MODERNIZATION OF DEONAR ABATTOIR

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- A.I.K.T.C.-S.o.A.

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TECHNICAL CAMPUS, NEW PANVEL
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❖ ACKNOWLEDGEMENT

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I would like to thank my friend **NIDA CHIKTE** for being there, correcting me each and every time and for being attentive to minute details. I also wish to express my appreciation to **MY ALL OTHER FRIENDS** who have helped me through their valued guidance and support.

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MOREOVER, AND MOST IMPORTANT OF ALL I WISH TO ACKNOWLEDGE

PARENTS FOR THIER HUGE HELP AND SUPPORT IN ALL

THE MOMENTS.

❖ ABSTRACT

A review of the slaughterhouses in use today shows that new techniques are required to solve the various issues that they are currently facing, which include environmental problems, religious and social conflicts, health hazards, unsystematic management, etc.

The review is based on various case studies that were analyzed so as to provide them with the best possible solutions for development and improvisation.

The concept of abattoirs (slaughterhouses) has been studied from scratch, right from the history of slaughterhouses, as to how they came into being, why they were needed, how they developed and how they are currently, to the lowdown of the global meat industry and the Indian meat industry.

Owing to varying contexts, the meat industry in India and abroad has numerous differences, though they were rooted from the same seeds. A study between the two depicts the level of improvement that needs to be achieved in India.

Focusing on the Indian industry, the Deonar abattoir was chosen for the purpose of modernization. Modernization in sense of transparency between the sellers and the consumers; use of advanced technologies such as the assembly line and cold storage; centralization of the slaughtering process; and breaking the taboos of animals being harmed.

The abattoir located in Deonar village, Govandi, is adjacent to the eastern highway, in the eastern suburbs of Mumbai. Since it is the only municipally owned abattoir within the city limits of Mumbai, sellers from different villages of Maharashtra, Rajasthan, etc. sell their animals to exporters and retailers from the abattoir. Deonar exists on a 64-acre site built in the early 1970s. The abattoir also exports meat to the Middle East, includes Saudi Arabia, United Arab Emirates, Oman and Qatar, as well as to other countries. There are a reported 1,400 general employees and 18 veterinarians working, and approximately 2000-2500 animals are slaughtered daily.

In the present day scenario, proper slaughter houses do not exist. A mere shed is provided with a chopping/slaughtering platform. The conditions at most municipality slaughter houses are unhygienic, with improper drainage facilities. Animals do not have a suitable area. They

are mostly huddled up in a corner. Due to such conditions, many animals die, majorly during the monsoon. Also, the slaughtering process is done manually. Hence, the modernization of abattoirs is the need of the hour, to not only protect the animals, but also cater to various other issues mentioned above.

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❖ LIST OF TERMINOLOGIES

❖ **PROCESSING UNITS:**

- **OFFICE ROOM:** ADMIN AREA/ OPERATING AREA
- **STORAGE:**
  - **COLD STORAGE -** AREA USED FOR STORING THE FINAL PRODUCT WHICH IS READY TO DISPATCH
  - **STORE ROOM-** A SPACE TO STORE UTILITY
- **CHILLIER ROOM-** A COLD PLACE TO KEEP THE CARCASS BEFORE SLAUGHTER
- **PROCESSING HALLS-** A SPACE WHERE CARCASS GET PROCESSED AS PER REQUIREMENTS
- **FREEZER/ CHILLING ROOMS**
  - BLAST FREEZER- A FREEZER FOR SLOW FREEZING
  - PLATE FREEZER- A FREEZER FOR FAST FREEZING
- **E.T.P.-** EFFLUENT TREATMENT PLANT
- **WASHING VEHICLES-** A SPACE FOR WASHING VEHICLES AFTER UNLOADING AND BEFORE DISPATCHED
- **RENDERING PLANT-** A PLANT FOR DEALING WITH THE REJECTED CARCASS AND UNWANTED PARTS
- **PACKING AREA-** A SPACE USED FOR PACKING THE PROCESSED CARCASS

❖ **SLAUGHTERING UNITS:**

- **UNLOADING AREA-** A SPACE WHERE UNLOADING OF ANIMALS IS DONE
- **LAIRAGE-** SHED FOR ANIMALS/ PENS
- **ANTE-MORTEM-** INSPECTION OF ANIMALS DONE BEFROE SLAUGHTERING, IF THEY ARE UNFIT FOR THE SLAUGHTERING
- **STUNNING AREA-** PROCESS OF RENDERING ANIMALS UNCONSCIOS

- **SLAUGHTERING AREA-** A SPATE AREA WHERE SLAUGHTERING IS DONE AND CARCASS ARE MADE
- **FLAYING AND DRESSING**- A SPACE FOR PRESSURIZED CLEANING OF CARCASS
- **VETERINARY LABORATORY**- LAB. FOR TESTING PRODUCT QUALITY
- **DISPATCHED AREA**- A STAGE FOR THE PACKED MAKE LOADING
- **OFAL COLLECTIONS**- A SEPARATE SPACE FOR COLLECTION OF NON-EDIBLE PARTS

❖ **OTHERS:**

- **CARCASS**- BODY OF SLAUGHTERED ANIMAL
- **OFAL**- THE ENTRAILS AND INTERNAL ORGANS OF A BUTCHERED ANIMAL

❖ LIST OF ABBREVIATIONS

- **BSI -** BUREAU OF INDIANS STANDARDS
- **APEDA –** AGRICULTURE & PROCESSED FOOD PRODUCT EXPORT DEVELOPMENT AUTHORITY
- **HACCP** - HAZARD ANALYSIS AND CRITICAL CONTROL POINTS
- **ETP –** EFFLUENT TREATMENT PLANT

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CHAPTER 1: INTRODUCTION

1.1. INTRODUCTION

❖ SLAUGHTERING

Animal slaughter is the killing of non-human animals, usually referring to killing domestic livestock. Generally, the animals are killed for food; but, they might also be slaughtered for other reasons such as being diseased and unsuitable for consumption. The slaughter involves initial cutting and opening the major body cavities to remove the entrails and offal1[1], but usually leaving the carcass in a single piece. Later, the carcass is usually butchered into smaller pieces.

Most commonly, the animals slaughtered for food are cattle and water buffalo for beef and veal, goats for goat meat, sheep and lambs for lamb and mutton, pigs for pork and ham, horses for horse meat, deer for venison, poultry (mainly chickens, turkeys and ducks) and fish in fish farming (aquaculture industry). As per obligations laid down by the government, the conversion of animals into food and other by-products is to be done in a humane manner. Also, it is obligatory to process the carcass in a hygienic and efficient way

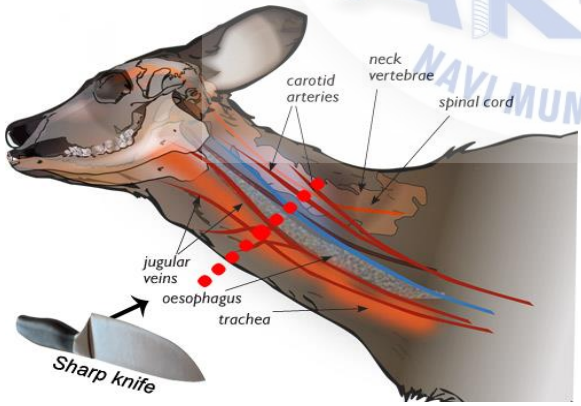

Figure 1: Slaughtering

[1]**offal- the entrails and internal organs of a butchered animal (Wikipedia)**

❖ ABATTOIR

'An abattoir is defined as a place where animals are killed for their meat. It is also referred to as a slaughter house or butchery.'[2]

Figure 2: Abattoir internal view

Basically, a slaughterhouse or abattoir is a facility where animals are slaughtered for consumption as food for humans.

Slaughtering animals on a large scale poses significant logistical problems, animal welfare problems, public health requirements; public aversion in many cultures influences the location of slaughterhouses.

Primarily, almost half an animal can be used to obtain meat. Some parts of an animal are waste. Hence, that remaining half is turned into by-products such as soaps, leather, candles and animal glue.

[2]Cambridge Advanced Learner's Dictionary & Thesaurus © Cambridge University Press

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Due to the increase in demand for meat by the growing number of residents in London, the public expressed disapproval against the meat markets, owing to imbalance in the requirement and supply ratio.

Extremely poor hygienic conditions prevailed at those slaughterhouses. Also, the cattle were treated brutally. As a result of this, pamphlets were circulated, that argued in favour of the removal of the livestock market and its relocation at the outskirts of the city.

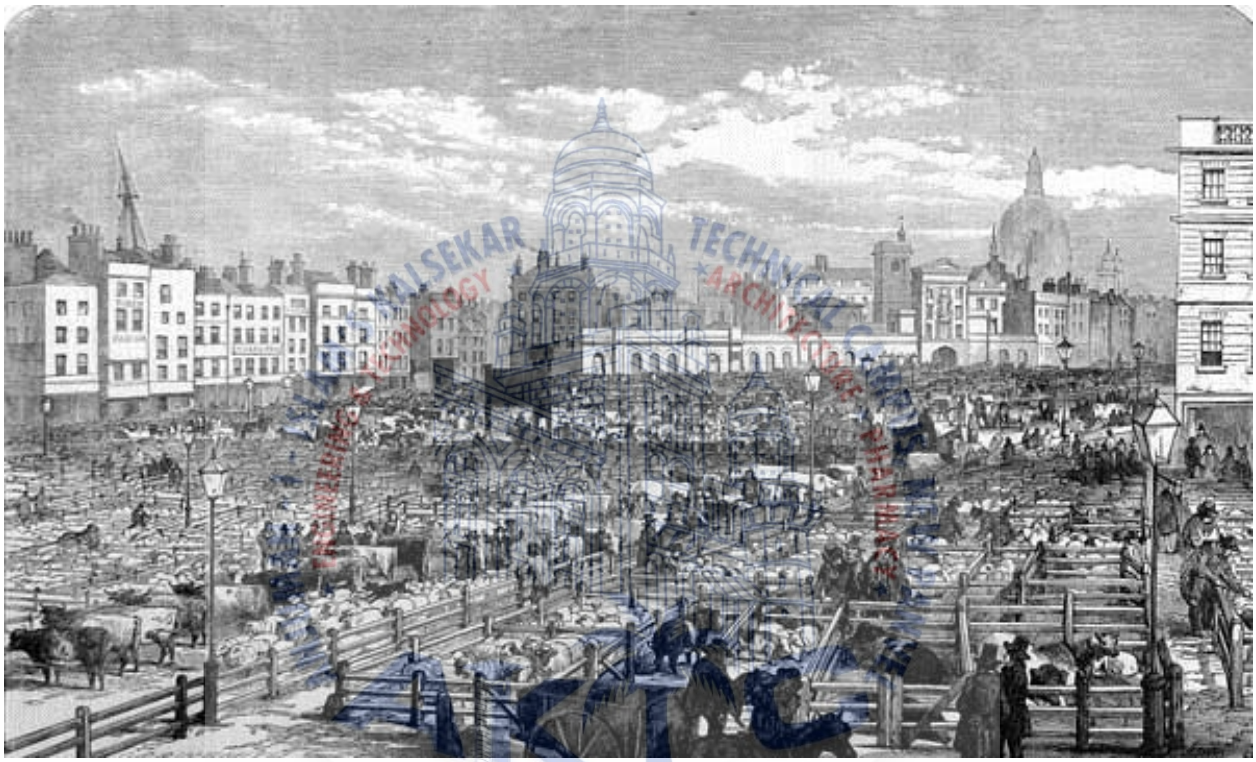

Figure 4: Cattle market at Copenhagen fields, Islington

Under the provisions of the Act of Parliament passed in 1852, a new cattle-market was constructed in Copenhagen Fields, Islington. Successively, the new Metropolitan Cattle Market was also opened in 1855 while West Smithfield was abandoned and left as a waste ground for close to a decade, until the construction of the new market began in the 1860s, under the authority of the 1860 Metropolitan Meat and Poultry Market Act. Designed by architect Sir Horace Jones, the market was completed in 1868.

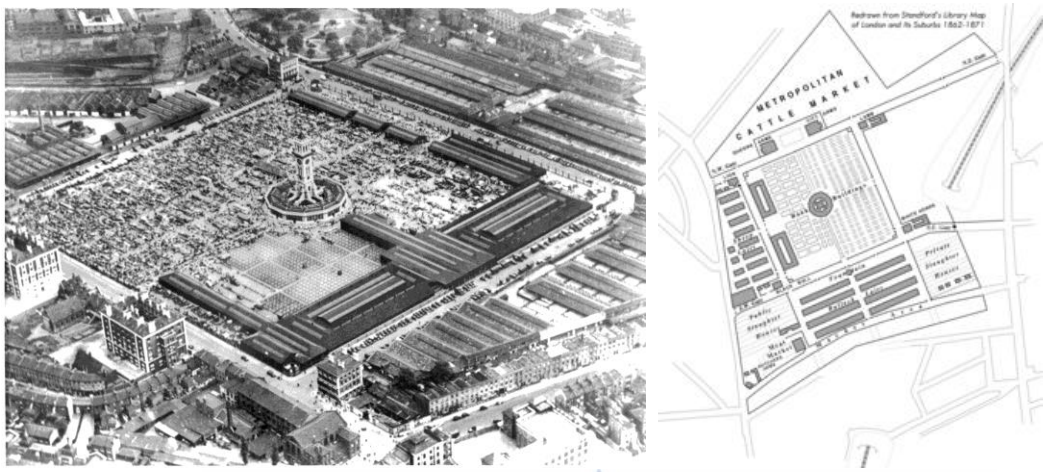

Figure 5: Metropolitan cattle market

Animals could be transported into the slaughterhouse by means of trains and the subsequent transfer of animal carcasses to the Cold Store building through a railway tunnel that was constructed beneath the market, or direct to the meat market via lifts.

Figure 6: Centralized Slaughterhouse at Parc De La Villette, Paris

In succession to this, the first large and centralized slaughterhouse in Paris was constructed under the orders of Napoleon III at the Parc de la Villette. This enterprise heavily influenced the subsequent development of slaughterhouses and institutions on similar lines throughout Europe.

❖ MANAGEMENT AND EXPANSION

The slaughterhouses were regulated by law to ensure adequate standards of hygiene, the minimization of animal cruelty and the prevention of the spread of diseases. It was essential for the slaughterhouse to be equipped with a specialized water supply system to effectively clean the slaughtering area and clear blood & offal. George Fleming and John Gamgee, that were veterinary scientists, campaigned for stringent levels of inspection to ensure that epidemics such as rinderpest[3] (a devastating outbreak of the disease covered all of Britain in 1865) would not spread.

Figure 7: Cattle affected by rinderpest

The Public Health Act 1875 mandated local authorities to provide central slaughterhouses. They were only permitted to close insanitary slaughterhouses in 1890.

Attempts were also made at reforming the practice of slaughter itself, as the methods that were prevalent faced increasing criticism for causing intemperate pain to the animals. The physician, Benjamin Ward Richardson, spent numerous years in advocating more humane methods of slaughter. He brought into use about fourteen possible anesthetics to be used in slaughterhouses and even experimented with the use of electric current at the Royal Polytechnic Institution. As early as 1853, he designed a lethal chamber that would cause

animals to die with the help of a gas in a rather painless way, and he founded the Model Abattoir Society in 1882 to investigate and campaign for humane methods of slaughtering.

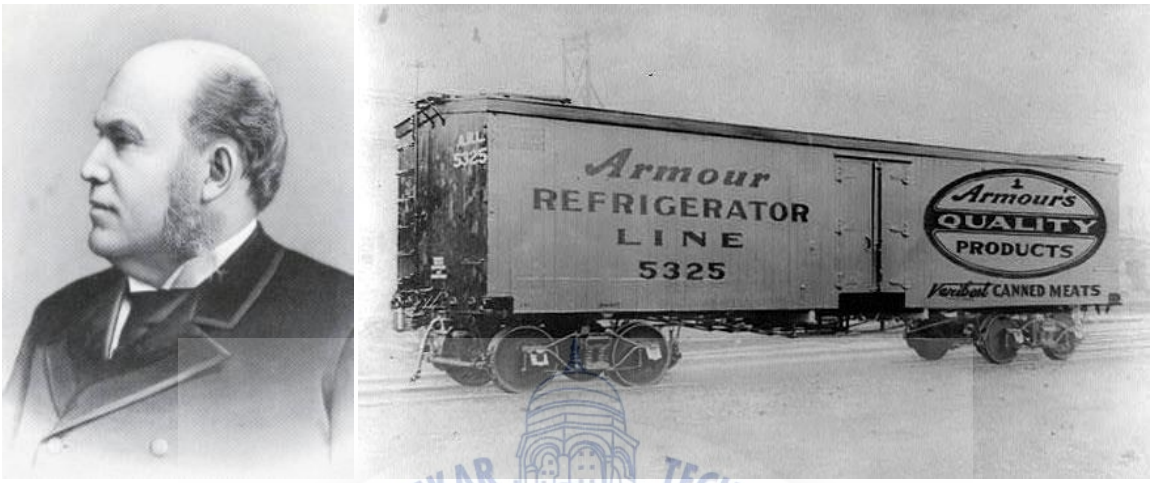

Figure 8: Philip Danforth Armour and His Refrigeration Line

The invention of refrigeration and the expansion of transportation networks by rail and sea aided in the safe export of meat worldwide. Additionally, Philip Danforth Armour invented the 'disassembly line'. That enterprise commendably increased the productivity and profit margin of industrial meatpacking businesses. Informal sources suggest that animal slaughtering became the first mass-production industry in the United States. This expansion was accompanied by increased concern about the physical and mental stature of the workers along with controversy over the ethical and environmental implications of slaughtering animals for meat.

[3]rinderpest- (also cattle plague or steppe murrain) was an infectious viral disease of cattle, domestic buffalo, and some other species of even-toed ungulates

❖ DESIGN

Towards the end of the 20th century, the layout and design of most slaughterhouses in the U.S. was influenced by Dr. Temple Grandin's work. She suggested that reducing the stress of animals to be taken for slaughtering would help slaughterhouse operators considerably improve efficiency and profit. In particular, she applied an understanding of animal psychology to design pens and corrals[4] which funnel a herd of animals arriving at a slaughterhouse into a single file ready for slaughter. Her corrals utilized long sweeping curves so that each animal was prevented from seeing what lies ahead and can only observe the hindquarters[5] of the animal in front of it.

Figure 9: A cattle ranch in Australia, designed by Dr. Temple Gradin

By 2011, Grandin is believed to have designed over 54% of the slaughterhouses in the US, as well as various others around the world.

