the grease to float to the surface and the settle able solids to sink to the bottom. The amount of time required varies depending upon the amount of grease and settleable solids as well as the temperature of the water, but a period of one hour may be taken as a reasonable time. The basin is usually made of concrete with an open top, set at such an elevation that waste water can flow by gravity into and out of the basin. For smaller installations, steel tanks can also be used.

Older designs of these basins usually have a trough along one side so that the grease that floats to the surface can be swept off with a wooden skimmer into the trough and then transported either in a steel drum or by means of a blow tank to the rendering department. The sludge on the bottom of the basin resulting from the settled solids is removed with dippers on long poles or with shovels when the catch basin is drained.

Newer catch basins have mechanical skimmers, which consist of two chain drives, each along one side of the basin, connected by bars or flights. The flights are moved slowly along the surface of the basin to the outlet end, where they deposit the grease they have skimmed into a skimming trough. The flights then dip down into the basin and travel along the bottom, where they push settled sludge toward the inlet end. To receive the sludge, the inlet end has a sump from which the material may be pumped.

By pumping small bubbles of air into the lower portion of catch basins, more grease can be recovered because the air bubbles bring grease with them as they float to the surface.

Municipal Requirements

Most municipalities have ordinances which place limitations on the characteristics of the waste water which may be discharged into the municipal sewer system. These limitations are set to prevent operational problems for the plant from becoming overloaded. In addition, an industry which discharges at a strength greater than domestic sewage usually must pay an over strength surcharge. Because of the high flows and concentrated wastes discharged from a meat packing plant, the primary treatment described above is usually necessary. Further reduction of BOD and suspended solids may be economically advantageous if the further treatment reduces the sewage charge sufficiently. In some cases, waste flow must also be treated biologically (secondary treatment) in order to meet BOD limitations.

When a municipality builds or expands its waste treatment facility, the industries served by it are expected to pay their share of the construction and operational costs. These costs can become extremely high, particularly in smaller communities where the industrial flow is a substantial percentage of the total. In these cases the economics of primary and possibly secondary treatment must be compared to the possibility of providing completely separate industry owned waste treatment facilities. By July 1, 1977, all municipal waste treatment facilities must provide a minimum of secondary treatment and all industries discharging to public wastes must be applying the best practicable control technology available. However, in some states, tertiary treatment is already required for effluent discharged into some streams and lakes with very low flows and/or stringent water quality requirements.

Secondary Waste Treatment

There are various methods of secondary waste treatment which can be used for the purpose of treating meat packing wastes. Factors that must be considered in choosing a system include land availability, proximity to commercial or residential areas, initial construction cost, operation and maintenance costs and ease of operation.

The secondary treatment methods commonly used for the biological treatment of packing house wastes include (1) anaerobic processes, (2) aerobic lagoon systems, (3) variations of the activated sludge process, (4) high rate trickling filters and (5) rotating biological discs. All of these treatment processes are capable of providing complete treatment and can achieve BOD reductions of 70% to 95% and suspended solids reduction of 80% to 95%. Each system has advantages and disadvantages; generally, the degree of treatment required together with the site location and limitations, capital costs and operational costs will dictate the selection of the treatment system.

Further Treatment

As water quality standards become more stringent, increasingly elaborate and complete treatment systems become necessary. These tertiary systems will have a high first cost as well as high annual operation and maintenance costs, all of which must be borne by the meat packer. One possible alternative is the disposal of treated waste water by application to the

soil. Where sufficient land area is available, this method may be less expensive in first cost as well as operation and maintenance costs compared to a highly sophisticated tertiary treatment facility. Factors determining the suitability of a given area for irrigation include area climate, soil contours, soil characteristics, depth of the water table below the surface and adjacent land use.

USDA Regulations Pertinent to Waste Disposal
Plant Drainage:

All parts of floors where wet operations are conducted shall be well drained. As a general rule, one drainage inlet should be provided for each 400 sq. ft. of floor space. A slope of about one-fourth of an inch per foot to drainage inlets is required for usual conditions. In areas such as beef sales coolers and other departments where a limited amount of water is used, the slope may be about one-eighth of an inch per foot. It is important that the floors slope uniformity to drains with no low spots which collect liquid. Floor drains are not required in freezer rooms or dry storage areas. When floor drains are installed in rooms where the water seal in traps is likely to evaporate without replenishment, they shall be provided with suitable removable metal screw plugs.

In certain departments, special floor drainage is required. For example, floor drainage valleys are essential under the dressing rails for hogs, calves and sheep. Such valleys should be about 24 inches wide and integral with the floor. The valleys should slope at least one-eighth inch per foot to floor drains within the valleys. In on-the-rail cattle slaughtering departments, floor valleys under the dressing rails are required unless the floor drainage is carefully localized, with drainage inlets placed advantageously beneath the dressing rails.

Size and Construction of Drainage Lines:

Waste material such as paunch contents, hog hair, blood and pen manure must be disposed of without creating objectionable conditions. Drains for cattle paunch contents should be at least eight inches in diameter to avoid clogging. Drains for hog, sheep and calf stomach contents should be at least si inches in diameter. Such drains should not be connected to the regular plant drainage lines or to toilet lines. All other lines must have an inside diameter of at least four inches.

Drainage lines within the plant must be constructed of cast iron or galvanized steel pipes. Each floor drain including blood drains must be equipped with a deep seal trap (P-shaped, U-shaped or S-shaped). Drainage lines must be properly vented to the outside air and be equipped with effective rodent screens. Where several four-inch drainage lines discharge into one trunk line, this line must be proportionately larger so as to handle efficiently the drainage discharged into it.

Drainage lines from toilet bowls and urinals must not be connected with other drainage lines within the plant and may not discharge into a grease catch basin. Such lines must be installed so that if leakage develops, it will not affect product or equipment.

Plant Waste Disposal:

An efficient method of disposing of plant wastes is essential. If permitted by local ordinance, plant wastes may be discharged into a municipal sewer system and this is most desirable. If the discharge is into a stream, flow of water must be sufficient at all seasons of the year to carry the waste water well away from the plant. The sewage disposal facility must be acceptable to the state or local health authority having jurisdiction over such matters.

Catch Basins for Grease Recovery:

Catch basins for the recovery of grease should be suitably located and not placed in or near edible products departments or areas where edible products are loaded or unloaded. To

permit ready cleaning, such basins should have sloped bottoms and be without covers. They should be constructed so that they can be completely emptied of their contents for cleaning. Hose connections for furnishing hot water for clean-up purposes should be provided at convenient locations near the basins. The area surrounding an outside catch basin should be paved with impervious material, such as concrete and provided with suitable drainage facilities. Suitable facilities, such as a blow tank, should be provided for the transfer of grease to the point of disposal after it is skimmed from the basins.

Air Pollution:

Air pollution can be caused by many substances. Those most commonly found in meat packing operations are particulate matter, odors and chemicals.

Particulate matter is contained in the smoke from smoke house exhaust duets and boiler stacks. Smoke from boiler stacks is the result of incomplete fuel combustion; proper combustion will solve the problem and conserve energy as well.

Odors are found in the plant ventilation air in general and in higher concentrations in smoke house exhaust and from inedible rendering facilities. Odors can best be removed from the air by washing it with water or chemical solutions in a scrubber. A scrubber is essentially a vessel or large duct containing sprays or other means of causing contact between air and the cleaning medium through which the air passes. If the air to be cleaned is contained in a building or process, it can be exhausted through the scrubber. In the case of livestock pens and sewage lagoons this is not practical and attempts to mask the odors with "perfumes" have been made. This approach has not been very successful.

Chemical pollutants include sulfur oxides of nitrogen and hydrocarbons. Sulfur emissions usually result from burning coal. Oxides of nitrogen and hydrocarbons are often emitted in objectionable quantities from gas-fired after burners used to control odor and smoke from smoke house exhaust and odors from inedible rendering operations. Chemical pollutants are usually controlled by reducing or eliminating them. Sulphur emissions may be reduced by switching to lower sulfur coal or another fuel and scrubbers may be substituted for after burners.

The permissible levels of air pollutants are established by NERI for Central government and State Pollution Boards.

Waste Treatment and Effluent Disposal
General:

The prevention and containment of meat and by-product waste is both an economic and public hygiene necessity. The chief sources of polluting matter in waste waters from abattoirs include faeces and urine, blood, bristles, washings and meat residues and fat from carcasses, floors, utensils, undigested food from intestines, paunch of slaughtered animals, and sometimes condensed vapour from rendering of offal.

For maintenance of proper hygiene standards the livestock processing industry is committed to using large quantities of water – a significant processing cost factor. Its post operational treatment in the plant and eventual disposal to acceptable outfall further adds to overheads thus making it essential for the minimum volume of water to be used consistent with achieving proper hygienic standards and the constant auditing of usage.

Following the suitable pretreatment or full treatment several means of disposal are usually available:

1. To an urban-sewage authority responsible for partial or full treatment.
2. To ocean outfalls without additional treatment.

3. To a waste treatment plant and thence to receiving waters.

4. To irrigation after fine screening and primary treatment.

Most countries have legislation or voluntary abatement codes for waste treatment which then sets standards of housekeeping which will reduce the grosser forms of pollution and in turn utilize the waste products which are collected.

Origin of waste waters in abattoirs and processing Plants

Stockyards or lair ages appurtenant to abattoirs are ordinarily provided with catch basins which are usually floored and covered. Wastes consist of water trough overflow, liquid excreta, and pen wash waters containing manure. Uncovered pens are subject to flushing in rainy weather with consequent leaching from manure itself to the sewer.

The character of these wastes would be expected to vary widely, dependent on the presence or absence of catch basins, practice in manure removals, and frequency of washings. The extent bedding materials and scraps of unused food add to the daily load and degree of initial dry cleansing of stock yards or transporter vehicles. Failure to observe such cleaning practices will increase coli form counts and organic load in the flushed effluents.

Manures should be collected dry and stacked in compost or manure bay for periodic collection for agricultural fertilizer use, or in hot dry climates sheep manure serves as an ingredient for brick making.

The operation listed below are the primary processes carried on in abattoirs proper with perhaps the addition of rendering operations and which contribute to the abattoir waste water load. Again as with Lair age initial dry cleansing in certain departments can reduce effluent loads.

Killing floor: Many plants collect blood for processing in rendering plants or sale to fertilizer manufacturers. Some plants use part of the blood to add to their meat meal and sell or give away the remainder. This will decrease substantially the oxygen demand and color of the effluent discharged to the sewer and should be encouraged.

Paunch Manure: This is usually segregated from the liquid wastes and added to lair age manure for composting separately. City abattoirs can also dispose off manure with garbage. Separate disposal of paunch manure reduces materially the settle able solids in the effluent entering the sewers.

Floor and Equipment Wash: These contain in all departments, blood, manure, flesh, fat and bone particles.

Carcass Dressing: Carcass washes contain blood, flesh and fat particles from trimming.

Rendering: Many abattoirs render condemned carcasses and offals for inedible tallow's and meat meal. Where wet rendering is practiced, tank water remaining after grease and residue are taken off, is further processed. Installations for drying rendering produce no tank water as any water charged into the melted is evaporated. Raw material can be prepared for rendering by hashing and washing. This operation adds a considerable quantity of residue to the effluent consisting of small flesh and fat particles and intestinal contents. Where the steam rendering process is used centrifuging produces additional tank water.

Hide Store: Green hides from the killing floor, are piled flesh side up and sprinkled with salt. A small amount of drainage from these piles, in addition to floor wash goes to the drainage system.

Cooling Room: Liquid wastes draining from this unit are of minor significance.

Casings Cleaning: After removal of solid contents, which is disposed off as semi-solid refuse for composting, casings are washed cleaned of their mucosa by squeezing or pressing, salted, drained, resalted and packed for dispatch. Trimmings and mucosa from the casings are rendered to recover grease and protein. The wastewaters from cleaning machines are discharged to catch basins for grease recovery.

Tripe Room: The tripe or muscular part of the stomachs of cattle is washed and scalded. The wash and scalding waters containing grease and suspended matter are discharged into catch basins.

Laundry: The laundries of the large plants are of considerable size and can produce an effluent with a 5 day **Biochemical Oxygen Demand (BOD) of 1300 ppm.**

Basic design considerations common to all types of collection systems

The drainage and sewage should be collected, treated and disposed with consideration to the quantities, type of livestock, the nature of the solid liquids, the possibility of the usage after treatment, the need to avoid environmental pollution and the safe-guarding of the public health.

The drainage and sewage collection installation should be designed to be separated into different systems at the point of origin, particularly for medium or larger plants:

1. Blood drainage
2. Lairage and paunch manure sewage
3. Slaughtering, by-products and rendering areas sewage
4. Domestic sewage
5. Storm drainage, marketing, parking and service area drainage.

Separation of waste systems will permit economics in the provision of secondary treatment measures throughout. The need for such measures being restricted to departments or areas where the pollution load and BOD is the highest. Separating will generally result in several main systems as above, but drainage from the slaughter by-products and rendering areas may need further segregation if required.

Drainage and sewage quantities will be basically related to the number of animals slaughtered and the total water (hot and cold) consumed in the slaughter hall, by products and rendering areas including all suspended solids and washing wastes, the calculation of total volume is discussed under volume of waste water for treatment.

Blood drainage system should be estimated for abattoirs on the basis of a minimum of 0.75 to 1.00 litre of blood for each sheep and goat and 10-12 litres for each buffalo and 3 litres for each pig slaughtered. These figures being increased by 30% for livestock with live weight characteristics comparable to that found in Northern Europe.

Paunch manure sewage system should be estimated for abattoirs on the basis of 1.25 kg of manure for each sheep and 16 kg of manure for each cattle unit slaughtered. These figures being increased by 30% for livestock with live weight characteristics comparable to that found in Northern Europe.

Domestic sewage system should be estimated on a population basis. Lairage, parking and services areas drainage systems are generally dependent on the final selection and location for the abattoir and can not be standardized solely on the basis of the plant slaughtering capacity.

Whatever the subsequent treatment or disposal, the effluent pre-treatment measures are mandatory and would require that raw effluent should contain not more than 50 ppm flotable fat and should have passed through a bar screen.

In such situations where effluent, whether it has received secondary treatment or not can be discharged into water courses or irrigation ditches. The discharge however, should only be permitted where the flow of water from all sources is sufficient at all seasons of the year to carry the sewage well away from the plant or where convenient in heavy rainfall areas the increased flow during the rainy season will not back up into the abattoir premises.

It cannot be emphasized strongly enough that effluent treatment begins in the plant, where every effort must be made to adopt an efficient byproduct recovery and dry clean up, for not only is such material in itself valuable but the amount of waste in water and actual volume of water used are also reduced, thus cutting costs.

Volume of Process water which may require treatment.

Assessing the volume of water needed to convert an animal into meat obviously depends on the degree of byproduct processing in the premises. At the lower end of the scale 170.0 litres of water per buffalo unit processed is used as a guide with 25% increase if inedible processing is undertaken. The BOD of the effluent could be in the region of 1500 ppm. These average levels assume maximum recovery of waste at source by efficient housekeeping and byproduct reclamation.

The relating of polluting water and matter to the number of buffalo and goat / sheep units slaughtered is considered to be a more satisfactory procedure than tonnage of meat slaughtered as the average weight of animals varies from country to country and regionally particularly in developing countries. Obviously two or smaller type animals still require the same individual dressing procedure and therefore more processing water than the equivalent weight of one larger animal. The total water effluents generated at the slaughterhouse complex is estimated as follows:

Quantity of Effluent Discharged

Sl. No.	Effluent Source	Quantity of effluent water (lit. per day)
1.	Buffalo slaughter-line – 200 animals per day @ 1000 lit per animal	2,00,000
2.	Goat / sheep slaughter-line – 550 animals per day @ 100 lit per animal	55,000
3.	Rendering Plant (Boiler)	5,000
4.	Lairage buildings	3000
5.	Workers and others	1000
	Total	**264,000 or.250 KLD***

- **Slaughterhouse normally does not operate on 100% capacity.**

Treatment phases and systems

Following the initial separation of the various categories of effluent the degree and method of treatment technology varies considerably due in part to non-uniformity of production, processing technology, effluent treatment equipment and location.

Wherever possible, effluent should be directed to a public sewer, this procedure though will require a measure of primary or pre-treatment as a minimum requirement. The requirements of developing countries differ inasmuch as mains sewer system do not exist except possibly in the centre of major or capital cities and in these countries therefore it must be assumed that effluents will discharge to surface waters (rivers, lakes or off shore sea outfalls) in these situations there are invariably various degrees of treatment processes which can contribute to the economic viability of the processing enterprise even more significantly

than in an industrialized country. The treatment processes that can be employed are classified into three different categories namely: Primary – physical and chemical treatments; Secondary – anaerobic or aerobic biological and lastly a combination of these two secondary processes. All the treatments given provide a measure of, if not complete control over pathogens and pollution levels.

In most systems after grease and coarse solids have been removed from the waste waters, the separate streams are usually allowed to mix and if arrangements can be made to discharge the waste waters to a local authority's sewer no further treatment at the abattoir may be required. Where it can be arranged discharge to a local authority's sewer is clearly the best method of disposal but in developing countries sewers are hardly ever available, or the treatment works have not the capacity to deal with trade waste, then in such situations it is practicable to treat the waste waters on their own by primary processing as indicated below.

Effluent flow equalization:

The use of balancing or equalizing tanks for flow equalization avoids the needs for specialized treatment plants to be over dimensioned to cater for peak flows. Consisting of simply a locally made steel or concrete tank (or lagoon where areas of land are available) the balancing tank offers advantages to both plant discharging into a municipal sewer as well as that treating its own effluent. In the former case a tank may be necessary to avoid exceeding the flow limit imposed by the recipient Water Authority at peak production times. In the latter case a balancing tank, by regulating variable diurnal flows, enables the in-plant treatment process to be designed for average rather than peak flows. The control of pollutant and shock-loads also may result in a more efficient use of subsequent treatment facilities. For a typical example the effluent is pumped forward at a regular rate over the desired working period (i.e. if total daily effluent = 400^2m, one pump could operate at 17^3m/hour for 24 hours over 40^3m for 10 hours). Effective throughput should be adjustable by inserting in the discharge line a T joint, with one controllable flow being directed back to the equalizing tank. The level must not fall below 30% of total volume to ensure liquor is available to allow equalization of inflowing effluents.

Primary (Physical Treatment System)

The physical treatment processes in common use are: proper clean up and house keeping procedures followed by screening for the removal of heavy and settleable solids, grease traps and skimming tank for the removal of fine solids and fats and oils.

Grid screening is invariably employed in pre-treatment of meat industry effluent being used to exclude flesh, bones, fleshing and other coarse solids from the waste waters. Their function is extremely important and results in both the elimination of nuisance conditions (pump or pipeline blockages), downstream, as well as improving the efficiency of further pretreatment processes. They may have little effect on the lowering of BOD fats and oils or suspended solids. Although bar screens are generally regarded unfavourably, being easily clogged and requiring constant attention in order to prevent blocking, this disadvantage however can be disregarded where there is abundance of cheap labour. A series of locally fabricated screens should prove adequate. Two or three in series ranging from a bar grid with apertures of 5 cms down to a fine mesh of 0.5 cm.

They require manual cleaning on a regular basis. More efficient but still requiring cleaning are the Baur Hydrasieve type of screens of patent wedge wire construction. Performance data – 1 m screen surface (spacing 1 mm) = $6 – 18^3$ m/hour flow.

The high grease and fat concentrations found in the meat industry waste water can be lowered by the provision of grease (or fat) traps in the floor drains and equipment of the departments concerned before screening in order to prevent blockage of pipes, drains and other equipment. Grease and fats can cause problems in sedimentation chambers with inadequate

scum boards, in filters their accumulation can block the filter causing subsequent pounding and a smell nuisance in activated sludge by causing bulking and in standard anaerobic digesters by forming a top blanket which will not degrade. The removal of up to 90% of free-floating greases and fats by grease traps can be achieved but in the case of meat wastes particularly where meat cutting is carried out, dissolved air flotation (DAF) is more efficient.

DAF is the most common flotation process and is mostly used for the primary treatment of abattoir waste waters. The air is dissolved in the waste water under pressure (3-4[3] m /hour per m^3 at tank) and subsequently evolved as micro bubbles (50-200 mm diameter) at atmospheric pressure. DAF enhances the recovery of fats, oils and greases (FOG) suspended solids (SS) and the BOD, 30-60% total SS and 50-80% FOG.

Primary (physical chemical) treatment

Relatively simple technology allows the removal of up to 95% of suspended solids and possibly 70% of BOD employing physio-chemical treatment.

In essence the physio-chemical process outlined below is:

Conditions or pre-treat the effluent by adding coagulants and flocculants in order to aid the sedimentation of suspended solids. This is followed by clarification – passing through a sedimentation tank which separates solids sludge from the supernatant, which is clear liquor almost free of suspended solids and with much reduced BOD levels.

Where the waste waters are treated entirely at the plant site, it is essential to provide for primary sedimentation and this is probably necessary if the waste is subsequently treated on percolating filters. Two types of settlement tanks are used and size varies quite widely.

Horizontal flow sedimentation tanks are necessary for heavy loads and should be dimensioned to have a six hour retention time. Such units however require regular desludging and it is necessary to have a spare tank. Desludging may be effected by gravity or sludge pump after the supernatant has been pumped or siphoned off to the stand-by unit. For flows over 1000 m^3/day mechanically scraped units may be cost effective.

Vertical sedimentation tanks of cylindrical local fabrication scam the most efficient and cost effective primary sedimentation for medium plants. They may be fabricated of steel (with epoxy coating), fiber glass or constructed in rectangular form employing reinforced concrete as available.

Given the 60 angles the walls are self-de slugging. The basic requirement then is for some degree of turbulence at the inlet to ensure mixing and encouraging flocculation. Turbulence must be avoided in the rest of the unit. Employing gravity, the solids settle and concentrate at base, from where they may be drawn off via the valve. The clarified effluent is gently drawn off at the top. The upward flow rate should be in the range 1.0 – 1.5[3] m/hour.

Sludge handling and disposal:

The sludge resulting form the sedimentation systems described should be free of toxic substances and would be acceptable in many areas as an agricultural fertilizer. The sludge yielded will contain 3-5% solids and can be moved by gravity or pumping to disposal area otherwise dry beds is required.

Drying beds or evaporation pans:

Drying beds or evaporation pans are recommended for small to medium plants although only on the periphery of urban situations. For countries with ample land resources to support livestock fattening areas sludge availability can improve economic viability and provide employment. They are labor intensive and must be emptied manually when solids concentration reaches approx. 1 m^3 per 40 kg of sludge.

Bed or pan construction:

Normally beds are constructed with layers of filtering materials with agricultural drainage pipes at the base to collect liquid effluent which should be recycled back to the equalization tank for further processing. Evaporation pans recommended for countries with high transpiration rates and low rainfall rare of similar construction with butyl lining for containing the sludge and overflow pipes and banking to retain effluent in flash storms or short monsoon periods.

An approximation of drying bed area is for each half a cubic metre of sludge slurry produced a day requires 1 m^2 of bed area/day. If for example a bed was 14 m 5 m in size to deal with 35 m^2 of slurry the drying period may vary from 2-4 weeks dependent on local conditions and the degree of any chemical conditioning received. If 6 day working week, it would require 10-12 drying beds dimensioned as above (Total area required 700 – 1400 m^2).

Pollution of ground waters:

During the installation and operation of beds, pans, basins, or lagoons due consideration must be given to local geological conditions. If data is not available, as to the permeability of the subsoil's, it may be expedient to line all such units (Butyl sheet etc. or bitumen painted concrete) to avoid contamination of ground wastes by leaching from the treatment plant.

Alternative sludge dewatering systems:

Sludge thickeners (coagulants) outlined earlier can be employed to further thicken sludge's to 10% solids in one day. However, even when so thickened they are still difficult to handle and require further treatment (i.e. drying beds).

Given efficient clarification (removal of suspended solids) from screening and physic-chemical processes the final effluent from such treatment should have minimal turbidity and color and being virtually toxic free, should be acceptable for discharge in most circumstances. Such treatment is fairly low in capital requirement and the technology should be comprehensible and well within an abattoir maintenance staff's field of competence. Only in urban situations should it be necessary to proceed to the higher capital intensive and difficult to control secondary stages of effluent treatment (biological) to remove the light levels of pollution remaining, these stages are listed below.

Secondary (Biological) Treatment Systems

These additional processes will be necessary mainly near urban areas where outflows of treated waste are liable to find their way into or near aquifers. Higher standards than those acceptable for remote areas treatment systems among which are:

- Aerobic
- Activated sludge process (conventional)
- Activated sludge process (oxidation ditch)
- Anaerobic biological treatment (lagooning)

The design and provision of which because of the standards and safe guards to be observed would be the responsibility of the local authorities concerned rather than abattoir operator who nevertheless would be required to contribute a service charge for such facilities. Only the large abattoirs discharging to municipal, sewers may find that adoption of further secondary treatment will prove economically justifiable in bringing about a subsequent reduction in their sewage charges.

Selection of the most suitable system depends on costs, BOD level required, land area available, odour level and municipal requirements as appropriate. These secondary systems highlighted in the next section which must be selective are capital intensive. Such secondary treatment from a medium size plant would be justified only by sharing it with other industrial

users or the inclusion of a domestic load from the township concerned in order to take advantage of the needed economics of scale. In all the above systems preliminary treatment at the abattoir would be assumed – particularly sedimentation – necessary when the effluent is treated on percolating filters as in aerobic systems.

Conclusions and Health Considerations for India

Purification of effluent is a centralization and acceleration of processes that normally occur in nature. However variations in the character of the raw waste, in degrees of pre-treatment in meat processing operations, in waste conservation practices, in climatic conditions and in subsoil characteristics will all affect design. Some pond lagoons are anaerobic by design, others by accident. Some systems receive induced aeration treatment in the primary treatment stage some in the secondary in the effort to bring the contaminated water into an intimate contact with air as practicable.

With different types of conventional mechanical processing systems in use and variants on their sub-systems, many of which are not standardized internationally, any attempt at generalization is difficult. However, certain broad conclusions can be drawn for developing countries, an important consideration being the premise that it is more realistic and practicable to install an easily run reliable treatment plant to remove up to 75% of pollutants than at possibly six fold capital cost for a sophisticated conventional plant, beyond the technological expertise available. The possibility being that within a matter of months even such plants become inoperative. On grounds of cost, maintenance and the process itself, sophisticated conventional treatment is ill-advised, the reasons being elaborated as follows:

a) Compared with other processes even conventional sewage treatment is very expensive in terms of both capital and running costs. Few developing countries have the manufacturing facilities for the relatively complex equipment required for conventional treatment, which has to be imported and paid for with scarce foreign currency, for example annual costs for conventional treatment range from 4 to 6 times that of waste stabilization pond and aerated lagoon systems.

b) Maintenance: Conventional treatment relies heavily on a large array of electrical machinery which has to be maintained to a high level for the plant to operate satisfactorily. Such maintenance skills are not available in many developing countries.

c) The process itself: (i) conventional sewage treatment is designed primarily to remove organic matter in order to prevent pollution in the receiving water courses; scarcely any attention is paid to the fate of faecal pathogens – yet in many tropical and sub-tropical developing countries the destruction of faecal pathogens is considerably more important than BOD removal. (ii) Sludge treatment can be both difficult and expensive, accounting for up to 40% of the total cost of sewage treatment. (iii) Odour development and release can be very intense for hot climates – especially for low-rate trickling filters, which also have the disadvantage of being the breeding ground of the Psychoda fly, whose presence in large clouds can effectively prevent all human activities in the vicinity of the works.

Abattoirs located with or near an urban periphery where land is scarce, conventional treatment is unavoidable and the use of super-rate trickling filters with hydraulic loading rates of up to five times those for high rate filters may be called for as well as alternating double filtration (ADF) techniques in order to achieve satisfactory standards with minimum land use. This consideration alone can dictate substantially the choice for an abattoir. In rural situations with little restraint on land availability, primary systems (physio-chemical treatment) generally suffice and should there be a need for higher standards of treated effluent some form of pond treatment has been found suitable.

Most developing countries lie in tropical or arid zones and when the incidence of epizootics is extremely high the danger to public health is greater than in temperate regions. Even so healthy animals in any region must be assumed to be undetected carriers of salmonellae. Pathogen organism such as the bacillus of typhoid, the cysts of dysentery and the eggs of helminthes have been shown to pass through anaerobic treatments processes unaffected initially. Because of this, whichever process or degree of sewage treatment is adopted the final effluent should be always disinfected and the heat treatment of sludge implemented particularly for inedible rendering plants where anthrax spores may prevail.