[4]corral-a pen for livestock, especially cattle or horses, on a farm or ranch

[5]hindquarters- the hind legs and adjoining parts of a quadruped

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- As part of an interview conducted by the daily newspaper Guardian, to one of the questions, Gandhiji answered, that the day India attains independence, all the slaughterhouses in India would be closed. Also, in 1929, Jawaharlal Nehru, in a public meeting, stated that if he were to become the prime minister of India, the first thing he would do is shut down all the slaughterhouses. But, on the contrary, since 1947, the number has increased from 350 to 36,000 slaughter houses. Presently, the highly mechanized slaughterhouses of Andhra Pradesh and Maharastra have the potential to slaughter close to 10,000 animals in a day.

❖ **PRESENT SCENARIO:**

Figure 11: Article regarding Beef banned

Source: The Times of India daily newspaper

Article 48 of the Constitution of India mandates the state to prohibit the slaughter of cows and calves, and other draught cattle. On October 26, 2005, the Supreme Court of India, in a judgment upheld the constitutional validity of anti-cow slaughter laws enacted by different state governments in India. From among 29 states in India, 24 of them currently have stringent regulations forbidding either the slaughter or sale of cows. Kerala, West Bengal, Arunachal Pradesh, Mizoram, Meghalaya, Nagaland, Tripura and Sikkim are the states that have no restrictions on slaughtering of cows.

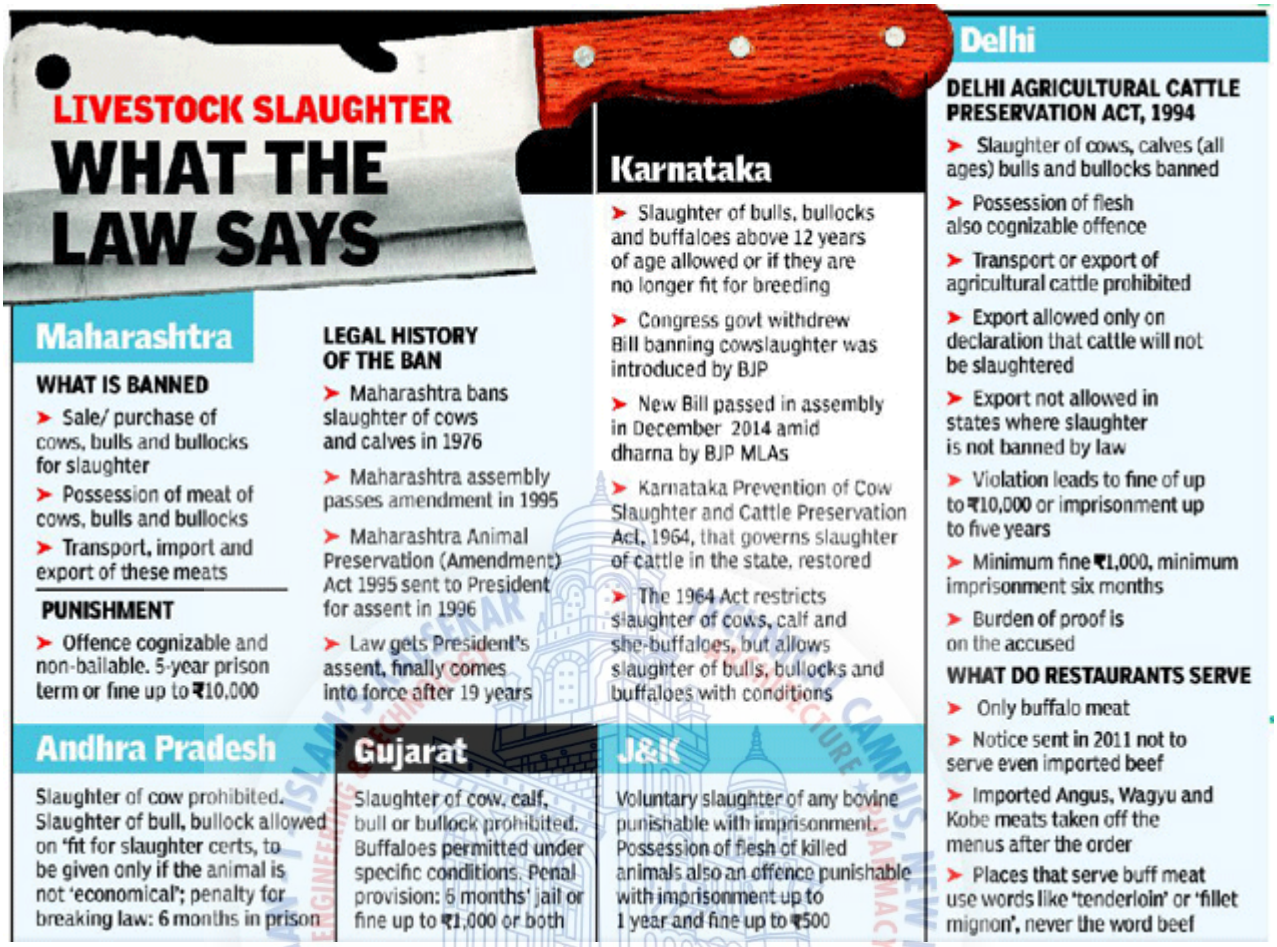

Figure 12: State Laws for beef banning

Source: The Times of India daily newspaper

The laws governing cattle slaughtering vary considerably from state to state. The 'Preservation, protection and improvement of livestock and prevention of animal diseases, veterinary training and practice' is Entry 15 of the State List of the Seventh Schedule of the Constitution, which implies that State legislatures have exclusive powers to legislate the prevention of slaughter and preservation of cattle. Some states allow cattle slaughter with restrictions like a 'fit-for-slaughter' certificate, which is issued depending on factors like age and gender of cattle, continued economic viability, etc. Some completely ban cattle slaughter, while there is no restriction in a few states. Prohibition of cow slaughter is a Directive Principle of State Policy contained in Article 48 of the Constitution. It reads, "The State shall endeavor to organize agriculture and animal husbandry on modern and scientific lines and shall, in particular, take steps for preserving and improving the breeds, and prohibiting the slaughter of cows and calves, and other milch and draught cattle."

." Cows are habitually shipped to states that have low or no requisites for slaughter, even though in most states it is against the law to ship animals across state borders slaughtering. However, even today, many illegal slaughterhouses function in metropolitan cities such as Chennai and Mumbai. As of 2004, there were about 3,600 legal and 30,000 illegal slaughterhouses in India. Efforts to close them down have majorly gone in vain until now. In 2013, Andhra Pradesh gauged that there were 3,100 illegal and 6 licensed slaughterhouses in the state.

In 2012, India produced 3.643 million metric tons of beef, of which 1.963 million metric tons was consumed domestically and 1.680 million metric tons was exported. India ranks 5th in the world in beef production, 7th in domestic consumption and 1st in exporting. However, most of the exported 'beef' is water buffalo meat; water buffaloes are not usually considered holy in Hinduism.

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- Centralized premises were constructed for slaughter of food animals.
- Acts and ordinances were promulgated on meat inspection to the effect that sale of carcasses and offal's meant for human consumption should have been produced only from animals slaughtered in these special premises and passed through meat inspection procedures.
- Backyard slaughtering was banned and slaughter houses came into existence.

The existing conditions in majority of the traditional slaughterhouses are far from satisfactory. Hence, the above features were incorporated.

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1.5. SPECIAL CHARACTERISTICS OF DEVELOPMENT OF ABATTOIR

A few pointers that can be followed while designing efficient modern abattoirs are:

- The modern abattoirs need not to be large ones.
- They can be small, medium or large with a capacity to slaughter 10 to 10,000 animals on modern scientific basis.
- They can cater to the needs of Indian consumers from rural and urban areas
- They can also meet export demands to earn foreign currency which will help in strengthening not only the meat industry but will also ensure the betterment of the livestock industry.
- The abattoir should be located away from residential areas.
- Access for animals (Rail/Road /Stock route) must be designated.
- The abattoir should be located where flooding is impossible, as in many traditional slaughterhouses, flooding poses as a major threat to the lives of the animals.
- An abundant supply of potable water as well as adequate facilities for treatment & disposal is important.
- The land acquired for proposed abattoirs should be sufficient for future expansion as overcrowding of facilities may lead to sanitization problems and disruption of services.

1.6. NECESSITY OF DEVELOPMENT OF ABATTOIR

Abattoirs in their present conditions are inhumane and unhygienic, as observed in most of the cases. These unhygienic environments prove harmful not only to the animals, but also to the workers and visitors of the abattoir. Due to this, the animals are unhealthy, which results in decrease in productivity, further affecting finance and human health as well. Also, due to the unsystematic procedure, the entire process is disorganized and has various loopholes. Further increase in demand for meat production and export is another factor that forms the base and need for redevelopment of the space and revitalization of the process to ensure enhanced results.

Conclusively, it is necessary to establish modern slaughterhouses to bring improvements in:

- Meat-handling practices
- Retrieval and proper utilization of by-products
- Waste treatment procedures for pollution control for re-organization and strengthening the meat industry on scientific lines to provide wholesome and safe meat to the domestic consumer and also play a major role in international meat trade/market (export)

CHAPTER 2: RESEARCH METHODOLOGY

2.1. AIM

- To attempt to make an explicit, self-sustained abattoir with modern systematic arrangement as per India's scenario for growth as per economic and environmental issues.

2.2. OBJECTIVES

- As Mumbai city have less no. of open spaces as per requirement, and the site is big enough to create a working area and part public open space and this issue is also politically concerned, that's why transparent abattoir will raise public awareness of contemporary meat production and to advocate for a more humane and honest relation to the meat we eat.
- As Deonar Abattoir is the Asia's largest abattoir of 64 acres built in the early 1970s with the modern technologies of that time. But now scenario has changed, increase in population and exporting competition demands more. This requires more systematically market arrangement and modern slaughtering techniques to fulfil the demands.
- As space function as a market and an abattoir which requires a very huge quantity of to serve sellers (In lacks), animals and for slaughtering process. And in some days of year (Bakri EID) water requirement is of appropriate 2 or 3 times daily. As well as Maharashtra is the state which suffers from drought, hence sustainable facilities will decrease the load of it.
- Make an attempt to increase the production which helps in increase in EXPORT and decrease in cost for LOCAL users.
- Caters the environmental Problems and Problems facing by the surrounding users.

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❖ **SOLUTIONS: WHICH HELPS TO CATERS ABOVE PROBLEMS**

1. **SITE LOCATION:**

Slaughterhouses should be located outside populated areas at the outskirts of the city, far from river banks or any other water body.

2. **LAND CONTAMINATION:**

Proper storage of wastes should be arranged for inside the premises in an aerated area to minimize biodegradation and foul smell.

3. **WATER CO1NTAMINATION:**

Presence of a liquid waste collection system to avoid any water discharges outside the premises should be provided.

4. **AIR EMISSIONS:**

Development of properly aerated storage areas must be ensured to minimize unpleasant smell. Planting of trees around

5. **SOLID WASTE :**
   - Improving waste handling to minimize losses.
   - Open storing waste in sheds to avoid smell inside the facility.
   - Recycling waste.
   - Sprinkling waste storage areas with crushed lime.

6. **NOISE:**
   - Planting trees around the slaughterhouses.
   - Construction with sound absorption techniques
   - Slaughterhouses walls should be at least 7 feet high.

7. **CONCLUSION WITH RESPECT TO SITE**

2.3.3. STATISTICS

❖ **GLOBAL MEAT INDUSTRY:**

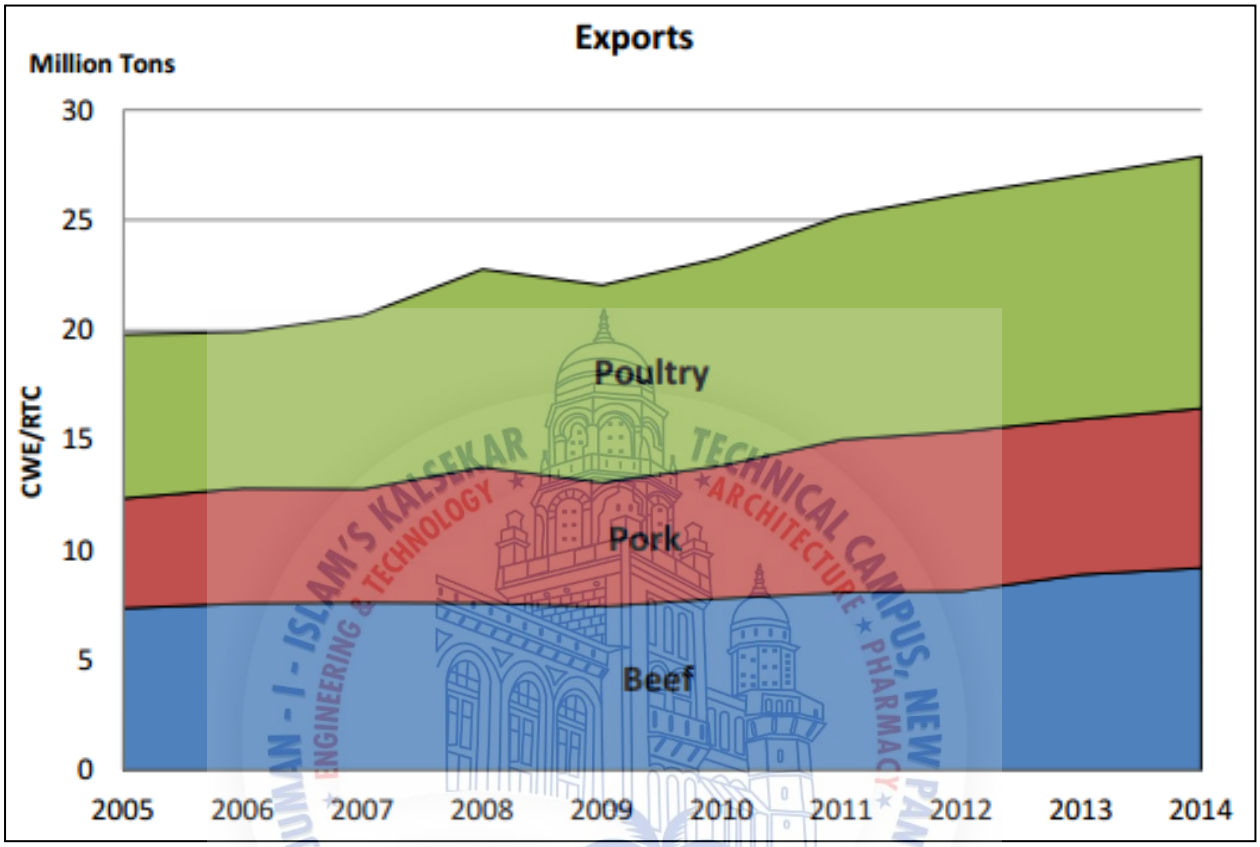

Figure 28: Graph shwoing increase of export globally

- Livestock production is growing rapidly as a result of the increasing demand for animal products.
- Global meat production and consumption will rise from 233 million tonnes in the year 2000 to 300 million in the year 2020.
- Over the last few decades, the increasing demand has been largely met by the worldwide growth in intensive livestock production, particularly poultry.
- This is expected to continue as real income grows in the emerging economies.
- Global meat exports have grown over 40% in less than 10 years, with 2014 forecast at another record on rising incomes and higher demand.

- Beef and broiler meat are expected to reach new track records and pork is estimated at near record levels.

❖ **BEEF & VEAL**

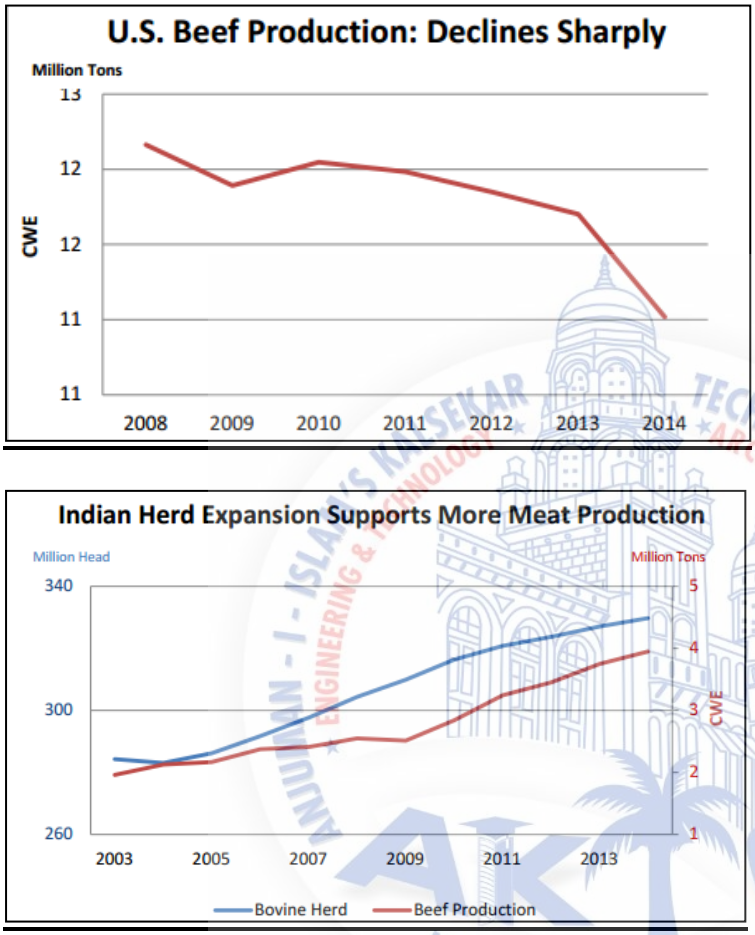

Figure 29: Graph showing increase of export (U.S. and India)

- Exports are forecasted at 9.2 million tons, expanding 24 percent in just 5 years, with Brazil and India accounting for most of that growth.
- High demand for dairy products encourages continued expansion as higher dairy prices spur the development of commercial farms.
- As a result, the herd forecast to grow 1 percent to almost 330 million head.

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❖ INDIAN MEAT INDUSTRY:

- As India has a huge livestock population, the livestock sector is an important component of Indian agriculture.
- Efficient utilization of these resources, including production and utilization of the livestock products is important to earn increased returns and sustain livestock production activities.
- In fact, in spite of big potential because of large livestock population, the meat industry in India has not taken its due share.
- The present production of meat is estimated at 6.27 million tons in 2010, which is 2.21% of the world's meat production.
- The contribution of meat from buffalo is about 23.33%, while cattle contributes about 17.34%, sheep 4.61%, goat 9.36%, pig 5.31%, poultry 36.68% and other species 3.37%.
- The meat production has increased from 764,000 tons in 1970-71 to 6.27 million tons in 2010.
- The compounded average growth rate (CAGR) during the last two decades works out to be 4.5%.
- It is noticed that about 10.6% cattle, 10.6% buffaloes, 24.1% sheep, 58.7% goats, 95.0% pigs and 190.0% chicken are slaughtered each year.
- The value of meat and by-products is Rs 79,889 crore including skin and hides, while the export value of meat and meat products work outs to be more than Rs 6,000 crore in the year 2009-10.
- The contribution of buffalo meat accounts for more than 75% of total exports/foreign earnings.

❖ **INDIA ANIMAL NUMBERS, TOTAL CATTLE SLAUGHTER BY YEAR**

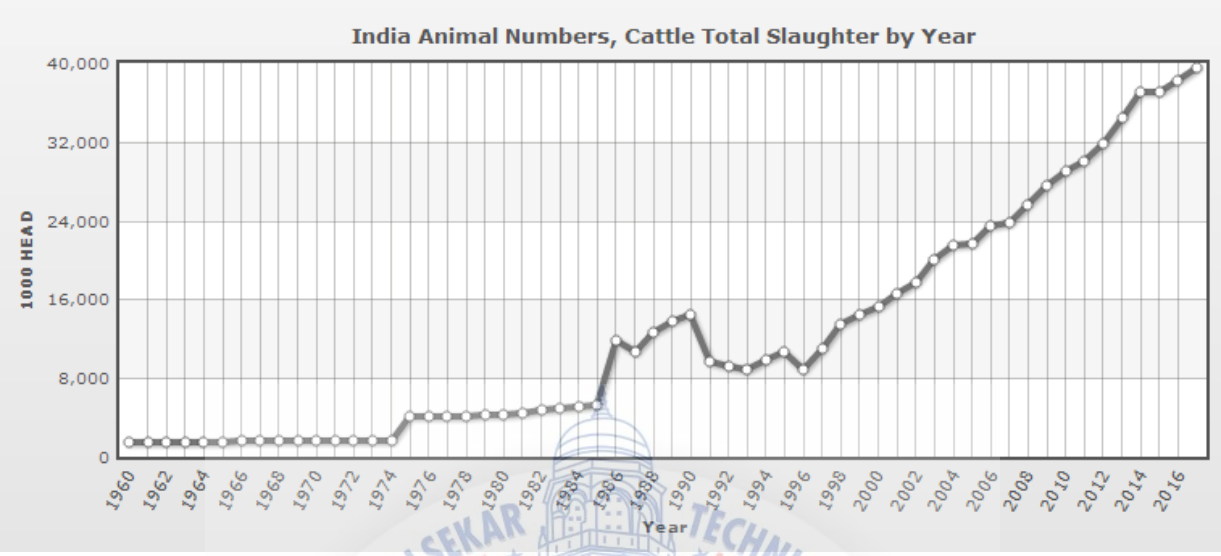

Figure 32: Graph showing increase of export (India)

- Consistent growth after 1975 until 2016 owing to the introduction to export and latest technology was improved too.

❖ **Table showing total no. of slaughtering in India and growth rate**

Market Year	Total Slaughter	Unit of Measure	Growth Rate
1960	1429	(1000 HEAD)	NA
1961	1438	(1000 HEAD)	0.63 %
1962	1446	(1000 HEAD)	0.56 %
1963	1454	(1000 HEAD)	0.55 %
1964	1463	(1000 HEAD)	0.62 %
1965	1472	(1000 HEAD)	0.62 %
1966	1587	(1000 HEAD)	7.81 %
1967	1598	(1000 HEAD)	0.69 %
1968	1610	(1000 HEAD)	0.75 %
1969	1623	(1000 HEAD)	0.81 %

1970	1635	(1000 HEAD)	0.74 %
1971	1647	(1000 HEAD)	0.73 %
1972	1660	(1000 HEAD)	0.79 %
1973	1673	(1000 HEAD)	0.78 %
1974	1686	(1000 HEAD)	0.78 %
1975	4025	(1000 HEAD)	138.73 %
1976	4055	(1000 HEAD)	0.75 %
1977	4085	(1000 HEAD)	0.74 %
1978	4125	(1000 HEAD)	0.98 %
1979	4185	(1000 HEAD)	1.45 %
1980	4225	(1000 HEAD)	0.96 %
1981	4500	(1000 HEAD)	6.51 %
1982	4720	(1000 HEAD)	4.89 %
1983	4930	(1000 HEAD)	4.45 %
1984	5140	(1000 HEAD)	4.26 %
1985	5300	(1000 HEAD)	3.11 %
1986	11870	(1000 HEAD)	123.96 %
1987	10692	(1000 HEAD)	-9.92 %
1988	12617	(1000 HEAD)	18.00 %
1989	13840	(1000 HEAD)	9.69 %
1990	14409	(1000 HEAD)	4.11 %
1991	9753	(1000 HEAD)	-32.31 %
1992	9185	(1000 HEAD)	-5.82 %
1993	8819	(1000 HEAD)	-3.98 %

1994	9851	(1000 HEAD)	11.70 %
1995	10710	(1000 HEAD)	8.72 %
1996	8800	(1000 HEAD)	-17.83 %
1997	10999	(1000 HEAD)	24.99 %
1998	13500	(1000 HEAD)	22.74 %
1999	14500	(1000 HEAD)	7.41 %
2000	15250	(1000 HEAD)	5.17 %
2001	16500	(1000 HEAD)	8.20 %
2002	17750	(1000 HEAD)	7.58 %
2003	20000	(1000 HEAD)	12.68 %
2004	21500	(1000 HEAD)	7.50 %
2005	21700	(1000 HEAD)	0.93 %
2006	23500	(1000 HEAD)	8.29 %
2007	23750	(1000 HEAD)	1.06 %
2008	25500	(1000 HEAD)	7.37 %
2009	27500	(1000 HEAD)	7.84 %
2010	29000	(1000 HEAD)	5.45 %
2011	30000	(1000 HEAD)	3.45 %
2012	31800	(1000 HEAD)	6.00 %
2013	34500	(1000 HEAD)	8.49 %
2014	37000	(1000 HEAD)	7.25 %
2015	37000	(1000 HEAD)	0.00 %
2016	38250	(1000 HEAD)	3.38 %
2017	39500	(1000 HEAD)	3.27 %

Table 1: Increase in Slaughtering, Export since 1960

❖ **STATISTICS OF THE DEONAR ABATTOIR: (LAST FIVE YEARS)**

YEAR	SHEEP/ GOAT	CATTLE				PIG
		BUFFALO	BULLOCK	BUFFALO (MALE)	TOTAL	
2011-12	2458095	48945	77405	480	1266830	54875
2012-13	2351824	22590	99567	5548	127705	50149
2013-14	2312812	22185	116476	4943	143604	45836
2014-15	2297223	32350	105673	3279	141302	43276
2015-16	2373934	66198	0	949	75697	45317

Table 2: Deonar Abattoir,last five years Slaughtering Statistics

❖ **LAST FIVE YEARS: SHEEP/GOAT, CATTLE & PIG IMPORT AND EXPORT CHART**

YEAR	SHEEP/GOAT				CATTLE				PIG	
	LOCAL		EXPORT		LOCAL		EXPORT		LOCAL	
	YEARLY	AVERAGE DAILY	YEALRY	AVERAGE DAILY	YEALRY	AVERAGE DAILY	YEALRY	AVERAGE DAILY	YEARLY	AVERAGE DAILY
2011-12	523170	1499	559633	1871	133195	45	230	0.70	54530	183
2012-13	475207	1361	558004	1866	128020	428			49342	166
2013-14	471	1351	480230	1606	146012	488			45408	152
2014-15	513500	1471	420107	1405	144329	482			42799	144
2015-16	681796	1953	371	1241	75968	254			44808	150

Table 3:Export and local Supply from Deonar Abattoir of last 5 years

CONCLUSION:

- Due to improper maintenance and absence of technology, there has been no improvement in export
- Lack of facilities
- Can commendably contribute to mass export if modernized

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- The industry in our country is equipped with traditional and unskilled people, so they are not exposed to the modern technology and machineries that can be used for domestic market.

A centralized system can be adopted in slaughterhouses, as they offer various benefits and provide solutions to the many problems that traditional slaughterhouses pose.

A few features of the centralization system are mentioned below:

- The factory premises would have adequate separation between clean (white zone) and semi clean (black zone) zones to prevent cross-contamination.
- At the black zone the tyres of trucks are allowed to dip in the disinfectant so as to prevent bacterial contamination in the factory.
- The factory would have a reception area. The common visitors would be prohibited entry in the slaughter and deboning halls. Only the authorized workers would be allowed entry with proper attire to check the contamination.
- The factory would have enough area for reception of animals and an adequate sheltered lairage. Any animal found suffering from any zoonotic disease would be rejected so as to avoid cross-contamination.
- The factory would have separate slaughtering places for sheep/goat and for buffaloes.
- Continuous and thorough washing would always be carried out in the slaughtering area.
- It would be ensured that dogs, cats and birds do not gain access in the slaughter/deboning hall.
- Any carcass/part of carcass rejected would immediately be passed onto the rendering plant through a separate chute.
- Suitable and separate space would be provided for the storage of skin and hides.
- A constant hot water supply (82°C) would be ensured in both the deboning and slaughter hall.
- Receptacles with suitable finely fitted covers would be provided for lifting garbage and refuse from the slaughter area.
- It is prohibited to drag the hide in the slaughter hall. They would be passed to the place below the hider and skin through the chute provided below the hide puller.

- Personnel working in the deboning area would always be allowed to go to the deboning hall through a clean area while personnel from the slaughter area pass through a semi clean area. Inter mingling of personnel from abattoir to deboning and packing area would not be allowed.
- It would be mandatory for the workers to undergo medical check-up by a qualified registered medical practitioner every six month. Records are maintained for the medical certificates. This avoids the cross-contamination of the meat through handlers.
- Samples would be taken randomly daily from different tables and meat cuts for the microbiological examination.
- Likewise, swab examination would be done randomly from butcher's hands, knives, hands of workers working on packaging tables for microbiological examination.

❖ **ADVANTAGES OF THE CENTRALIZATION SYSTEM:**

- By adopting the centralization system in place of traditional slaughtering methods, the slaughtering process would become simpler, faster and all the more efficient. Also, it would help in solving numerous issues such as environmental problems, health hazards, pollution, etc.
- By centralizing the system, the slaughtering process would become considerably organized as compared to traditional slaughterhouse systems. It would also save much time and cost, contributing positively to the economy.
- The assembly line is part of the centralization system. By using that, the process would be much more efficient and fast. Also, it would be easy for the personnel to manage the undertakings of the slaughterhouse. Governing the activities of the slaughterhouse would become convenient and hassle-free due to the organized structure.
- Processes would be carried out in proper hierarchy and under controlled conditions, avoiding the emergence of environmental problems. Also, waste generated would be properly managed and cleaning would be a simultaneous process. Hence, health issues would not occur.
- It utilizes less space and hence the extra area can be used for spill outs or other purposes.

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2.3.5. MODERNIZATION

Looking at the present scenario of slaughterhouses, modernization is the need for the hour. With traditional slaughterhouses posing threats to health, the environment and hygiene; the need for modern slaughterhouses or abattoirs is alarmingly high. Modernizing the slaughtering process or system offers various benefits and ensures the overall development of not only the abattoir and the meat industry but also the country.

Presently, in India, traditional slaughterhouses are majorly in the picture. This could be due to lack of awareness of modern methods, lack of funds or mere lack of interest. Though, investing in renovating a slaughterhouse to make it a modern one is a fruitful deal. Once the setup is done, only timely maintenance checks will have to be done, that will check the efficiency and quality of the process, and updating the standards of the machineries used.

As compared to traditional processes, the modern or centralized process is much faster, efficient, cost-friendly, environment friendly and hygienic.

❖ CONTEXT:

The modern slaughterhouses or meat plants can conveniently be located on the outskirts of the city, adjacent to the highway. They need not be part of the local city market as the processed meat from the plant will directly be transported to the city, avoiding contamination.

❖ ZONING:

- All stages of the slaughtering process would be evenly spread out as per their hierarchy. In case of traditional slaughterhouses, all the activities are carried out at the same place. This leads to cross contamination.
- In modern slaughterhouses, separate areas are allocated for the storage of animals, storage of processed meat in cold storages, proper waste disposal areas, water storage area, washing and cleaning area, cutting area, etc.
- This segregation of activities makes the process easy to govern.

❖ **CONNECTIVITY (ROADS, HIGHWAYS, ADJACENT AREAS):**

- According to the laws governing slaughterhouses, the slaughterhouse or meat plant must not be in close vicinity of the city and must be away from any water source.
- Adhering to these rules is compulsory. Hence, these meat plants are located on the outskirts of the city so as to avoid problems caused to the residents. But, they are preferably constructed adjacent to roads and highways so as to allow for easy connectivity and delivery of the processed meat to the desired location before it becomes stale.
- Being away from the city, the meat plant does not disturb the residents with noise and smell. Considerable amount of land, air and water pollution is also avoided. This makes the modern process an environment friendly one.

❖ **MICRO LEVEL CIRCULATIONS:**

- Micro level circulations refer to pedestrian and vehicular circulation on site.
- Though the services and activities on site would be divided, there would be a convenient distance between them. This makes circulation on the site easy.
- For transporting meat on site, small movers can be utilized. The entire process would be mechanized, easing manual labour.
- As per regulations set down by the governing body for slaughterhouses, only the plant personnel would be allowed to access certain areas on site. But, even they would require regular checks before they enter the premises, to avoid any sort of contamination. Outside people would not be allowed in the areas where meat is stored.
- As far as cattle circulation goes, adequate means of transportation must be provided for the animals, while causing them no harm or distress. Correls designed by Dr. Temple could be utilized. They ensure smooth movement of the animals. Or a rail network can be provided on site, for the purpose of transporting animals and a separate secured system for processed meat.

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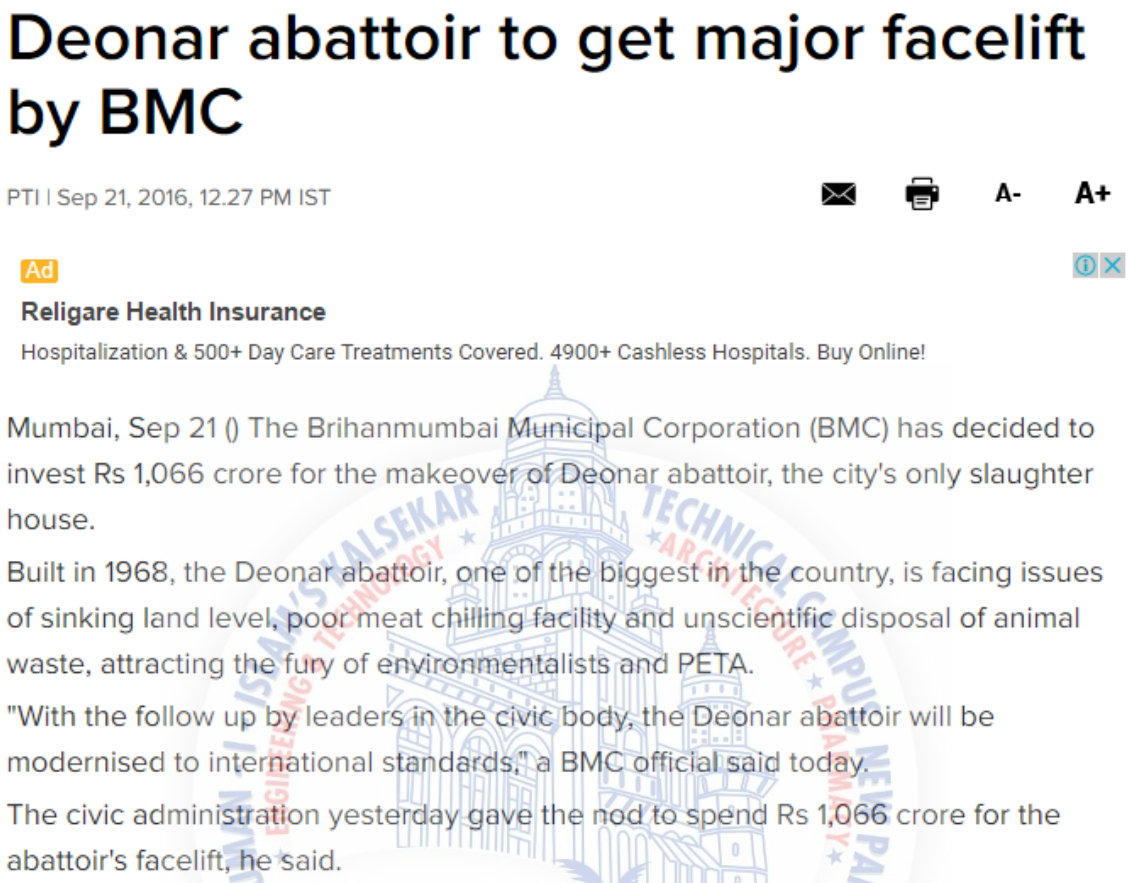
2.3.6. PROPOSED MODERNIZATION PROJECT



Deonar abattoir to get major facelift by BMC

PTI | Sep 21, 2016, 12.27 PM IST

A- A+

Mumbai, Sep 21 () The Brihanmumbai Municipal Corporation (BMC) has decided to invest Rs 1,066 crore for the makeover of Deonar abattoir, the city's only slaughter house.

Built in 1968, the Deonar abattoir, one of the biggest in the country, is facing issues of sinking land level, poor meat chilling facility and unscientific disposal of animal waste, attracting the fury of environmentalists and PETA.

"With the follow up by leaders in the civic body, the Deonar abattoir will be modernised to international standards," a BMC official said today.

The civic administration yesterday gave the nod to spend Rs 1,066 crore for the abattoir's facelift, he said.

Figure 38: TOI article

- Source:
    1. Times of India
    2. Interviews from Govt. officials
        - Mr (G.M)
        - Mr Sandeep Patil (Sr. Engg.)
        - Mr Shaikh Rais (Jr. Engg.)
        - Mr Mubarak Tadvi (Asst. Engg.)

Link: http://timesofindia.indiatimes.com/city/mumbai/BMC-likely-to-spend-Rs1066cr-for-Deonar-abattoir-modernization/articleshow/54434133.cms

CHAPTER 3: LIST OF CASE STUDIES AND THIER PURPOSES

❖ NET:

A. CASE STUDY: MASAKA SLAUGHTERHOUSE, KIMANYA-KYABAKUZA, UGANDA:

- To understand the zoning
- Structure requirement of the Pig slaughter house
- Service flow
- To understand design of the slaughterhouse for pigs that respond to the needs and conditions.
- However, the design serve as a model for other districts interested in a similar initiative

B. CASE STUDY: SHEUNG SHUI SLAUGHTER HOUSE, HONG KONG:

- To study the process of slathering of pig and castles
- To understand the area required for designing
- To understand the ergonomics
- To understand the zoning of layout

C. CASE STUDY: FREY'S MEAT PLANT:

- To understand the zoning in details and area requirement
- **To understand the services:**
    - Waste water storage tank
    - Well and Septic
    - Propane Gas

❖ LIVE:

D. CASE STUDY: AHMEDNAGAR GOAT FARM AND SLAUGHTER HOUSE (AGF) FED.LTD. AHMEDNAGAR, MAHARASHTRA:

- To understand the area required as per BSI
- Details study of slaughtering process
- To understand the Separation of space and connectivity of CLEAN and DIRTY area
- To understand the details and working of every area required in abattoir layout

E. CASE STUDY: ALLANA PROCESSING UNITS:

- To understanding the process of carcass
- To understanding the Zoning of processing unit
- To understanding the process of packing and dispatch
- To understanding the requirement of processing unit and flow of process

A. CASE STUDY: MASAKA SLAUGHTERHOUSE, KIMANYA-KYABAKUZA, UGANDA

❖ LOCATION

- Kijjabwemi Industrial Area, 2km from Maska town, close to the Masaka-Mbarara Highway
- Parish Kimanya; Sub-county: Kimanya-Kyabakuza; Masaka Municipality

❖ MAP 1: MAP OF LOCATION

Figure 39: Location Plan

❖ OWNER

- A Private Public Partnership (PPP) between the Masaka Local Government which grant the plot to the Masaka Pig Cooperative Union. A progressive ownership transfer from the Masaka Local Government to the Cooperative Union is planned.