Climatic disadvantages not withstanding the land situation is such that it is often more available for crop production and irrigation procedures than in the possibly more urbanized industrialized countries. Where suitable land area is available and climatic conditions are favorable the digested effluents can be lagooned in properly designed oxidation ponds, so that photosynthesis may operate and effluents having negative BODs may be discharged. Such pond treatment avoids nitrification difficulties and overcomes problems associated with finely divided sludge since the only solids discharged are those associated with living phytoplankton which may be assumed to become a component part of the biological flora of the receiving waters. One advantage of this pond treatment lies in the ability to reduce bacterial count in the effluent discharged. On the other hand for the medium type abattoir the costs of such effluent discharged. On the other hand for the medium type abattoir of effluent quality the lagoon or pond treatment stage could be omitted and primary treatment alone would be of adequate quality for irrigation on to livestock grazing farmlands or to fodder crops for sheep. Such a primary effluent would be high in organics (BOD could reach 100 mg.1), still have some suspended solids (eg. 100 mg/1) and high bacterial numbers, consequently it would probably contain any pathogenic micro-organisms in the waste waster.

Lagoons by contrast would decrease greatly the chance of any pathogenic organisms being present in the final effluent. However, if the effluent was used after primary treatment only, this problem could be greatly overcome by using a rotation of grazing and by resting irrigated lands after the irrigation period for at least two weeks before further grazing. During this period pathogenic and other micro-organism would die off.

Use of this primary effluent for sheep pastures or sheep fodder crops would be in line with WHO Technical Report No.517 “Reuse of Effluents”. Such an effluent has been used in many countries including New Zealand. Water Renovation Standards in California and Germany have listed primary effluent as suitable for fodder fibre and seed crops. Adoption of these measures reduces the waste treatment costs, and economies in pasture renovation from land irrigation will enhance the revenues accruing from livestock fattening in situations where stock need extended rest and feed prior to slaughter.

SPECIFICATION OF EFFLUENT TREATMENT PLANT

- Nature of effluent : Slaughter house wastewater
- Quantity of effluent : 50 KLD

S.No	Parameters	Characteristics of inlet effluent	Characteristics of treated water After Anaerobic Digestion	Characteristics of treated water after Aeration
1	pH	7.5	5.5 - 9.0	6.5 to 8.5
2	BOD	3000	About 500	<30
3	COD	4000	<500	<250
4	Total suspended solids	Up to 1800-2000	<150	<100
5	Oil & grease	Up to 60	<10	<5

Note: All the parameters given above are in "mg/I" except pH.

TREATMENT SCHEME

- Screening in screen chamber by rotatory screen.
- Oil & Grease separation in Oil & Grease Trap.
- Collection & homogenization in Equalization Tank (Short retention time)
- Dissolve Air Flotation Process for removal of oil and grease / suspended solids.
- Buffer Tank for collecting effluent from DAF and feeding it in Anaerobic Digester
- Anaerobic Digestion in up flows Anaerobic Sludge Blanket Reactor.
- Secondary treatment by Extended Aeration in Aeration Tank
- Subsequent settling in secondary settling tank.
- Disinfection by chlorine dosing in Chlorine Contact Tank.
- Tertiary treatment in Multi-grade Sand Filter for further of suspended solids.
- Sludge Dewatering and Drying on Sludge Drying Beds

Treatment Concept

The effluent produced in the slaughterhouse first it should be divided in two channels. These channels should be separated by two gates. The effluent produced first should pass through a screen chamber for the removal of large floatable particles (large sized solids, horn, nails etc) and be trapped and removed manually. Two chambers should be provided for screenings. This facility is provided so that while one is being cleaned, the other can be used. The effluent then should flows to the oils & grease trap. In the oil & grease trap, the gravity-based trap separate oil and greases from the effluent. To help the grease to rise on top, mild diffused aeration should be incorporated. The effluent should go to Equalization Tank. Since the effluent is highly biodegradable almost 24 hours storage in the tank should be considered. The diffused aeration should be incorporated to prevent septic conditions and to keep the suspended matters in suspension. The effluent should be pumped to the Primary settling tank.

In primary settling tank removal of suspended solid should be done by gravity settling. This should be achieved by providing adequate retention time in a quiescent state. Settling rate should be enhanced by addition of flocculent. Then effluent should be transferred to dissolved air flotation system. Here again suspended solids and oil and grease should be removed from the effluent. Out come of this unit should be pumped to aeration tank–I.

In the aeration tank-1 the BOD/COD load reduction should takes place. In this tank the bacterial culture should be added. There should be sufficient in Board of air by floating/fix surface aerator. For balanced growth of microorganisms in a biological treatment reactor, the ratios BOD:N:P should be 100:5:1 for aerobic system. Microorganisms degrade the complex organic pollutant contained in the effluent and establish a multiplication cycle. The mixed liquor should be transferred to secondary clarifier-I for settling, separation and activation of flocks.

Secondary clarifiers-I should be circular tank having cone shaped bottom with central feed and peripheral treated effluent collection arrangement. There should also be a slow moving mechanical scrapper for scrapping the sludge and pushing it to the central pit. The sludge settles in the central pit and it shall also be partially de-moisturized. In this first stage of aeration cycle the BOD reduction should be to the tune of 85-90%. The output BOD should be of 190 mg/L after first stage of aeration cycle.

In the Aeration Tank-2 the BOD/COD load reduction should take place. In this the bacterial culture should be added. There should be sufficient inBoard of air by floating surface aerators. For balanced growth of microorganisms in a biological treatment reactor, the rations BOD:N:P should be 100:5:1 for aerobic system. The urea and DAP tank should include in the

scope of supply will be able to accommodate one days requirement of the chemicals. Microorganisms degrade the complex organic pollutant contained in the effluent and should establish a multiplication cycle. The continued growth of microorganism results into formation of flocks which have tendency to settle down when provided a quiescent settling zone. The mixed liquor here after should be transferred to secondary clarifier-II for settling, separation and activation of flocks.

Secondary Clarifier-2 should be a circular tank having cone shaped bottom with central feed and peripheral treated Effluent collection arrangement. There should also be a slow moving mechanical scrapper for scrapping the sludge and pushing it to the central pit. The sludge settles in the central pit and it shall be transferred to sludge sump from sludge pit via sludge regulating valve. The Sludge shall be also partially de-moisturized. In this second stage of Aeration cycle, we expect the BOD reduction to the tune of 90-95% and we expect the output BOD of <30 mg/L. The supernatant clarified water should flow by gravity to treated water Tank.

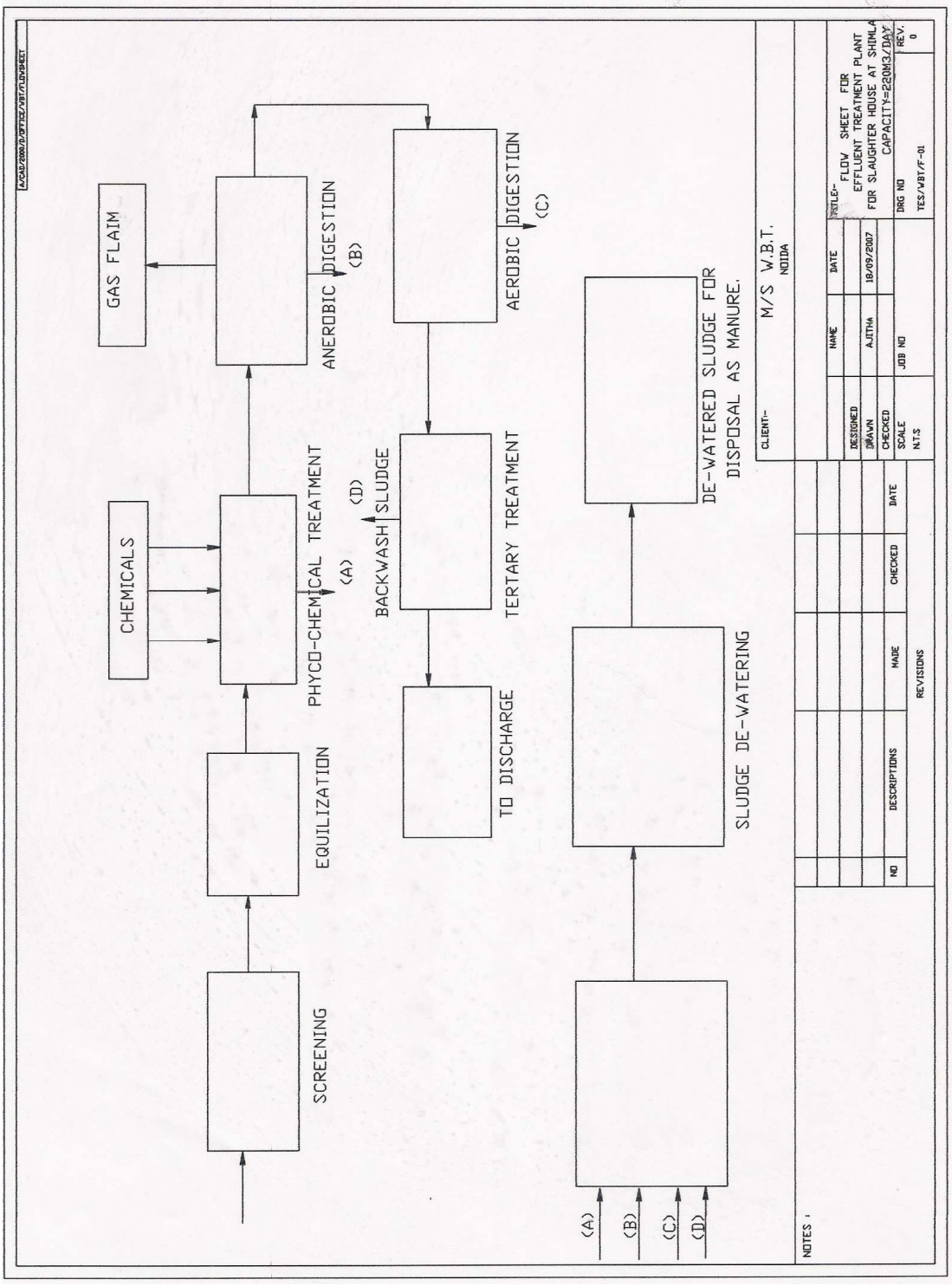
The clarified waste water shall flow into the Chlorine Contact Tank. Chlorination shall be done here for disinfection in this tank. Suitable dosing system should be provided for Chlorination. The treated water then should be pumped to pressure sand filter and disposed off suitably.

From sludge sumps about 50% of sludge should be re-circulated to aeration tanks. Only excess sludge should be sent to the sludge drying beds. The sludge drying beds further concentrate the sludge and converts it into sludge cakes. The filtrate water should be transferred to the equalization tank.

Important Notes

1. All the tanks will be constructed in RCC. Only sludge drying beds will be in brick work.
2. Screen chamber, Equalization tank & Buffer tank shall be below the ground. All other structures will be partially above & partially below ground.
3. 2 no's rotatory screen will be provided in the 2 no's screen chamber.
4. Equalized effluent will be transferred by pumps to Dissolve Air Flotation Process.
5. DAF system will comprise of Air Compressor, Recirculation pumps, mixing vessel, DAF tank etc.
6. After DAF process Effluent will overflow to Buffer Tank in which 2 no's horizontal centrifugal pumps are fitted to transfer the effluent in the Upflow Anaerobic Sludge Blanket Reacter (UASB)
7. Degasification in Degasifier.
8. Separation of sludge in Tube settler. A part of sludge in recycled to the buffer tank & rest will disposed of to the sludge drying beds.
9. Secondary treatment will be done in Aeration Tank and subsequent settling of sludge will take place in Secondary Settling Tank.
10. 2 no's Sludge disposal pumps will be provided for recycling and disposing of sludge.
11. Chlorine will be dosed by 2 no's metering type diaphram pumps to control dosing.
12. 2 no's centrifugal horizontal pumps will pump the effluent for tertiary treatment in Multigrade Filter.
13. Sludge obtained from tube settler, and excess sludge obtained from Secondary Settling Tank will be dewatered and dried on the sludge drying beds prior to disposal.

PROCESS FLOW BLOCK DIAGRAM



Area required for the establishment of the ETP: The ETP will have the following:

- Equalization Tank
- Anaerobic Reactor
- Aerobic Reactor
- Intermediate Tanks
- Sludge Dewatering Tank
- Sludge Drying Tank and Storage
- Space for installation of Electro-Mechanical Equipments

An estimated area of 1,800 sq. mt will be required for an ETP of 500 KLD capacity.

Civil works and equipment required

A. **Civil Works Required**

- Bar Screen Chambers
- Equalization Tank
- Anaerobic Reactor with associated civil works
- Aerobic Reactor
- Intermediate storage tanks
- Sludge digester
- Platforms
- Foundations
- Separation walls
- M.C.C. Room
- Pumps Room
- Plant Operator's Cabin

B. **Electro Mechanical Works**

- Bar screens in M.S. Epoxy/S.S.
- Pumps for various lifting and feeding
- Physico-chemical treatment reactors
- Chemicals preparation & Dozing system
- Clarifiers for primary & secondary phase separation
- Blowers and Air diffusion (Diffusers) system
- Tertiary Filtration system.
- Complete Instrumentation & Automatic control of pumps
- Complete piping
- Complete Cabling
- Central Motor & Instrument control panel
- Sludge Dewatering system complete with removal arrangement

CHAPTER – XIII

COMMON UTILITIES AND ANCILLARY FACILITIES

1. PLANT & MACHINERY COLD WATER SUPPLY, PUMPS & PIPING

S No	ITEMS	SPECIFICATION
1	**Main Hall**	
I	Hydropneumatic Pumps of appropriate capacity with pressure regulator, auto cut off at pre set pressure complete with all accessories and fittings, 1st Pump should deliver the output for Goat / Sheep (Halal + Jhatka) and 2nd Pump should deliver the output to Buffalo Slaughter Hall. 3rd Pump should be connected to the 1st & 2nd pumps so that it functions as a stand by, in the event of failure of any 1st or 2nd pump.	Refer enclosed detailed specifications
II	**Main Pipe Line Distribution, G.I. Pipe Line with fittings from**	Refer enclosed detailed specifications
	Overhead water tank to Hydropneumatic Pump inlet.	Jindal/ TATA/ Prakash/ Surya/ equivalent make 'B'Class
	Hydropneumatic Pumps interconnection with necessary valves & fittings	
	G .I. Pipe line with fittings From Pump Outlet to Slaughter Halls	Jindal/ TATA/ Prakash/ Surya/ equivalent make 'B' Class
	Goat/sheep (Halal) S/H,	
	Buffalo S/H	
	N R V .	D R P /Kirloshkar /IVC Elcone / equivalent Make
	Ball Valve / Gate Valve	D R P /Sant/ Leader/ Glow equivalent Make
III	**Goat/sheep (Halal) Abattoir**	
	Pipe Line Distribution from Main line to the individual Slaughter Halls	
	G.I. Pipe line with fittings distributions for all Plant & Machinery, washing facility, as required	Jindal/ TATA/ Prakash/ Surya/ equivalent make 'B' Class make 'B' Class
	Ball Valves /Gate Valves	DRP / Sant /Leader / Glow equivalent Make
IV	**Buffalo Abattoir**	
	Pipe Line Distribution from Main line to the Individual Slaughter Halls	Jindal/ equivalent make 'B' Class
	G.I. Pipe line with fittings distributions for all Plant & Machinery, washing facility, as required	Jindal/ equivalent make 'B' Class

	Ball Valves /Gate Valves	DRP/ equivalent Make
V	**Toilets & Scrubbing Room**	
	G I Pipe From Pump Room (i.e Pump input) to toilets & Scrubbing Room	Jindal/ TATA/ Prakash/ Surya/ equivalent make 'B' Class
	G I Pipe fittings, Valves & Accessories	DRP/ Sant/ Leader/ Glow equivalent Make
2	**Lairage**	
	(Cold Water line for Lairage will be Tapped From Pipe line connected Between Hot water Generator Pump & Overhead Water Tank.)	
	G I Pipe From Main line up to Lairage	Jindal/TATA/ Prakash / Surya/ equivalent make 'B'Class
	G I Pipe line inside Lairage	Jindal/TATA/ Prakash /Surya/equivalent make 'B' Class
	G I Pipe for Sub lines inside Lairage	Jindal/TAT / Prakash / Surya/ equivalent make 'B' Class
	G I Pipe fittings, Valves & Accessories	
3	**Administrative Building**	
	Main Pipe line From Overhead Tank to Administrative Building.	Jindal/ TATA/Prakash / Surya/ equivalent make 'B'Class
	G I Pipe inside the Building for Toilets	Jindal/TATA/Prakash/ Surya/ equivalent make 'B'Class
	Wash Basins & others. G I Pipe Fittings, Valves & Accessories	
4	**E . T. P**	
	G I Pipe from Overhead Water Tank to E T P Under Gravity.	Jindal/TATA/Prakash/ Surya/ equivalent make 'B'Class
	G I Pipe fittings, Valves & Accessories	
5	**RENDERING PLANT & TRIPARY**	
	G.I. Main Pipe line with fittings from Goat S/H to Rendering Plant & Tripary.	
	G.I. Pipe line distributions with fittings for all Plant & Machinery in Rendering Plant and Tripery as required	
	Ball Valves & Gate Valves as per requirement.	
1	G.I. Pipe work for Greenery & washing of Common Area from Over head water tank; all around the complex	Refer enclosed detailed specifications
2	G.I. fittings (Elbow, tee; etc))	

2. HOT WATER GENERATOR, BOILER, PUMPS & PIPING

S.No.	Items	Specification
1	Supply Erection & Commissioning of Hot water Generator with Calorific & Boiler Complete with all accessories and fittings of appropriate capacity required to generate and distribute hot water supply for buffalo, & goat / sheep slaughter halls & steam for Rendering Plant.	
2	Hydropneumatic Pumps of appropriate capacity with pressure regulator, auto cut off at pre set pressure complete with all accessories and fittings, 1st Pump should deliver the output for goat and 2nd Pump should deliver the output to buffalo slaughter hall. 3rd pump should be connected to 1st & 2nd pumps so that it functions as a stand by, in the event of failure of any 1st or 2nd pump.	
	-Insulation of Hot water Pipes	
3	**Main Pipe Line Distribution, G. I. / MS Pipe Line with fittings from Pump room to all the Slaughter Halls**	
	From Over Head Water Tank to hot water generator & boiler through water softner of appropriate capacity.	
	From hot water generator to pumps & calorifier	Jindal/ TATA/ Prakash/ Surya/ equivalent make 'B' Class
	From Hot water generator & boiler to Hydropneumatic pumps through clorifier. Inter connections of hydropneumatic pumps	Jindal/ TATA/ Prakash/ Surya/ equivalent make 'B' Class
	From Pump to Slaughter Halls through clorifier.	
	Goat / sheep S/H buffalo S/H	
	N R V	D R P / Kirloskar / IVC Elcone / equivalent Make
	Ball Valve / Gate Valve	D R P/ Sant / Leader/ Glow equivalent Make
	Insulation of Hot water Pipes	
4	**Goat Abattoir**	
	Pipe Line Distribution from Main line to the Individual Slaughter Halls	Jindal/ TATA/ Prakash/ Surya/ equivalent make 'B' Class
	MS. Pipe line with fittings distributions for all Plant & Machinery, washing facility, as required	Jindal/ TATA/ Prakash/ Surya/ equivalent make 'B' Class
	Ball Valves / Gate Valves	DRP / Sant/ Leader/ Glow equivalent Make
	Insulation of Hot water Pipes	
5	**Buffalo Abattoir**	
	Pipe Line Distribution from Main line to the Individual Slaughter Halls	Jindal/ TATA/ Prakash/ Surya/ equivalent make 'B'

		Class
	MS. Pipe line with fittings distributions for all Plant & Machinery, washing facility, as required	Jindal/ TATA/ Prakash/ Surya/ equivalent make 'B' Class
	Ball Valves /Gate Valves	DRP/ Sant/ Leader/ Glow equivalent Make
	Insulation of Hot water Pipes	
6	**MS pipe Line for Tripary.**	
	MS Main pipe line with fittings from goat S/H to Tripary.	Jindal/ TATA/ Prakash/ Surya/ equivalent make 'B' Class
	MS. Pipe line with fittings distributions for all Plant & Machinery, washing facility, as required	Jindal/ TATA/ Prakash/ Surya/ equivalent make 'B' Class
	Ball Valves /Gate Valves	DRP/ Sant/Leader/ Glow equivalent Make
	Insulation of Hot water Pipes	
7	**MS STEAM Pipe Line I.B.R For Rendering Plant.**	
	MS Pipe line I.B.R with flanges & fittings From Boiler located in pump room to Rendering plant.	Jindal/ TATA/ Prakash/ Surya/ equivalent make 'B' Class
	MS. Pipe line I.B.R distribution with fittings through header for all Plant & Machinery, as per requirement.	Jindal/ TATA/ Prakash/ Surya/ equivalent make 'B' Class
	Ball Valves /Gate Valves	DRP/ Sant/ Leader/ Glow equivalent Make
	Insulation of Steam lines.	
8	**M.S Pipe Line for Condensate**	
	MS. Pipe line distribution with fittings for condensate from all Plant & Machinery, up to condensate tank.	
	M.S Tank(1000 Ltrs) for storing & utilizing condensate for washing	
	MS. Pipe line with pump from condensate tank and its distribution with fittings and valves for washing within rendering plant	
	Flexible Hose pipe 10 mtrs each for washing	
9	Cooling Tower of appropriate capacity for handling the vapours generated from cookers	Quoted under Section - II - A, Part - VIII item No. 11.0
10	G.I. pipe Line with fitting, flanges , NRV for making a close loop between cooling tower and shell & tube condenser	
11	M.S Pipe Line with fitting, flanges for connecting cooker to shell & tube condenser	
	The cost of imported plant and machinery should be inclusive of custom duty, imported or any other related tax applicable on date.	

3. AIR COMPRESSOR & PIPING

S. No	ITEMS	SPECIFICATION
1	COMPRESSOR (999 CFM at 10 Bar)	Make (ELGI) / Equivalent
2	Main Pipe Line Distribution, M.S Pipe Line with fittings from Compressor To	Jindal/ TATA/ Prakash/ Surya/ equivalent make 'B' Class
	Goat / sheep Abattoir	
	Buffalo Abattoir	
	Gate Valve For Main Line (gun metal)	DRP / Sant/ Leader/ Glow equivalent make
	F R L Unit	
	Nuts & Bolts	
3	**Goat / sheep Abattoir**	
	Pipe line distribution with fittings from main line to the Individual Slaughter Halls	Jindal/ TATA/ Prakash/ Surya/ equivalent make 'B' Class
	M.S. Pipe line with fittings distributions For all Plant & Machinery, washing facility, as required	Jindal/ TATA/ Prakash/ Surya/ equivalent make 'B' Class
	Gate Valves (gun metal)	DRP / Sant / Leader/ Glow Equivalent make
	F R L Unit For Equipments	
4	**Buffalo Abattoir**	
	Pipe Line Distribution with fittings from Main line to the Individual Slaughter Halls	Jindal/ TATA/ Prakash/ Surya/ equivalent make 'B' Class
	M.S. Pipe line with fittings distributions for all Plant & Machinery, as required .	DRP/Sant/ Leader / Glow equivalent make
	Gate Valves (gun metal)	I S I Mark.
	F R L Unit For Equipments	
5	**COMPRESSED AIR LINE FOR TRIPARY**	
	Main MS Pipe line with fittings from goat S/H to Tripery.	
	M.S. Pipe line distributions with fittings for all Plant & Machinery, as required .	
	Gate Valves (gun metal)	DRP/Sant/ Leader / Glow equivalent make
	F R L Unit For Equipments	
6	**MISC. ITEMS**	
	Welding Rods	
	Flexible Hose Pipes	

4. WATER SOFTENING PLANT

Water Treatment Plant (Softening Plant)

Water testing report of the borewells has to be done. Since the water of the adjoining area of the proposed site of slaughterhouse is hard and consists of dissolved minerals, it gives hard water as its particular characteristic. The minerals that contribute to water hardness are calcium and magnesium, mainly in combination with bicarbonate, sulphite and chloride. It is the calcium and magnesium together with bicarbonate, which contribute to the problems linked to water hardness. When hard water is heated above 61°C (or as it evaporates) the balance between the dissolved minerals is upset and the bicarbonate converts into carbonate. This leads to the precipitation of calcium carbonate. In view of this the water intake into the boiler is very critical and needs to be as per the specification given below.

WATER SPECIFICATIONS	**:**	
Water Hardness	**:**	0.5 ppm max.
Total Alkalinity (as $CaCO_3$)	**:**	700 ppm max. but not exceeding 20% of TDS
Caustic Alkalinity (as $CaCO_3$)	**:**	350 ppm max.
pH	**:**	10.5-12
Unreacted Sodium Sulphite (as $Na_2 SO_3$)	**:**	30-50 ppm
Phosphates (as PO_4)	**:**	20-40 ppm
TDS	**:**	3000 ppm max.
Residual Hydrazine (as N_2H_4)	**:**	0.5 ppm max.

In view of the water quality being hard it is recommended that a water softening plant be set up to soften the water to a grade which shall be good for use on these machines and plant. A water softening plant is therefore recommended. Before deciding about the installation of water softener a sample of water for the above specification may be got tested through a certified water testing laboratory.

5. FIRE FIGHTING SYSTEM

The Fire Fighting System for proposed slaughter house / abattoir consists of Hydrant System for the Protection of Slaughter House building, goat lairage, buffalo lairage, Admin. Block, Parking and Retiring areas etc.

150 mm dia Hydrant Ring Main is proposed to be laid all around Slaughter House and Sub Mains along-with 100mm dia Ring Main for Goat & Buffalo Lairage area. 4 Nos. first Aid House Reels having 20mm dia Rubber Hose with 6 mm Dia Shut Off Nozzle are being provided inside Slaughter House Shed for Internal Protection. All External (Yard) Hydrants shall be Stand Post type having 1 No. 63 mm dia Gun Metal Oblique Type Hydrant Valve. Each Yard Hydrant station shall have glass fronted Door type M.S House Cabinet consisting of 2 Nos 63 mm dia RRL hose with male & Female GM Coupling to be connected with Fire Hydrant in case of Fire. 1 No. 63 mm dia Gun Metal Short branch pipe having 20 mm dia Nozzle is also provided for fire water Spray under normal circumstances.

A Wet Riser of 100mm dia has been proposed for Admin. Block to provide internal protection for all the 3 Floors. First Aid house Reels, Fire Hydrant Valves, RRL House and Branch Pipes shall be provided in a cupboard type Civil Shaft and MS/ Wooden Door shall be provided and will remain locked under normal condition.

1 No. Electrically Driven Main Fire Pump, 1 No Diesel Driven Pump(Alternate for Main Pump in case of Electric failure) and 1 No Jockey (Pressurization Pump)has been proposed to cater water supply for the entire system and all the lines shall be charged to a pressure 7 Kg/cm² at all times. The system shall remain Automatic through pressure switches in such a way that pumps will start sequentially of its own in case of opening of any Hydrant / House Reel, hence, providing water immediately in case of any fire.

The Sequential operation of the pumps is in such a manner that my small leakages in the system shall be taken care of by jockey Pump and in case of opening of any Hydrant Valves/House Reel, Main fire Pump will start immediately. Further due to power failure, if electric pump fails to start, Diesel pump will automatically take care of the system and water at a pressure 7 kg shall be available to fight the fire.

The sizes of under ground pipe lines (duly protected by Anti-Corrosive Tape) is selected in such a way that a minimum pressure of 3.5 Kg/cm² shall be available at all / farthest hydrant.