❖ **TARGET SLAUGHTER CAPACITY:**

- The Masaka Pig Cooperative Union members and the local government authorities target a capacity of upto 50 pigs per day. Considering the current pig production in the district this target goal may not be reached immediately, therefore the proposed layout of the slaughterhouse focuses rather on a two bays Compartment model where each bay is able to handle 25 pigs per day and not on a monorail slaughter line.
- The second bay can be built later when the slaughterhouse operations exceed the initial capacity of 20 to 25 pigs per day.

❖ **SLAUGHTERHOUSE SITE:**

- The site had been purposely selected by the local government as there are already two tanneries north to the assigned plot and there are no neighbours whose religious feelings may be hurt by intensive pig slaughtering.
- The details of the site which had been granted by the district/municipality are shown hereafter

❖ **PLANS DISCRIPTIONS:**

1. Plan 1: Site plan established by the Commission of Surveys and Mapping in the scale of 1: 2.000 showing the location of the assigned plot in relation to neighbouring plots and road infrastructure.
2. Plan 2: Plot plan established by the Commission of Surveys and Mapping in the scale of 1: 500 indicating the north point.
3. Plan 3: Simplified site plan showing all existing (office) and planned buildings (slaughterhouse, water tank, well, pig holding pens, biogas digester, fish pond and/or lagoons, loading/unloading ramp, weighing bridge, pathways for animals from ramp to holding pen and from holding pen to slaughterhouse and the walls on the top and bottom sides of the plot. The north point is shown.

- **STRCUTURE DESCRIPTION:**
  - The building will be constructed in west-east direction to reduce exposition to sun in order to minimize heating up An existing access road is indicated. This road is however located outside the assigned plot and if it cannot be acquired its usufruct should be inked. The more convenient option of acquiring additional land on the northern side of the plot is discussed in Chapter 10: Conclusions
  - A **cross section plan (Plan 4)** with approximate gradients indicates the requirements for levelling the plot.

4. Cross section plan with gradients and earthwork for levelling

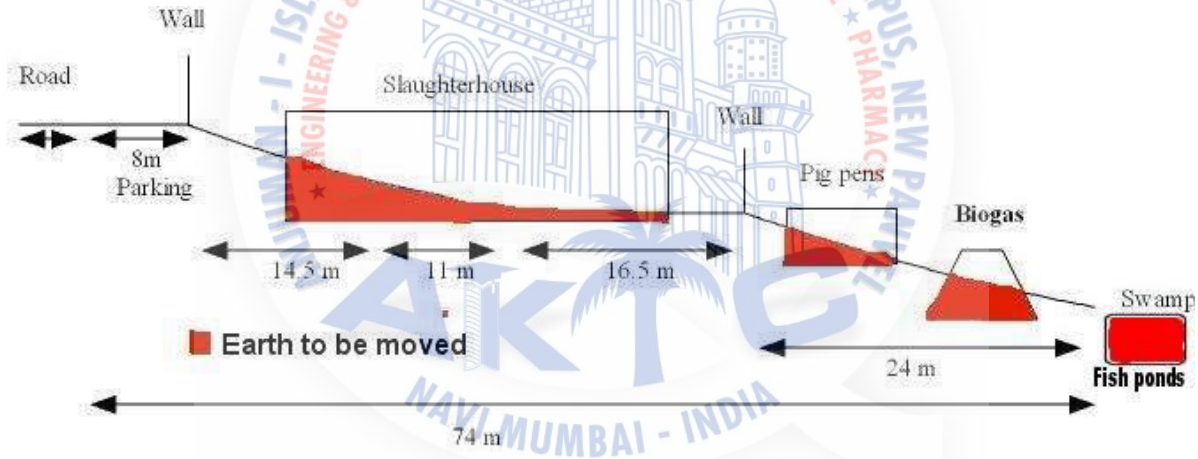


Figure 40: Site section

Plan 1:

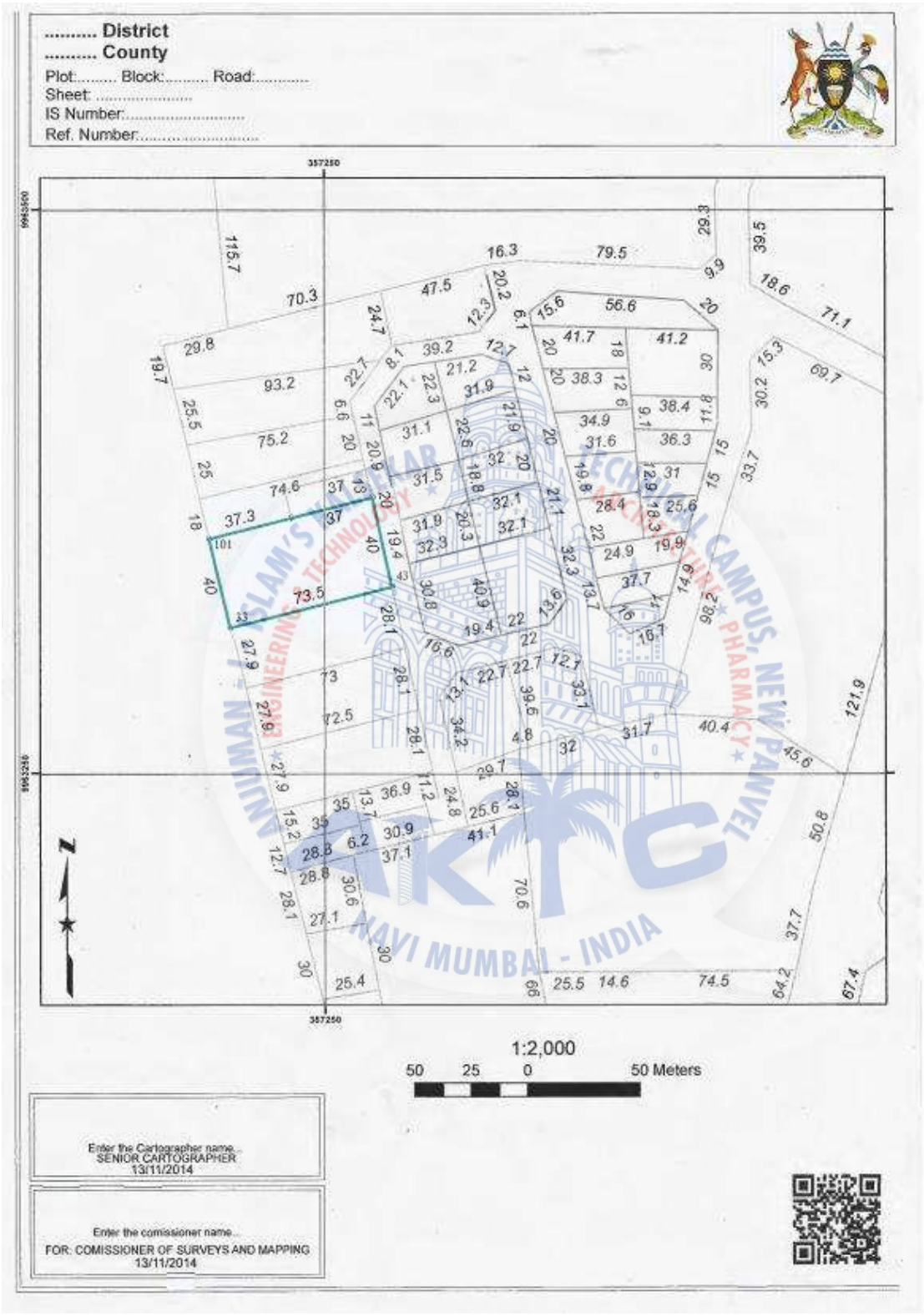


Figure 41: Site plan - 1

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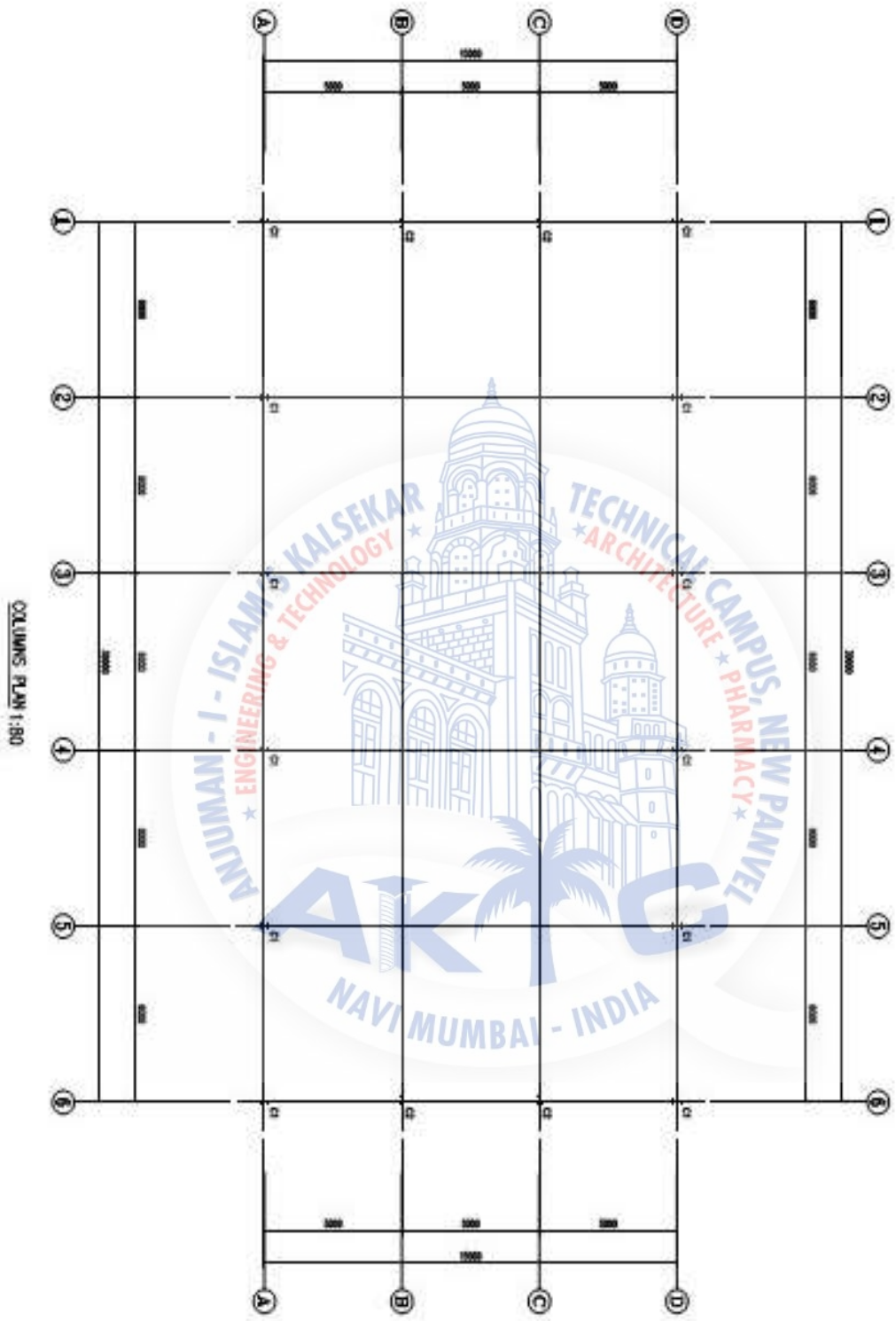

Figure 46: Floor-plan of the metal warehouse –Column layouts

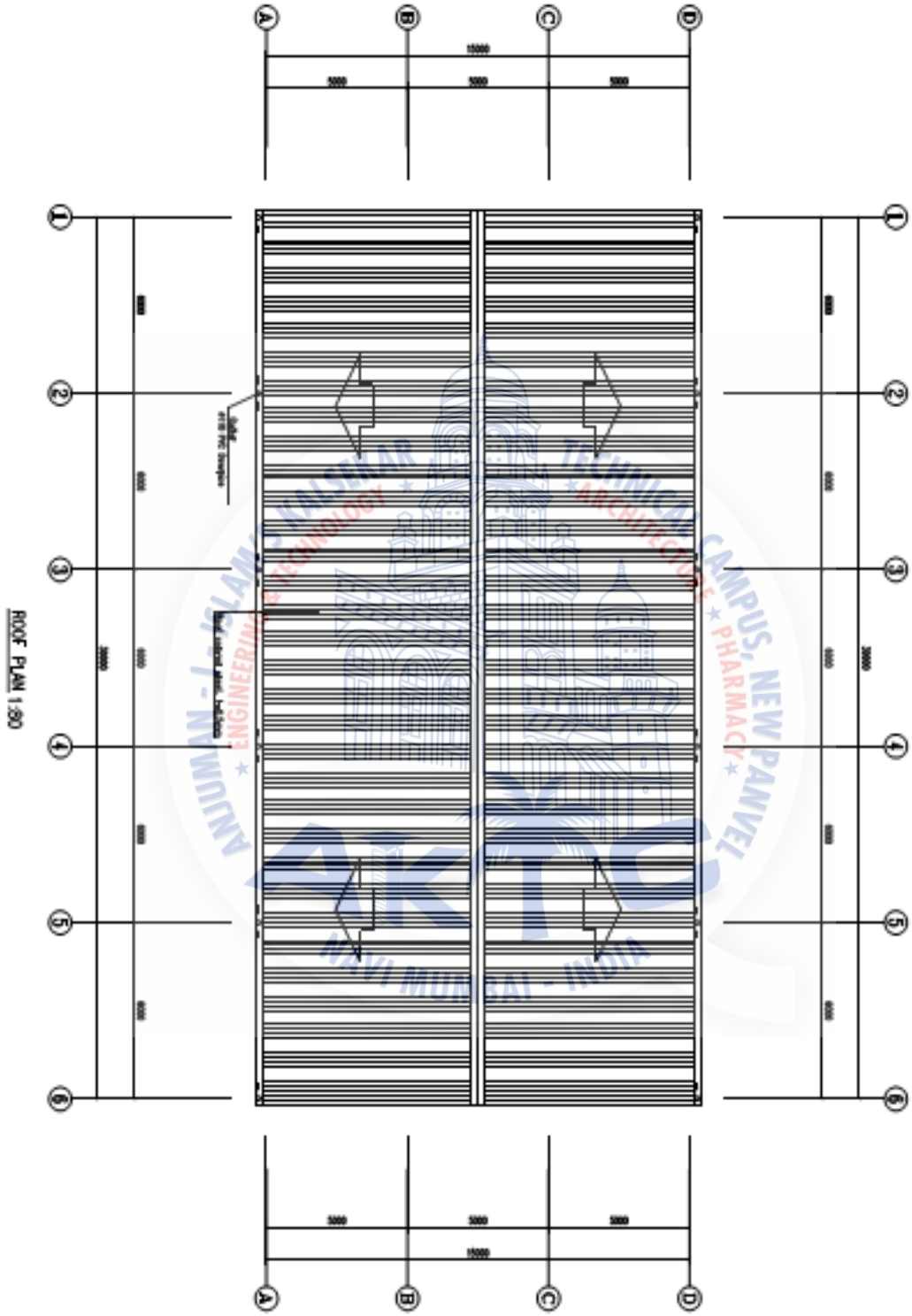

Figure 47: Roofing of planned metal construction

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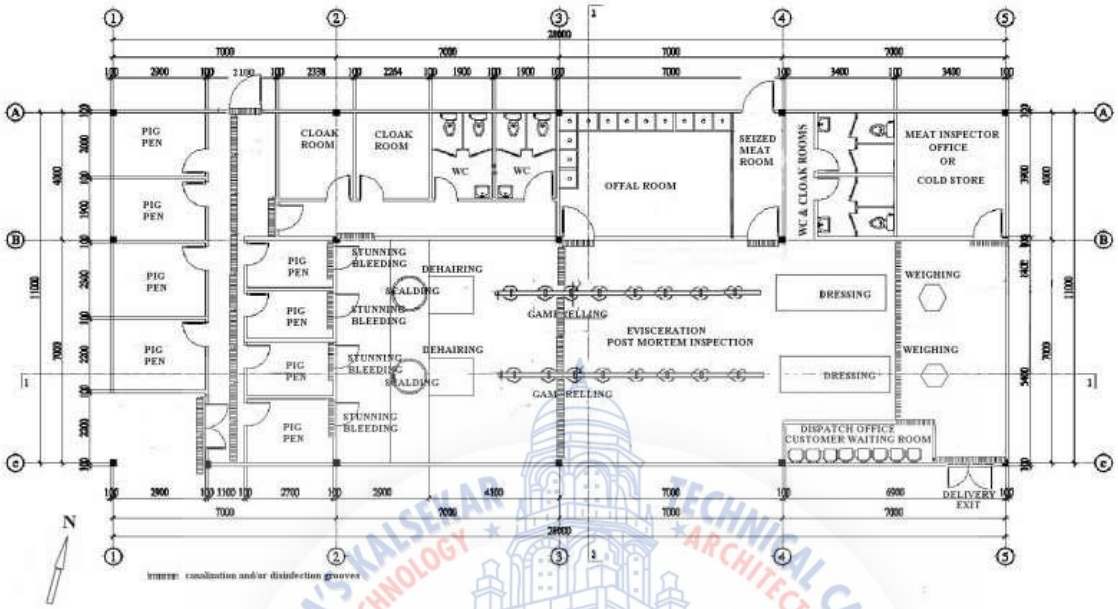

Figure 53: Floor plan of slaughterhouse

- with a capacity of 50 pigs/day

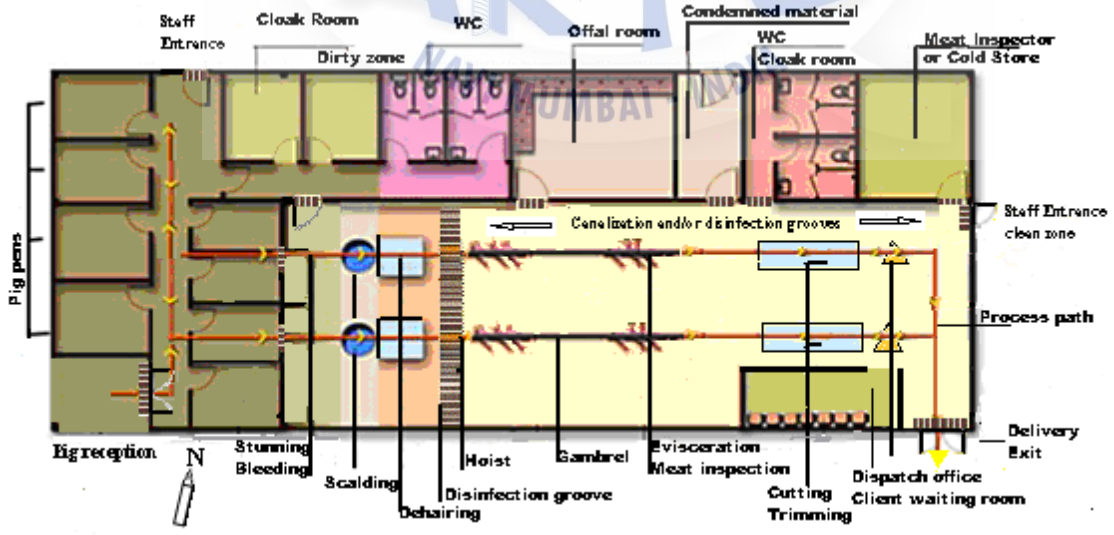

Figure 54: Floor plan of slaughterhouse

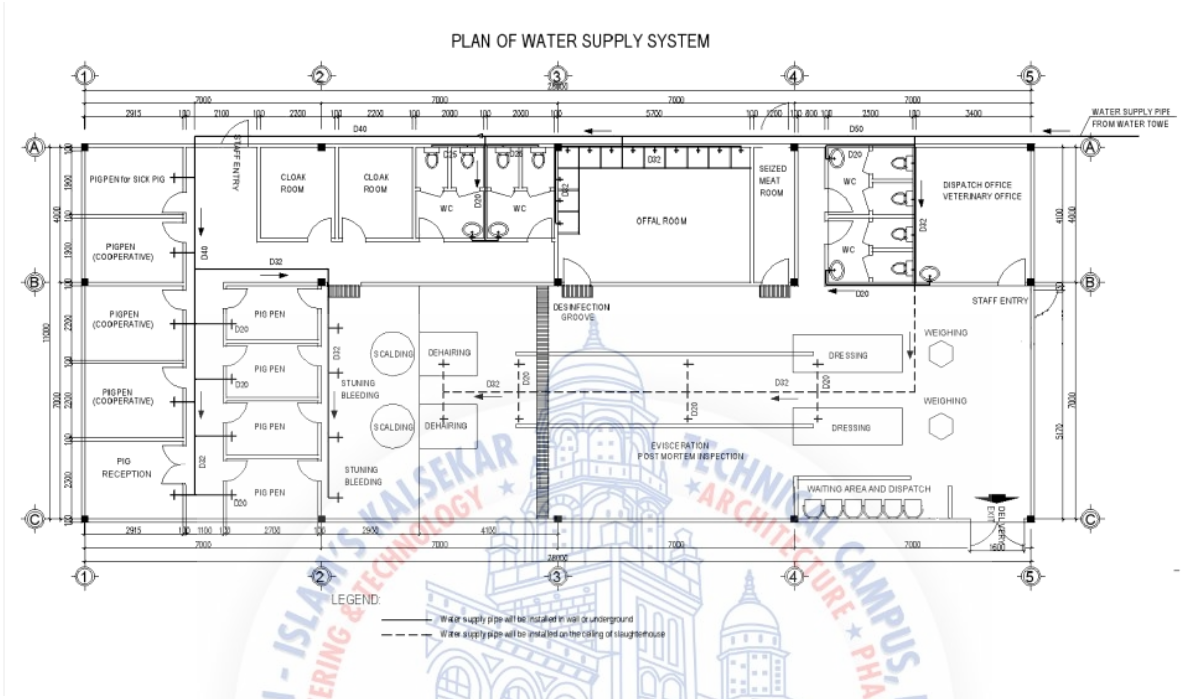

Figure 55: Water supply system

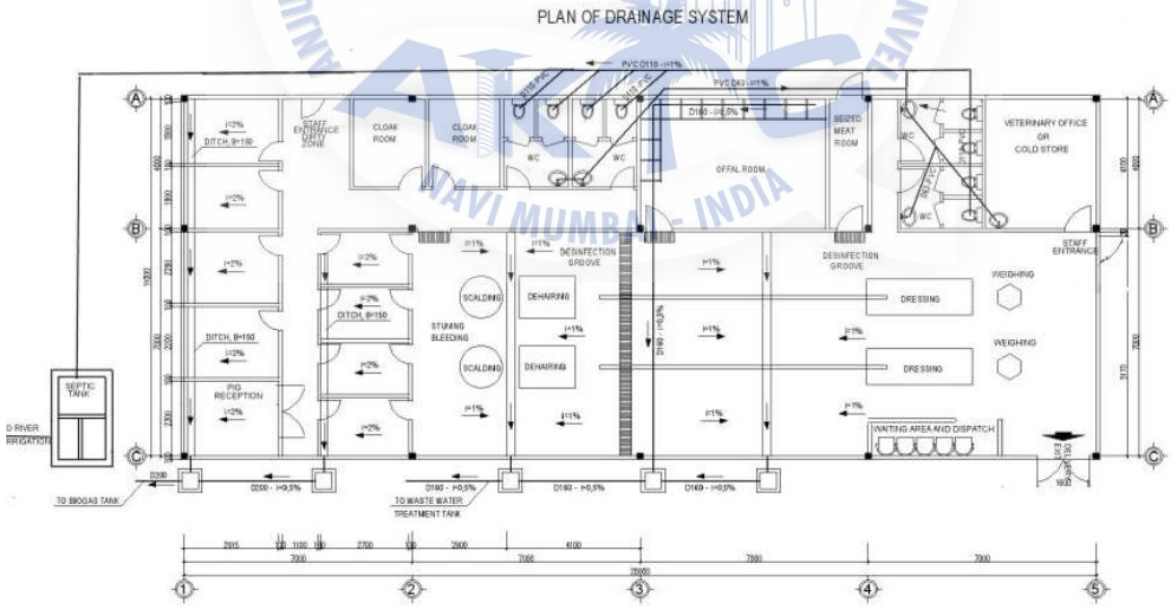

Figure 56: Drainage system

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❖ BIOFUEL PRODUCTION FROM GREASE AND FAT 18

- Biodiesel can be made from domestically produced crops, animal fat and waste vegetable oil.
- It is biodegradable making it safe to handle and transport.
- Animal fats are attractive feedstock for biodiesel because of their low costs
- Animal fat feed stocks can be made into high-quality biodiesel
- One of the important attributes of biodiesel is that it lowers the levels of harmful pollutants in the exhaust of diesel engines.
- Biodiesel can be used as fuel for a boiler or heater in the slaughterhouse

Figure 59: Bio fuel generator

❖ OBJECTIVE OF THE PROJECT

- To propose a design of the slaughterhouse for pigs that respond to the needs and conditions of Masaka district.
- However, the design could serve as a model for other districts interested in a similar initiative

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❖ **BACKGROUND:**

- The site was chosen because of its isolation from built up areas; convenience to rail and road networks for the delivery of animals and distribution of fresh meat.- And its adjacent waste treatment plant which would have capacity to assist in the essential process of waste water treatment.
- The intent of the new slaughterhouse is to provide a stable and adequate supply of fresh warm meat to the community whilst ensuring the highest international standards for hygiene and safety, operational efficiency and environmental management.

❖ **FACILITIES PROVIDED:**

- Abattoir's and quarantine facilities consisting the following elements:

❖ **SUSTAINABLE FACILITIES:**

- Waste water treatment
- Solar hot water treatment
- Chillier and Boiler plant
- Indoor air controller
- Odour control and gas emission
- Solid waste disposal

❖ **PROCESS OF SLAUGHTERING:**

- Animals are kept in the stock yard once they are received by slaughter houses. They are kept for a day in stockyards and pen. Until and unless they are kept for a day they are not watered. The animals are then taken to the slaughtering area from the holding area and the following activities are done.
- Stunning;
- Suspension from an overhead rail by the hind legs;
- Sticking processing can be done by the collected blood;
- Hide removal is process for cattle for removal of hair or scalding and dehairing is process for hogs for removal of hair;

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- The animal is led into the bleeding area where it is restrained by a tether through the floor ring prior to stunning (using a captive bolt pistol).
- Once the animal is stunned then animal is led into shackling process by one leg and another tied with a rope pulley block.
- The animal is kept at one place for bleeding in this posture and blood is collected in a drum for disposing process.
- Once bleeding is complete the head can be blown off and the animal lowered onto the cradle for dressing.
- Once the feet is removed, the skin is open and the breast born has being somewhat blown out.
- Leg hooks are then attached and the carcase raised to a 'half-hoist' position on the spreader.
- Blowing of skin can then remove and hide too. Once the inspection of buggy and red offals is done the paunch can be removed and can be placed on the examine table for inspection.
- Once the carcass has been examined it can divided and can be quaterly cut down and can be hung individually on the lower rail.
- As soon as the carcass has been partially removed away and half hanged another animal enters the bleeding area.

❖ **LAIRAGE:**

- Lairage should be freezed to the daily expections of killing animals.
- This will allow stock to be held overnight before slaughter. In some conditions large space must be used although the holding of stock at the abattoir for an extended period before slaughter should not be permitted.
- Lairage areas for each and every animal should be provided as per the requirement for the specific abattoir. Pen areas required for each species are as follows;
- Species Area for Lairage
    - Cattle - 1.7m2/head
    - Pigs/Sheep - 35m2/head
    - Goats - 0.25m2/head

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C. FREY'S MEAT PLANT

- **LOCATION:** Toranto, Ontario

❖ TABLE OF CONTENTS

❖ OVERVIEW

- The Frey's Meats plant was built by the current owners, starting in 2003 and the expansion continued to 2005.
- They operate a custom Slaughter and processing operation for beef, pork and lamb. Ideally located in the heart of scenic Ontario farm country, their Suppliers of raw product are local and many of their producers are Organic.
- The owners are a member of the growing "Buy Local "Network, serving region-wide retail and restaurant demand. The retail storefront also permits direct-to-consumer sales and special orders. Excellent certifications allow export to US markets and products for the growing Halal specialized products.
- The kill floor is CFIA Licensed, USDA/ISNA approved and HACCP recognized.
- The processing plant has a provincial license which is easily converted to CFIA, and shows great potential to increase business. Proximity to Greater Toronto and the New York and Michigan borders is an opportunity to expand further processing of packaged goods into new market

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- **PLANS**

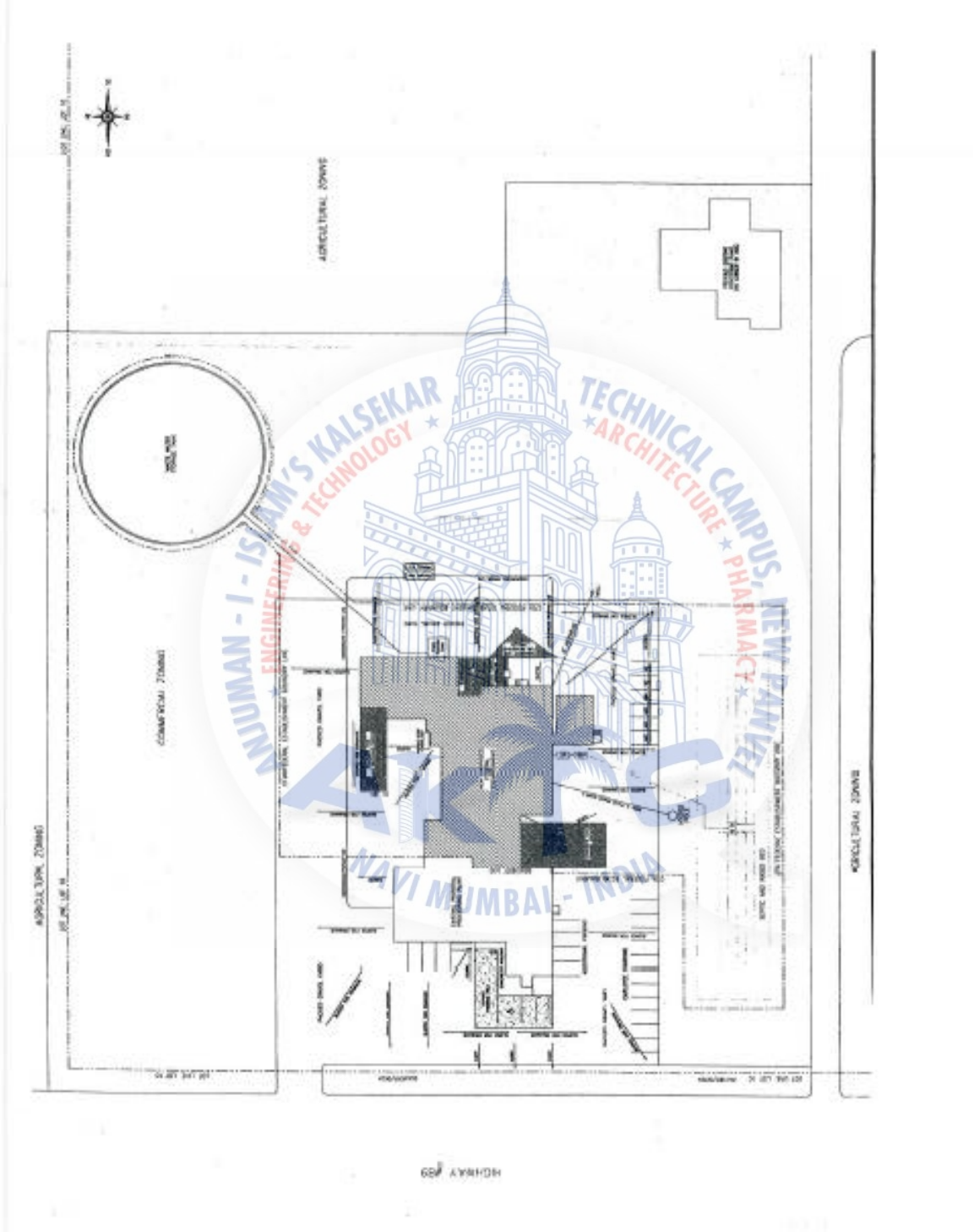

Figure 66: Site plan

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D. CASE STUDY: AHMEDNAGAR GOAT FARM AND SLAUGHTER HOUSE (AGF) FED.LTD. AHMEDNAGAR, MAHARASHTRA

- NAME OF THE PROJECT : AHMEDNAGAR GOAT FARM
- LOCATION: VADAGOAN TANDALI ,AHMEDNAGAR,MAHARASHTRA
- SITE AREA: 0.938 ACRES
- YEAR OF ESTABLISHMENT: 1993

Figure 69: Overall view

- Goat farming in India has been done using old traditional and conventional methods for centuries. Ahmednagar goat federation has used and started using modernistic and scientific techniques to make goat farming and processing a more commercially viable proposition. Then goats are grown in stall-fed conditions. The well trained members at farms gives proper maintenance and record of each and everything happening in the premises .Medical check-ups and vaccinations has been done on daily basis so that the animal should stay healthy and no disease should harm.
- These new technique has been taken goat farming to the upper level which help our country export market. This method has been applied at many AGF's farms and has given a good result.