The broad design and installation parameters and the necessary equipment required for such a firefighting system are given below:

S. No	Description
A	**Fire Fighting System**
1	Single Headed GM ISI oblique Hydrant Leading Valve- IS:5290
2	First Aid House Reel Wall Mounting swinging type with 20mm dia 36 m House
3	RRL Hose as per IS:636 - 15M
4	Gm 63 mm dia Short Branch Pipe
5	MS Hose door, 16 G MS Sheet.
6	GM Fire Brigade connection - 4 Way
7	Weather Proof House Cabinet, 16 G MS Sheet, size 0.75m X 0.6m X 0.25M
8	GM Fire Brigade Draw Out connection with 100 mm dia Foot Valve and pipes
9	MS pipe - Medium (O/G) as per IS:1239(M)
	150 mm dia
	100 mm dia
	80 mm dia
	25 mm dia
10	MS Pipe - Medium (U/G) as per IS:1239(M) with Anti-Corrosive Treatment and Exacacation
	150 mm dia
	100 mm dia
	80 mm dia
11	Butterfly Valves, Pn 1.0
	150 mm dia
	100 mm dia
	80 mm dia
12	25 mm dia Ball Valve
13	Valve Chamber (1200 X 1200 X 100mm)
B.	**Fire Pumps & Accessories**
1	Elect. Driven Main Fire Pump-2280 LPM 70 M Head 2900 RPM with 100 mm By-pass line and 60 HP TEFC Electric Motor
2	Diesel Driven Fire Pump-2280 LPM, 70 M Head 1800/1500 RPM with 100mm by-pass line and suitable Diesel Engine
3	Jockey Pump- 180 LPM, 70 M Head 2900 RPM with 15 HP TEFC Elect. Motor

4	Elect. Motor Control Panel for Automatic Operation of above Pumps
5	Air Vessei-200mm X 1000mm X 6mm thick with ARV & Stop Valve
6	Water type NRV
	150mm dia
	80mm dia
7	B'fly Valve, PN 1.0
	80 mm dia
	100 mm dia
	150 mm dia
	200 mm dia
8	Power and control wire / cable and Single Earthing with pressure switch
9	100 mm dia dial Type Pressure Guages
C	**Fire Extinguisher**
1	Water CO2 - 9 lt
2	CO2 - 4.5 KG
3	CO@ - 6.8 Kg
4	Foam Type - 9 lt

The quantities of the various equipments will be worked out as per actual requirements.

6. SANITATION AND HYGIENE

All operations of the units will be fully separated and no interchange of any type will be allowed/ provided the product can meet the highest food regulation of country. Each operation will be provided with adequate sanitation facility for use. All sanitation facilities required at the end of a shift to fully clean out and sanitize the floors, drains, walls, equipment, etc. will be available. Full provision for ante and post mortem examination will be made as per HACCAP so that hygienic control is maintained on the meat going out of the slaughterhouse.

The proposed mezzanine floor within the slaughter house complex will be hub of maintaining personal hygiene by the butchers as well as the officials. The proposal is to fully automatised the hygienic component so that the changeover is effective under sterile conditions. The proposed list of equipment is given below.

Preliminary list of equipments

S. No.	DESCRIPTION
1	**Cleansing trough Type 20550-2w**
	double wall body made of stainless steel 1.4301 stainless steel tap incl. integrated sensor incl. thermo-mixing valve 1/2" and 1 soap dispenser Type K incl. installation kit with support bar excl. back-pressure valves Area : R 8.06
2	**Laundry bin incl. 4 swiveling flaps**
	Area R 8.12
3	**Rack for aprons and helmets**
	with 5 hooks, distance: 200 mm single-row execution wall fastening made of stainless steel Area : R 8.15
4	**Rack for aprons and helmets**
	with 5 hooks, distance: 200 mm single-row execution wall fastening made of stainless steel Area : R 8.16

5	**Clothespress Type GSW**
	2 partitions with 10 shelves width of partition: 300 mm without door inclined roof : 25% total height : 2.000 mm inclusive of.legs Area : R8.19
6	**Boot drying panel**
	made of stainless steel 1.4301 for 40 pairs of boots size : 2.200x1.575x425 mm wall mounted inclusive of ."Air dry " hot - air blower according to drawing No. 3A04-0352C Area : R 8.20
7	**Boot drying panel**
	made of stainless steel 1.4301 for 45 pairs of boots size : 2.200x2.385x425 mm wall mounted incl . "Air-dry" hot-air blower according to drawing No. 3A04-0352C Area: R 8.20
8	**Rack for aprons and helmets**
	with 42 hooks, distance :200 mm triple - row execution wall fastening made of stainless steel Area : R 8.20
9	**Cleansing trough Type 20550-4W**
	double wall box made of stainless steel 1.4301 outlet made of stainless steel with integrated sensor incl. thermo-mixing valve 1/2" and 3 soap dispensers Type K incl. parts for wall fixation excl. back-pressure valves Area : R 8.21
10	**Modular Hygiene Station**
	Star Clean Type 23881with a 1.600 mm sole cleaning module switch cabinet and rail on one side slot for 23 I packet and 2 stairs sensor actuation, Inlet Control Type 23740 in right hand design dimensions: 2.670 x 940x1.860 mm power supply :400 V 3/N/PE,50-60 Hz power consumption : 0.8 KW water supply :3/4", mixed water T=43º C drain: R1 1/2 Area: R 8.21
11	**Apron - cleaning machine**
	Type 23260.2-1200 for rubber and safety aprons with 2 brushes length: 1.200 mm each according to drawing no 1774.96-3/b Area: R 8.21
12	**Rack for aprons and helmets**
	with 42 hooks, distance :200 mm triple - row execution wall fastening made of stainless steel Area: R 8.22
13	**Rack for aprons and helmets**
	with 42 hooks, distance :200 mm triple - row execution wall fastening made of stainless steel Area: R 8.23
14	**Rack for aprons and helmets**
	with 42 hooks, distance :200 mm triple - row execution wall fastening made of stainless steel Area: R 8.24
15	**Cleansing trough Type 20550-3w**
	double wall box made of stainless steel 1.4301 outlet made of stainless steel with integrated sensor incl. thermo-mixing valve 1/2" and 2 soap dispensers Type K incl.parts for wall fixation excl.back - pressure valves

	Area: R 8.25
16	**Towel dispenser Type E**
	made of stainless steel incl. wall/basin support and waste-paper basket made of wire mesh Area: R 8.25
17	**Cleansing trough Type 20550-2W**
	double wall body made of stainless steel 1.4301 stainless steel tap incl. integrated sensor incl. thermo-mixing valve 1/2" and 1 soap dispenser Type K incl. Installation kit with support bar excl. back-pressure valves Area: R 8.26
18	**Clothespress Type GSW**
	2 partitions with 10 shelves width of partition: 300 mm without door inclined roof : 25% total height : 2.000 mm incl.legs. see photo no. 6 of brochure No.23904 Area : R 8.32
19	**Clothespress Type GSW**
	2 partitions with 10 shelves width of partition: 300 mm without door inclined roof : 25% , total height : 2.000 mm incl.legs - see photo no. 6 of brochure No.23904 Area: R 8.35
20	Sink
21	Dish Washer
22	Towel Hooks
23	CUB Board For visitors
24	Mirror
25	Refrigerator cap-300 ltr.
26	Conference table with Chair
27	Table and Chair
28	Wall Rack for Laundry and cleaning agent room
29	Benches
30	Kitchen Equipment (Oven microwave etc)
31	Device for tims registration and access control
32	Washing Machine and Drying Machine
33	Insect Killer
34	Air-curtain

7. LABORATORIES

The project should have a group of laboratories for: -

(i) Modern Abattoir
(ii) Rendering plant
(iii) ETPs for testing of effluent both for input as well as output.

In the abattoir the laboratory would be primarily focusing on results of anti and post mortem inspections, quality control parameters of slaughter hall, chilling plant and dispatch area. This would be manned by veterinary experts in the fields of microbiology, toxicology, veterinary public health, water specialists and biochemists. These laboratories would also be

used for certification of carcasses/ meat/ offal and rejects. A brief description of the rooms, furniture and equipments required for these laboratories is given below:

List of equipments

S. No.	Laboratory Equipments
1.	Rooms - (Size 10' X 8')
2.	Tables & Special fittings Stools Chairs
1	Microscope- Simple
2	Microscope- Compound
3	Gas Burners (3) with Cylinder
4	**Water bath** **Alternative** Water Bath Rectangular (Double Wall Electric
5	**Hot air oven** **Alternatives:** Size 300mm x 300mm x 300mm Size 355mm x 355mm x 355mm Size 455mm x 455mm x 455mm Size 605mm x 455mm x 455mm Size 605mm x 605mm x 605mm Size 910mm x 455mm x 605mm Size 910mm x 605mm x 605mm **OPTIONAL** - Electronic Digital Controller- Cum - Indicator - Air Circulation fan
6	**Bacteriological Incubators** **Alternatives:** Size 300mm x 300mm x 300mm Size 355mm x 355mm x 355mm Size 455mm x 455mm x 455mm Size 605mm x 455mm x 455mm Size 605mm x 605mm x 605mm Size 910mm x 455mm x 605mm Size 910mm x 605mm x 605mm **OPTIONAL** - Electronic Digital Controller -Cum Indicator - Air Circulation fan

7	**BOD incubator** **Alternatives:** LTS-M (4 cu ft) 455 x 610 x 410mm LTS-1 (6.1 cu ft) 505 x 830 x 415mm LTS-2 (10 cu ft) 570 x 875 x 550mm LTS-3 (12 cu. Ft) 650 x 900 x 580mm LTS-4 (15 cu. Ft) 700 x 900 x 640mm
8	**Laminar flow (Horizontal)** **Optional** - Cock for gas air or Vaccum line - Satin finish Stainless Steel Table Top - LFH-2 **Alternative** Laminar air flow (Vertical Type) **Optional** - Built in UV Light - Exhaust LFV - 4 - Satin finish Stainless Steel
9	**Autoclave (Vertical)** **Alternative** Autoclave (Vertical)) (With Digital Tempreature Controller - cum Indicator with Pressure Control Switch
10	**Pressure cooker** **Alternatives:** 5 Ltrs 10 Ltrs 20 Ltrs
11	**pH Meter**
12	**pH meter - Probe type**
13	**Tissue homogenizer**
14	**Stomacher**
15	**Digital Colony Counter** With 3 Digit Display **Alternative** Digital Colony Counter With 4 Digit Display
16	**Knife sterilizer**
17	**Set of knives**
18	**Meat cutting boards**

19	**Refrigerator** **Alternatives:** 170 Ltrs 300 Ltrs 520 Ltrs
20	**Deep Freezer -20 degree C**
21	**Hunter colour Lab**
22	**Senior Microtome** **Alternatively** Precision Rotary Microtome
23	**Computer**
24	**Weigh Balance**
25	**Glassware**
26	**Media & Chemicals**

CHAPTER – XIV

POLLUTION CONTROL SYSTEM

Water Pollution

Normal sequence for the basic slaughtering operations for large and small animals is identical. The various unit operations include: lairage, slaughtering, bleeding, dressing, evisceration and carcass splitting. Animals are required to be given sufficient rest, fodder and water, approximately for 24 hours before slaughtering, in order to avoid glycogen depletion, which generally occurs during transit. Then the animals are to be inspected by veterinary surgeons, known as ante mortem health inspection and the non-confirming animals rejected for slaughtering.

Lairage

After ante mortem health inspection, the animals are given enough quantity of water but no fodder, for 12 hrs prior to slaughtering, in order to flush out the pathogenic microorganisms. However, it was observed that only very few slaughter houses (less than 1%) have lairage facilities. The modern slaughterhouse at Bareilly should have potable water facility for these operations.

Slaughtering and Bleeding

Large animals are slaughtered as per Islamic Rites by halal method. The animal is stunned in a stunning box and the jugular vein is cut manually by the butcher to drain blood on the rail. In this slaughterhouse the blood is collected and sends through a chute into the rendering plant.

Dressing

The dressing operation consist of:

- Sticking of heart to ensure complete bleeding
- Removal of horns, hind legs, head trimming and de-masking
- Flaying of abdomen and chest
- Removal of hide

Evisceration

Dressing is followed by Evisceration, where edible and non edible offals are segregated. While the edible offals are cleaned with water and sold, the non edible portions are disposed of as solid waste. Care is taken not to puncture the intestine during evisceration to avoid contamination of carcass with intestinal contents.

Carcass Splitting

Before splitting the carcass into quadrates the carcass is washed with water. Normally the carcass splitting is done manually by the axe. However in some of the large scale slaughter houses the carcass is split with an electrically operated circular saw.

The split carcass is transported to meat dealer's shop/ processor unit either by slaughter house's meat delivery van or in dealers own transport. In modern slaughter houses, the split carcass is washed with high pressure water before transportation.

Evisceration

Dressed Carcass are eviscerated before selling as dressed chicken or are chilled frozen for further processing.

Water Usages

The process water consumption areas are:

- Drinking water for animals during lairage
- Washing of slaughter and bleeding floor
- Washing of dressing hall
- Washing of Carcasses
- Cleaning of intestines
- Cleaning of Knife, axes, tables and any other equipments used in slaughter house

The domestic water consumption areas are:

- Toilets
- Canteen (only in case of large Slaughter house)
- Drinking and hand washing of meat dealers, animal dealers, butchers and transporters

Scientific Water Consumption

Animal	**Category**	**No. of units**	***Specific Water Consumption L/Head***	
		Visited	**Range**	***Average***
1	**2**	**3**	**4**	***5***
Buffalo	Large	5	50-200	*102*
	Medium	4	25-100	*45*
	Small	2	10-40	*25*
Goat/ Sheep	Large	3	15-40	*25*
	Medium	3	50-70	*54*
	Small	3	35-50	*40*
Poultry	*Small*	*5*	*2-3*	*2.5*

- In some cases, domestic water consumption is also included in the reported figures
- Modern and semi modern slaughter houses consume more water / head killed as compared to conventional old slaughter houses, because of additional water consumption for carcass cleaning, frequent floor and equipments washings.
- Wide variations in the computed specific water consumption figures are probably due to following reasons
- Variation in availability of adequate water supply in the slaughter house - in many of the units there was no piped water supply.
- Variations in slaughtering practices i.e. floor slaughtering followed by whole operation of dressing, evisceration and cutting of carcass on floor or floor slaughtering and bleeding but dressing operations in hung position or modern slaughtering with all operations done in multi-hoist point.
- Large slaughter houses located in Metropolitan cities have facilities like lairage, chilling room, frozen storage resulting in more water usage and subsequently more waste water generation.
- Most of the units have no records of water consumption and the reported figures are based on rough estimates.

Waste Water Quantity

Based on the data reported by various units, the specific wastewater generation – litre per head each category have been computed and given below:

Animal	Category	No. of units visited	*Specific Water Consumption L/Head*	
			Range	*Average*
1	**2**	**3**	**4**	***5***
Buffalo	Large	5	40-200	*93*
	Medium	4	25-100	*45*
	Small	2	10-40	*25*
Goat/ Sheep	Large	3	12-35	*21*
	Medium	3	40-70	*50*
	Small	3	30-50	*37*
Poultry	Small	5	2-3	2.5

Except for domestic water consumption and drinking water provide for animals in lairages, the major portion of the water supplied would be discharged as wastewater. Hence the reasons attributed for variations in specific water consumption are applicable for the above variations in the computed specific wastewater generation figures.

Waste water characteristics and pollution load generation

Wastewater characteristics

Composite wastewater samples of the combined wastewater were collected at a 30 minute interval during the entire slaughtering operation. In case of batch discharges, samples were colleted form individual source and flow proportionate composite samples were prepared and analyzed for pH, BOD, COD, TSS, O/G, Total Kjeldhal Nitrogen (TKN) and total P. The red colour of the wastewater is due to discharge of blood (haemoglobin) which is easily biodegradable and, therefore, treated wastewater will not be having colour problem. The wastewater characteristics are presented in the following table:

Category	Unit	pH	BOD (mg/1)	COD (mg/1)	TSS (mg/1)	O/G (mg/1)	TKN (mg/1)	P Total (mg/1)
Large	1	8.1	5,565	10,911	3347	357	1082	60
	2	8.0	4,042	8,786	3090	255	505	49
Medium	1	8.2	43,950	89,693	11,650	3,250	11,100	630
	2	7.9	11,066	21,699	2,130	1,400	2,107	112
Small	1	8.0	6,600	13,750	2,600	1,100	1,150	65
	2	7.6	1,750	3,539	875	219	-	-

The higher BOD, COD, TSS, O/G, TKN and Pt concentration in the wastewater from medium scale slaughter houses are due to lower water usage resulting in more concentrated effluents.

The calculated specific pollution load in terms of kg or pollutant per ton or live weight killed are shown in the following table

Category	Unit	Specific Pollution Load (Kg/TLWK)					
		BOD	COD	TSS	O/G	TKN	P Total
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Large	1	3.8	7.5	2.1	0.2	0.74	0.06
	2	5.5	11.9	4.5	0.3	0.68	0.06
Medium	1	3.1	6.3	0.8	0.2	0.80	0.04
	2	5.0	9.8	1.0	0.6	0.96	0.05
Small	1	6.6	14.3	2.6	1.0	1.15	0.06
	2	6.0	12.5	3.0	0.7	-	-

Variations in the specific pollution loads are due to following reasons:

- Only in a few units the blood is collected by some private enterprises for manufacture of medicines/ tonics. However in most of the slaughter houses the blood is allowed to drain on the floor and depending on the drainage facilities the blood partly gets into wastewater drain and partly (coagulated) is disposed off along with solid waste.
- Depending on the facilities available and the practice followed for intestinal cleaning, by various slaughter houses, varying amount of intestinal contents is discharged into the wastewater drain.
- Depending on the handling of rumen digesta i.e. total dumping (flushing of entire content directly to waste water drain), wet dumping (content is washed out and screened) and dry dumping (entire content is collected and dumped as solid waste) etc. waste load generation varies.

Specific Wastewater and Pollution Load Generation Factor

Large Scale

Since unit 2 represents the type of a modern large scale slaughter house into which the other large scale slaughter house in the country should be developed, having lairage facility, using hot water for carcass washing etc., the following specific pollutant factor calculated for this unit will be used for subsequent effluent standard setting purposes.

Fresh water consumption (m^3/TLWK)	Wastewater generation (m^3/TLWK)	BOD load (kg/TLWK)	COD load (kg/TLWK)
1.5	1.4	5.5	11.9

Medium Scale

Partial collection of blood by a pharmaceutical company is done in unit 1 which reduces the organic load by about 25% whereas in most of the medium scale slaughter houses, blood collection is normally not practiced.

In addition, due to non-availability of piped water supply in unit 1, the major portion of the remaining blood coagulates and is subsequently disposed off as solid waste.

Because of these reasons the following specific pollutant factors calculated for unit 2 are adopted for medium scale bovine slaughter house.

Fresh water consumption (m^3/TLWK)	Wastewater generation (m^3/TLWK)	BOD load (kg/TLWK)	COD load (kg/TLWK)
0.5	0.5	5.0	9.8

Small Scale

Because of very high wastewater volume generation in unit resulting from open taps and excessive water usage the following specific pollutant factor calculated for unit 1 will be used for small scale Bovine slaughter houses.

Fresh water consumption (m^3/TLWK)	Wastewater generation (m^3/TLWK)	BOD load (kg/TLWK)	COD load (kg/TLWK)
1.0	1.0	6.6	14.3

Comparison between the specific wastewater and pollution generation factors of large, medium and small scale Bovine slaughter houses

Parameter	Large	Medium	Small
Specific fresh water consumption (m^3/TLWK)	1.5	0.5	1.0
Specific wastewater Generation (m^3/TLWK)	1.4	0.5	1.0
Specific BOD load (kg/TLWK)	5.5	5.0	6.6
Specific COD load (kg/TLWK)	11.9	9.8	14.3
Specific TSS load (kg/TLWK)	4.5	1.0	2.6
Specific O/G load (kg/TLWK)	0.3	0.6	1.0

The above figures indicate that large size bovine slaughter houses use more water per unit because of higher hygienic requirements. Small scale bovine slaughter houses have the highest specific BOD and COD lead because of the absence of any blood collection system. The high specific TSS load in large scale bovine slaughter houses is because of more frequent floor washing and subsequent flushing of intestine contents into the waste water drain.

Air Pollution

In modern slaughter house possible sources of pollution include boiler. DG sets etc. These sources require proper control measures.

Solid Waste Generation (SWG)

The complex has to have a dry rendering plant capable of handling generated solid waste to dispose of the waste in the most appropriate manner into bone meal, meat meal and technical fat.

Existing Wastewater treatment & disposal (EWWT&D)

The complex has to have an Effluent Treatment plant of required capacity to process wastewater from the abattoir complex,

Pollution Abatement Measures (PAM)

All the PAM parameters are being made as per the standards of Central Pollution Control Board.

Effective segregation of wastes like blood, offals, stomach contents etc. and their subsequent utilization for manufacture of pharmaceuticals, chemicals, cattle feed, manure etc. will reduce the pollution load from slaughter houses substantially as discussed below:

- The major pollutant from the slaughtering operation is blood which constitute 4-6% of liveweight killed of animal and having BOD concentration of 1,50,000 to 2,00,000 mg/l. Proper collection and dry handling of blood i.e. dried for use as an animal feed supplement or fertilizer will not only reduce the water requirement for cleaning of killing area but also will reduce the total BOD load by approximately 20%.
- Discharge of stomach content in wastewater results in substantial increase in TSS and BOD & COD load. Dry handling of stomach contents i.e. proper collection and offsite disposal as fertilizer or soil conditioner by farmers will eliminate this pollution load.
- Dry handling of inedible offals viz. intestine, oesophagus, bladder and hair etc. will reduce TSS and BOD & COD load substantially in the wastewater stream.
- Collection of solids from dressing and eviscerating areas and their subsequent reuse as by product will reduce the organic and solid waste loads substantially.

STANDARDS

Selection of parameters for standards

Wastewater from the slaughter house, meat and seafood processing units is biogradable in nature. BOD, COD, SS O &G and pH are the basic pollutants generated by these sectors. All these basic pollutants are inter-related and their concentration in the waste water is dependent on the organic matter content (both soluble and suspended portions). Since BOD is a measure of easily biodegrability of the organic matter which is important for the water quality of the recipient. It is more pragmatic to control the effluent quality in terms of BOD. Considering the easily biogradble nature of the wastewater from the sector, the disposal levels of other parameters will be within the acceptable limits as long as recommended disposal limit of BOD is achieved.

Parameter	Waste water characteristics		
	Large	Medium	Small
Flow m^3/d	154	21.2	4.0
BOD(mg/1)	3364	4875	3990
COD(mg/1)	7027	9480	8090
TSS(mg/1)	2533	2053	2288
Oil & Grease (mg/1)	155	727	577

Since most of the slaughter houses in India are composite ones i.e. slaughtering bovines as well as goats and sheep, the wastewater characteristics of both bovines and goat & sheep have been computed for the purpose of developing standards for category A,B,&C of slaughter houses.

Standards for slaughter houses – Lairge (Category –A)

The daily BOD load from representative large scale (Category-A) slaughter houses is calculated as 518 kg ($154m^3$ x 3.364 kg/m^3) equal to a population of 11.511 (1 PE = 45 gms BOD/ day)

Most of the large scale slaughter houses in metropolitan cities are located in very congested areas having space just sufficient to kill and dress animals therefore, indicting that full scale unit level treatment is not feasible. Hence, the slaughter houses having sewer connection and subsequently a terminal wastewater treatment plant should discharge their wastewater after proper screening and removal of free floating oil and grease into the municipal sewer. However, the units without sewer connection should treat their waste water before disposal.

Best Practicable Treatment System Alternatives:

Two other technically feasible treatment alternatives are given below.

Alternative 1:

Consists of the following units

- Self cleaning screen
- Anaerobic treatment by anaerobic pond followed by
- Aerobic treatment aerated in an aerated lagoon with 0.2 kg $BOD/m^3/d^{-1}$, followed by polishing pond.

Alternative -2

Consists of the following units:

- Self cleaning screen

- Anaerobic treatment by anaerobic pond
- Aerobic treatment of the above treated wastewater in a single stage activated sludge process (extended aeration type with F/M ratio 0.25/day $^{-1}$)

The excess sludge produced from the treatment system will be conditioned using Lime and Ferric Chloride and dewatered in a Plate & frame type filter press system.

For supply of oxygen at activated sludge process, diffused type aeration system is most appropriate compared to surface aeration due to:

- Seasonal variations in slaughtering (e.g. slaughtering is done in 2 shifts/ day for 5 months during winter and 1 shift/ day for 5 months during summer) requiring high operational flexibility for controlling oxygen supply. Such flexibility is not economically feasible with a surface aeration system.
- Aerosol problems associated with surface aeration, which is not recommended for slaughter house on hygienic grounds.

However, the aeration system for the aerated lagoon will consist of floating tripoid mounted low speed type flow surface aerator.

The annualized costs of the individual alternatives which achieve a final treated effluent BOD of 10 mg/1 have been computed to be below 30% of the annual slaughtering fee, indicating economic viability of the treatment alternatives. Although alternative 1 required the least overall annualized and annual operating cost, the land requirement is higher than for alternative -2.

Best practicable Treatment System for Slaughter Houses – Large scale (Category –A)

Since the annualized costs for installation of alternative -1 is within the economic viability of the units. This treatment system producing a final treated effluent BOD concentration of 100 mg/1 is recommended.

Hence the best practicable treatment scheme consists of screening followed by anaerobic pond treatment with a subsequent aerobic treatment in a single activated sludge process system.

The excess biomass/ sludge produced from the activated sludge process should be dewatered using a filter press system. Installation of a sludge drying bed for dewatering purpose is not recommended because of large area requirement and generation of odour / unhygienic conditions, which is not acceptable in the slaughter house. In addition, cost comparison shows that the investment requirement for a sludge drying bed is equal to that of an effective filter press system.

A treatment system with the above masseurs will result in the following final treated effluent characteristics.

BOD	- 100 mg/1
TSS	- 100 mg/1
Oil & grease	- 10 mg/1

The above figures is adopted as effluent disposal standards for large scales slaughter houses not connected to sewer.

Standards for slaughter house units (Medium & small) : Category B & C

The daily BOD load from representative medium and small scale slaughter houses category B & C is calculated as 103 kg (21.2m^3 x 4.875 kg/m^3) and 16.0 kg (4.0m^3 x 3.99 kg /m^3) equal to a population equivalent of PE 2289 & 355 respectively (1 PE = 45 gms BOD/day)

The medium & small scale slaughter houses are located either in small cities or towns. Most of these slaughter houses are more than 50 years old and do not have basic facilities like adequate slaughtering floor, proper roofing, sufficient land, power and water supply. In such cases installation of the proposed treatment system to achieve value based standards may not be feasible. Therefore, the effort should be to minimize the pollution generation by providing adequate basic facilities like stockyard, lairage, raceways, sticking areas, dressing floor, water supply, effluent disposal etc. required for a slaughter house.

For the slaughter houses (modernized) connected to a sewer system discharge of the wastewater into the sewer should be allowed after proper screening and free floating oil and grease removal. However, the units without sewer connection should treat their wastewater before disposal.

Best Practicable Treatment System

Medium and small scale slaughter houses are generally not operated and maintained by Municipality and because of non- availability of power, a pond system is the only technically feasible treatment alternatives. Hence the following wastewater treatment system is recommended i.e. installation of a two stage screening system (bar type) followed by anaerobic treatment in an anaerobic pond. The BOD removal efficiency of the anaerobic pond will be approximately 70%. Subsequently the wastewater is further treated in a facultative pond and polishing pond to achieve a final BOD concentration of $\leq$ 500 mg/l

A treatment system with the above measures will result in the following final treatment effluent characteristics.

BOD = 500 mg/1

The above figure is adopted as effluent disposal standards for medium and small scale slaughter house not connected to sewer.

Summary of Recommended Effluent Disposal Standards

The effluent disposal standards for the slaughter house sector are as follows:

Category	BOD (mg/L)
Connected to sewer	
- Large units (> 70TLWK/D)	Disposal via screen
- Medium & small units 70 TLWK and below	And oil & grease trap
Not Connected to sewer	
- Large units (> 70TLWK/D)	100
- Medium & small units 70 TLWK and below	500

Air Emission Standards

Slaughter houses do not have process related air emissions. Only in modern slaughter houses air pollution is generated in the form of combustion products form oil fired package boilers. The existing boiler emission standards (prescribed by the Central Pollution Control Board) are applicable.

IN-PLANT MEASURES

Reduction of water consumption

Reserve excessive water use results in the flushing of organic martial i.e. Protein and which not only increases the pollution load but also leads to an avoidable loss of valuable products. In addition, since the size of the required wastewater treatment system is directly to the wastewater flow and pollution load, investment costs are high. Therefore conservation will effectively reduce the size, capital and operating costs facilities required being the prescribed effluent standards. Technically feasible in-plant water conservation measures are given below.

Installation of effective washing systems and self closing valves at water supply lines:

High efficiency spray nozzles with quick shot off valve in carcass/ bird washing evisceration line, workers hand washing and all clean up hoses will reduce the water consumption.