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- **FLOW DIAGRAM**

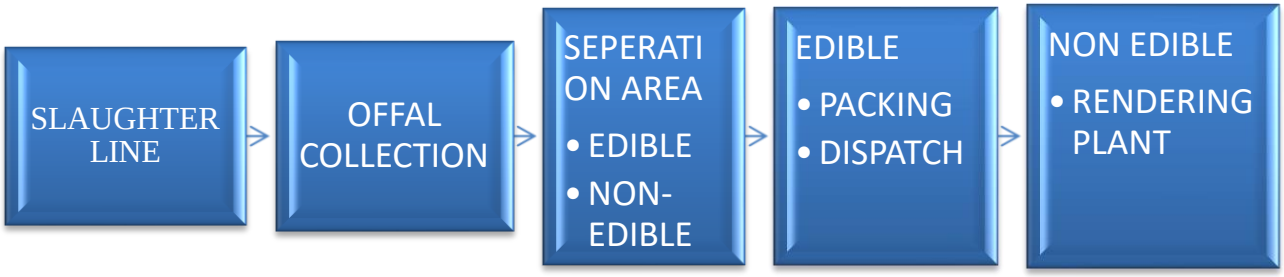

Figure 76: Major process of slaughtering

Figure 79: Worker flow

Figure 77: Seperation of Space

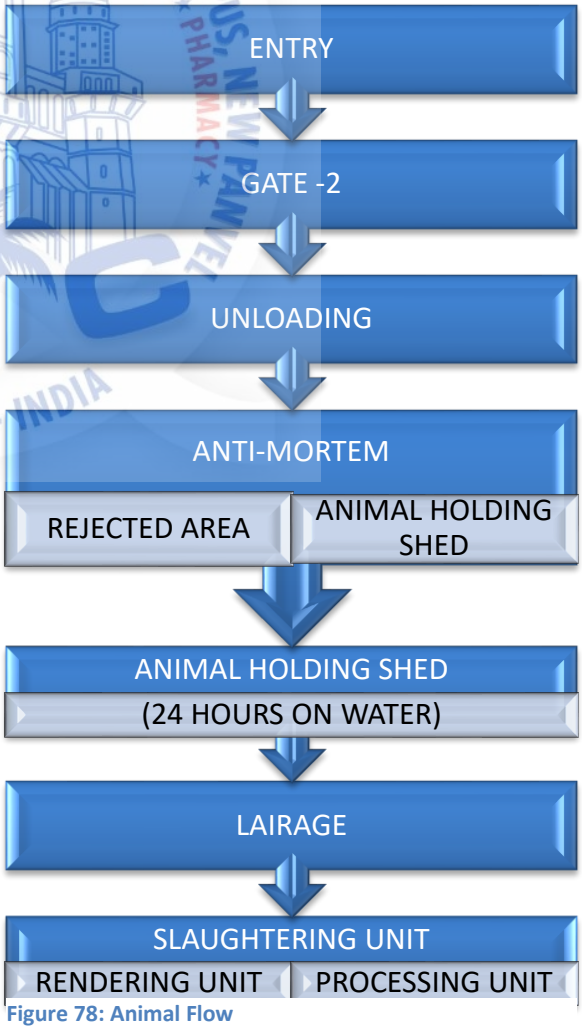

Figure 78: Animal Flow

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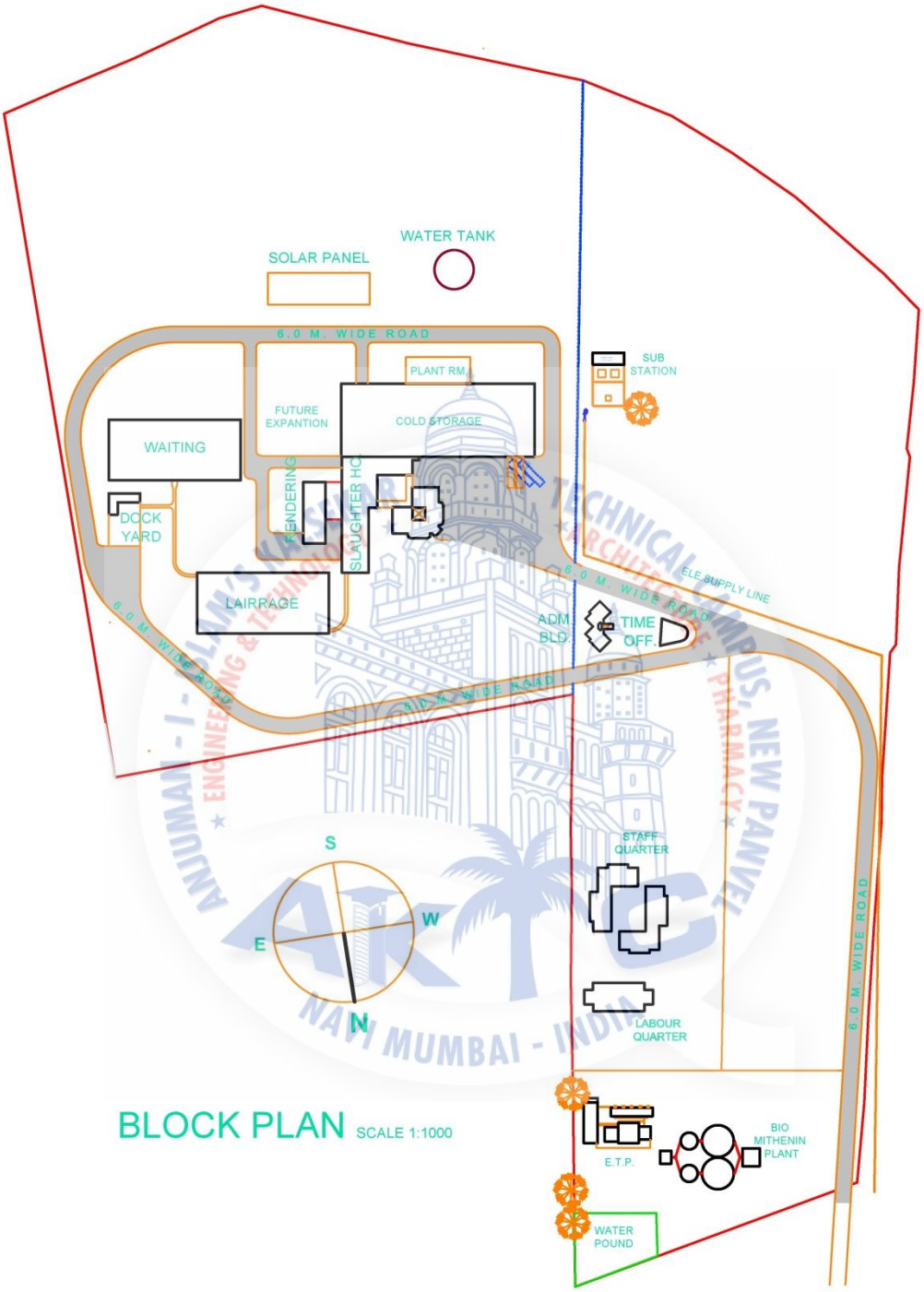
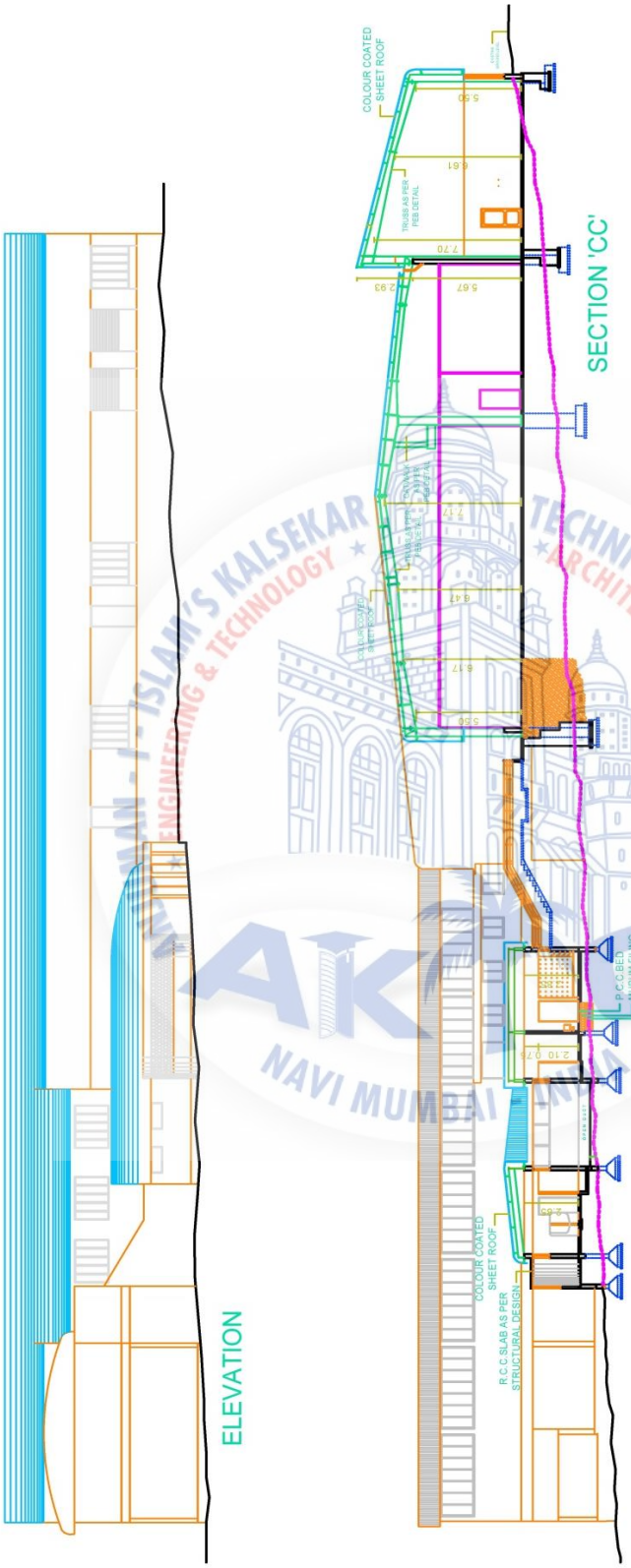


Figure 92: Block Plan



- SECTION SHOWING LEVEL DIFFERENCE AND FLOW OF SPACE
- ELEVATION SHOWING FAÇADE TREATEMENT, WINDOW PLACING AND NO. OF STOREY
- SLOPING ROOF IS SHOW IN ELEVATION AND SECTION

*Scale: not to scale

Figure 93: Elevation and Section

E. CASE STDUY: ALLANA PROCESSING UNITS

- **LOCATION:** CIDCO MIDC, Turbhe, Navi- Mumbai
    - Site is near to the sion – panvel highway

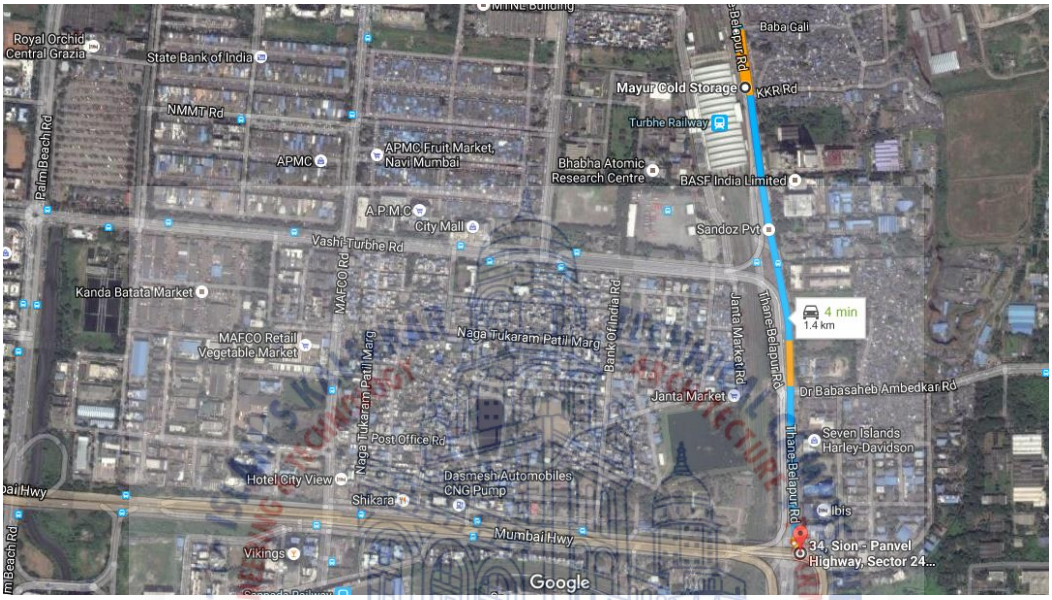


Figure 94: Site Plan

- **PROCESS FLOW:**

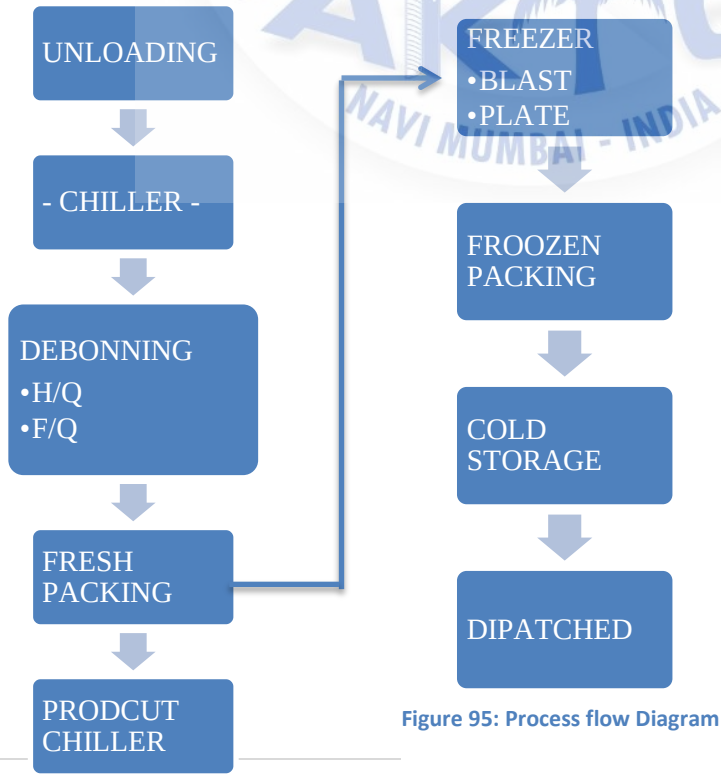


Figure 95: Process flow Diagram

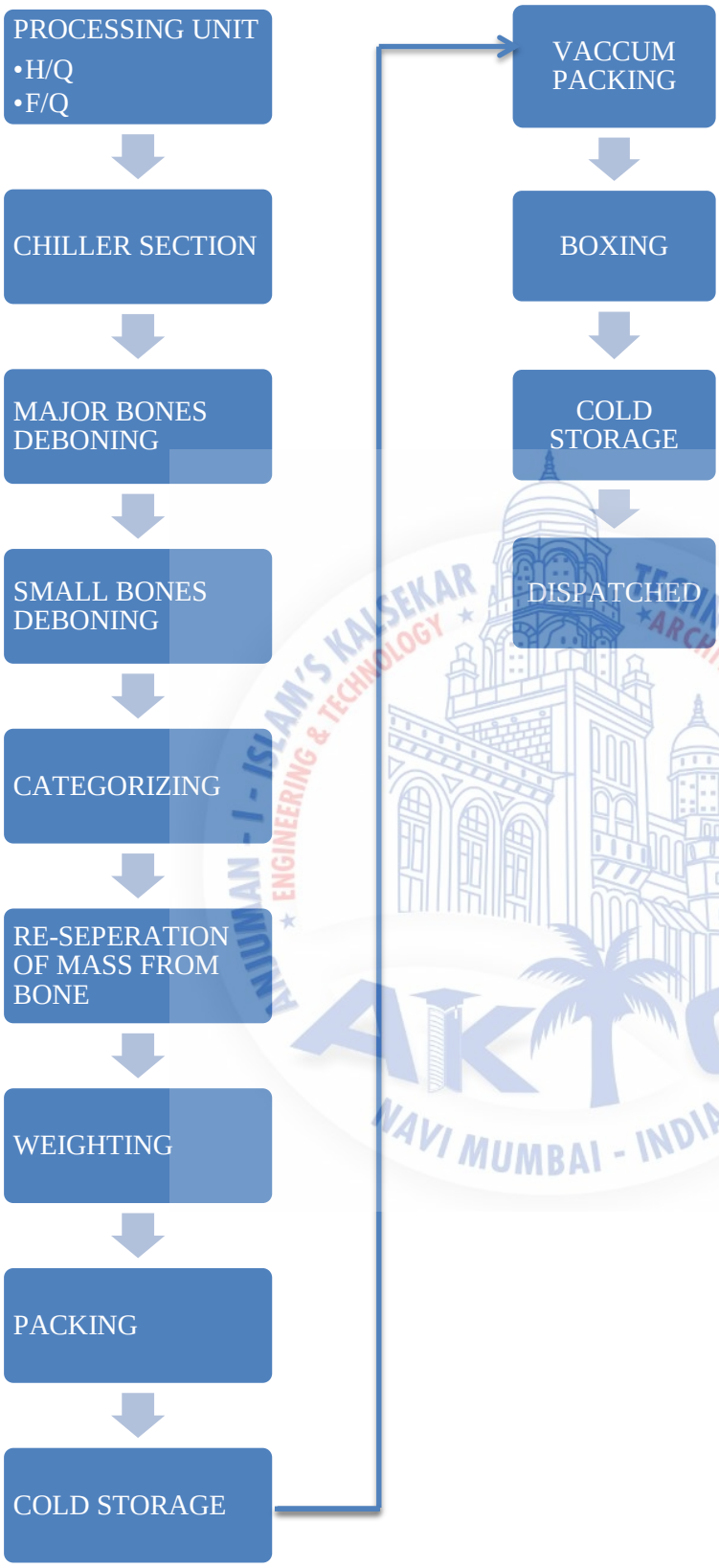


Figure 96: Detailed Process Flow Diagram

- **UNLOADING DECK:** Unloading of carcass (H/Q and F/Q)

*F/Q – Fare Quarters

H/Q – Hind Quaters

- **Debonning:**
    1. **Seperation:** It is the process of seperation of Major Bones for Carcass
    2. **Seperation**: It is the process of seperation of minor Bones after major bones seperation
    3. **Bifercation:** Process of categorizing of pieced part
    4. **Seperation:** Seperation of fat from categorized part
    5. **Weightning:** Done before Packing for rquirement fullfiling
    6. **Packing -1 :** Done before final
    7. **Cold storage:** For freezing and Maintaining the temp. for packing
    8. **Vaccum packing:** It is Process of Air tighting packing
        - **Metal detactor:** passed through metal deteactor befroe Boxing
    9. **Boxing :**Aas per Standards
    10. **Cold storage:** stored for maintaing the temp. berfore dispatch
    11. **Dispatched:** A deck for loading in trucks

***Note:**

- **Blast freezer:** Beef stored here for freezing for 12 hours (Temp.: -20*c)
- **Plate freezer:** Beef stored here for instant freezing for 3- 4 hours (Temp.: -40*c)

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F. CONCLUSIONS FROM CASE STUDIES:

- Slaughtering of Pig, Cattle and Goat/ Sheep.
- Detail Processing of Meat/ Beef
- Blocks placing
- Process of Pig slaughtering is different from the slaughtering of Cattle and Goats, it requires additional facilities and more space for processing and slaughtering
- In Deonar abattoir, all the major activities like skinning, offal removal, separation of edible and non-edible products is done manually hence more area is required and as per modernization and more induced of technology same work done with more productivity with less space required, hence more number of slaughtering is done
- Systematically and proper flow of slaughtering and processing create a separation of CLEAN and DIRTY area, which increases the Quality of the products
- By creating separation (Clean and Dirty) of area proper, production increases and the separation of department of work is crated, hence no interfering of work
- Back flow disturbs the flow of process and create chaos for the organizers and workers
- Implement of technology increases the outcome and proper planning as per standards and flow reduces cost of structure construction

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4.1.3. ACTIVITIES AND USERS

❖ **ACTIVITIES**

- Activities at Deonar Abattoir are governed B.M.C.
- Persons holding valid licenses issued by Assistant Commissioner (Markets) and General Manager of Deonar Abattoir for different trades connected with sale, purchase and slaughter of sheep and goats, horned cattle and pigs are only allowed to enter into the Abattoir premises and to operate their respective business.

❖ **WORKING SCHEDULE**

- The horned cattle slaughtering unit, sheep and goats slaughtering unit are closed on every Thursday
- Pig Unit on Sunday, Zatka or Jewish Unit on Monday.
- There is no weekly holiday for other slaughtering units (viz. Midnight Sheep & Goats Slaughter Unit, Suburban Cattle Slaughtering Unit, Suburban Sheep Slaughtering unit).
- However, all the slaughtering units are kept closed for 16 days in a year as fixed by the Corporation
- **LIVE STOCK MARKET:**
    - Sheep & goat – On every Tuesday and Saturday.
    - Horned cattle – On every Monday and Friday

❖ **MAIN FUNCTIONS OF DEONAR ABATTOIR**

- To work under regulations concerned with :
    - Issue of licenses for different trades connected with the sale and slaughter of animals at Deonar abattoir.
    - Allocation of quota of horned cattle to the licensee and allotting them flow number.
    - Fixing operational timings of slaughtering units for local as well as for export slaughter.
    - Regulations of the Abattoir by other acts, bye-laws etc. The bye-laws framed by the Corporation under the authority of sections*

rules by the B.M.C.

- Maintenance of Deonar Abattoir and the livestock market held in the premises.
- Delivery of beef carcasses, carcases through Municipal agencies
- Disposal of by-products and seized animals
- Permitting removal of live sheep & goat for religious purpose (e.g. Bakri Id, Holi etc.)
- Arrangements for Bakri-Idd festival.
- **LIVE STOCKS MAKRET:**
    - About 25,000-35,000 sheep & goats are brought from Gujrat, Rajasthan, M.P., U.P. and Maharashtra for sale in livestock market on every Tuesday and Saturday. Dealers from Punjab, Gujarat, Maharashtra, and Karnataka bring horned cattle for sale.
    - The local licensees, exporters, the mutton shop holders (Salsette diary) at Thane District take benefit of this livestock market.
    - The citizens can also purchase the sheep & goats in the livestock market and take the same out of Abattoir compound for religious slaughter on payment of schedule charges. However they have to bring N.O.C. From local police station where they reside for this purpose.
    - **No horned cattle or pig is however, allowed to be taken out for slaughter purpose.**

❖ **THE DESIGNED CAPACITY OF THE SLAUGHTERING AND PROCESSING UNITS IS AS UNDER IN 1972 :**

Sr.No.	Main Sheep Unit by Halal method	6000 sheep and goats in 8 hours shift on three conveyor lines.
2	Main Cattle Unit by Halal method	300 Horned cattle in 8 hours shift.
3	Zatka Unit for sheep and goats.	100 Sheep & Goats in 8 hours shift.
4	Jewish slaughtering Unit for sheep and goats.	200 sheep and goats in 8 hours shift.
5	Pig Slaughtering Unit.	200 Pigs in 8 hours shift.

*No Jewish Slaughtering techniques if followed now

Table 6: Design Capacity

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4.1.4. SITE DIMENSIONS

N

❖ SHOWING: ROAD DIMENSIONS & SITE DIMENSION

- **SITE AREA**: 64 acres

*scale: 1: 3000

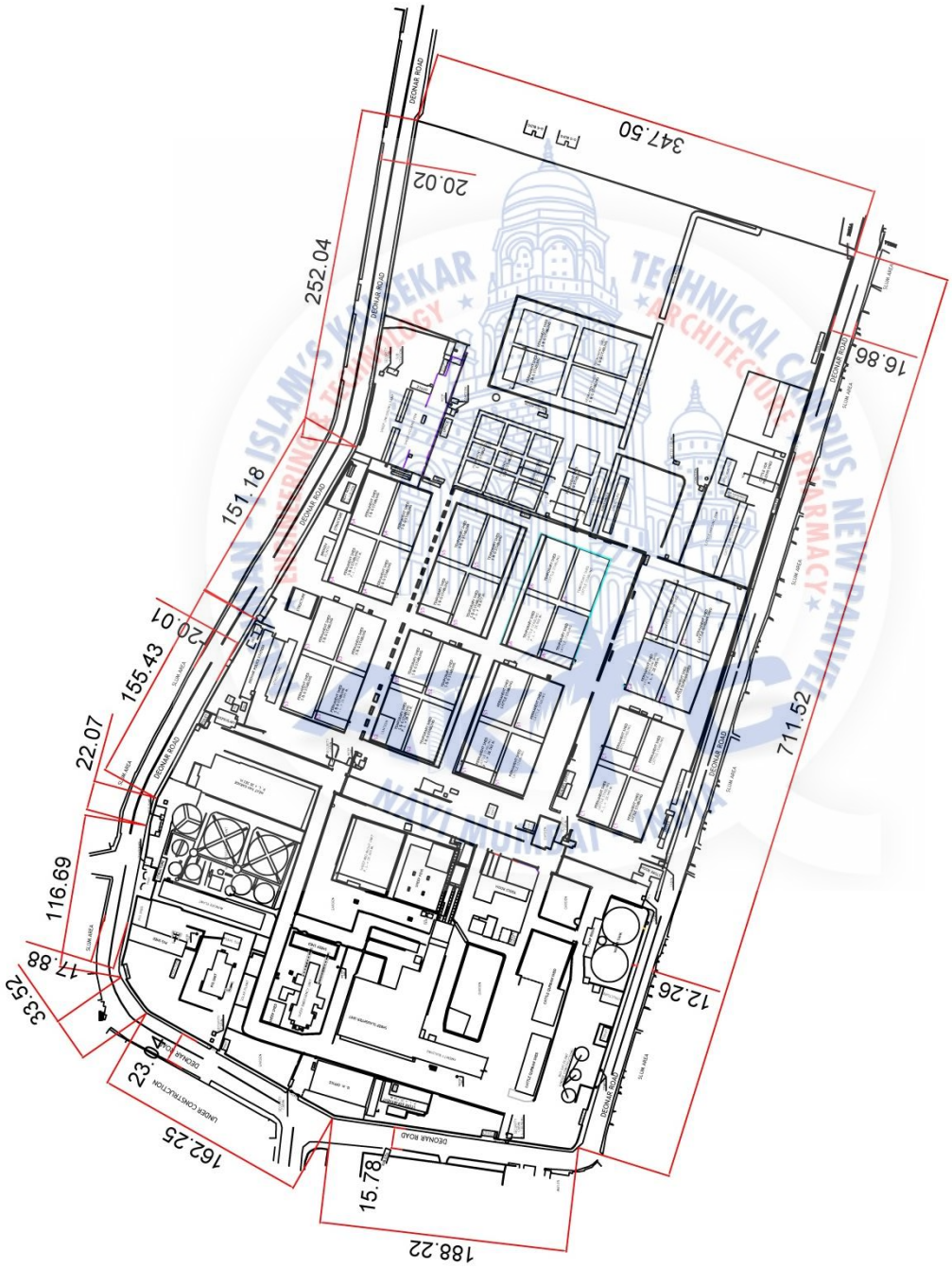

Figure 119: Layout plan

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4.1.6. CONTEXT ZONING

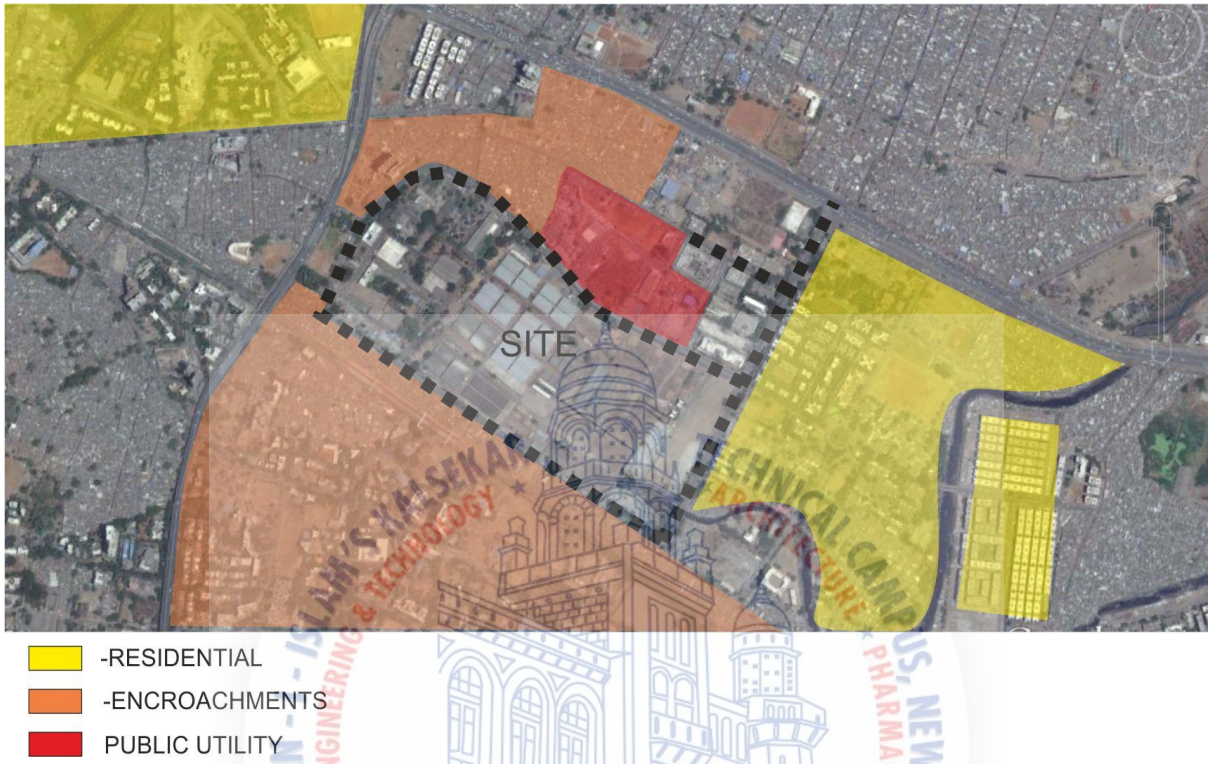

Figure 120: Zoning

As site is majorly surrounded with encroachments and residential area and near to the highway and free way as shown in location plan

- ❖ OBSERVATIONS:
- As slum is there are no proper zoning
- But Deonar city is progressing infrastructural
- Progress and planning as per growth in necessary due to growth of infrastructure near Deonar

4.1.7. CIRCULATION

a. CONNECTIVITY TO HIGHWAY

Figure 121: Highway connectivity

*NOT TO SCALE

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A. MICRO CONNECTIVITY (TRUCK – ROAD)

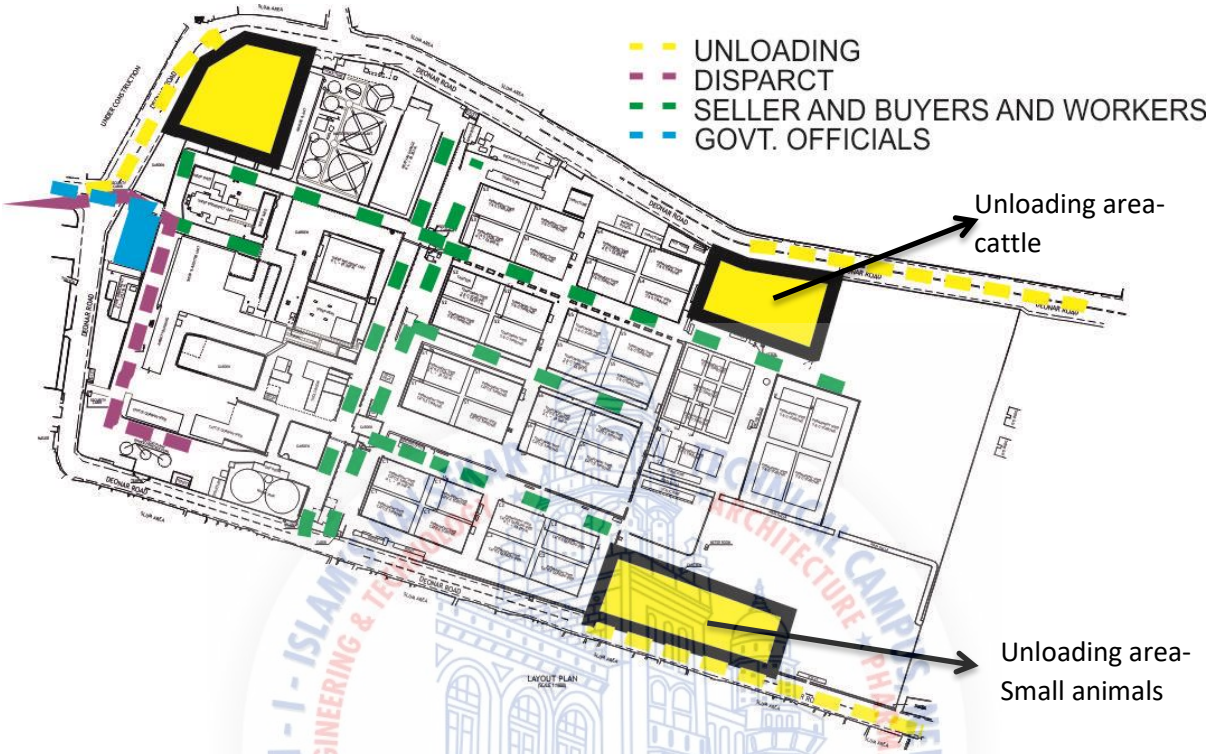

Figure 123: Internal circulation-1

❖ VEHICULAR CIRCULATION:

❖ OBSERVATIONS:

- **GATE 1:** for govt. officials and trucks entry other than unloading (like garbage and dispatch)
- Separate loading areas for pig, buffalo and goats
- **GATE 3 AND 4** is majorly used for the vehicles of sellers and buyers
- Dispatch area is near to the gate
- Unloading area of cattle's does not disturb the traffics or vehicular circulation, it is on the industrial zone
- Unloading area of cattle's does not disturb the traffics or vehicular circulation, it is on the industrial zone
- Can access by any gate by walking
- Can access each and every parts by walking

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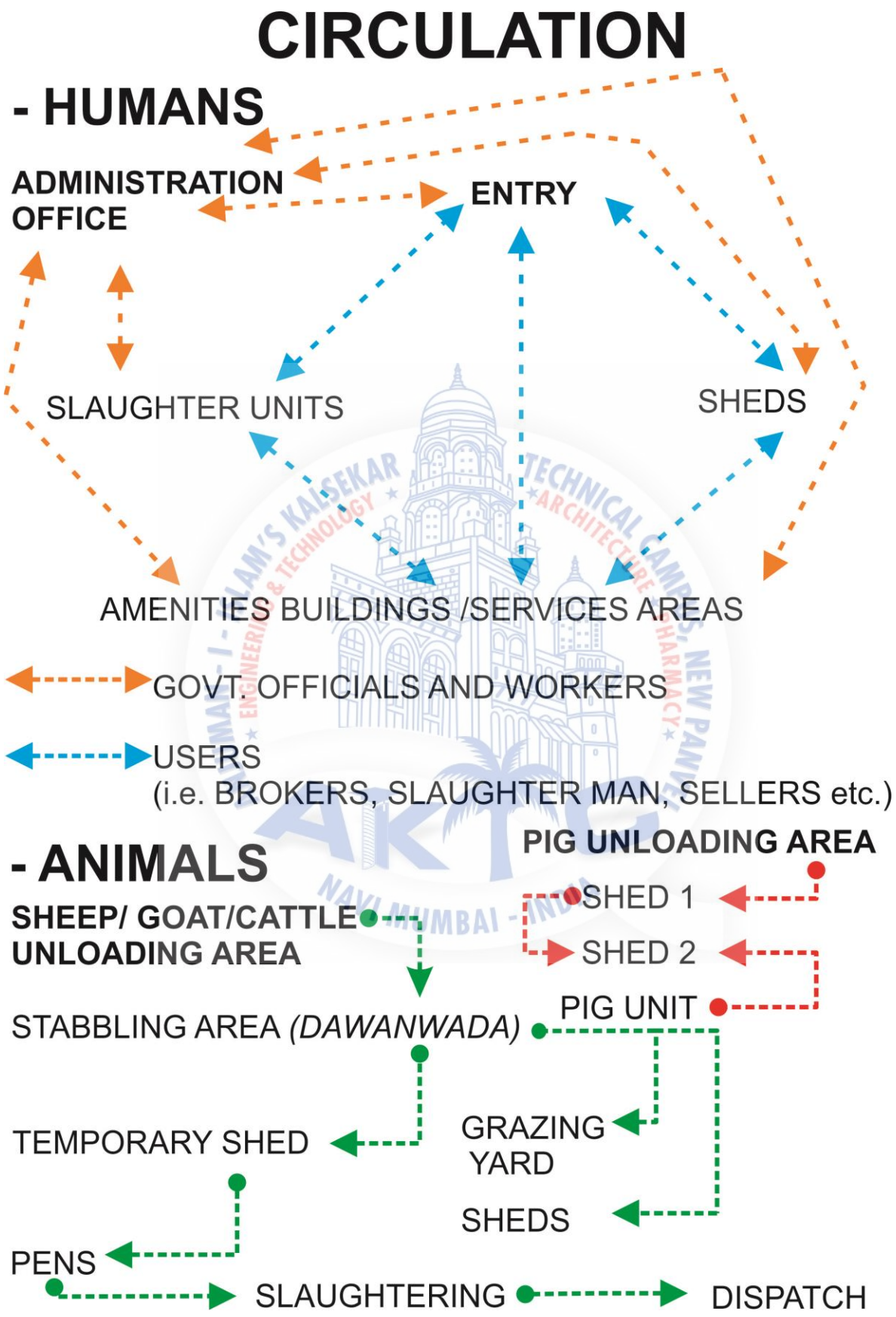


Figure 126: Circulations

4.1.10. .....