- Reuse/ recycle of process wastewater from cleaner area to progressively dirtier areas
- Reuse of carcass wash water and chiller overflow as flush water used for carrying hair/ feathers in pig or chicken slaughter houses to a screen system before final discharge into sewer. Defrost water can be used for all washing purposes USEPA has recommended the reuse of process wastewater for several secondary purpose, except for areas where potable water supply is required.
- Vacuum system of feather/ hair removal
- Replacement of the feather and hair flow away flume by a dry operating vacuum based conveyance system will significantly reduce water consumption.
- Dry clean up operation

Introduction of a dry cleaning step for all clean-up for all operations followed by controlled and efficient wet cleaning will reduce water consumption substantially.

Reduction of pollution load

Reduction in pollution load will reduce the required treatment plant capacity and the operation on site treatment. In addition, introduction of measures for the reduction in pollution mostly leads to the recovery of valuable by-products improving the overall profitability. A technically feasible pollution load reduction measures are given below:

- Segregation and collection of blood for by-product recovery
- Blood having a BOD concentration in the range of 1,58,500 – 2,00,000 mg/l, contributes substantially to the BOD load from all types of slaughter houses if discharged to the wastewater. Therefore, proper segregation and collection of blood is strongly recommended for all slaughterhouses. Blood collection/ recovery and dry cleaning of the hall areas before wash will reduce the BOD load by 42%.
- Collection and separate disposal of stomach and intestine contents.
- Discharge of stomach and intestinal contents to the wastewater substantially increase the TSS and BOD & COD load to the wastewater treatment system. Introduction of dry procedures for the collection of stomach and intestinal contents, therefore, is strongly recommended. The collected solids can be reused by farmers as fertilizer or soil conditioner. A 10% reduction in total waste load by dry collection of stomach content alone is quite possible.
- Dry offal handling: Replacement of the flume water conveyance system by a dry operating technique will avoid wastewater generation from this particular activity and hence reduce the overall pollution load from the unit
- Separation of hair, feathers and solids from eviscerating wastewater.
- Hairs, feathers and other screenable solids should be removed from the wastewater as close to the place of generation/ discharge as possible. Wastewater streams containing high content of these solids should be a segregated and pre-treated by a self cleaning screen system prior to combination with the remaining wastewater of the unit.
- Segregation and pre-treatment of wastewater from viscera and intestine washing activities.

Minimization of water consumption, segregation and effective O/G removal will effectively reduce the pollution load from this activity.

Installation of an effective self cleaning type screening system at wastewater streams with a high suspended solids content is strongly recommended for all types of the above

industries. This will substantially reduce the overall BOD and COD load to the wastewater treatment plant and avoid choking of sewer lines in cases where only pre-treatment is required prior to sewer discharge.

By- Product recovery

Pollution load from slaughter houses, meat and sea food processing units can be substantial reduced by incorporating one or all of the above mentioned techniques. The separated "wastes" can be converted into valuable by-products by the following technically feasible methods.

- Blood should be collected by pharmaceutical companies for manufacturing haemotonic preparations. Alternatively blood plasma could be used in sausage preparations. Blood can also be converted to blood meal which, after mixing and drying with rumen digesta can be used as animal feed.
- Rumen digesta contain 10-20% proteins, vitamins and essential minerals which, after processing / drying is an ideal animal feed. Alternatively rumen digesta can be used as manure after composting.
- Rendering: Fat should be collected separately and rendered into tallow or lard by using wet or dry rendering processes. Indirect heat is used to melt fat and evaporate moisture from the animal tissue. Tallow and lard is a valuable raw material for several chemical industries.
- Protein recovery by Dissolved Air Floatation system (DAF):

Dissolved air floatation is the most widely used and proven method not only for pre-treatment of waste water but also for subsequently fat and protein recovery for all the above industries. "Standard BOD removal efficiencies are between 80-85% for the treatment of wastewater from the above industries. Prior to floatation coagulation and flocculation steps are required which is either achieved by dosage of acid for FDA (Food and Drug Administration approval) polyelectrolytes. The collected float with a solids content of 16-18% consists mainly of proteins and fats. Coagulation of proteins and melting of fats is carried out in the subsequent protein recover system consisting of a heat exchanger and dryer scheme. The dried product, with a protein content of approximately 98% is used as animal feed. It is reported that 1.5 – 3.0 kg of protein and 0.2 – 0.3 kg fat can be recovered form one cubic meter of slaughter house wastewater having a BOD concentration of 1000 – 1400 mg/l. Large scale slaughter houses, meat and fish processing units should consider installation of a DAF based protein recovery system.

Noise Pollution

DG sets and compressors are expected source of noise pollution. For DG sets there are standards and guidelines to contain noise

Odour Pollution

Odour problem is comparatively less in modern slaughter houses. It can be minimized by proper ventilation. Odour problem from specific source such as rendering plant can be controlled by use of scrubber and/ or other method.

It is observed that waste generation in modern slaughter house depends on process and material handling practices followed.

HACCP IN SLAUGHTER HOUSES/MEAT PLANTS

Hazard Analysis and Critical Control Point (HACCP), is used to describe an internationally recognised way of managing food safety and protecting consumers. It is a requirement of EU food hygiene legislation that applies to all food business operators except farmers and growers.

EU Regulation 852/2004 (Article 5) requires food business operators, including meat plant operators to implement and maintain hygiene procedures based on HACCP principles. This legislation replaced the Meat (HACCP) Regulations 2002.

HACCP

The Hazard Analysis and Critical Control Point (HACCP) system is internationally accepted as the system of choice for food safety management. It is a preventative approach to food safety based on the following seven principles:

- identify any hazards that must be prevented eliminated or reduced
- identify the critical control points (CCPs) at the steps at which control is essential
- establish critical limits at CCPs
- establish procedures to monitor the CCPs
- establish corrective actions to be taken if a CCP is not under control
- establish procedures to verify whether the above procedures are working effectively
- establish documents and records to demonstrate the effective application of the above measures

The HACCP approach provides a systematic way of identifying food safety hazards and making sure that they are being controlled day-in, day-out. This involves the following four steps: Plan, Do, Check. These steps are described in more detail below.

1. PLAN

Plan what needs to be done to maintain food safety and write it down.

It is particularly important to:

- minimize the likelihood of food poisoning bacteria contaminating meat and associated products
- avoid physical and chemical contamination of meat
- reduce the potential for growth of food poisoning bacteria on meat and associated products
- minimize the potential for cross contamination of ready-to-eat foods by food poisoning bacteria on meat during further processing or in the kitchen.

Hazards : Microbiological, Chemical, Physical

Controls : **Good Hygiene Practices** Maintenance, Cleaning, Pest control, Training, Personal hygiene, Traceability, Waste Management, Wrapping & Packaging, Transport

Operational hygiene controls Raw Materials, Animal welfare & transport, Slaughter, Dressing, Storage, Cutting, Processing

Documentation: HACCP plans, Staff instructions, Monitoring and Corrective action procedures, Daily records

2. DO

Do what you planned to do to maintain food safety.

Documentation : (see above)

3. CHECK

Check that you are doing what you planned to do to maintain food safety and write down what was checked and when.

Supervision, Monitoring, Verification Review incl. Micro testing

Documentation (see above)

4. ACT

Act to correct any food safety problems and write down what has been done about the problem and when.

Corrective actions : Documentation (see above)

Some more information on hazards, controls, documentation and HACCP training can be found below.

Hazards

The seven principles aim to focus attention on the identification and control of microbiological, as well as chemical and physical food safety hazards during production. The hazard assessment and the regular monitoring of critical control measures must be documented to provide the basis for audit checks and may provide evidence of due diligence in the event of legal action.

In meat plants HACCP plans will focus on control measures that can reduce the likelihood of contamination of meat from microbiological hazards, such as Salmonella, *E.coli O157* and Campylobacter, during production. These meat-borne pathogens can be carried by healthy animals and cannot be detected by sight or smell.

Although thorough cooking kills most bacteria, meat may be handled by lots of people before it is cooked and the bacteria will spread to other foods that may not be cooked. Bacteria multiply very quickly, especially in warm conditions. Retailers and consumers need to take precautions, including temperature controls and keeping raw meat and cooked meat and other ready to eat foods separate.

Conscientious implementation of HACCP principles by plant operators demonstrates their commitment to food safety; improves employee awareness of their role in protecting consumers, and emphasises management's responsibility for the safe production of meat.

Controls

Food safety management is achieved by a combination of good hygiene practices (legal requirements for which are in Regulation 852/2004) and operational hygiene procedures (legal requirements for meat production are in Regulation 853/2004).

Guidance on these legal requirements may be found in the Guide to Food Hygiene and Other Regulations for the UK Meat Industry (see Meat Industry Guide below).

Documentation

Documentation is an important part of food safety management. Records should be easy to keep up to date as they provide evidence of the operator's thinking and decisions. Where visual monitoring is necessary, for example to ensure carcasses are free of visible faecal contamination, records can be limited to 'exception reporting'. This means making a record only when there is a problem or something unusual happens and noting the corrective action taken as a result. See Model Documents and Food Safety Management Diary below.

HACCP training

Food business operators need an understanding of HACCP principles so that they can set up and maintain HACCP-based procedures. Staff should also be aware of the importance of the procedures they carry out in minimising the spread of food-borne hazards, which may be biological (e.g. E.coli O157 or campylobacter); physical (e.g. wool, metal); or chemical (e.g. veterinary medicine or cleaning product residues).

CHAPTER – XV

CIVIL WORKS SPECIFICATIONS

Lairage Building - Specification of mechanical and civil works

1	Building Description	Specification	Remarks
A	Frame Type	Rigid Frame Multi Spain	
B	Width	61.00mtr c/c	
	Width Module	1 @18.50 mtr c/c +1 @24.00 mtr c/c +1 @18.50 mtr c/c	
C	Length	54.00 mtr c/c	
D	Bay Spacing	7@ 7.7 mtr c/c	1m overhang purlins to flush the existing structure
E	Roof Slope	1 in10	
F	Clear Height	4.50 mtr	
G	Eave Height	As per design	
H	End Frames	Not to be designed for future expansion	Light Frames

2	Design Criteria : The building to be designed as per guideline of MBMA / AISC		
A	Dead Load	0.15 KN / Sqm	
B	Live Load	0.57 KN / Sqm	
C	Wind Load	Based on basic wind speed of 47 m / sec 18:875 (part3) 1987	
D	Additional Collateral Load	NIL	
E	Earthquake Load	Seismic Co-effcient as per zone - 1V	

3	Roofing - Single Skin		
A	Profile	Trapezodical Roofing	
B	Material	Bare Alu Zinc	
C	Thickness	0.45 mm (26 gauge thick TCT)	
D	Colour	Bare	
E	Transparent FRO Sheets	1.50 mm thk (UV resistant)	2.0% of roof area

4	Wall Cladding	Single Skin	
A	Prifele	Trapezodial Roofing	
B	Material	Pre-painted Alu-Zinc	
C	Thickness	0.45 mm (26 gauge thick TCT) to be confirmed	STANDARD COLORS i.e off White, Torres Blue Gull Grey, Mist Green

D	Colour	To be confirmed	
E	Height of brick wall	1500 mm	

5	**Sky Lights**	FRP Sheets 1.5 mm thk Covering 2.5% of roof area	
A	Material	Wall Cladding Material	
B	Thickness	Wall Cladding Material	
C	Colour	Wall Cladding Material	

6	**Downspouts**	Box Type metal downspout pipes with suitable elbows	
7	**Purlins**		
A	Size	As per Design	
B	Material	Non galvanized (MS)	
C	Thickness	As per design	

8	**Bracing Type**		
A	Roof	As per Design	
B	Wall	As per design	
Structures = the columns of the building will be framed in steel structures keeping in view of truss loads.			

Sl No	**DESCRIPTION**	**UNIT**
1	**Earth Work:**	
1.1	Excavation in foundation or plinth in Ordinary soil including pumping and Bailing out of water from; the trenches, Refilling, back filling watering and ramming the excavated earth into the trenches or into the spaces between the building and side of the foundation or in the plinth and /or removal and disposal of surplus earth as directed within 50 meter lead.	
	a) upto all depths from N.G.L.	Cum
1.2	Earth work in filling with good earth brought from out-side Including cost of cartage & Soil compaction. In layers not exceeding 20 m in depth, Breaking clods, watering, rolling each layer with ½ ton roller, ramming with Steel rammers and rolling every 3rd layer & top Most layer with 10.00 ton power roller and dressing up under floor, road, etc. complete	Cum
1.3	Providing and injecting chemical emulsion for PRE-CONSTRUCTIONAL ANTI-termite treatment And creating a chemical barrier under and alround the column pits. Wall trenches, basement excavation to surface of plinth filling, junction of wall and floor, along the external perimeter of building, Aldrin Emulsifiable concentrate (0.5%)	Sqm
2	**Cement Concrete Work**	
2.1	Cement concrete bidding in foundation including shuttering consolidation and curing etc. complete.	
	a) 1:4:8 (1 cement : 4 coarse sand):	Cum.
	8 graded stone aggregate 40 mm nominal size)	

2.2	Cement concrete bed block:-window Sills etc. 1:2:4 including centering, shuttering, curing, and exposed surface finished with 12 mm thick smooth plaster in (1:3)	Cum.
3	**RCC Work**	
3.1	Reinforced cement work- 1:1.5:3 (1 cement 1.5 coarse sand: 3 graded stone aggregate 20 mm nominal size) including laying, curing, but excluding cost of centering, shuttering, reinforcement, and plastering in.	
	a)Foundations, raft, slabs & plinth beams and Footings, bases of Columns etc. and mass concrete.	Cum.
	a) In super structure	Sqm.
3.2	Centering and shuttering up to and at any level including shuttering, propping, etc. and removal of forms as per design and as directed with good timber/ply/steel materials, approved by the architects for: foundations footings, raft slabs, plinth beams, sides of columns. Beams & Slabs at all heights	Sqm.
4	**Brick Work**	
4.1	Brick masonry in foundation and plinth using bricks of class designation 75 In cement mortar 1:6 (1 cement: 6 coarse sand/stone dust) including curing etc. complete.	Cum.
4.2	50mm thick D.P.C. in cement concrete 1:2:4, including shuttering, curing, and two coats hot bitumen of penetration 85/25 applied at the rate of 17.00 kg per 10 sqm for each layer after cleaning the surface with brush.	Sqm.
4.3	Brick masonry in super structure using bricks of class designation 75 in cement mortar 1:6, including cost of necessary scaffolding up to any height of any floor including curing complete.	Cum.
4.4	115mm thick brick masonry partition wall using bricks of class designation 100 laid in cement mortar 1:4 with 2 Nos. 6mm dia. Bars or Ms flat 1"X1/8" at every 4th layer including curing, scaffolding etc. complete.	Sqm.
5	**Plastering Work**	
5.1	12 to 15mm thick smooth cement plaster over walls up to all heights laid, cured complete including making grooves as directed at the junction of RCC and brick work.	
	a) 1:1:4 (1 cement : 1 coarse sand: 4 fine sand) in internal face	Sqm.
	b) 1:1:4 (1 cement: 1 coarse sand: 4 fine sand)on external face	Sqm.
6	**Door Window**	
6.1	Providing and fixing anodized/ powder coated/ electrocoloured aluminium hinged windows and ventilators, made out of standard aluminium sections, as per design including G.F. hinges, aluminium stays, handles, lugs etc. complete with 5mm thick float glass of "MODIGUARD" or equivalent glazing fixed in rubber/nylon gaskets, with aluminium beading. Stainless steel screws, rubber weather strips, rawl plugs gutties, etc. complete as per the Architects' design and as directed.	
	a) Fully openable	Sqm.
	b) Partly openable & partly fixed	Sqm.
	c) Fully fixed	Sqm.
7	**Flooring Work**	

7.1	Providing and laying fine sand filling, watering and ramming etc. complete as directed	Cum.
7.2	100mm thick cement concrete under floor in 1:4:8 (1 cement: 4 coarse sand: 8 graded crushed stone aggregate of 40mm & down gauge) laid, cured, rammed complete.	Sqm.
7.3	100 mm thick boulder soling under floor over the sand filling, rammed complete	Sqm.
7.4	50 mm thick C.C flooring under layer 35mm thick of C.C 1:2:4 (1 cement: 2 coarse sand: 4 stone aggregate 12.5 mm size) and 15 mm thick wearing layer in C.C 1:2 (1 cement: 2 stone aggregate of size 4.75 mm down gauge) laid integral with base coarse in alternate panels and finished with a floating of neat cement including providing and fixing 40x4mm glass strips in panel as directed by the Engineer in charge.	Sqm.
8	**Steel Work**	
8.1	Providing and placing in position for steel reinforcement for R.C.C. works including cutting, bending, binding and placing in position including the cost of binding wire, wastage and rolling margin complete at any height depth.	M.T
9	**Finishing Work**	
9.1	Providing and applying two or three coats of plastic emulsion paint of approved quality and shade including preparation of surface with oil bound putty etc. to give an even shade.	Sqm.
10	**Miscellaneous Work**	
10.1	40 mm thick cement concrete 1:2:4 in plinth protection laid in panels over 75 mm thick cement concrete 1:4:8 bedding laid cured, complete.	Sqm.
10.2	Providing and making floor drains in bricks work 1:6 with 230 mm thick walls, 75 mm thick CC 1:4:8 bedding 12 mm thick cement plaster 1:3 finished with a floating coat of neat cement on side top and bottom including rounding of edges necessary excavation and disposal of surplus earth upto a distance of 50 mtrs complete as per design, covered with steel grating and with inside average dimensions.	
	a) 350 x 450 mm (Av)	RMT
10.3	Providing and fixing 1.5 to 2 meter high M.S. railing as per design including top rail 50 mm dia. M.S. pipe, 16mm M.S. Sq. bars including necessary welding grouting in cement mortar and painting etc. completes as per design and drawing.	Sqm.

Slaughter House building

S.No	Description	Unit
1	**Earth Work:**	
1.1	Excavation in foundation or plinth in Ordinary soil including pumping and Bailing out of water from; the trenches, Refilling, back filling watering and ramming the excavated earth into the trenches or into the spaces between the building and side of the foundation or in the plinth and /or removal and disposal of surplus earth as directed within 50 meter lead.	Cum.
	a) upto all depths from N.G.L.	
1.2	Earth work in filling with excavated surplus Earth or good earth brought from out-side Including cost of cartage & Soil compaction In layers not exceeding 20 m in depth, Breaking clods, watering, rolling each layer with ½ ton roller,	Cum.

	ramming with Steel rammers and rolling every 3rd layer & top Most layer with 10.00 ton power roller and dressing up under floor, road, etc. complete	
1.3	Providing and injecting chemical emulsion for PRE-CONSTRUCTIONAL ANTI-termite treatment and creating a chemical barrier under and alround the column pits. Wall trenches, basement excavation to surface of plinth filling, junction of wall and floor, along the external perimeter of building, Aldrin Emulsifiable concentrate (0.5%)	Sqm.
1.4	**Filling back excavated earth**	
2	**Cement Concrete work**	
2.1	Cement concrete bidding in foundation including shuttering consolidation and curing etc. complete.	
	a) 1:4:8 (1 cement : 4 coarse sand):8 graded stone aggregate 40 mm nominal size)	Cum.
2.2	Cement concrete bed block:-window Sills etc. 1:2:4 including centering, shuttering, curing, and exposed surface finished with 12 mm thick smooth plaster in (1:3)	Cum.
2.3	P/mixing 2% water proofing compound in concrete work	
3	**RCC work**	
3.1	Reinforced cement work- 1:1.5:3 (1 cement 1.5 coarse sand: 3 graded stone aggregate 20 mm nominal size) including laying, curing, but excluding cost of centering, shuttering, reinforcement, and plastering in.	
	a) Foundations, raft, slabs & plinth beams and Footings, bases of columns etc. and mass concrete.	Cum.
	b) in super structure	Cum.
3.2	Centering and shuttering up to and at any level including shuttering, propping, etc. and removal of forms as per design and as directed with good timber/ply/steel materials, approved by the architects for: foundations footings, slabs, plinth beams, sides of columns, slab and beam lintels etc. for all heights	Sqm.
3.3	Centering and shuttering for:	
(a)	Foundation, footings, pedestals, plinth beam	
(a)	Columns, walls	
(b)	beams, slab, lintels	
3.4	Reinforced cement work- 1:1.5:3 (1 cement 1.5 coarse sand: 3 graded stone aggregate 20 mm nominal size) including laying, curing, cost of centering, shuttering in machine foundations including leaving necessary pockets but excluding the cost of reinforcement.	
4	**Brick Work:**	
4.1	Brick masonry in foundation and plinth using bricks of class designation 100 In cement mortar 1:6 (1 cement: 6 coarse sand/stone dust)including curing etc. complete.	Cum.
4.2	50mm thick D.P.C. in cement concrete 1:2:4, including shuttering, curing, and two coats hot bitumen of penetration 85/25 applied at the rate of 17.00 kg per 10 sqm for each layer after cleaning the surface with brush.	Sqm.

4.3	Brick masonry in super structure using bricks of class designation 75 in cement mortar 1:6, including cost of necessary scaffolding up to any height of any floor including curing complete.	Cum.
4.4	115mm thick brick masonry partition wall using bricks of class designation 100 laid in cement mortar 1:4 with 2 Nos. 6mm dia. Bars or Ms flat 1"X1/8" at every 4th layer including curing, scaffolding etc. complete.	Sqm.
4.5	**Brick work in staircase steps**	
5	**Plastering work:**	
5.1	12 to 15mm thick smooth cement plaster over walls up to all heights laid, cured complete including making grooves as directed at the junction of RCC and brick work.	
	a) 1:1:4 (1cement: 1 coarse sand:4 fine sand) in internal face	Sqm.
	b) 1:1:4 (1 cement: 1 coarse sand:4 fine sand) on eternal face	Sqm.
5.2	10 MM. thick plaster on exposed surface of RCC	
6	**Door window**	
6.1	Providing and fixing anodized/powder coated/electrocoloured aluminium hinged windows and ventilators, made out of standard aluminium sections, as per design including G.F. hinges, aluminium stays, handles, lugs etc. complete with 5mm thick float glass of 'MODIGUARD' or equivalent glazing fixed in rubber/nylon gaskets, with aluminium beading. Stainless steel screws, rubber weather strips, rawl plugs gutties, etc. complete as per the Architects' design and as directed.	
	a) Fully openable	Sqm.
	b) Partly openable & partly fixed	Sqm.
	c) Fully fixed	Sqm.
6.2	P/fixing stainless steel frame 16 gauge, and fixing shutters comprising of flush doors with SS sheet above it.	
6.3	Supplying and fixing rolling shutters of made out of powder coated G.I. coils as per design	
	80 x 1.25 mm. M.S. laths with 1.25 mm. thick top cover.	
6.4	Extra for providing electrical automation system for rolling shutter as per specifications.	
6.5	P/F mortice lock with latch	
6.6	P/F 5.0 MM. thick glass	
6.7	P/F door closures	
6.8	Providing and fixing stainless steel pipe polished with wall thickness of 2.0 mm. 1500 mm. high including grouting in floor complete	
6.9	Providing and fixing 38 mm. thick flush door shutters core of block board construction with frame of first class hard wood and well matched commercial ply veneering with vertical grains or cross bands and face veneer on both faces of shutters and 25 mm. thick hard wood lipping from approved manufacturer including all required fittings such as 3 Nos. 125 mm. size oxidized iron butt hinges with necessary screws and aluminum fittings including door stopper, rubber buffer, handles, tower bolts etc. complete as per drawing.	
6.10	Providing and fixing plastic laminated sheet of 1.0 mm. thickness of approved make, design, quality and colour on flush door shutters as per direction complete.	

6.11	Extra for providing vision panel not exceeding 0.1 sq.m. in all type of flush doors (Cost of glass excluded) (Overall area of door shutter to be measured).	
	(a) Rectangular or square	
6.12	P/F 100 MM. Dia. Polished SS pipe including ss brackets to be grouted/ bolted to RCC sructure	
7	**Flooring Work:**	
7.1	50 mm thick marble chips flooring rubbed & polished to granolithic finish under layer 35mm thick cement concrete 1:2:4 and top layer 15mm thick with white and black marble chips of sizes from 7 mm to 10 mm nominal size laid in cement marble powder mix 3:1 by weight in proportion of 4:7 by volume with 40mm x 4mm thick glass P.V.C. strips with white cement.	Sqm.
7.2	Providing and laying 8 mm thick white / approved colour glazed tiles 205 x 205 size on 12 mm thick cement plaster 1:4 (1 cement : 4 coarse sand) and jointed with white cement slurry, cured & cleaned complete in all respects.	Sqm.
7.3	Providing and laying fine sand filling, watering and ramming etc. complete as directed.	Cum
7.4	100mm thick cement concrete under floor in 1:4:8 (1 cement: 4 coarse sand : 8 graded crushed stone aggregate of 40mm & down gauge) laid, cured, remmed complete.	Cum
7.5	providing and laying 150 thick boulder soling compacting the same and filling the gaps with binding material like moorum etc.	Cum
7.6	100 mm. thick cement concrete under floor in 1:2:4 (1 cement: 2coarse sand:4 graded crushed stone aggregate 20 mm. and downgauge) laid cured, rammed complete. And vaccume dewatered by mechanical means. Nominal reinforcement of 8 dia. @ 250 mm. c/c included	sqm.
7.7	50mm thick C.C. flooring under layer 35mm thick of C.C. 1:2:4 (1 cement : 2 coarse sand: 4 stone aggregate 12.5mm size) and 15 mm thick wearing layer in C.C. 1:2 (1 cement: 2 stone aggregate of size 4.75mm down gauge) laid integral with base coarse in alternate panels and finished with a floating coat of neat cement including providing and fixing 40x4mm glass strips in panel as directed by the Architect	sqm.
7.8	Providing and laying 5mm. thick epoxy flooring/4mm. epoxy screed and 1 mm. epoxy topping having water absorption '0' ml, surface spread of flame-class-2,including cleaning the surface thoroughly of primer coat with brush and thereafter the mortar laid with trowel and maintaining even thickness by means of steel strips at every one apert and finally smoothened with a small sized roller including the necessary curing as per direction of Engineer in charge	sqm
7.9	Extra for mixing Nitoflor hardtop floor hardener in cement concrete flooring	
7.10	Providing and laying 25 mm. thick (Minimum) machine cut Kota stone in skirting, risers, treads, counters laid in pattern over 12 mm. (average) thick base of cement mortar 1:3 (1 cement :3 coarse sand) and jointed with white cement slurry mixed with pigment to match the shade of slab.	
8	**Steel Work**	
8.1	Providing and placing in position for steel reinforcement for R.C.C. works including cutting, bending, binding and placing in position including the cost of binding wire, wastage and rolling margin complete at any height depth.	M.T.

8.2	Providing,fabricating,erecting,placing and fixing in position steel work for pipe rack with M.S. angles, channels,square/ round bars, square/round tubes,Tee bars,plate flats, including the cost of all consumable materials such as welding rods,gases etc. including all tools tackels etc., necessary hinges, pivots, cleats, brackets, bolts, supports etc. complate as per drawings and design including one sharp coat of red oxide primer and two or more coats of synthetic enamel paint of approved brand and colour at any level.	
8.3	Providing, fabricating, erecting, placing and fixing in position steel work in gate fencing, grills, grating, ladders, stairs and railing glazing frames and louver structure with M.S. angles, channels, square/ round bars, square/round tubes, Tee bars, plate flats, M.S. sheets including the cost of all consumable materials such as welding rods, gases etc. including all tools tackels etc., necessary hinges, pivots, cleats, brackets, bolts, supports etc. complate as per drawings and design including one sharp coat of red oxide primer and two or more coats of synthetic enamel paint of approved brand and colour at any level.	
9	**Finishing Work**	
9.1	Providing and applying two or more coats of plastic emulsion paint of approved quality and shade including preparation of surface with oil bound putty etc. to give an even shade	Sqm.
9.2	P/A oil bound distemper	
9.3	P/A exterior emulsion paint	
10	**Miscellaneous Work**	
10.1	40 mm thick cement concrete 1:2:4 in plinth protection laid in panels over 75 mm thick cement concrete 1:4:8 bedding laid cured, complete.	Sqm.
10.2	Providing and making floor drains in bricks work 1:6 with 230 mm thick walls, 75 mm thick CC 1:4:8 bedding 12 mm thick cement plaster 1:3 finished with a floating coat of neat cement on side top and bottom including rounding of edges necessary excavation and disposal of surplus earth upto a distance of 50 mtrs complete as per design of the Architects with inside average dimensions.	
	a) 350 x 300 mm (Av)	RMT
11.0	**FALSE CEILING WORK**	
11.1	Supplying and fixing of 150C coil coated steel false ceiling system comprising of 150 mm. width and 15 mm. deep roll formed out of 0.5 mm. thick polyester coated galvanized steel (2-120 gms) zinc coating 240 Mpa yield stress fixed on steel runners in size of 32mm wide * 39 mm. deep manufactured out of 0.6 mm. galvanised steel with flexible suspension arrangement consisting of suspension G.I. rod, suspension clip etc. including all hardware required for fixing of ceiling. the top coat of panel shall be 20 micron polyester coated finish and back coat of 5 mocron alkyd primer. the panel shall be factory cut in maximum length of 6.0 mtr. with special G.I. splice in between two panels.The work shall be carried out strictly as per manufacturer specification.	
11.2	Providing and fixing upvc rain water down take pipes of 6kgf working pressure including all accessories	
(a)	150 mm. dia.	

11.3	Providing and fixing 0.55 mm. thick M.S. precoated roof sheeting,cladding fixed to structural steel with necessary screws with minimum galvanising of 120 gsm. As per specifications	
11.4	Providing and fixing "SILFILL" (Armour board) of supreme industries limited of 50 mm thickness (thickness built up using minimunm 10 mm thick specifically extruded high performance sheet) in floor joints/columns /beam joints	
11.5	Providing and fixing 60 mm " SILSEAL ROD" of supreme industries limited of density not less than not less 24 KG/M3 and filling the joints with 15 mm"Polyurethane sealant sonolastic SL1 of MBT" confirming to ASTM(290 including marking tape on either side of joints to ensure a neat & clean finish of the joints including using pigments to match the colour of the floor	
	Note: for forming sealing slots in expansion joints, the strips of required depth to be cut before installation and same should be installed flushed with finished surface. The strip to be pulled of at the time of sealing.	
11.6	Providing and fixing Aluminium Plate over expansion joints 150 mm wide and 3 mm thick fixed as per standard method.	
12	**TRUSS WORK**	
12.1	Truss work for slaughter house comprising of pre fabricated rafter and bare galvalume roof sheeting with insulation	

Road Work

Sl.No	DESCRIPTION	UNIT
1	**Earth Work:**	
1.1	Excavation in soil up to a depth of 300mm including the site clearance, compacting the exposed surface with 10 ton roller, providing and laying of 22 layers os W.B.M.100mm each as per the specifications of Indian Road Congress, providing layer of 100mm P.C.C.(1:4:8)over W.B.M. Then providing a final layer of 150 mm R.C.C. (1:2:4) with steel reinforcement of Tor *mm dia @ 250 mm c/c	Sqm.
1.2	Providing and laying of the Kerb stone on the side of the road as per the direction of E.I.C. These shall be made of P.C.C. 1: 3:.	RMT

Overhead Water Tank – Capacity –500 cum
Height: - 20 M.

Sl.No	DESCRIPTION
1.0	**Earth Work:**
1.1	Excavation in foundation or plinth in Ordinary soil including pumping and Bailing out of water from; the trenches, Refilling, back filling watering and ramming the excavated earth into the trenches or into the spaces between the building and side of the foundation or in the plinth and /or removal and disposal of surplus earth as directed within 50 meter lead.
	a) upto all depths from N.G.L.
2.0	**Cement Concrete work**
2.1	Cement concrete bidding in foundation including shuttering consolidation and curing etc. complete.
	a) 1:4:8 (1 cement : 4 coarse sand):8 graded stone aggregate 40 mm nominal size)

3.0	**RCC work**
3.1	Reinforced cement work- 1:1.5:3 (1 cement 1.5 coarse sand: 3 graded stone aggregate 20 mm nominal size) including laying, curing, but excluding cost of centering, shuttering, reinforcement, and plastering in.
	a) Foundations, raft, slabs & plinth beams and Footings, bases of columns etc. and mass concrete
	b) in super structure
3.2	Centering and shuttering up to and at any level including shuttering, propping, etc. and removal of forms as per design and as directed with good timber/ply/steel materials, approved by the architects for: foundations footings, raft slabs, plinth beams, bases of columns
4	**Plastering work:**
4.1	12 to 15mm thick smooth cement plaster over walls up to all heights laid, cured complete including adding of water proofing compound as per specification .
	a) 1:1:4 (1cement: 1 coarse sand: 4 fine sand) in internal face
5	**Flooring Work:**
5.1	Providing and laying fine sand filling, watering and ramming etc. complete as directed
5.2	100mm thick cement concrete under floor in 1:4:8 (1 cement: 4 coarse sand : 8 graded crushed stone aggregate of 40mm & down gauge) laid, cured, remmed complete.
5.3	50mm thick C.C. flooring under layer 35mm thick of C.C. 1:2:4 (1 cement : 2 coarse sand: 4 stone aggregate 12.5mm size) and 15 mm thick wearing layer in C.C. 1:2 (1 cement: 2 stone aggregate of size 4.75mm down gauge) laid integral with base coarse in alternate panels and finished with a floating coat of neat cement including providing and fixing 40x4mm glass strips in panel as directed by the Engineer in charge
6	**Steel Work**
6.1	Providing and placing in position for steel reinforcement for R.C.C. works including cutting, bending, binding and placing in position including the cost of binding wire, wastage and rolling margin complete at any height depth.
7	**Miscellaneous Work**
7.1	40 mm thick cement concrete 1:2:4 in plinth protection laid in panels over 75 mm thick cement concrete 1:4:8 bedding laid cured, complete.
7.2	Providing and making floor drains in bricks work 1:6 with 230 mm thick walls, 75 mm thick CC 1:4:8 bedding 12 mm thick cement plaster 1:3 finished with a floating coat of neat cement on side top and bottom including rounding of edges necessary excavation and disposal of surplus earth upto a distance of 50 mtrs complete as per design.
	Covered with steel grating and with inside average dimensions.
	a) 350 x 450 mm (Av)
7.3	Providing and fixing 1.5 meter high M.S. railing as per design including top rail 50 mm dia. M.S. pipe, 16mm M.S. Sq. bars including necessary welding grouting in cement mortar and painting etc. completes as per design and drawing.

CHAPTER - XVI

INSTALLATION OF PLANT, MACHINERY AND EQUIPMENTS

The installation work would comprise

a) General installation i.e. positioning and installing all the processing, miscellaneous and service equipment as per approved layout drawings as per the contract.
b) Supply and installation of structural platforms and table.
c) Supply and installation of all service and product piping including ancillary items.
d) Insulation and cladding of piping equipment and electrical auto tracing of FO, including supply of materials.
e) Interconnections of services and electrical with equipment.
f) Guide line for expansion work.
g) Clean up of work site.
h) Supply of all cleaning chemicals and lubricants.
i) Testing, commissioning and start-up.
j) Painting including supply of paints as approved by the Owner.
k) Training of personnel.

Detailed specifications are given in the subsequent clauses.

General Installation

Positioning of Equipment

The work involves preparation of access for moving of the plant and equipment including their fittings from the work site godown or from the place within the site where they have been unloaded, to the place of erection, decorating and placing on the foundation wherever required. All the civil foundations as per the manufacture/supplier's drawings shall be arranged by the Contractor. The Supplier shall place the equipment and carry out final adjustment of the foundations including alignment and dressing of foundation surface, embedding and grouting of anchor bolts and bed plates. The Supplier shall be responsible for obtaining correct reference lines for purpose of fixing the alignments of various equipments from master benchmarks provided by the owner.

Tolerances shall be as specified in equipment manufacture's drawings or stipulated by the Owner's Engineer. No equipment shall be permanently bolted down to foundations or structure until the alignment has been checked by the Supplier and witnessed by the Purchaser. The Supplier shall carry out minor alternations in the anchor bolts, pockets etc., at no extra cost and set the equipment properly as per approved layout, drawings and manufacture's instructions. The Supplier shall supply all the necessary foundation/anchor bolts and bedplates if required without extra cost.

The Supplier shall supply, fix and maintain, at his own cost, during the erection work, all the necessary centering, scaffolding, staging required not only for proper execution and protection of the surrounding plant and equipment. The Supplier shall take out and remove any or all such centering, scaffolding, staging, planking etc., as occasion shall require or when ordered to do so and shall fully rein-state and make good all things disturbed during execution of the work, to the satisfaction of the Owner. The Supplier shall be paid no additional amount for the above.

Structural platforms shall be required to provide access for various equipment. Tables shall be required for handling of carcass/offals. These platforms and tables shall be fabricated keeping stability and other functional as well as aesthetic requirements into consideration as approved by the Owner. The payment shall be made on the basis of the actual weight execution and the unit rates agreed upon or as per provisions made in the contract for such items.

SERVICE PIPING INSTALLATION

General Guidelines

All piping systems shall comply with the latest editions of the following regulations wherever applicable:

- Indian Boiler Regulations.
- Regulations of Explosives Inspectorate.
- All applicable Indian Standards.
- All applicable State Government/Central Government laws/acts.

Scope of Supply

The Supplier shall supply all piping materials like pipes, fittings, valves, and flanges measuring instruments and all other items as shown in the flow diagram/specifications and schedule of quantities. All the pipes & fittings and insulation material etc. should be of class and make as approved by the Owner. Prior approval of the Owner must be obtained by the Supplier for the class and make of all materials. The Supplier should furnish the details of make selected by him, in the proforma given in Annexure-I.

Scope of Piping Erection

This to be performed by the Supplier as outlined below:

- The scope of Erection for piping, includes all system covered in the flow diagrams and specifications.
- The Suppliers work commences/terminates at the pipe connections with valves or flanges as specified in flow diagrams/battery limits.
- The Supplier shall also install necessary piping and any specialties furnished with or for equipment such as relief valves, built-in pass and other items of the type.
- The Supplier shall install primary elements for flow, control valves.
- The Supplier shall perform necessary internal matching of pipes for installing orifices, slow nozzles, control valves etc.
- The Supplier shall install all pipes, valves and specialties being procured from other sources.

Testing of Piping

The Supplier shall test all piping systems mentioned below including valves and specialties and instruments as per procedure mentioned under 1.3.4.4.

a) Soft and raw water
b) Hot water and chilled water
c) Air
d) CNG/Diesel (LDO)

- All piping shall be internally cleaned and flushed by the supplier after erection in a manner suited to the service and as directed by the Owner.
- For hydrostatic testing and water flushing, the Supplier shall furnish necessary pumps, equipment, instruments and piping etc.

The details of testing pressure for various pipelines are mentioned below:

S.No.	Name	Test pressure	Test medium
i)	Hot and chilled water pipe lines	4-6 kg/sq cm	Water
ii)	Water pipe lines (Soft, raw, chilled)	4-6 kg/sq cm	Water
iii)	Furnace oil	16 kg/sq cm	Water
iv)	SS pipes	6 kg/sq cm	Water
v)	Air	10-12 kg/sq cm	Air
vi)	Ammonia	20 - 22 kg/cm	Nitrogen

Note:

1) Duration of test shall be 3 hours for all pipes mentioned at i, ii, iii & iv with no allowable pressure drop.
2) For air lines duration of test is 8 hrs with allowable pressure drop of 0.l1 kg/sq. cm able pressure drop of 0.2 kg/sq. cm
3) For ammonia line duration of test is 24 hrs with allow.
4) The vacuum test for complete system should be given for 48 hrs at absolute zero.
5) The Owner/Engineer in–charge shall provide only water at available supply point from which the Supplier's temporary piping shall be connected.

Other Guidelines

- Colour code shall be used to identify pipe material. The supplier shall be able to identify on request all random piping prior to field fabrication.
- The Supplier shall be responsible for the quality of welding done by them and shall conduct tests to determine the suitability of the welding procedure by him.
- All piping supports, guides, anchors, hangers, rollers with structural frame work shall be supplied and erected by the Supplier. The kinds of pipe supports like GI clamps, wooden saddles, roller supports and support framework shall be as per the design approved by the Owner prior to taking up the work.
- All piping shall be suspended, guided and anchored with due regard to general requirements and to avoid interference with other pipes, hangers, electrical conduits and their supports, structural members and equipment and to accommodate insulation, if any and conform to buildings structural limitations. It is the responsibility of the Supplier to avoid all interference while locating hangers and supports.
- Anchors and/or guides for pipelines or for other purposes shall be furnished, when specified, for holding the pipeline in position for alignment. Hangers shall be designed, fabricated and assembled in such a manner that they can not become disengaged by any movement of the support pipes.
- All piping shall be wire brushed and purges with air blast to remove all rust, mill scale from inner surface. The method of cleaning shall be such that no material is left on the inner or on outer surfaces, which will affect the service-ability of the pipes.
- Effective precautions such as capping and sealing shall be taken to protect all pipe ends against ingress of dirt and damage during transit or storage. The outside of the steel pipes (Black) shall be painted with two coats of red oxide paint or as directed by the Owner.

SPECIAL INSTRUCTIONS AND SPECIFICATIONS

All the piping for chilled water, ammonia, soft and, air and furnace oil/FO piping shall generally be of welded construction. Whenever welding is done for pipes of smaller size special care should be exercised to avoid clogging of flow area with the welding material.

INSTALLATION OF PIPING AND EQUIPMENT

Insulation of Chilled Water and Ammonia Pipelines

All the chilled water and ammonia pipe lines shall be insulated by expanded polystyrene or polyurathene foam or any other high grade insulation with pre-formed purchaser. This insulation shall be with pre-formed sections or cast in situ. The insulation with pre-formed sections shall be carried out in the following manner:

- Before starting insulation work all pipe lines shall be tested for 8.5 kg/sq. cm pressure.
- The surface of the pipes to be insulated should be properly cleaned.
- Hot bitumen of 85/40 or 85/25 conforming to IS 702 should be applied uniformly @ 1.5 kg per sq. m on the surface of the pipes.
- A similar layer of bitumen should be applied on the inner surface and on the edges of the insulation sections.
- The sections should then be stuck to the coated pipes with joints staggered adjacent sections should be tightly pressed together.
- All joints should be properly sealed with bitumen.
- A thick vapour seal of hot bitumen @ 2.5 kg/sq.cm should be applied uniformly on the outer surfaces of the pipe sections and allowed to dry.
- In case the insulation sweats or the specified/required insulation properties are not attained, the entire insulation in such region shall be redone with fresh material, entirely at the Supplier's cost.
- The thickness of insulation may be as per Annexure II.

  Note: *In situ* insulation shall be carried out as per standard procedure.

Insulation of Chilled Water Tank

Chilled water tank shall be insulated by expanded polystyrene or polyurathene foam or any other high grade insulation acceptable to the purchaser. This insulation could be in the form of pre-formed slabs or cast *in situ*.

The insulation with pre-formed slabs shall be carried out in the following manner:

- The surfaces shall be cleaned with the help of brushes to remove any loose particles.
- A coat of bitumen of 85/40 or 85/25 conforming to IS 702 at 1.0 kg/sq. m shall be applied over the flooring and alkathene sheets shall be press-laid to act as a vapour barrier.
- Bitumen shall then be applied on the alkathene sheets and one side and edges of the insulation slabs to ensure total rate shall then be fixed in position, making sure that there shall be no joints between slabs.
- For double layers insulation bitumen shall again be applied on all contacting surfaces to ensure a total rates of 1.5 kg/sq. m between contacting surfaces.
- A coat of bitumen at 1.5 kg/sq. m shall be applied over the insulation surfaces.

  Note: *In situ* insulation shall be carried out as per standard procedure.

Insulation of Hot water Pipe Lines

All the hot water pipe lines shall be insulated with mineral wool or equivalent of specified thickness. The insulation shall be carried out in the following manner and should be supplied in the form of properly required sizes.

- Clean the surfaces to be insulated. Apply a coat of red oxide primer and fix glass wool/mineral wool of specified thickness, tightly to the pipes, butting all joints and tie with lacing wire.
- It should then be covered with GI wire netting of 20 mm x 24 SWG.
- In case the insulation does not have the desired insulation properties, the entire insulation will have to be redone at the Supplier's cost to give the desired results.
- Incase of condensate return piping all the steps mentioned above shall be executed except that thickness of the insulation shall be 25 mm.

Aluminium/GI Cladding

- The chilled water, ammonia, water & hot water lines after insulation's shall be covered by Aluminium/GI cladding as per the instructions of Engineer in charge.
- Aluminium cladding will be done with 22 gauge aluminum sheet with proper grooves and overlaps and screwed in position with 12 mm self-tapping parker screws.
- GI sheet cladding will be done with 22 guage sheet with proper grooves and overlaps and screwed in position with 12 mm self tapping parker screw. The GI sheet cladding will finally painted 2 (coats) by approved shade and quality of paint.

FO System- Electrical Auto Tracing and Insulation

FO would be used as fuel for the boilers. All the pipe lines and fittings from tanker unloading to the firing point and storage tanks should be steam/electrically auto traced. The system should maintain the temperature of FO at 80 degree Celsius and designed in such a manner that heating should be stopped as 80 Degree Celsius temperature is attained and should be started when the temperature comes down to 60 degree celsius. The tank piping and fitting shall be insulated with 50 mm thick glass wool/mineral wool and retained with the chicken wire mesh and finally cladded with 22 SWG aluminum sheet.

The characteristics of the LDO/CNG are as under:

Total sulphur % by wt. Max	500 or 50 ppm
Gross Calorific Value (K. Cal/Kg)	
Flash point minimum	61.5° Celsius min.
Water content % by vol. Max	0.05
Sediment % by wt. Max	0.05
Pour point max.	60 degree Celsius
Viscosity, Redwood 1 sec.@70 max	2.0-4.5 cSt @40°C
Kinematic viscosity,	100 degree Celsius
	Min.7 CST
	Max. 14 CST
Ash content % by wt. max	100 ppm max
Density @ 15 degree Celsius	820 (min) to 860 (max) kg/m^3
	820 (min) to 850 (max) kg/m^3

All the necessary materials of quantity and make approved by the Owner, required for carrying out insulation, cladding and other works mentioned above shall be supplied by the Supplier.

INTER CONNECTIONS OF SERVICE AND ELECTRICALS WITH EQUIPMENT.

The Supplier shall lay service piping and provide connections with the equipment complying strictly with the equipment manufacturer's instructions. The Supplier shall also carry out all the interconnecting service piping with the various items of plant/system. The work shall be complete with capillary piping if required and connections with instruments and controls supplied with the equipment.

The Supplier shall also carry out electrical connections for equipment with the control panels including equipment lighting as per the wiring diagrams of the equipment suppliers.

Connections shall be made for small electrical operated devices on equipment installed as accessories to, or assembled with equipment. Connections regarding instruments, float switches, limit switches, pressure switches, thermostats and other miscellaneous equipment shall be done as per manufacturer's drawings & instructions.

GUIDELINES FOR EXPANSION WORK

Shutdowns

Plant shut-down shall be required for making tappings/ interconnections of the new equipment proposed to be installed under expansion with the existing equipment. These shut downs should be planned carefully well in advance to enable the Owner to take suitable actions for ensuring normal plant operations. The details of shut downs; the numbers and duration should be worked out and intimated to the Owner for approval. The Supplier should ensure completion of all the necessary works well within the allowed time so that no inconvenience is caused in regular operation and working of the existing plant.

Cleanliness

Wherever the Supplier is required to work in existing plant area he should take due care and extra precautions to ensure absolute cleanliness and minimum hindrance for proper working of the existing plant.

Change over

The programmes for change over from existing system to new plant system be prepared by Supplier and should be got approved by the Owner.

Modifications and rectification's of existing plant equipment.

During expansion work, the Supplier shall be required to carry out modifications, repairs/replacement of existing equipment. The Supplier without any extra cost will carry out the alterations/modifications specified in the contract/order and or minor in nature requiring not more than 24 man-hours for each item. However, if the modifications are of major nature and not specified in the Contract/order, the Supplier shall be paid for each works based on man-hour rates.

CLEAN UP OF WORKS SITE

All soils, filth or other matters of an offensive nature taken out of any trench, drain or other places shall be deposited on the surfaces, but shall at once carted away by the Supplier from the site of work for proper disposal.

The Supplier shall not store or place the equipment's, materials or erection tools on the drive way passages and shall take care that his work in no restricts or impedes traffic or passage of men, or materials during erection, the Supplier shall with any additional payment, at all time keep the working storage area used by him free from accumulation of dust or combustible materials, waste materials rubber packing, wooden planks to avoid fire hazards and hindrance to other works.

If the Supplier fails to comply with these requirement in spite of written instructions from the Owner, Owner will proceed to clear these areas and the expense incurred by the Owner in this regard shall be payable to the Supplier. Before completion of the work, Supplier shall remove or dispose off in a satisfactory manner all scaffolding, temporary structures, waste and debris and leave the premises in a condition satisfactory to the Owner. And packing materials received with the equipment shall remain as the property of the owner and may be used by the Supplier on payment of standard charges to the Owner and with prior approval of the Owner. At the completion of his work and before final payment, the Supplier shall remove and shall restore the site to neat workman like conditions at his cost.

CLEANING CHEMICALS AND LUBRICANTS

The necessary quantities of cleaning chemicals, lubricants etc., required for the installation, commissioning, testing and start-up of all the equipment till handing over are to be supplied by Supplier and nothing extra would be paid for these.

TESTING, COMMISSIONING AND START-UP

The Supplier shall operate, maintain and give satisfactory trial run of the plant satisfactorily for a period of continuous one week at the rated output. All rectification of damages/defects and routine trouble shooting should be carried out by the Supplier. During this period, Supplier shall incorporate/execute necessary minor modifications for maximising operational efficiency. The Supplier should also execute minor modifications as may be suggested by the manufacture/Owner. The Supplier shall suggest recommended log sheet proformas for recording necessary operating data and pass it on to the Owner in proof of satisfactory rated output and performance of the equipment/plant.

The commissioning shall also include the following for each equipment:

- Field dis-assembly and assembly of equipment, instruments and controls where required for access to fixing or adjustment.
- Clean out of lubrication system including chemical cleaning wherever required.
- Circulation of lubricant to check flow.
- Clean out and check out of all the service lines.
- Check out and commissioning of instruments, equipment and plants, filtering of transformer and other oils so that if deteriorated, they shall attain the required properties/standards, specified tests in this regard must be carried out by approved authorities and their satisfactory reports, submitted to the Owner before start-up.
- Recharging or make-up filling of lubricant oil up to the desired level in the lubrication system of individual machine.
- Operation in empty condition to check general operation details wherever required and wherever possible.
- Closed loop dynamic testing with water wherever required.
- Operation under load and gradual load increase to attain maximum rated output.
- Trouble shooting during the trial period.
- The Supplier shall demonstrate proper working of all mechanical and electrical controls, safety and protective device, in presence of the Owner's engineer and the same should be duly recorded.

Commissioning of automation system:

- The supplier should provide a detailed schedule of testing for all automation and control systems.

- All controlled or monitoring devices on the plant should be tested from the relevant control center and recorded to be operating as designed, including feed back detection.
- A log of these operations is to be maintained, and each completed group of tests to be signed by the supplier's commissioning engineer.
- The purchaser reserves the right to witness as much of these test procedures as he may feel necessary.

After conducting testing, in case particular equipment is not working properly or not giving rated output the Supplier will furnish a detailed report to the Owner stating therein the detailed account on the performance of the equipment with possible reasons for improper working of the same.

The Owner after receipt of report from the Supplier would take up the matter with manufactures and if required would invite the representative of original manufactures. In case the Owner considers that the nonperformance of equipment is only due to inexperience of the Supplier, then the charges incurred for the manufacturer's representative visit would be debited to the Supplier's account.

Further before commencement of testing of commissioning, the Owner reserves the right to invite the original manufacture's representative for start-up help, assist and guide the Supplier during commissioning in the following cases:

a) The supplier has no previous experience of commuting and start-up of the similar equipment.

b) The Owner is of the opinion that the Supplier is not capable to commission and start-up of certain specific equipment.

However, in either of the cases the manufacturer's representatives would be called with prior information to the Supplier and the Supplier will have to extend all co-operation to such representatives in good spirit and in the interest to the work.

After satisfactory commissioning and start-up the Supplier shall keep his representatives under whose supervision the Owner's staff shall be operating and maintaining the plant and equipment for a minimum period of one week. The Supplier's representatives should be present at all times during the running and operation of plant and equipment. During this period the Supplier shall ensure proper working of complete plant and equipment and attend any works required to be done and shall also take complete responsibility for proper operation and maintenance of the complete plant and equipment.

PAINTING

All the equipment/machinery's like motors, pumps, HT/LT panel, transformer, switch boards, stators, junction boxes, isolators, storage tanks, supporting structures, pipe supports and MS/GI pipes and all exposed and visible iron parts included in the scope of erection/commissioning shall be given double coat of paint of approved shade over a double coat of anticorrosive primer wherever necessary, irrespective of the condition of original paint of equipment/machinery's/structures/supports. All surfaces, wherever required must be properly cleaned from scale, dirt and grease prior to painting. Spray painting must preferable be used on all the equipment/machinery's and wherever practicable. Suitable and necessary cleaning/wiping of sight/dial glasses, other non-metallic parts, flooring, walls and other surfaces which have been spoiled by paint during painting must also be carried out by the supplier.

Lettering and other markings, including capacity and flow direction markings, shall also be carried out be the Supplier on the tanks, pipe lines, stators, motors, isolators and

wherever else necessary as directed and as per the standard practice of installation. ISI color codes and color charts as mentioned in Annexure-II must be adhered to.

Code of Practice for Painting of Service Pipelines, Equipment and Structural Work

Painting of Service Pipe Line

On Non-insulated Pipe Line

- Ground colour to be applied throughout the length of the pipeline.
- Colour bands to be applied near every valve and branch connections as well as in every room near the entry.
- The 1st band should be 4" wide and the second band should be 1" wide
- On the 1st band a white arrow to be put to indicate the direction of flow.
- The arrows should be put on the bottom of the pipe lines so that the same are visible from below in case of horizontal bank of pipes and on sides in case of vertical bank of pipes.
- The valves should be painted with the same colour as the ground colour of the pipeline.

On Insulated Pipeline but without Aluminium Cladding

Procedure same as above.

On Insulated Pipeline with Aluminium Cladding

- Ground colour to be applied in a length of 500 mm of the pipe all round near every valve and branch connections as well as in every room near the entry. The complete length of the pipe line should not be painted.
- Colour bands should be applied in the middle of every ground colour strip. The 1st colour band should be 4" wide and the second band should be 1 " wide.
- On the 1st band a white arrow is to be put to indicate the direction of flow of the fluid 4"
- The arrows should be put on the bottom of the pipe lines, so that the same are visible from below in case of horizontal bank of pipes and on sides incase of vertical bank of pipes.
- The valves should be painted with same colour as the ground colour.
- The ground colours and the colours of the 1st and 2nd colour bands have been indicated on the enclosed list for the pipe lines carrying various types of fluid and gases. The list also indicates the shade nos. of the colours to be used. Inc case the exact shade is not available, the nearest possible shade in the same colour may be selected.
- Only synthetic enamel paint should be used for the painting and band markings on the pipe lines and it should be ensured that the finish should be glossy.
- Where no colour bands have been recommended, only the ground colour is to be applied as per the above procedure. If only one colour band is recommended the same should be 4" wide and applied on the ground colour. In case of 2 nos colour bands, the 1st band should be 4" wide and second band 1" wide and should be applied on the ground colour.
- The avoid mixing of colours, it is recommended to apply the bands only after the ground colour paint is dry and subsequently to apply the arrow only after the 1st band paint is dry.

PAINTING OF EQUIPMENT & STRUCTURAL WORK

All storage equipment	Pale cream shade
Outer M.S.	No.352 of ISI
All M.S. Platforms/.Pipe supports/ pipe bridges and any other structures	Dark admiral gray shade No.632 of ISI
Can scrubber, can steaming block, can conveyers, casein press, casein shredder, casein drier, casein grinder, ghee tin seaming machine, equipment trolley, washing trough, feed water tank water softening plant.	Dark admiral gray
Coal handling equipment	Black
Boiler chimneys, power plant Chimney and generator exhaust	Heat resisting epoxy
Refrigeration compressors and Air compressors	Original colour
Air handling units of cold store, deep freeze and butter, Packing, making room Lab including ducting	Aluminium
Spray washer	Lower half in dark aluminum gray & Upper half in aluminum paint or original colour.
Weigh scales	Original colour
Refrigeration plant receiver	Dark admiral gray
Atmospheric condensers	Bitumen paint
HT & LT panels	Original colour
LT distribution switchboards	Dark admiral gray
Softwater	Sky Blue
Raw water	Bus green
DM Water	
CL_2 Water	Nile blue
Ammonia Liquid line	Yellow
Hot gas line	Red
Compressed Air	Green

TRAINING OF PERSONNEL

Necessary staff as may be deputed by the Owner shall be trained by the Supplier for operating the plant. The personnel will be associated for the training during the installation, testing, commissioning and start-up period and the training tenure shall be extended for a minimum period of one month from the date of commissioning and start-up. This training will be a continues process during commissioning and stand by period.

MAINTAINING THE PLANT

In making repairs throughout the plant, conditions of the department – such as high humidity, abundance of water, cold and heat and the particularly corrosive environment found

in certain areas – should be kept in mind at all times. While the use of stainless steel has many advantages, it cannot be used in every situation and newer and different types of materials should not be overlooked. Some departments have such a corrosive environment that galvanized conduit for electrical wiring will last only a few months. Plastic conduit should be used in such locations.

Electrical junction boxes and outlet boxes as well as conduit are available made of rigid polyvinyl chloride (PVC). Approved by Underwriters' Laboratories, the fittings made from this material will not require painting and will not flake as a result of corrosion.

Similarly, Teflon may have distinct advantages for certain applications in the plant. This plastic is easy to clean, will not mix with or harm foods, and is odorless, colourless and non-contaminating. Meat will not stick to it, and it is available as a cementable lining. Epoxy plastics, phenolic based protective coatings and paints are another group of materials that should be considered. All materials that may come in contact with meat products must have USDA approval. The USDA publishes a list of approved materials.

The use of stainless steel also has many advantages. In slaughtering, cutting and sausage departments, type 302 will provide adequate service in most cases. Type 304 should be used if considerable welding has to be done. If welded equipment is to be in contact with salts for fairly long periods, type 304 ELC (extra low carbon) is recommended. This grade prevents contamination that might result from the welds.

Where curing salts are present, Type 316 is satisfactory for drawn parts. Again, for welded equipment, best service is provided by Type 316 ELC. These grades are recommended for conditions such as those encountered in blood cooking, lard rendering and hydrolyzing of animal hair.

Outside Maintenance

The appearance of roofs should be checked twice yearly for general condition, as should such superstructures as skylights, exhaust vents and fire escapes. Roofs will become susceptible to leaks with time and ferrous metal parts will rust unless painted periodically.

Walls also should be checked on the outside at least twice a year. They may be part of a cooler or a freezer, or they may be the backstop for washing operations on a kill floor. Even though the former may be protected with insulation and a membrane and the latter with tile or a splash shield, moisture eventually will seep through. Add to this the outside ambient conditions – and in some parts of the country a temperature spread of 100 degrees between summer and winter is not unusual – and deterioration of the wall is likely.

Tuck pointing or painting may be indicated. Polysulphide and silicone base synthetic rubber caulking should be used as construction sealants for such applications as stone construction sealants for such applications as stone construction, curtain-wall construction and pipe joints.

The floors of animal pens, runways and ramps also should be checked frequently. A hole in the concrete can cause a broken leg, resulting in a "downer" that requires special handling as well as producing possible product loss.

Inside Maintenance:

While ceilings and walls are not subjected to great physical abuse, they must be maintained in a sanitary condition. Concrete ceilings usually require relatively little maintenance unless the surface has spalled. This is usually caused by alternate freezing and thawing in the room. If the room in which the spalling ceiling is located will continue to be subjected to freezing and thawing cycles, then the surface of the concrete must be protected

against further deterioration. Usually, this means applying a layer of insulation over the concrete to protect the concrete surface from rapid temperature changes. The insulation should then be surfaced with a smooth impervious surface such as glass fiber reinforced polyester sheets. If there are no environmental conditions that would cause exposed concrete to deteriorate, maintenance of the concrete ceiling should be limited to an occasional washing if it tends to get dirty. Concrete ceilings should never be painted as it is very likely that the paint will begin to peel off in a short time. This will result in the USDA forbidding operations to be carried on in the area where the paint is peeling. The only sure cure for this problem is to remove all the paint.

Ceilings of Portland cement plaster are similar to concrete ceilings in that they do not require maintenance unless environmental conditions in the room are causing deterioration; if this is the case, the plaster surface must be protected in a similar fashion in that required for concrete.

Wooden ceilings are undesirable and should be covered with sheets of glass fibre reinforced polyester. Metal ceilings are usually not satisfactory in meat processing facilities. Ungalvanized steel requires constant painting. It is difficult to repaint under the conditions found in many rooms which include low temperature and high humidity. These conditions will cause the steel to rust and any dripping of water will cause the department to be closed by the USDA inspectors. Galvanized metals are slightly better but the galvanizing usually found on sheet metal is not very thick so that usually within a short time rust will appear. Aluminum ceilings do not rust but the humidity combined with detergents, sanitizing agents and salt will cause corrosion of the aluminum and the formation of various compounds of aluminum salts that must be removed from the ceiling.

Walls may need bumper plates to protect them against trucks and swinging meat loads. Broken tiles or breaks in the Portland cement finish on walls should be repaired promptly. Walls also should be checked for signs of rodent activity. Mortar joints in masonry walls must be kept pointed up so that the joints are smooth, hard and dense. Portland cement plaster walls should be checked frequently for cracks. These cracks should be promptly filled with Portland cement grout if they are 1/8" wide or greater. Smaller cracks may be chalked.

Portland cement plaster walls which were satisfactory previously may no longer be capable of being maintained in a sanitary condition in rooms where a great deal of clean-up is required. In such a case, the wall surface can be covered with sheets of glass fibre reinforced polyester plastics. The material can be obtained in sheets from 4' x 8' in size up to much larger sizes. The largest practical size should be used since the number of joints will be reduced. It costs more money to provide sanitary joints and the joints are usually the part of the wall that becomes unsanitary.

The control of mold always has been a serious problem for the meat processor, since its presence can cause considerable economic loss. Mold contaminates the air, grows on walls and ceilings and eventually contaminates products. The use of fungicides in paint to combat this problem has been studied extensively.

There are a number of factors that must be considered in selecting the proper fungicide. Once determined, the paint companies should include the material in the paint to prepare it properly while still retaining its other qualities. The proper fungicide must be:

1. Toxic to all types of fungi, but not to man in the concentration used.
2. Harmless to the material to which it is applied.
3. Tasteless and odorless
4. Acceptable to government regulatory agencies.
5. Unable to give an unpleasant colour to the paint.

Various types of proprietary enamels and coatings are available for cooler walls and ceilings. The coatings should be odor-free, easy to apply, USDA approved and should dry to a smooth finish. The fact that these coatings probably must dry at room temperature which may be in the neighborhood of 32^0F must be taken into consideration.

Condensation on ceilings is another problem the engineer may be called upon to solve rather frequently. Often the best way to prevent condensation is to direct air circulation against the ceiling. Even at relatively high humidity, if the air is circulated fast enough it will often absorb the moisture and dry the ceiling.

Under more severe conditions of temperature and humidity, it may be necessary to heat the surface of the ceiling above the dew point of the air in order to prevent condensation. While it seems like a waste of energy to apply heat, especially in a refrigerated room, this may be the only way in which a department can be kept operating under conditions of very high humidity.

Floors may be subjected to grease, oil, water, blood, salt and heavy trucking. These factors combine to erode concrete and in some cases, the grout used on sanitary brick floors. Proprietary materials of various types are available for repairing damaged floor surfaces. Many of these are epoy, polyester or similar plastic formations intended for thin (1/8" to ¼") toppings bonded to the old floor. The bond to the old floor is extremely important and it is often very difficult to get the old floor clean enough so that the new toppings will adhere to it. Even if a good bond is obtained, it must be recognized that the expansion and contraction rate of the thin plastic topping is considerably different from that of the brick or concrete floor below. This means that if the thin toppings are used in refrigerated rooms where the floor is cleaned up with hot water, the temperature differences of the floor will cause different amounts of expansion and contraction in the topping and the old floor beneath which will eventually break the bond between the topping and the old floor, at which time the topping will peel off.

In old multistory plants, membranes incorporated into the flooring structures as a preventive measure against leaks may crack, allowing fluids to seep through. This type of damage is particularly hard to repair, since the point where the fluids leak through the membrane and the point where they drip from the ceiling may be many feet apart. One method of repairing such a leak that has met with some success is to force a sealing solution under air pressure between the layers of the floor. To stop the leakage, several applications may be necessary with the drill points where the material is forced into the floor considerable distances part. This method, however, usually is not effective for more than a year or so. For permanent repair it is necessary to take up the floor topping, find the leak, repair the membrane and replace the floor.

Valves in steam lines and in hot water, cold water and refrigeration lines should be checked frequently. Small leaks, if left unchecked, will develop into large leaks; no matter what the size, wasted utilities mean money thrown away. On valves, bonnets may need tightening, packing may need replacing, or seats may need grinding.

The majority of steam, hot water and cold water valves are found on the kill floors and in the rendering department; refrigeration valves are found in coolers, freezers and in engine rooms. Leaking ammonia valves make themselves known immediately because of the pungent odor of the ammonia gas. Ammonia leaks occurring in loaded coolers must be repaired with haste, since exposure of meats to any concentration of ammonia makes them unfit for sale.

Steam traps of which there may be a considerable number in the rendering department and in the sausage department, also must be checked frequently. They should operate correctly in that they pass condensate promptly but prevent steam from blowing through. One method of checking on the operation of steam traps is to place a portable pyrometer on the discharge

pipe of the trap and check temperatures while the equipment which the trap drains is in operation.

Traps must be sized properly for the steam load and condensation rate of the equipment to which they are attached. Incorrect sizing can slow down processing considerably. To help start up equipment quickly, thermostatically vented traps or bleeder lines that bypass the traps can be used to remove the cold condensate and non-condensable.

All equipment that has moving parts should be lubricated regularly with due attention given to operating speeds of the parts, bearing loads and temperatures of the environment in which the equipment operates. Cooler doors should be checked for ease of operation and closure tightness. Gaskets and the hardware used on doors become worn or damaged with time and must be replaced. If electrically operated, the opening and closing mechanism of a door may need adjusting from time to time.

Maintaining the Departments:

A preventive maintenance program of any sort takes into account where much mechanical equipment is in operation, where a breakdown would be most critical and during what periods of the normal work week the departments are inoperative and therefore are available for maintenance work. In such a program, top priority must be given to the kill floors, with the cutting and rendering departments also high on the list.

Slaughtering Departments:

At plants where killing floors do not start operating until noon on Mondays. Monday mornings are a good time to schedule detailed maintenance. For the balance of the week, operations usually run from 7 a.m. until 3.30 p.m. Thus, another opportunity is presented late in the day (or at night) for maintenance. In addition, killing crews usually have two 15-minutes break, one in the morning and one in the afternoon. In some plants these breaks as well as the noon lunch time are used to change blades on mechanical saws and to adjust any machines that are not operating perfectly.

Since a stoppage of the dressing chain in almost all plants stops the complete slaughtering process, with resultant pay for waiting time as well as loss of production, the smooth continuous operation of the kill floors is critical. A prolonged stoppage could even result in loss of those carcasses that are partially dressed. For these reasons, a maintenance man frequently is stationed on or near the kill floor. Some plants even have a small room near or above the kill floor where spare parts are kept for any equipment that can be expected to become inoperative.

On beef-kill floors, operations of hoists and their limit switches must be checked as must conveyor drives and all other mechanical devices and hand tools. All should be lubricated regularly, with care being taken that no oil or grease will drip on carcasses during the operation.

Rendering Department:

Start-up of the rendering process usually lags half an hour to an hour behind the start of the slaughtering operations but continues for a considerable length of time after the killing operations are concluded. Thus Monday mornings are also a good time for checking the equipment in this department. Where more than one cooker is used, leeway is available in situations where a cooker may have to be kept out of operation for a few hours.

Practically all pieces of equipment in this department need checking. Bone hogs or shredders have knives which are mounted in slots and thus can be moved in or out. These knives must be adjusted for wear to keep the size of the bone pieces within desired limits. If

hammer mills are used, the hammers will wear the usage and eventually kust be turned or replaced. Hashers must be checked for alignment of blades, sharpness of blades and general condition of the machine.

On the cookers, pressure gauges and thermometers should be kept in good working order and calibrated if necessary. If dry-rendering cookers are used and they are operated under vacuum, stuffing boxes, heads and discharge doors must be maintained to insure air tightness. Even if the cookers are not operated under vacuum, they must seal tightly against internal pressure and against leakage of tallow or partially rendered materials.

In dry-rendering cookers, and in some blood dryers, paddles are used to keep the mass rotating and to keep the heat-transfer surface of the shell clean. These agitators must be checked to be sure they are in good condition and the clearance between their shoes and the shell is correct. The shells of the melters and blood dryers must be checked for wear, which usually shows at the bottom of the vessel. Some shells can be turned to compensate for wear, thus prolonging their life.

In plants where the wet-rendering process is employed, the tanks are constructed of heavy steel because they are subject to considerable corrosion. This is particularly evident around the heads and joints. Eventually, these tanks become so corroded and the shell so thin that they are unsafe to operate and must be replaced.

Mechanical or extraction presses must be checked periodically for wear of their worms and cages. Replacement of these parts is a major operation that must be scheduled during a period when considerable time is available.

Like bone shredders, mills used for grinding cracklings must be checked for wear and, when necessary, the hammers or other impact-wearing parts must be replaced.

In rendering departments, particular attention should be given to heating coils wherever they are located to assure their tightness. Leaks from coils contribute water to lard or tallow; at best they help nothing and at worst they can lower the selling price of the product. Similarly, evaporators must be tight and operating under sufficient vacuum.

In rendering, tallow or lard departments, no copper should be used under any circumstances. This means no brass valves, cocks, pump rods or stuffing boxes. Copper is detrimental to the keeping qualities of the product; since brass is an alloy containing large amounts of copper, it too is not useable.

CHAPTER – XVII

FORWARD LINKAGES

The total population of Bareilly UA/Metropolitan region is 979,933.

Proposed capacity of Modern Slaughterhouse at Bareilly

Sr. No.	Species	No. of Animals to be Slaughtered			Meat Production (Tons)	
		Per Shift	Per Day	Per Annum	Per Day	Per Annum
1.	Buffalo	100	200	60000	22	6600
2.	Goat/sheep	275	550	165000	5.5	1650
	Total	**375**	**750**	**225000**	**27.5**	**8250**

The major quantity of carcass required for the consumption of the local population shall be distributed through the existing licensed meat selling outlets.

Meat Marketing in Bareilly

The following categories of meat shops are located in Bareilly City

- Shops selling goat/sheep meat
- Shops selling goat/sheep meat & poultry
- Shops selling Poultry
- Shops selling bufallo meat
- Shops selling Pig meat

There are number of Licensed and Unauthorized meat shops in Bareilly city and nearby towns. About 200 licensed and 20 unauthorized shops of buffalo meat and 100 licensed goat / sheep meat shops are available in Bareilly city alone as reported by Municipal Corporation.

Presently, meat shops are operating under unhygienic conditions and do not follow any food safety norms. The available infrastructure is neither upto the standards and norms required for selling meat food products nor is customer friendly in terms of display, cutting and other services as packaging and personal hygiene.

Modernization of Existing Shops and Establishing new Model Meat Outlets

The existing shops need to be upgraded to the food safety norms keeping in view the scope and limitations. Also the meat sellers may be encouraged to make new model meat shops in the entire of Bareilly and surrounded districts. Additionally a Modern Model Meat Outlet should have the following minimum requirement:

Details of the Model Meat Retail shop

Location of the Retail Outlets:

If it is feasible, a meat market should be developed, which shall preferably be located at a place away from vegetable, fish or other fruit market and shall be free from undesirable odour, smoke, dust and other contaminants. The place should have the main services, such as portable water supply, electricity and proper hygienic waste disposal facility. The selection of the sale outlets should be done keeping in mind the above facility.

Size of the Outlet:

The minimum space required for the sale of raw meat and processed products of mutton and chicken should be 200 sq. feet. Fish should not be allowed to be sold in the same premises, except for the packed and frozen fish and its products.

Lay Out of the Outlet:

The typical layout of the meat stall for sale of the meat is described in the IS 7053: 1996 – Indian Standard: Meat and Meat Products – Basic Requirements for a Stall for Sale of Meat of Small and Large Animals. However, the sale counter or entry room should have sufficient space to accommodate at least one display counter (5 x 3 feet), one deep freezer of at least 150 lit. capacity and one marble top raised platform for sales counter. There will be a provision of at least one fly killer (18"x 2 tubes), air curtain (1.2 meter), geyser (25 lit. capacity), SS wash basin, rack / box for keeping butcher knives, packaging materials etc.

The entire meat shop will have an aesthetic ambience thereby eliminating traces of wastage disposal in the surroundings. The Consumers shall be tempted to buy more frequently under such pleasant conditions.

Transport:

The meat and meat products must be transported in refrigerated vans right from the slaughterhouse to the retail shops. Carcass & meat must be handled by machines and tools while loading and deloading following hygienic norms.

Export to Other Cities:

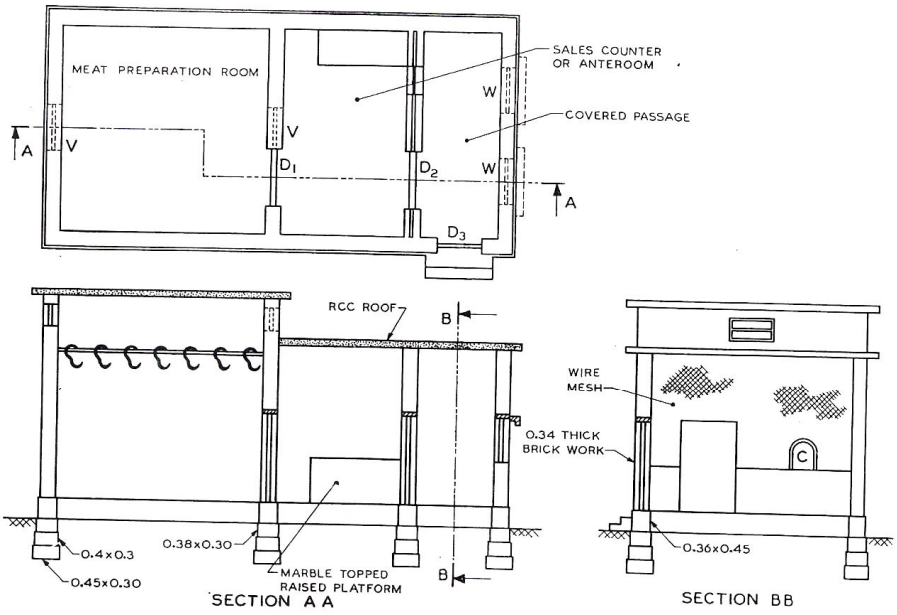
The Modern Slaughterhouse will have the frozen and cold room facilities.

The surplus goat and sheep which are sent as live animal to different cities may be slaughtered and send as frozen carcass. This shall reduce the economical expenditure of transporting, maintaining live animals, reduce deaths on the way and minimize transfer of infection or disease.

Marketing of Hides and Skins

Hides and skins of animals are valuable by-products from slaughterhouse. There are traders who collects them from slaughterhouses and supply to the users, i e tannery, leather markets, etc.

TYPICAL LAYOUT OF MEAT STALL



D_1 = Wooden Door 2×1.2
D_2 = Wooden Door with Wire Mesh 2×1.2
D_3 = Wooden flush Door 2×1
W = Wooden Window 1.4 × 1
V = Wooden Ventilator 1 × 0.6
C = Wooden Counter Window 0.45 × 0.45

All dimensions in metres.

List of Equipments for Retail Outlet

Sl. No.	Equipment description
1	Display Counter at -15^{0}C temp - min 5ft x3 ft)
2	Deep freezer at -20^{0}C+ temp
3	Gen Set – 5 KVA
4	Fly killer - 18”x 2 tubes
5	Air curtain - 1.2 meter)
6	Electronic Wt. Scale with printer – 10 kg capacity
7	Butcher's Table – SS – 3 x 2 feet
8	Butcher's knives – set of 6 pieces
9	Cutting Sheet/ Chopping pad – 2 x 3 feet
10	Packaging Material – made of food grade plastics (IS 10171 : 1987)
11	Crates, Display Trays Butcher's aprons etc Q.S.
12	Geyser – 25 lit. capacity
13	Defrost-microwave –Optional
14	Sitting Chair
15	Miscellaneous

CHAPTER – XVIII

PROJECT COST &SOURCES OF FUNDS

PROJECT COST WITH BUFFALO AND GOAT / SHEEP SLAUGHTERLINES

S. No.	Particulars of the work	Estimated Cost (cr.)	Estimated Cost	Service component	Total
1	**Site development,**				
1.1	Land development, Road, drainage, Horticulture work, miscellaneous services etc.	0.30			
	Sub - total		**0.30**	**50%**	**0.15**
2	**Civil Works**				
2.1	Lairage Buffalo (200 buffalo), Goat/ sheep (550 goat)	0.45			
2.2	Rendering Plant Building	0.30			
2.3	ETP (68 KLD) civil	0.40			
2.4	Internal road work	0.10			
2.5	Electric room, pump house, rest room	0.20			
2.6	Overhead water tank	0.20			
2.7	Parking space	0.10			
2.8	Buffalo slaughter hall	0.90			
2.9	Sheep / goat slaughter hall (Halal)	0.45			
2.10	Sheep / goat slaughter hall (Jhatka)	0.45			
2.11	Chiller Room	0.20			
2.12	Process Hall	Private Partner Expenditure			
2.13	Cold Room - two	Private Partner Expenditur			
2.14	Administrative Block	0.15			
	Sub - total	**3.90**	**3.90**	**50%**	**1.95**
3	**Plant & Machinery**				
3.1	Goat/sheep (Halal)	2.40			
3.2	Goat/sheep (Jhatka)	2.40			
3.3	Buffalo	4.00			
3.4	ETP – Mechanical	0.60			
3.5	Rendering Plant- Mech	2.80			
3.6	Lairage building – Mech	0.10			
	Sub Total	**12.30**	**12.30**	**15%**	**1.85**
4	**Electrical works**				
4.1	Panel Boards, Electric cables, fittings, street lights etc.	0.60			
4.2	DG sets	0.25			
	Sub Total	**0.85**	**0.85**	**20%**	**0.17**

5	**Common utilities**				

5.1	Personal hygiene equipments / Laboratory equipments	0.10			
5.2	Hot water generator, boiler, pumps & piping	0.40			
5.3	Air compressor & piping	0.20			
5.4	Cold water supply, pumps & piping / Water softening Plant	0.10			
5.5	Fire fighting system	0.10			
	Sub Total	**0.90**	**0.90**	**20%**	**0.18**
6	**Cold chain system**				
6.1	Chillers, Plate Freezer, Blast Freezer, Cold Storage	1.75			
6.2	Refrigerated Vans - 2	0.45			
	Sub total	**2.20**	**2.20**	**15%**	**0 .33**
	Total from 1 to 6		**20.45**		
7	**Miscellaneous**				
7.1	Backward & Forward linkage, Telephone, Office furniture, Personal computer, photocopier, fax, printer, etc.	0.35		20%	0.07
7.2	Consultancy fee @3% of 20.45crores	0.61		100%	0.61
7.3	TA/ DA for official visit to Modern slaughter houses in India	0.02		10%	0.002
7.4	Deposit for electric sub-station	0.25			0
7.5	Contingency @3% of 20.45 crores	0.61		10%	0.06
	Sub Total	**1.84**	**1.84**		**0.74**
	Grand Total		**22.29**		**5.37**
8	**Service Tax @12.36% of the service component Rs. 4.53**		1.33		
	Grand Total		**23.62**		
	Total Project Cost		**Or Rs. 24.00 Crores**		

Sources of funds

ESTIMATED SOURCES OF FUNDS

(Rs. in Cr)

S.No.	PARTICULLARS	AMOUNT
1.	Grant in Aid From Central Government (MFPI) (50% of 21.00)	10.50
2.	Investment from Bareilly Municipal Corporation / Private investor	13.50
	Total funds	**24.00**

Assumptions:

1. MFPI will sanction grant-in-aid of the 50% of cost of TCW and Plant & Machinery of the project.
2. Bareilly Municipal Corporation / Private investor will contribute towards balance of the total project Cost.

The Slaughterhouse will be given on Lease or on PPP mode to Private Entrepreneur, who will make the Slaughterhouse available for I shift for Service Slaughtering, while the II Shift will be used by him for commercial purpose. Private Entrepreneur will share the expenditure of Rs. 13.50 crore on PPP model..

The Private Entrepreneur will be selected through an open bid system based on the amount of annual lease rent which it would pay to the Bareilly Municipality.

ASSUMPTIONS/ PARAMETERS CONSIDERED FOR OPERATING COST AND PROFITABILITY

A. PROJECT CAPACITY

Sr. No.	Species	No. of Animals to be Slaughtered			Meat Production (Tons)	
		Per Shift	Per Day	Per Annum	Per Day	Per Annum
1.	Buffalo	100	200	60000	22	6600
2.	Goat/sheep	275	550	165000	5.5	1650
	Total	**375**	**750**	**225000**	**27.5**	**8250**

B. CAPACITY & SHIFT UTILIZATION

Particulars	Year1	Year2	Year3	Year4	Year5 onwards
Buffalo	80	80	80	90	100
Goat/Sheep	80	80	80	90	100

First shift of the project shall be used for only Service slaughtering, as per the norms and guidelines of the Municipal Corporation and the 2nd shift shall be used for commercial purposes by the selected operator of the slaughter house.

C. POWER AND UTILITES

Power and utilities estimates considered at prevailing market rates.

D. REPAIRS & MAINTENANCE

Repairs and maintenance considered at 2% on buildings and 3% on Plant and machinery.

E. DEPRECIATION

Depreciation is considered on Straight Line Method (SLM).

F. REVENUE STREAMS

Following assumptions were considered for arriving input and output cost.

1. License Fees for Service Slaughtering.

Slaughter Line	License Fee	Particulars
Large Animal	150	First Shift
Goat	100	First Shift

G. Other Revenue Streams

Particulars	Large Animal	Goat
Meat Sales (Per KG)	150	225
Skin Sale (Per Piece)	300	100
Bone Meal Sales	13	13
Sale of Fat (per Ltr)	20	20
Purchase Price (per Animal)	14,400	2,000
Meat Recovery Per Animal (Kg)	110	10
Blood Recovery	8%	5%
Bone Recovery	35%	30%

Profitability Projections for Modern Slaughter House at Bareilly

	Construction Period		Operational Periods							
Concession Year	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**
Operational Year	**Year 0**	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**
Operating Revenues										
License Fees Large Animals (shift I)			44	44	44	49	55	55	55	55
License Fees Got (shift I)			80	80	80	90	100	100	100	100
Meat Sales -Large Animal			4818	5420	6023	6324	6625	6926	7227	7528
Meat Sales -Goat			1807	2033	2258	2371	2484	2597	2710	2823
Gross Operating Revenues			**6749**	**7577**	**8405**	**8835**	**9264**	**9678**	**10093**	**10507**
Operating Expenses										
Cost of Feedstock procurement			5811	6537	7264	7554	7845	8135	8426	8716
Repairs & Maintenance			120	120	120	168	168	168	216	216
Administration Expenses			58	65	73	76	78	163	169	174
Power & Utilities			95	95	95	95	95	95	95	95
Salaries & Wages			174	196	218	229	240	251	262	272
Other Ovrheads			29	33	36	38	40	42	44	45
Gross Operating Expenses			**6287**	**7046**	**7805**	**8159**	**8466**	**8853**	**9210**	**9519**
Gross Operating Profits (PBIDT)			**462**	**531**	**600**	**675**	**799**	**825**	**882**	**987**
GOP %			7%	7%	7%	8%	9%	9%	9%	9%
Depriciation			442	349	276	219	175	140	112	91
Interest			0	0	0	0	0	0	0	0
Profit Before Taxation (PBT)			**19**	**182**	**323**	**456**	**624**	**686**	**770**	**897**
Taxation			47	83	118	153	202	219	244	284
Profit After Taxation (PAT)			**(27)**	**98**	**205**	**303**	**422**	**467**	**526**	**613**

IRR		-1200	-1200	415	447	482	522	596	607	639	704
npv		23%									
IRR		-1200	-1200	462	531	600	675	799	825	882	987
		27%									
equity IRR	₹ 303,379,843.28										
Equity NPV				415	447	482	522	596	607	639	704
	-1350	(420)	(630)	415	447	482	522	596	607	639	704
				41%							
	₹ 43,384,582.13										

Amount in Rs. Lakh

Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30
Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28
55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55
100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
7829	8131	8432	8733	9034	9335	9636	9937	10239	10540	10841	11142	11443	11744	12046	12347	12648	12949	13250	13551
2936	3049	3162	3275	3387	3500	3613	3726	3839	3952	4065	4178	4291	4404	4516	4629	4742	4855	4968	5081
10921	**11335**	**11749**	**12163**	**12577**	**12991**	**13405**	**13819**	**14233**	**14647**	**15061**	**15475**	**15889**	**16303**	**16717**	**17131**	**17545**	**17959**	**18374**	**18788**
9007	9297	9588	9879	10169	10460	10750	11041	11331	11622	11912	12203	12494	12784	13075	13365	13656	13946	14237	14528
216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216	216
180	186	288	296	305	314	323	331	340	349	357	366	375	384	392	401	410	418	427	436
95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
283	294	305	316	327	338	349	360	371	381	392	403	414	425	436	447	458	469	480	490
47	49	51	53	54	56	58	60	62	63	65	67	69	71	72	74	76	78	80	81
9828	**10137**	**10542**	**10854**	**11166**	**11478**	**11790**	**12102**	**12414**	**12726**	**13038**	**13350**	**13662**	**13974**	**14286**	**14598**	**14910**	**15222**	**15534**	**15846**
1092	**1197**	**1206**	**1308**	**1411**	**1513**	**1615**	**1717**	**1819**	**1921**	**2023**	**2125**	**2227**	**2329**	**2431**	**2533**	**2635**	**2737**	**2840**	**2942**
10%	11%	10%	11%	11%	12%	12%	12%	13%	13%	13%	14%	14%	14%	15%	15%	15%	15%	15%	16%
74	60	49	41	34	29	24	21	18	16	14	12	11	10	9	8	7	7	6	6
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1019	**1137**	**1157**	**1268**	**1376**	**1484**	**1590**	**1696**	**1801**	**1905**	**2009**	**2113**	**2216**	**2319**	**2422**	**2525**	**2628**	**2731**	**2833**	**2936**
323	361	367	404	440	475	510	545	580	614	650	683	717	751	785	818	852	885	919	952
696	**776**	**790**	**864**	**937**	**1009**	**1080**	**1151**	**1221**	**1291**	**1360**	**1429**	**1499**	**1568**	**1638**	**1707**	**1776**	**1845**	**1914**	**1983**
770	836	839	905	971	1037	1164	1172	1239	1307	1373	1442	1510	1578	1646	1715	1783	1852	1921	1989
1092	1197	1206	1308	1411	1513	1675	1717	1819	1921	2023	2125	2227	2329	2431	2533	2635	2737	2840	2942
770	836																		
770	836	839	905	971	1037	1104													

Projected Cash Flow Statement

	Construction period		Operational Year							
Concession Year	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**
Operational Year	**Year-0**	**Year-0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**
SOURCES OF FUNDS:										
Equity Share Capital	(1350)	0								
Grant	0	(1050)								
PBIDT			462	531	600	675	799	825	882	987
Working Capital Borrowings		0	0							
TOTAL (A)	**(1350)**	**(1050)**	**462**	**531**	**600**	**675**	**799**	**825**	**882**	**987**
DISPOSITION OF FUNDS:										
Capital Expenditure	(1350)	(1050)								
Interest on Term Loan			0	0	0	0	0	0	0	0
Tax			47	83	118	153	202	219	244	284
Repayment of Loans			0	0	0	0	0	0	0	0
TOTAL (B)	**(1350)**	**(1050)**	**47**	**83**	**118**	**153**	**202**	**219**	**244**	**284**
Opening Balance			0	415	862	1344	1866	2462	3069	3708
Surplus			415	447	482	522	596	607	639	704
Closing Balance			415	862	1344	1866	2462	3069	3708	4411

Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18
1092	1197	1206	1308	1411	1513	1615	1717	1819	1921
1092	**1197**	**1206**	**1308**	**1411**	**1513**	**1615**	**1717**	**1819**	**1921**
0	0	0	0	0	0	0	0	0	0
323	361	367	404	440	475	510	545	580	614
0	0	0	0	0	0	0	0	0	0
323	**361**	**367**	**404**	**440**	**475**	**510**	**545**	**580**	**614**
4411	5181	6018	6856	7761	8732	9769	10874	12045	13284
770	836	839	905	971	1037	1104	1172	1239	1307
5181	6018	6856	7761	8732	9769	10874	12045	13284	14591

Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30
Year 19	**Year 20**	**Year 21**	**Year 22**	**Year 23**	**Year 24**	**Year 25**	**Year 26**	**Year 27**	**Year 28**
2023	2125	2227	2329	2431	2533	2635	2737	2840	2942
2023	**2125**	**2227**	**2329**	**2431**	**2533**	**2635**	**2737**	**2840**	**2942**
0	0	0	0	0	0	0	0	0	0
650	683	717	751	785	818	852	885	919	952
0	0	0	0	0	0	0	0	0	0
650	**683**	**717**	**751**	**785**	**818**	**852**	**885**	**919**	**952**
14591	15964	17406	18916	20494	22140	23855	25639	27491	29411
1373	1442	1510	1578	1646	1715	1783	1852	1921	1989
15964	17406	18916	20494	22140	23855	25639	27491	29411	31400

Projected Balance Sheet

Concession Year	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Operational Year										
PARTICULARS				**0**	**0**	**0**	**0**	**0**	**0**	**0**
LIABILITIES:										
Equity Share Capital			1350	1350	1350	1350	1350	1350	1350	1350
Reserves & Surplus			0	(27)	71	276	579	1000	1467	1994
Grant			1050	1050	1050	1050	1050	1050	1050	1050
Total Liabilities			**2400**	**2373**	**2471**	**2676**	**2979**	**3400**	**3867**	**4394**
ASSETS:										
Gross Block			2400	2400	2400	2400	2400	2400	2400	2400
Depreciation			0	442	791	1068	1287	1462	1602	1714
Net Block			2400	1958	1609	1332	1113	938	798	686
Net Current Assets			0	415	862	1344	1866	2462	3069	3708
Total Assets			**2400**	**2373**	**2471**	**2676**	**2979**	**3400**	**3867**	**4394**
			0	0	0	0	0	0	0	0

Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
0	**0**	**0**	**0**	**0**	**0**	**#REF!**	**0**	**0**	**0**
1350	1350	1350	1350	1350	1350	1350	1350	1350	1350
2607	3303	4079	4869	5733	6670	7678	8758	9909	11130
1050	1050	1050.00	1050.00	1050.00	1050.00	1050.00	1050.00	1050.00	1050.00
5007	**5703**	**6479**	**7269**	**8133**	**9070**	**10078**	**11158**	**12309**	**13530**
2400	2400	2400	2400	2400	2400	2400	2400	2400	2400
1805	1878	1938	1988	2028	2062	2091	2115	2136	2154
595	522	462	412	372	338	309	285	264	246
4411	5181	6018	6856	7761	8732	9769	10874	12045	13284
5007	**5703**	**6479**	**7269**	**8133**	**9070**	**10078**	**11158**	**12309**	**13530**
0	0	0	0	0	0	0	0	0	0

Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30
0	**0**	**0**	**0**	**0**	**0**	**#REF!**	**0**	**0**	**0**
1350	1350	1350	1350	1350	1350	1350	1350	1350	1350
12421	13781	15210	16709	18278	19915	21622	23398	25243	27157
1050.00	1050.00	1050.00	1050.00	1050.00	1050.00	1050.00	1050.00	1050.00	1050.00
14821	**16181**	**17610**	**19109**	**20678**	**22315**	**24022**	**25798**	**27643**	**29557**
2400	2400	2400	2400	2400	2400	2400	2400	2400	2400
2170	2183	2196	2206	2216	2225	2233	2241	2247	2254
230	217	204	194	184	175	167	159	153	146
14591	15964	17406	18916	20494	22140	23855	25639	27491	29411
14821	**16181**	**17610**	**19109**	**20678**	**22315**	**24022**	**25798**	**27643**	**29557**
0	0	0	0	0	0	0	0	0	0

TAX CALCULATIONS

PARTICULARS	YR-I	YR-II	YR-III	YR-IV	YR-V	YR-VI	YR-VII
PROFIT BEFORE TAX	19	182	323	456	624	686	770
ADD DEP. AS PER COMP. ACT	442	349	276	219	175	140	112
PBDT	462	531	600	675	799	825	882
LESS DEP. AS PER IT ACT	317	274	236	203	176	152	131
ADJUSTED PROFIT	144	257	364	472	623	674	751
CARRY FORWARD PROFIT/ LOSS	144	257	364	472	623	674	751
TAX =MAT+SURCHARGE	4	36	65	91	125	137	154
TAX=REGULAR+SURCHARGE	47	83	118	153	202	219	244
TAX PAYABLE	**47**	**83**	**118**	**153**	**202**	**219**	**244**
				271.12	77	194	

YR-VIII	YR-IX	YR-X	YR-11	YR-12	YR-13	YR-14	YR-15	YR-16	YR-17	YR-18
897	1019	1137	1157	1268	1376	1484	1590	1696	1801	1905
91	74	60	49	41	34	29	24	21	18	16
987	1092	1197	1206	1308	1411	1513	1615	1717	1819	1921
113	98	85	74	64	55	48	42	36	32	28
874	994	1112	1133	1245	1355	1464	1573	1680	1787	1893
874	994	1112	1133	1245	1355	1464	1573	1680	1787	1893
179	204	228	231	254	275	297	318	339	360	381
284	323	361	367	404	440	475	510	545	580	614
284	**323**	**361**	**367**	**404**	**440**	**475**	**510**	**545**	**580**	**614**

YR-19	YR-20	YR-21	YR-22	YR-23	YR-24	YR-25	YR-26	YR-27	YR-28	YR-29	YR-30
2009	2113	2216	2319	2422	2525	2628	2731	2833	2936	13058	14873
14	12	11	10	9	8	7	7	6	6	5	5
2023	2125	2227	2329	2431	2533	2635	2737	2840	2942	13063	14878
24	21	18	16	14	12	11	9	8	7	6	6
2002	2107	2211	2315	2419	2523	2626	2729	2832	2935	13058	14878
2002	2107	2211	2315	2419	2523	2626	2729	2832	2935	13058	14878
402	423	443	464	485	505	526	546	567	587	2613	2976
650	683	717	751	785	818	852	885	919	952	4237	4827
650	**683**	**717**	**751**	**785**	**818**	**852**	**885**	**919**	**952**	**4237**	**4827**

CHAPTER – XIX

STATUTORY AND RECOMMENDATORY REGULATIONS FOR ESTABLISHMENT AND RUNNING OF SLAUGHTERHOUSE

Statutory Regulations

There are various Government agencies from which permission / NOC for establishment modern abattoir is required to be taken. The detail of these statutory regulations along with copies of the relevant Act, Rules, Guidelines are as under: -

1. Permission from the Ministry of Environment and Forests, Government of India under their notification as published in the Gazette of India, Extraordinary Part-II - Section-3 - Sub-Section (ii), after conducting Environment Impact Assessment (EIA) study of the project. The contact person is:

   Director (IMPACT ASSESMENT)
   Paryavaran Bhawan, CGO Complex, Lodi Road
   New Delhi-110003
   Tele:011-24360695, 26253878

2. Permission from the State Pollution Control Board under Environment Protection Act 1986. The Contact address is:

   Uttar Pradesh Pollution Control Board
   PICUP Bhawan
   3rd Floor, B-Block
   Vibhuti Khand, Gomti Nagar
   Lucknow-226010 (U.P)
   Tele : 0522-2720831, 2720681, 2720691
   Fax : 0522-2720764
   E-mail : info@uppcb.com

3. Permission from the Director General Civil Aviation, Government of India under the Air Craft (Amendment) Act 1988 (No. 58 of 1988). The contact person is:

   DIRECTOR GENERAL, CIVIL AVIATION
   Opposite Safdarjang Air port
   New Delhi.

4. Implementation of prevention of cruelty to animals rules 2000 **under the Prevention of Cruelty to Animals Act, 1960** notified on 26th March 2001 in relation to transport of animal on foot, and slaughterhouse.

   Copies of the relevant rules under SPCA are annexed as **Annexure - I & II.**

5. Implementation of various regulations of Market and Slaughterhouses Municipal Corporations Act.

ANNEXURE - I

NOTIFICATION

New Delhi, the 26th March, 2001

S.O.-268 (E) - Whereas the draft **Prevention of Cruelty to Animals (Transport of Animals on Foot) Rules, 2000** were published as required by sub-section (1) of section 38 of the Prevention of Cruelty to Animals Act, 1960 (59 of 1960), under the notification of the Government of India in the Ministry of Social Justice and Empowerment number S.O. I 163(E) dated the 26th December 2000 in the Gazette of India, Extraordinary, Part II, Section 3, Sub Section (ii) dated the 27th December, 2000 inviting objections and suggestions from all persons likely to be affected thereby, before the expiry of the period of sixty days from the date on which copies of the Gazette containing the said notification are made available to the public.

And, whereas copies of the said Gazette were made available to the public on the Ist January, 2001.

And, whereas no objection or suggestion has been received from the public in respect of the said rules by the Central Government.

Now, therefore, in exercise of the powers conferred by sub-sections (1) and (2) of section 38 of the Prevention of Cruelty to Animals Act, 1960 (59 of 1960), the Central Government hereby makes the following rules, namely:

1. Short title and commencement :

(1) These rules may be called the **Prevention of Cruelty 5 to Animals (Transport of Animals on Foot) Rules, 2001**

(2) They shall come into force on the date of their publication in the Official Gazette.

2. Definitions.- In these rules unless the context otherwise requires

a. "animal" means livestock and includes the following animals namely -

(i) cattle including cow, bulls and bullocks, buffalo bulls and bullocks, cows, buffaloes, Mithuns, yaks and calves.

(ii) equines includings horses, ponies, mules and donkeys.

(iii) horse including entires (stallions), goldings, brood mares, colts and fillies

(iv) goat including adult goat, male or female of two years age and above.

(v) ruck including male goat

(vi) kid young goat below one year of age

(vii) nanny female goat

(viii) sheep including adult sheep, male or female of two years age and above

(ix) ewe female sheep

(x) lamb young sheep below one year of age

(xi) ram male sheep

(xii) whether includes male lamb that has been castrated before reaching sexual maturity

(xiii) pig includes adult pig, male or female of one year of age or above

(xiv) piglet includes young pig below one year of age.

b. "veterinary doctor' means a person registered with the Veterinary Council of India established under the Indian Veterinary Council Act, 1984 (52 of 1984)

c. "Schedule" means a schedule appended to these rules.

3. Application of the rules - These rules shall apply to transport of animals on foot when the distance from the boundary of village or town or city of the origin of such transport to the last destination is 5 km or more than 5 km.

4. Condition of health of animals transported on foot-

(1) Every animal to be transported on foot shall be healthy and in good condition for such transport.

(2) A certificate of a veterinary doctor in respect of each animal to be transported to the effect that such animal is in a fit condition for such transportation and is not suffering from any infectious, contagious or parasitic diseases and that it has been vaccinated against any infectious, contagious or parasitic diseases shall accompany such animal

(3) The certificate under sub rule (1) shall be in the form as specified in the First Schedule.

5. Certain animals not to transport on foot - New born animals of which the navel has not completely healed, diseased, blind, emaciated, lame, fatigued, or having given birth during the preceding seventy two hours or likely to give birth during transport shall not be transported on foot. Transport in on-farm social group - Animal shall be transported in their on farm social groups (established at least one week prior to journey)

7. First aid equipment to accompany animals transported on foot - The owner of the animals shall provide veterinary first aid equipment to be accompanied with such animals while transported on foot.

8. Certificate to be carried during transportation - In case the person transporting the animals on foot is not the owner of the animal then such person shall carry a certificate as specified in the Second Schedule during such transportation.

9. Watering arrangement during transportation of animals - The owner of the animals shall make watering arrangement in route during transport of such animals on foot.

10. Feed and fodder arrangements during transportation of animals-Sufficient feed and fodder with adequate reserve of such feed and fodder for the animals shall be made available by their owner during their transport on foot.

11. Prohibition of the use of whip, etc during transportation of animals on foot -

(1) No person shall use a whip or a stick in order to for the animal to walk or to hasten the pace of their w nor such person shall apply chillies or any oft substance to any part of the body of the animal for this purpose during their transportation on foot.

(2) If any animal needs to be tied during transport on foot, it shall be tied by a rope covered with suitable cushioning such as cloth around its leg and such animal shall not be tied by its nose, all legs or any other part of the body except by its neck.

(3) If more than one animal is to be tied adjacent to one another by a single rope during their transport on foot, the space between any two of such animals shall be minimum two feet and animals so tied shall be of similar physical condition and strength and no more than two such animals shall be tied adjacent to each other by a single rope.

12. Certain Prohibition on transport of animals on foot

(1) No person shall transport on foot an animal before sunrise or after sunset.

(2) No animal shall be transported on foot beyond the distance, time, rest interval and temperature specified for such animal in the Table below, namely:-

TABLE

Species (Animal)	Maximum distance covered/day /hour	Maximum no. of Walking /day of hours (Travelling)	Period of rest (interval)	Temperature range Max. Min
Cattle (Cows)	30 km/day 4 km/hr	8 hours	At every 2hours for drinking and at every 4 hrs for feeding	12 deg. C to 30 deg.C
Buffaloes	25 km/day 3 km/hr	8 hours	At every 2 hours for drinking ano at every 4 hrs for feeding	12 deg. C to 30 deg. C
Cows and Buffaloes Calves	16 km/day 2.5 km/hr	6 hours	At every 1½ hrs for drinking and at every 3 hrs. for feeding	15 deg. C to 25 deg.C
Horses, Ponies, Mules, Donkeys	45 km/day 6 km/hr	8 hours	At every 3 hrs for drinking and at every 6 hrs. for feeding	12 deg. C to 30 deg. C
Young ones (Foal)	25 km/day 4 km/hr	6 hours	At every 2hrs. for drinking and at every 4 hrs. for feeding	15 deg. C to 25 deg. C
Goats and Sheep	30 km/day 4 km/hr	8 hours	At every 2 hrs. for drinking and at every 4 hrs. for feeding	12 deg. C to 30 deg. C
Kids and Lambs	16 km/day 2.5km/hr	6 hours	At every 1 1/2 hrs. for drinking and at every 3 hrs. for feeding	15 deg. C to 25 deg. C
Pigs	15 km/day 2 km/hr	8 hours	At every 1 Y2 hrs. for drinking and at every 3 hrs. for feeding	12 deg. C to 25deg. C
Piglets	10 krn/day 1.5 km/hr	6 hours	At every 1 Y2hrs. for drinking and at every 3 hrs. for feeding	15 deg. C to 25 deg. C

Note : After being provided with water every animal shall be given a break of 20 minutes before the commencement of the transport of the animal on foot and in case of feeding the break shall be given for one hour before the commencement of the transport of the animal on foot.

(3) No animal shall be made to walk under conditions of heavy rain, thunderstorms or extremely dry or sultry conditions during its transport on foot.

13. Transportation of animals in certain cases not permitted without shoes - Animals whose hooves are not provided with shoes (as in the case of pack or draught animals) shall not be transported on foot on hard cement, bitumen-coated or metalled roads, steep gradients or hilly and rocky terrain, irrespective of weather conditions (summer or winter)

14. Power of Police to require the owner to take animal to nearest Magistrate

(1) If any police officer above the rank of constable or any other person authorised in this behalf by the Central or state Government or by the Animal Welfare Board of India by the general or special order, has reason to believe that an offence has been or is being committed in respect of an animal in contravention of these rules, he may require the owner or other person in charges of such animal to take the animal to the nearest magistrate.

(2) If the owner or the person in charge of the animals referred to in sub rule (1) refuses to comply with the demands of the police officer under that sub rule, it shall be lawful for such police officer or such other persons to take the animal to the nearest magistrate.

FIRST SCHEDULE

Form for Certificate of fitness for transport of animals

(See rule 4 (3))

This Certificate should be completed and signed by a qualified Veterinary Doctor

Date and time of examination

Species

Number of Trucks/Railway Wagons

Number of Cattle

Sex Age

Identification

Breed (giving characteristics) - Area where it is found with status regarding general resistance and heat tolerance

Individual Features of the animal -

Body colour

Height

Body weight (approx)

Animal length

Breadth (measured between pelvic bones)

Colour of the eyes

Shape of the horns

General conditions (like fleshy, bony projections)

Health Status

History of the animal, feed status whether or not sign of anorexia/diarrhea

1. Record Body Temperature
2. Examine eyes for buging or protrusion of eyeball, blindness, Corneal opacity & specify
3. Condition of skin, (including signs of dehydration, injuries, anorexia (check for presence of warts on the skin)
4. Ears

   Examine ears - (check for animal body response to hearing, check for any infection, inflammation or secretion (a) excess of wax, blood or any fluid)
5. Examine sub maxillary spell for swelling (for any abnormality or pain)
6. Check for status of pregnancy of female animal If yes - which stage 1st, 2nd or 3rd stage
7. Examine udder & teats & specify
   a. Relative size of quarters
   b. Check for signs of swelling/atrophy/fibrous
   c. in duration on palpation of individual quarter and specify.

   a. Check teat canal for teat tumour or fibrosis of teat canal and specify.
8. a) If female - check

   Check for sign of vaginal discharge on examination of the vulva and specify

b) In male - check
Testicles-Size, any sign/abnormalities for monogastric animals
Penis - injury, abrasions or the sheath, discharges to be recorded

9. Sign of abdominal pain (check for gait or posture of the animal, check for signs of abdominal distention, left flank to be checked for rumen examination (full, empty) tympani/blood
10. Digestive System
    Examine mouth and specify
    1 Detail out dentition
    2 Specify - evidences of
    - tooth damage
    - broken or worn incisors
11. Respiratory system
    a. Record Respiration rate
    b. Auscultation & specify for signs of dyspnoea, respiratory distress & specify
12. In cows possessing horns check and specify
    a. shape of horns
    b. number of horn rings
    c. any difference in the direction
    d. or appearance of two horns
13. Examine ribs for fracture and specify
14. Examine abdominal wall for presence of ventral or umbrilical hernia and specify.
15. Examine limbs and joints for bony enlargements or synovial distentions & specify check for signs of lameness - specify
16. Examine interdigital space for any lesions check and specify
17. Any indications of foot soreness, excessive wear of soles or laminitis
18. Examine circulatory system
    1. Specify pulse rate
    2. Check for presence of oedema dependent portion or ascitis and specify
19. Transported from_____to_____via
    I hereby certify that I have read the Prevention of Cruelty to Animals (Transport of animals on Foot) Rules, 2001.
    1. That, at the request of (Consignor) I examined the above mentioned Cattle in the goods vehicle/railway wagons not more than 12 hours before their departure.
    2. That each cattle appeared to be in a fit condition to travel by rail/road and is not showing any signs of infectious or contagious or parastic disease and that it has been vaccinated against rinderpest and any other infections or contagious or parasitic disease(s)
    3. That the cattle were adequately fed and watered for the purpose of the journey.
    4. That the cattle have been vaccinated.
    (a) Type of vaccine (b) Date of vaccination :

Signed_____
Address_____
Date_____
_____
Qualification_____

SECOND SCHEDULE

Authorisation certificate

(See rule 8)

1. Name and age of the owner
2. Father's Name
3. Address of the Owner
4. No. of animals for transport specifying species, age and sex of each animal
5. Name of the person/persons transporting the animals
6. Specify the place of origin and the place of last destination of such animals for transport
7. Attach a copy of the veterinary certificate granted under Rule 8
8. Details of feed, fodder and watering arrangements provided during transport of such animals

I do hereby declare that I am the owner of the aforementioned animals. I have authorized Shri_____S/o_____r/o_____to transport the said animals. I have read and understood the Transport of Animals on Foot Rules, 2001 and undertake that the said Rules have been and would be complied with during transport.

I do hereby state that the above information is true and correct.

To be filled in by the Transporter

I_____S/o_____r/o_____do hereby give my consent transport the aforementioned animals from the aforesaid place of origin to the place of destination.

I have read and understood the Transport of Animals on Foot Rules, 2001 and undertake that the said Rules would be complied with during transport.

I do hereby state that the above information is true and correct.

Sd/-

(Transporter)

[F.No.19/l/2000-AWD]

DHARMENDRA DEO, Jt. Secy.

NOTIFICATION

New Delhi, the 26th March, 2001

S.O.269 (E) - Whereas certain draft rules further to amend the Transport of Animals Rules, 1978 were published as required by sub-section (1) of section 38 of the Prevention of Cruelty to Animals Act, 1960 (59 of 1960) under the notification of the Government of India in the Ministry of Social Justice & Empowerment number S.O. 1164 (E) dated 26th December 2000 in the Gazette of India. Extraordinary, Part 11, Section 3. Sub Section (ii) dated the 27th December, 2000 inviting objections and suggestions from all persons likely to be affected thereby, before the expiry of the period of sixty days from the date on which copies of the Gazette containing the said notification are made available to the public.

And, whereas copies of the said Gazette were made available to the public on the 1st January 2001.

And, whereas no objection or suggestion has been received from the public in respect of the said draft rules by the Central Government.

Now, therefore in exercise of the powers conferred by sub-section (1) and (2) of section 38 of the Prevention of Cruelty to Animals Act 1960 (59 of 1960), the Central Government hereby makes the following rules further to amend the Transport of Animals Rules 1978, namely

1. (1) These rules may be called the **Transport of Animals (Amendment) Rules, 2001**.

(2) They shall come into force on the date of their publication in the Official Gazette.

2. **In the Transport of Animal Rules 1978 (hereinafter referred to as the said rules), after chapter VI, the following chapters shall be inserted, namely** :

Chapter VII

TRANSPORT OF POULTRY BY RAIL, ROAD AND AIR

76. **Definition** - In this Chapter unless the context otherwise requires, "Poultry" includes day old chicks and turkey poults, chickens, quails, guinea fowls, ducks, geese and turkeys.

77. **General requirement - In transport of poultry by rail, road or air -**

(a) the container shall be properly cleaned and sterilised before the poultry is placed in them

(b) poultry shall not be exposed to the sunlight, rain and direct blast of air during transport.

(c) poultry shall not be transported when the temperature exceeds 25 degree Celsius or when the temperature falls below 15 degree Celsius.

78. **Day-old chicks and turkey poults** - In transport of day old chicks and poultry by rail, road and air

(a) chicks and poults shall be packed and dispatched immediately after hatching and shall not be stored in boxes for any length of time before dispatch.

Note : In the said transport endeavour shall be made by the consignor or his agent so that consignments shall arrive at destination within the shortest possible time after being taken out of the incubator. Seventy two hours shall normally be regarded as the maximum period to be taken trom incubator to brooder in winter and 48 hours in summer;

(b) chicks or poults shall not be fed or watered before and during transportation.

(c) every effort shall be made to ensure that chicks and poults arrive as quickly as possible at the dispatching site

(d) personal attention shall be given by the consignor or the forwarding agent to ensure that all consignments are kept out of direct sunlight, rain and heat;

(e) care shall be taken to carry the boxes in a level position so that chicks are not in danger of falling over on to their backs an' 11 The putting up of other merchandise over and around chick boxes shall be avoided.

79. **Poultry other than day-old chicks and turkey poults**

- In transport of poultry other than day old chicks and turkey poult by rail, road or air

(a) the poultry to be transported shall be healthy and in good condition and shall be examined and certified by a veterinary doctor for freedom from infectious diseases and fitness to undertake the journey.

(b) poultry transported in the same container shall be of the same species and of the same age group

(c) poultry shall be properly fed and watered before it is placed in containers for transportation and extra feed and water shall be provided in suitable troughs fixed in the containers.

(d) Arrangements shall be made for watering and feeding during transportation and during hot weather, watering shall be ensured every six hours;

(e) male stock shall not be transported with female stock in the same container

80. **Road Travel** - In transport of poultry by road the container shall not be placed one on the top of the other and shall be covered properly in order to provide light, ventilation and to protect from rain, heat and cold air.

81. **Rail Travel** - In transport of poultry by rail -

(a) in case the journey is for more than twelve hours, an attendant shall accompany the consignment:

(b) poultry shall not be exposed to rain or direct blast of air;

(c) as far as possible poultry shall be transported in wagons having adequate facilities for ventilation and no other merchandise which may result in mortality of birds shall be loaded in the same wagon;

82. **Air travel** - In transport of poultry by air or for international transport the containers carrying poultry shall be kept in pressurised compartments with regulated temperature and the container shall preferably be kept near the door and shall be unloaded immediately on arrival.

83. **Containers for transportation** - In transport of poultry by rail, road or air -

(a) containers used to transport poultry shall be make of such material which shall not collapse or crumble and they shall be well ventilated and designed to protect the health of poultry by giving it adequate space and safety.

(b) the containers shall be so designed as to render impossible for birds to crowd into the corners during transportation, and to avoid the danger of boxes being stocked so close together as to interfere with ventilation.

(c) all the containers shall be clearly labelled showing the name, address and telephone number of the consignor and the consignee.

(d) the minimum floor space per bird and the dimension of the containers for transporting poultry shall be a specified in the Table below, namely :

TABLE

S.No.	Kind of Poultry	Minimum	Demension			
		Floor space cm^2	Length cm	Width cm	Height cm	Number in a container
i.	Month old chickens	75	60	30	18	24
ii.	Three month old chickens	230	55	50	35	12
iii.	Adult sock (excluding geese and turkeys)	480	115	50	45	12
iv.	Geese and turkeys	900	120	75	75	10 youngs
		1300	75	35	75	2 growing
		1900	55	35	75	1 grown up
v.	Chicks	-	60	45	12	80
vi.	Poult	-	60	45	12	60

84. Special requirement of containers for chicks and poults - In transport of poultry by road, rail or air –

(a) wire mesh or a net of any material shall not be used as a bottom for the containers.
(b) the container shall be properly secured to avoid pilferage
(c) the following instruction shall be printed on a label and fixed to the lid or printed directly on sides, namely "Care in Transit".
(d) the consignee shall be informed about the train, transport or flight number and its time of arrival well in advance
(e) poultry shall not be transported continuously for more than 6 hours and whole batch shall be inspected at every 6 hours interval.
(f) the transportation shall not remain stationary for more than 30 min and during this period, it shall be parked in shade and arrangements shall be made for feeding and watering
(g) all precautions against fire shall be taken and provision of fire extinguishers in transport shall be provided.

Chapter - VIII

TRANSPORT OF PIGS BY RAIL OR ROAD

85. DEFINITION - In this chapter, unless context otherwise requires, "pigs" includes piglets, hogs, hoglets and animals of pigs family,

86. Duration of travel - Rules 87 to 95 shall apply to the transport of pigs by rail or road involving journeys of more than six hours.

87. Health Certificate -

(1) A valid health certificate by a veterinary doctor to the effect that the pigs are in a fit condition to travel by rail or road and are not suffering from infectious or contagious or parasitic disease shall accompany each consignment in the transport of pigs by rail or road.

(2) In the absence of a certificate under sub-rule (1), the carrier shall refuse to accept the consignment for transport.

(3) The certificate under sub rule (1) shall be in a form specified in Schedule K

88. Identification of consignor and consignee - For the purpose of this Chapter -

(a) each consignment shall bear a label showing in bold red letters the name, address and telephone number (if any) of the consignor and consignee, the number and type of pigs being transported and quantity of rations and food provided to them.

(b) the consignee shall be informed in advance about the train or vehicle in which the consignment of pigs is being sent and its arrival time.

(c) the consignment of pigs shall be booked by the next train or vehicle and shall not be detained after the consignment is accepted for booking.

89. **First aid** - In transport of pigs by rail or road.

(a) first-aid equipment shall accompany the pigs;

(b) suitable ramps shall be provided for loading and I unloading the pigs;

(c) in the case of a railway wagon, when the loading or unloading is done on the platform the dropped door of the wagon shall be used as a ramp.

90. **Group of pigs** - In transport of pigs by rail or road, male young stock shall not be mixed with female stock in the same compartment.

91. **Facility of food and water** - In transport of pigs by rail or road, sufficient food and fodder shall be carried to last during the journey and watering facility shall be provided at regular intervals.

92. **Padding of floor during travel** - In transport of pigs by rail or road, material for padding, such as straw, shall be placed on the floor to avoid injury if an animal lies down, and this shall be not less than 5 cm thick.

93. **Ban on fettering** - In transport of pigs by rail or road, the animals shall not be fettered unless there is a risk of their jumping out and their legs shall not be tied down.

94. **Space requirement during rail travel** - In transport of pigs by rail

(a) no railway wagon shall accommodate more than the number of pigs as specified in the Table below :

TABLE

Broad gauge (1)		**Metre gauge (2)**		**Narrow gauge (3)**
Area of Wagon	Area of Wagon	Area of Wagon	Area of Wagon	
Less than 21.1 squares Metres	More than 21.1 Square Metres	Less than 12.5 Square Meter	More than 12.5 Square Meter	
Number of Pigs 35	Number of Pigs 50	Number of Pigs 25	Number of Pigs 30	not allowed

(b) adequate ventilation shall be provided in every wagon and the upper door of one side of wagon shall be kept open and properly fixed and the upper door of the wagon shall have wire gauge closely welded mesh arrangements to prevent burning cinders from the engines entering the wagon and leading to fire breakout.

95. **Space requirement during road travel** - In transport of pigs by road -

(a) goods vehicles of capacity of 5 or 4.5 tons, which are generally used for transportation of animals, shall car not more than twenty pigs.

(b) in the case of large goods vehicles and containers, Explanation : For the purpose of this rule the certificate partition shall be provided at every two or three metres shall be issued in such form as may be specified for this across the width to prevent the crowding and trapping purpose by the Central Government of pigs

(c) in the case of pigs under six weeks of age, separate panels shall be provided.

Chapter IX

MISCELLANEOUS

96. Issue of certificate before transportation -

(1) A valid certificate issued by an officer or any person or Animal Welfare Organisation duly recognised and authorised for this purpose by the Animal Welfare Board of India or the Central Government shall be procured by any person making transport of any animal before transportation of such animal verifying that all the relevant Central and State Acts, rules and orders pertaining to the said animals including the rules relating to transport of such animals have been duly complied with and that the animal is not being transported for any purpose contrary to the provision of any law.

(2) In the absence of such certificate, the carrier shall refuse to accept the consignment for transport.

97. Cancellation of permit or authorisation for transport -

(1) In the event of contravention or non compliance of any of the rules contained in these rule for transport of animals, if it is pointed out in writing by any officer or persons or Animal Welfare Organisations authorised for this purpose by the Animal Welfare Board of India or the Central Government, then, any permit or authorisation issued for such transport shall be immediately cancelled by the concerned authority and it shall be the duty of the police to stop the further transport even from the intermediary station and proceed against the said offenders and deal with the animal in accordance with law.

(2) The custody of the animals immediately after unloading from the rail wagons, truck or any other vehicle shall be given to the authorised Animal Welfare Organisation if available, till the competent authority or the magistrate having jurisdiction decides about their care and upkeep.

98. General conditions of transport -

(1) Animals to be transported shall be healthy and in good condition and such animals shall be examined by a veterinary doctor for freedom from infectious diseases and their fitness to undertake the journey; provided that the nature and duration of the proposed journey shall be taken into account while deciding upon the degree of fitness.

(2) An animal which is unfit for transport shall not be transported and the animals who are new born, diseased, blind emaciated, lame, fatigued or having given birth during the preceding seventy two hours or likely to give birth during transport shall not be transported.

(3) Pregnant and very young animals shall not be mixed with other animals during transport.

(4) Different classes of animals shall be kept separately during transport.

(5) Diseased animals, whenever transported for treatment, shall not be mixed with other animals

(6) Troublesome animals shall be given tranquilisers before loading during transport.

(7) Animals shall be transported in their on-farm social groups (established atleast one week prior to journey).

3. In the said rules, after Schedule J, the following Schedule shall be inserted. namely :

SCHEDULE K

(see rule 87 (3)

Proforma for certificate of fitness to travel Pigs

(This certificate should be completed and signed by a Veterinary doctor)

Date and time of examination_____

Species of Animals_____

Number of Animals_____

Sex_____Age_____

I hereby certify that I have read Rules 86 to 95 in Chapter VIII of the Transport of Animal Rules, 1978

1. That, at the request of (consignor) 12 hours before their departure I examined the above mentioned animals not more than

2. That each appeared to be in a fit condition to travel by rail/road/sea and is not showing any signs of any infectious or contagious or parasitic disease(s) and that it has been vaccinated against any infectious or contagious disease(s)

3. That the animals were adequately fed and watered for the purpose of the journey.

4. That the animals have been vaccinated.

(a) Type of vaccine(s)

(b) Date of vaccination

Date_____ Signed_____

Address_____

_____

Qualification_____

(F.No.1911/2000-AWD)

DHARMENDRA DEO. Jt. Secy.

Note : The principal rules were published in Gazette of India vide Government of India Ministry of Agriculture and Irrigation (Department of Agriculture), Krishi Bhavan, New Delhi number 18-6/70 LDI dated 23.3.1978

ANNEXURE - II

NOTIFICATION

New Delhi, the 26th March, 2001

S.O.270(E) - Whereas the draft **Prevention of Cruelty to Animals (Slaughter House) Rules, 2000** were published, as required by sub-section (1) of section 38 of the Prevention of Cruelty to Animals Act, 1960 (59 of 1960), under the notification of the Government of India in the Ministry of Social Justice and Empowerment number S.O. 1165 (E) dated the 26th December, 2000 in the Gazette of India, Extraordinary, Part II, Section 3, Sub Section (ii) dated the 27th December, 2000 inviting objections and suggestions from all persons likely to be affected thereby, before the expiry of the period of sixty days from the date on which copies of the Gazette containing the said notification are made available to the public.

And, whereas copies of the said Gazette were made sufficient for livestock subject to veterinary inspection available to the public on the 1st January 2001.

And, whereas no objection or suggestion has been received from the public in respect of the said draft rules by the Central Government.

Now, therefore, in exercise of the powers conferred by sub-sections (1) and (2) of section 38 of the Prevention of Cruelty to Animals Act, 1960 (59 of 1960), the Central Government hereby makes the following rules, namely :

1. Short title and commencement:

(1) These rules may be called the **Prevention of Cruelty to Animals (Slaughter House) Rules, 2001**

(2) They shall come into force on the date of their publication in the Official Gazette

2. Definitions - In these rules unless the context otherwise requires -

a) "Act" means the Prevention of Cruelty to Animals Act, 1960 (59 of 1960);

b) "Slaughter" means the killing or destruction of any animal for the purpose of food and includes all the processes and operations performed on all such animals in order to prepare it for being slaughtered.

c) "Slaughter house" means a slaughter house wherein 10 or more than 10 animals are slaughtered per day and is duly licensed or recognised under a Central, State or Provincial Act or any rules or regulations made thereunder.

d) "veterinary doctor' means a person registered with the Veterinary Council of India established under the Indian Veterinary Council Act, 1984 (52 of 1984).

3. Animals not to be slaughtered except in recognised or licensed houses –

(1) No person shall slaughter any animal within a municipal area except in a slaughter house recognised or licensed by the concerned authority empowered under the law for the time being in force to do so.

(2) No animal which -

(i) is pregnant, or

(ii) has an offspring less than three months old, or

(iii)is under the age of three months or

(iv) has not been certified by a veterinary doctor that it is in a fit condition to be slaughtered.

(3) The municipal or other local authority specified by the Central Government for this purpose shall, having regard to the capacity of the slaughter house and the

requirement of the local population of the area in which a slaughter house is situated, determine the maximum number of animals that may be slaughtered in a day.

4. **Reception area or resting grounds** –

(1) The slaughter house shall have a reception area of adequate size sufficient for livestock subject to veterinary inspection.

(2) The veterinary doctor shall examine thoroughly not more than 12 animals in an hour and not more than 96 animals in a day.

(3) The veterinary doctor after examining the animal shall issue a fitness certificate in the form specified by the Central Government for this purpose.

(4) The reception area of slaughter house shall have proper ramps for direct unloading of animals from vehicles or railway wagons and the said reception area shall have adequate facility sufficient for feeding and watering of animals.

(5) Separate isolation pens shall be provided in slaughter house with watering and feeding arrangements for animals suspected to be suffering from contagious and infectious diseases, and fractious animals, in order to segregate them from the remaining animals.

(6) Adequate holding area shall be provided in slaughter house according to the class of animals to be slaughtered and the said holding area shall have water and feeding facilities.

(7) The resting grounds in slaughter house shall have overhead protective shelters.

(8) Ante-mortem and pen area in slaughter house shall be paved with impervious material such as concrete non-slippery herring-bone type suitable to stand wear and tear by hooves, or brick, and pitched to suitable drainage facilities and the curbs of said impervious material 150 to 300 mm high shall be provided around the borders of livestock pen area, except at the entrances and such pen shall preferably be covered.

5. Lairages –

(1) Every animal after it has been subjected to veterinary inspection shall be passed on to a lairage for resting for 24 hours before slaughter.

(2) The lairage of the slaughter house shall be adequate in size sufficient for the number of animals to be [aired;

(3) The space provided in the pens of such lairage shall be not less than 2.8 sq.mt. per large animal and 1.6 sq.mt. per small animal

(4) The animals shall be kept in such lairage separately depending upon their type and class and such lairage shall be so constructed as to protect the animals from heat, cold and rain

(5) The lairage shall have adequate facilities for watering and post-mortem inspection.

6. Slaughter –

(1) No animal shall be slaughtered in a slaughter house in sight of other animals

(2) No animal shall be administered any chemical, drug or hormone before slaughter except drug for its treatment for any specific disease or ailment.

(3) The slaughter halls in a slaughter house shall provide separate sections of adequate dimensions sufficient for slaughter of individual animals to ensure that the animal to be slaughtered is not within the sight of other animals.

(4) Every slaughter house as soon as possible shall provide a separate space for stunning of animals prior to slaughter, bleeding and dressing of the carcasses

(5) Knocking section in slaughter house may be so planned as to suit the animal and particularly the ritual slaughter; if any and such knocking section and dry landing area associated with it shall be so built that escape from this section can be easily carried out by an operator without allowing the animal to pass the escape barrier.

(6) A curbed-in bleeding area of adequate size as specified by the Central Government shall be provided in a slaughter house and it shall be so located that the blood could not be splashed on other animals being slaughtered or on the carcass being skinned.

(7) The blood drain and collection in a slaughter house shall be immediate and proper

(8) A floor wash point shall be provided in a slaughter house for intermittent cleaning and a hand-wash basin and knife sterilizer shall also be provided for the sticker to sterilize knife and wash his hands periodically.

(9) Dressing of carcasses in a slaughter house shall not be done on floor and adequate means and tools for dehiding or belting of the animals shall be provided in a slaughter house with means for immediate disposal of hides or skins;

(10) Hides or skins shall be immediately transported from a slaughter house either in a closed wheelbarrow or by a chute provided with self-closing door and in no case such hides or skins shall be spread on slaughter floor for inspection

(11) Floor wash point and adequate number of hand wash basins with sterlizer shall be provided in a dressing area of a slaughter house with means for immediate disposal of legs, horns, hooves and other parts of animals through spring load floor chutes or sidewall doors or closed wheelbarrows and in case wheelbarrows or trucks are used in a slaughter house, care shall be taken that no point wheelbarrow or truck has to ply under the dressing rails and a clear passage is provided for movement of the trucks.

12. Adequate space and suitable and properly located facilities shall be provided sufficient for inspection of the viscera of the various types of animals slaughtered in a slaughter house and it shall have adequate facilities for hand washing, tool sterilisation and floor washing and contrivances for immediate separation and disposal of condemned material.

13. Adequate arrangements shall be made in a slaughter house by its owner for identification, inspection and correlation of carcass, viscera and head.

14. In a slaughter house, a curbed and separately drained area or an area of sufficient size, sloped 33 mm per metre to a floor drain, where the carcasses may be washed with a jet of water, shall be provided by the owner of such slaughter house.

7. Slaughter house building - The different construction of a slaughter house shall be built and maintained by its owner in the manner as specified below, namely :

a) Plant Building - (i) Materials used shall be impervious, easily cleansable, and resistant to wear and corrosion. (ii) Materials such as wood, plaster board, and porous acoustic-type boards, which are absorbent and difficult to keep clean shall not be used.

b) Floors - The floors shall be non-absorbent and nonslippery with rough finish and shall have suitable gradient for drainage.

c) Coves - Coves with radii sufficient to promote sanitation shall be installed at the juncture of floors and wall, in all rooms and which shall not be less than 100 mm

(d) Interior Walls - (i) interior walls shall be smooth and flat and constructed of impervious materials such a glazed brick, glazed tile, smooth surface Portland cement plaster, or other non-toxic, non-absorber material applied to a suitable base. (ii) Walls

shall b provided with suitable sanitary type bumpers to prevent damage by hand trucks, carcass shunks, and the like. (iii) The interior walls shall have washable surface up to the height of 2 meters from the floor so that the splashes may be washed and disinfected.

(e) Ceilings - (i) Ceilings shall be of the height of 5 mts or more in workrooms and so far as structure conditions permit, ceilings shall be smooth and flat (ii) Ceilings shall be constructed of Portland cement plaster, large size cement asbestos boards with join sealed with a flexible sealing compound, or other acceptable impervious material and finished so as minimise condensation, mould development, flaking and accumulation of dirt. (iii) The walls above glazed type portion and ceiling shall be painted with water resistant paint to maintain them clean.

(f) Window Ledges - Window ledges shall be sloped 45 degrees to promote sanitation and to avoid damage to glass in windows from impact of hand trucks and similar equipment, the windowsills shall be 1200 mm above the floor level with proper ventilation through mechanical venting or through working vents shall be provided in the roof structure.

(g) Doorways and Doors - (i) Doorways through which product is transferred on rails or in hand trucks shall be at least 1500 mm high and shall be atleast 1500 mm wide. (ii) Doors shall either be of rust-resistant metal construction throughout, or if made with rust resistant metal having tight softwood, they shall be clad on both sides with soldered or welded seams. (iii) Doorjambs shall be clad with rust-resistant metal securely affixed so as to provide no crevices for dirt or vermin and the juncture at which the door joins the walls shall be effectively sealed with a flexible sealing compound.

(h) Screens and Insect control - All windows, doorways and other openings that may admit flies shall be equipped with effective insect and rodent screens and 'Fly chaser' fans and ducts or air curtains shall be provided over doorways in outside wall of food handing areas that are used for dispatch or receiving.

(i) Rodent-Proofing-Except in the case of solid masonry, walls constructed of glazed tile, glazed brick, and the like, expanded metal or wire mesh not exceeding 12.5 mm mesh, shall be embedded in walls and floor at their junction and such mesh shall extend vertically and horizontally to a sufficient distance to exclude the entrance of rats and other rodents.

(j) Vehicular areas for Trucks - (i) Concrete paved areas, properly drained and extending at least 6 metres from building, loading docks or livestock platforms shall be provided at places where vehicles are loaded or unloaded. (ii) Pressure washing jets and disinfection facilities for trucks carrying animals shall also be provided at such places.

(k) Drainage - (i) All parts of floors where wet operations are conducted shall be well drained and as far as possible, one drainage inlet shall be provided for each 37 metre square of floor space (ii) A slope of about 20 mm per metre to drainage inlets shall be provided for usual conditions and it shall be ensured that the floor slopes uniformly to drains with no low spots, which collect liquid. (iii) Floor drains shall not be provided in freezer rooms or dry storage areas and when floor drains are installed in rooms where the water seal in traps is likely to evaporate without replenishment, they shall be provided with suitable removable metal screw plugs.

(l) Traps and vents on drainage lines - (i) Each floor drain, including blood drains, shall be equipped with a deep seal trap (P-, U-, or S-shape) (ii) Drainage lines shall be properly vented to the outside air and be equipped with effective rodent screens.

(m) Sanitary drainage lines - Drainage line from toilet pans and urinals shall not be connected with other drainage lines within the plant and s6l not discharge into a grease catch basin and such lines shall be installed so that if leakage develops, it shall not affect the product or the equipment.

(n) Lighting and ventilation - (i) Unrefrigerated work rooms shall be provided with adequate direct natural light and ventilation or ample artificial light and ventilation by mechanical means. (ii) Uncoloured glass having a high transmissibility of light shall be used in skylights and windows (iii) The glass area shall be approximately one-fourth of the floor area of a workroom and such ratio shall be increased where there are obstructions, such as adjacent buildings, overhead catwalks, and hoists, which interfere with the admittance of direct natural light. (iv) Distributed artificial lighting of much quality and at such distances as may be specified by the Central Government shall be provided at all places where adequate natural light is not available or is insufficient.

(o) Every abattoir shall be provided with distributed artificial light of an overall intensity of not less than 200 lux at the distances as may be specified by the Central Government throughout the slaughter hall and workrooms and at places where meat inspection is carried out, the overall intensity of artificial light shall be not less than 500 lux.

(p) every abattoir shall be provided with suitable and sufficient means of ventilation to the outside air and the construction of the slaughter hall shall be so arranged that the dressed carcasses are not exposed to direct sunlight;

(q) a sufficient, safe, potable and constant supply of fresh water shall be available at adequate pressure through the premises.

(r) the pressure for the general purpose of floor washing may preferably be 200 to 330 kPa for through floor cleaning

(s) for thorough and efficient washing of carcasses, a higher pressure between 1000 kPa to 1 700 kPa shall be maintained.

(t) floor washing point shall be provided preferably for minimum 37 meter square on slaughter floor and working departments

u. a constant supply of clean hot water shall be available in the slaughter hall and workrooms during working hours and the hotwater required for frequent sterilising of equipment shall not be less than 82 degree celsius

v. where necessary for sanitary maintenance, equipment shall be constructed and installed so as to be completely self-draining.

w. the following materials shall not be used in an abattoir, namely –

(i) copper and its alloys in equipment used for edible products.

(ii) cadmium in any form in equipment handling edible products

(iii) equipment with painted surface in product zone

(iv) enamel containers or equipment is not desirable and

(v) lead

(x) all permanently mounted equipment shall either be installed sufficiently away from walls (minimum 300 mm) to provide access for cleaning and inspection.

(y) all permanently mounted equipment shall either be installed sufficiently above the floor (minimum 300 mm) to provide access for cleaning and inspection or be completely sealed (watertight) to the floor area.

8. Engagement in slaughter house –

(1) No owner or occupier of a slaughter house shall engage a person for slaughtering animals unless he possesses a valid license or authorization issued by the municipal or other local authority.

(2) No person who has not attained the age of 18 years shall be employed in any manner in a slaughter house.

(3) No person who is suffering from any communicable or infectious disease shall be permitted to slaughter an animal.

9. Inspection of slaughter house –

(1) The Animal Welfare Board of India or any person or Animal Welfare Organisation authorised by it may inspect any slaughter house without notice to its owner or the person incharge of it at any time during the working hours to ensure that the provisions of these rules are being complied with.

(2) The person or the Animal Welfare Organization authorized under sub rule (1) shall after inspection send its report to Animal Welfare Board of India as well as to the municipal or local authority for appropriate action including initiation of legal proceedings if any, in the event of violation of any provisions of these rules.

(F.No.19/1/2000-AWD)
DHARMENDRA DEO, A. Secy.

CHAPTER – XX

OPERATIONAL GUIDELINES

Please refer to Ministry of Food Processing Industries, Government of India's website which is as follows

Source: www.mofpi.nic.in

DBP
(A Complete Unit of Dished Ends)

D.B.P. ENGINEERING WORKS PVT. LTD.

F-53, SITE 'C" UPSIDC, INDUSTRIAL AREA. GREATER NOIDA, G. B. NAGAR-201306
Phone .:0120-2560629, 2560529, (OFFICE) FAX : -0120-2560529
Website:-www.dbpengineering.co.in, e-mail:dbpengineeringworkspvtltd@yahoo.co.in

Ref.....

Date.....

Dated: 16.07.2013

M/s Center for Integrated Animal Husbandry & Dairy Development
Flat No. 205, F-64, C/9
Sector – 40, Noida

Sub.: Supply and installation of Plant & Machinery for Modern Slaughterhouse at Bareilly

Dear Sir,

Thanks for your enquiry in respect of supply and installation of the following items on turn key basis for the above mentioned project. We submit our prices for the following items as per the details sent by you.

S. No	Item	Amount (Rs. in Lakhs)
1.	Goat / sheep slaughterline (Halal) – capacity 175 animals/ shift	265
2.	Goat / sheep slaughterline (Jhatka) – capacity 100 animals/ shift	265
3.	Effluent Treatment Plant – capacity 68 KLD	86
4.	Rendering Plant – capacity 20 tons per day	295
5.	Refrigerated Van	26

Note: Equipment specifications will be as per the list enclosed with your enquiry.

Terms and Conditions:

1. 3 % Charges for erection and commissioning will be extra.
2. Delivery six months after release of 50% advance payment.
3. **Taxes**: VAT, Excise duty and other applicable taxes will be charged as extra at the delivery time.
4. Freight and insurance to be born by the client.
5. **Guarantee**: Six months against manufacturing defects.
6. **Validity** : 90 days.

We assure you for the efficient and best services. We look forward to receive the supply order from the client.

With kind regards.

Yours sincerely.

For D.B.P. ENGINEERING WORKS PVT. LTD.

MICRO TRANSMISSION SYSTEMS

H.O. : C - 23, Sector - 85, Phase - II, Noida, Distt. G.B. Nagar (U.P.)
Branch Office : B - 37,Sector - 88, Phase - II, Noida, Distt. G.B. Nagar (U.P.)
Ph. : 0120-3104699, Mob. : +91-9811163168, 8860076918
Email : microtransmission@gmail.com

Ref. No.:..... Dated. :....15.07.2013

M/s Center for Integrated Animal Husbandry & Dairy Development
Flat No. 205, F-64, C/9
Sector 40, Noida

Subject: Offer for Plant & Machinery for Modern Slaughterhouse at Bareilly

Dear Sir,

Thanks for your enquiry letter No. SH-627/2013 dated 25th May 2013 on the subject cited above. We submit our lowest prices for the following items as per the details mentioned in your letter.

Sl. No.	Item	Amount (Rs. in Lakhs)
1.	Buffalo slaughterline capacity 100 animals per shift with deboning items but excluding cold chain system	400
2.	Goat / sheep slaughterline (Halal) capacity 175 animals per shift	240
3.	Goat / sheep slaughterline (Jhatka) capacity 100 animals per shift	240
4.	Cold chain system including Refrigerated Vans	220
5.	Rendering Plant (Mech.) capacity 20 tons per day	280
6.	Common Utility Items as per enclosed list	90
7.	Effluent Treatment Plant (Mechanical) capacity 68 KLD	60

Note: Equipment specifications will be as per the list enclosed with your enquiry.

Terms and Conditions:

1. Above prices are inclusive of 5.5% charges for erection and commissioning.
2. For staff training 3 % additional will be charged.
3. Delivery six months after release of 30% advance payment.
4. Taxes: VAT and other applicable taxes will be charged as extra at the delivery time. Excise duty as applicable will also be charged extra.
5. Freight and insurance to be born by you at actuals.
6. Guarantee: One year against manufacturing defects.
7. Rs. 25,000/- will be charged extra for trial run per day.
8. Validity : 60 days.

We assure you for the efficient and best services.

With kind regards.

Yours sincerely,

For **Micro Transmission Systems**

ESS DEE ENTERPRISES

13.07.2013

M/S Center for Integrated Animal Husbandry & Dairy Development
Flat No. 205, F-64, C/9
Sector 40, Noida

Sub: **Quotation for Plant & Machinery for Modern Slaughterhouse at Bareilly**

Dear Sir,

Thanks for your enquiry in respect of supply and installation of the following items on turn key basis for the Modern Slaughterhouse at Bareilly. We are glad to submit our prices for the following items as per the list attached to your letter:

Sl. No.	Item	Amount (Rs. in Lakhs)
1.	Buffalo slaughterline – capacity 100 animals per shift with deboning items but excluding cold chain system	450
2.	Goat / sheep slaughterline (Halal) – capacity 175 animals per shift	255
3.	Goat / sheep slaughterline (Jhatka) capacity 100 animals per shift	255
2.	Effluent Treatment Plant – capacity 68 KLD	80
3.	Rendering Plant – capacity 20 tons per day	300
4.	Refrigerated Van	25

Note: Equipment specifications will be as per the list enclosed with your enquiry.

Terms and Conditions:

1. 3 % Charges for erection and commissioning will be extra.
2. 50% advance payment and rest at delivery.
3. **Taxes**: VAT, Excise duty and other applicable taxes will be charged as extra at the delivery time.
4. Freight and insurance to be born by you.
5. **Guarantee**: Six months against manufacturing defects.
6. **Validity** : 90 days.

We assure you for the efficient and best services.

With kind regards,

Yours sincerely,

For ESS DEE ENTERPRISES