LEGAL

- **SITE IS UNDER BMC (GOVT.SITE)**
- **RESERVED FOR:**
  - ABATTOIR
- **Max. permissible F.S.I. :** 5
- **SOURCE**: EASTERN SUBURB, M WARD D.P 2034

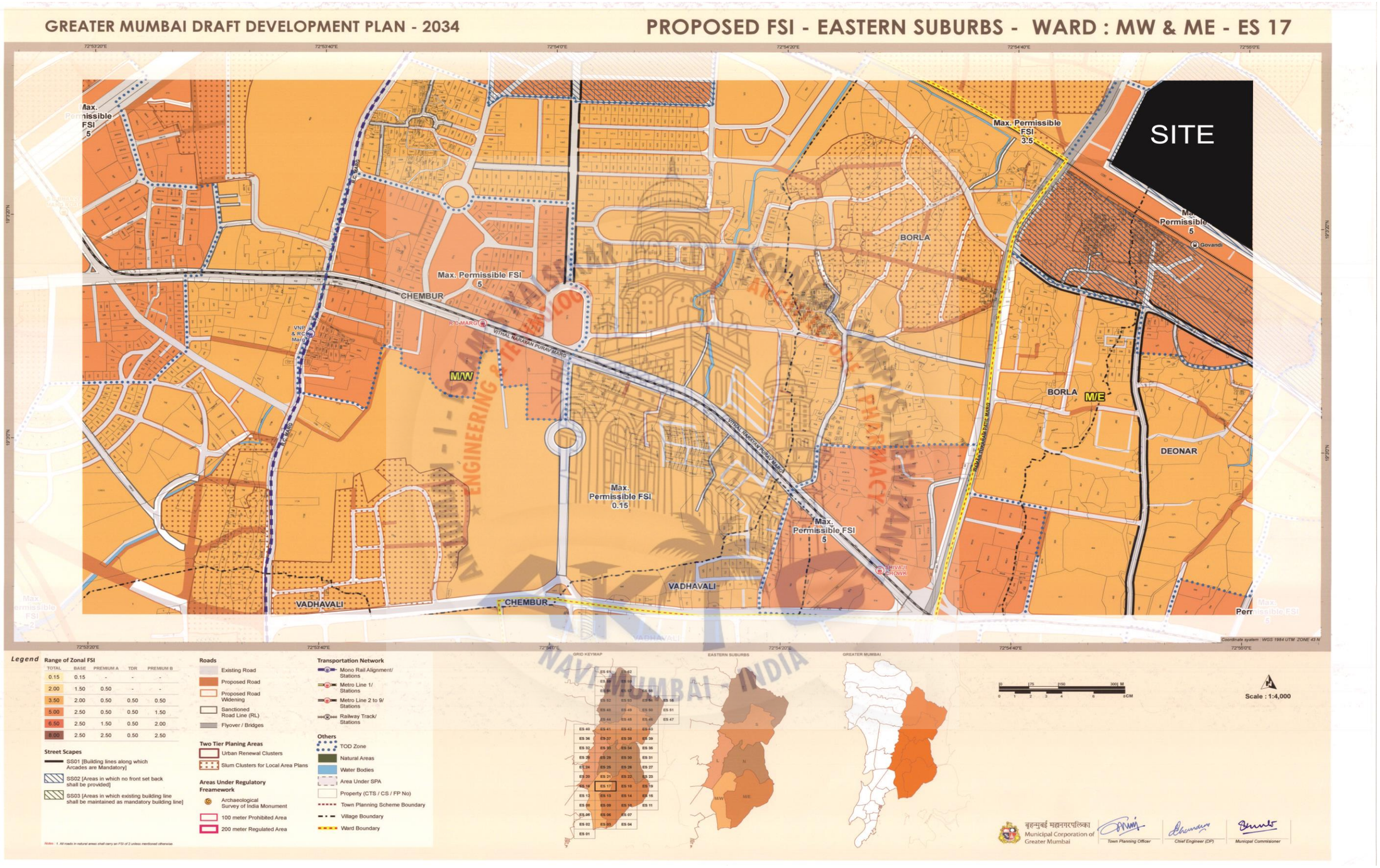


Figure 127: D.P. - 2034 - 1

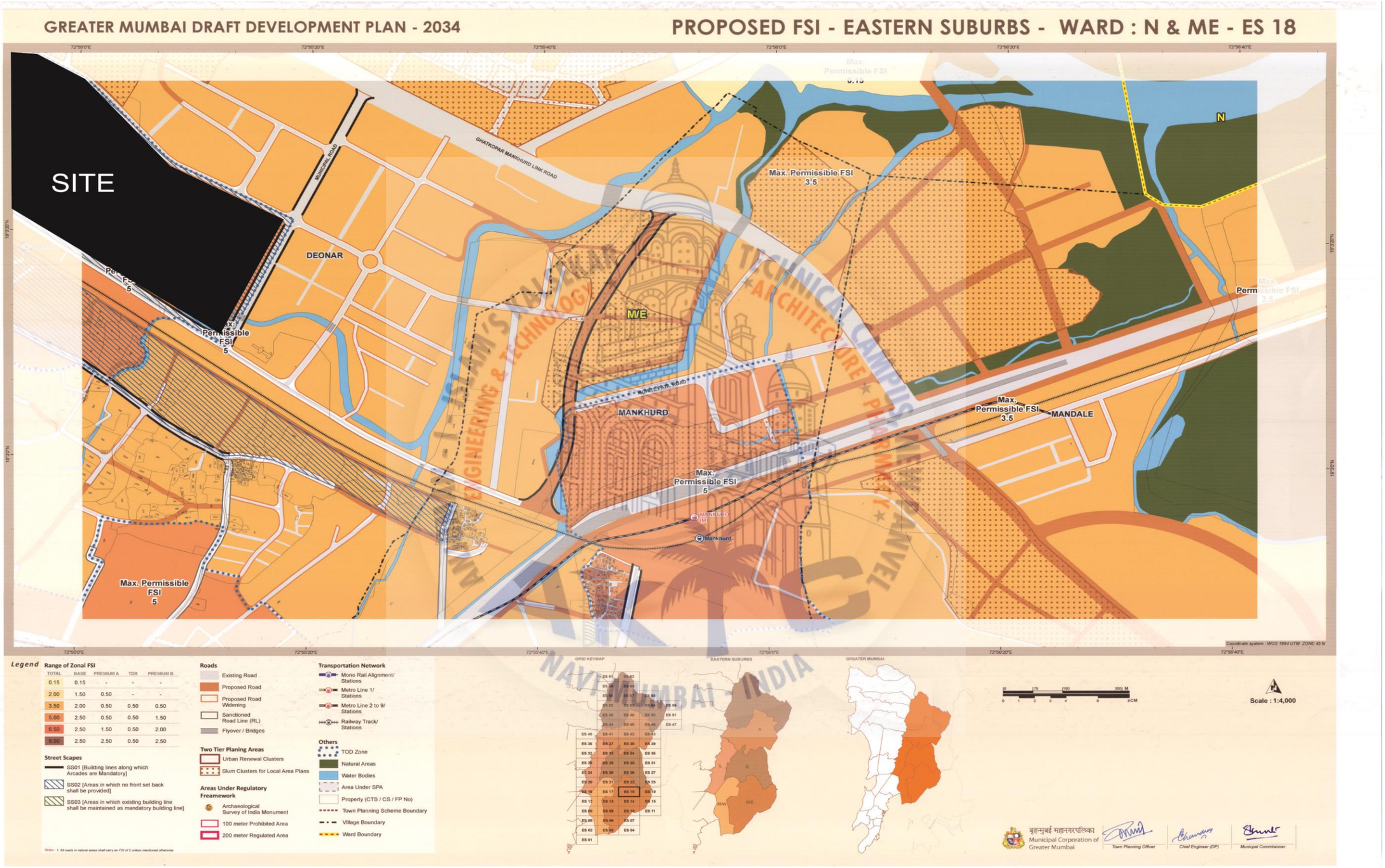


Figure 128:D.P. - 2034 - 2

4.1.11. .....STRUCUTRE ANALYSIS

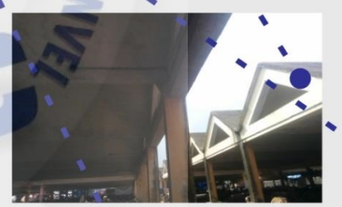
EXISTING STRUCTURAL CONDITIONS

MAJOR AREAS:	FACILITIES UNDER MAJOR AREA:	GROUP OF PEOPLE USING:	AREA (sq.mts)	CURRENT CONDITIONS
UNLOADING AREA	• UNLOADING OF ANIMALS • COUNTING ARES • OFFICE • VENTS • SECURITY AREA • TOILET	GOVT.OFFICIALS SELLERS DOCTORS		• AN OPEN GROUND WITH DIRECTION RAILING • AN OPEN SPACE USE FOR COUNTING BEFORE TAKING TO SHED
STABLING AREA	• STABLING SHEDS • GRAZING YARD	SELLERS, ANIMALS DOCTORS		• A SEMI OPEN STEEL FRAZE STRUCTURE WHICH OPEN AT GRAZING AREA
PARMENET SHEDS	• DAWANWADA • DEALERS OFFICES • BROKERS AREA	BROKERS SELLERS		• AN OFFICE FOR DEALERS WITH G.I. ROOFING SHEET AND RCC • SEMI OPEN RCC SHED
SLAUGHTERING	• PENS • SLAUGHTERING UNIT • MID-NIGHT SLAUGHTERING UNIT • EMERGNECY SLAUGHTERING UNIT • CATTLE QURBANI SHED	SLAUGHTER MENS, EXPORTERS, BROKERS DOCTORS		• G+1 RCC STRUCUTRE A SEMI OPEN STEEL FRAME STRUCTURE • SERVIES AREAS HAVE BOUNDRY WALL /FENCING WHICH IS NOT ACCESSIBLE BY ANY OTHER GROUP EXCEPT GOVT. WORKERS
MAINTENANCE	• OFFICIALS OFFICE • AMENITIES BLDGS. • SERVICES	GOVT.OFFICIALS		• RCC STRUCUTRES












MATERIALS:

- COMMONLY USED MATERIAL FOR **SHEDS** IS STEEL AND FOR ROOF G.I. SHEETS AND STEEL ROOFING SHEETS
- SHEEP/ GOAT SHEDS S1 - S6
- CATTLE QURBANI SHEDS
- MAJORITY OF SERVICES AREA HAVE STEAL ROOFING SHEETS
- R.R.C. IS SECOND MAJOR USED MATERIAL
- ADMINISTRATION OFFICE
- SHEEP/ GOAT SLAUGHTERING UNIT
- FOR SERVICES AREA
- CATTLE SHEDS C1 & C2

- SHED FOR SHEEP/GOAT
- SERVICES
- CATTLE SHED



- STEEL ROOFING
- STEEL FRAME STRUCTURE
- SEMI OPEN SPACES
- R.C.C. STRICTURE WITH G.I.

M.HASSAAN RAZA BOMBAYWALA
-12ARC03

4.1.12. .....

S.W.A.T. ANALYSIS

1. **STREHNGHTS**
    - Current site at the city skirting,
    - Near to the highways, which have accesses to the Greeter Mumbai, suburbs, greater Suburbs, and other cities near to Mumbai?
    - Site is big enough to fulfil the requirement and as well the rarely used spaces will be used for the secondary income and a space which is used by the surrounding users
    - One side of the site is Industrial area, hence less no. of vehicles circulation is there

2. **WEEKNESS**
    - Site is surrounded by slum form two sides
    - Toilet for the people in slums is proposed in the Deonar premises

3. **APPORTUNITIES**
    - Road networks is very good to site, hence site can be accessible even fin peak traffic hours.
    - Rarely used open space can be used for the local user

4. **THREATS**
    - Surrounded by slum, can increase chances of misuse site for secondary income
    - Site is surrounded by slums from two side, hence vehicular circulation and slum residents can be disturb

4.2. COMPARATIVE ANALYSIS

4.2.1. ZONING

❖ **EXITING ZONNING**

*not to scale

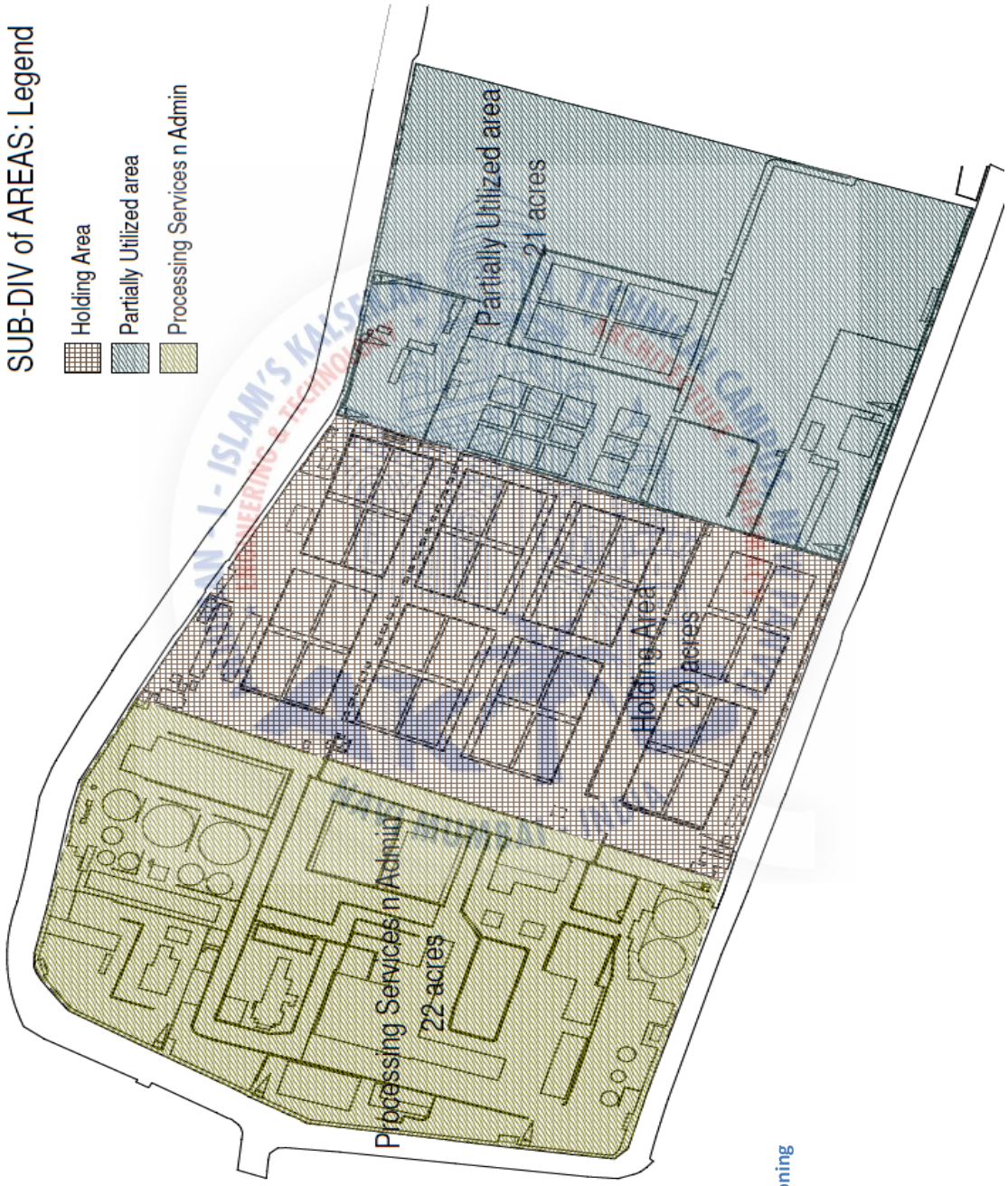


Figure 129: Zoning

- OFFICE PREMISES.
- PUMP HOUSE FOR PROVIDING FRESH WATER.
- WATER TANK
- STORE AND MECHANICAL DEPT.
- TOOLS ROOM
- PLATFORM FOR UNLOADING PIGS
- SLAUGHTER HOUSE - PIGS.
- SHEEP SLAUGHTER HOUSE
- SHEEP PEN
- SHEEP MIDNIGHT UNIT
- CATTLE *QURBANI* SHED
- MEAT VAN GARAGE
- CANTEEN
- DISPENSARY FOR MUNICIPAL EMPLOYEES.
- EFFLUENT TREATMENT PLANT.

- CATTLE SHED (2 NOS.)
- SHEEP SHED (6 NOS.)
- STORE ROOM
- GARDENS

- CATTLE AND SHEEP VENTS
- UNLOADING AREA FOR SHEEP AND CATTLE
- PERMANENT
- GRAZING YARD

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❖ **Slaughtering practices and techniques**

- **The Humane Method & Conventional Techniques of Slaughter**
  1. Complete state of unconsciousness -mechanical, electrical or chemical means (Stunning)
  2. Stunning- Painless, Motionless, eliminating excitement and cruelty
  3. Steps of **Humane Method**
     1. **Stunning:** Make unconscious prior to slaughter
     2. **Bleeding:** vertical hanging position (Head down),
        - Knife through the neck behind the jaw bone and below the first neck bone
        - sever the blood vessels of the neck and let out blood
        - bleeding should be as complete as possible
     3. **Skinning:** Removing of skin from the body
     4. **Eviscerating:** open the animal body to dislodge the contents and produce the carcass
     5. **Postmortem Inspection:** Carried out by professional veterinarians
     6. **Special Measures:** Stamped as – INSPECTED/ PASSED/

- **Traditional And Ritualistic Slaughter (Used In India)**

1. **Muslim method of slaughter – HALAL method**

- Most widespread
- Laws are derived from the Koran
- welfare of the animals is a major consideration (Jewish faith also apply to Muslims)
- Death animals, consumptions of blood and swine are forbidden.

❖ **Rules of HALAL method**

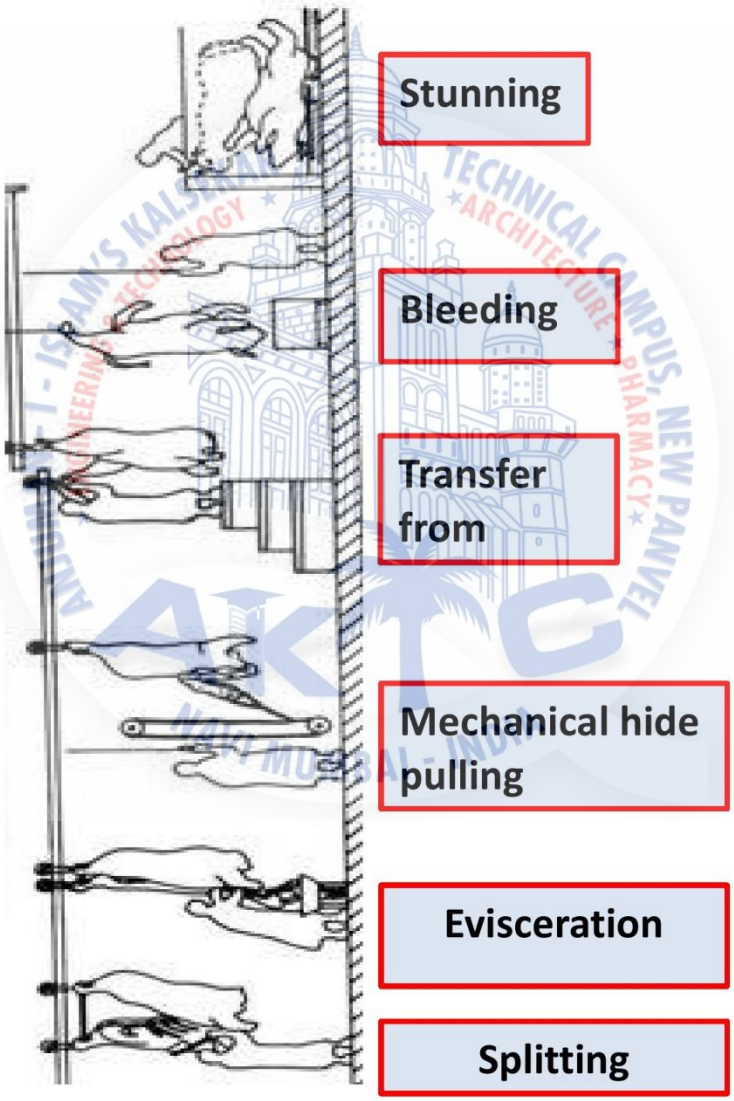
- Uttered - ***"bismillahi Allahu Akbar"***
- Done by - **adult sensible Muslim**
- **Stunning** - allowed
- Should done **quickly**
- **Casting-** laid on its back
- Neck vessels and passages (oesphagus and trachea) are severed by a **single slash** of a **sharp knife**
- must not - **in the sight of** the beast
- Prior to killing – should feed water

2. **Jhakta (Sikh) method:**

- Instant decapitation process
- Sikh, Hindu in the India follows this method.
- Limited to only to sheep and goats
- By only one blow head is separated

❖ **Processing of animal after slaughter**

- Processing includes:
  - Skinning
  - Evisceration
  - Splitting
  - Washing
  - Dressing of carcasses
  - Refrigeration



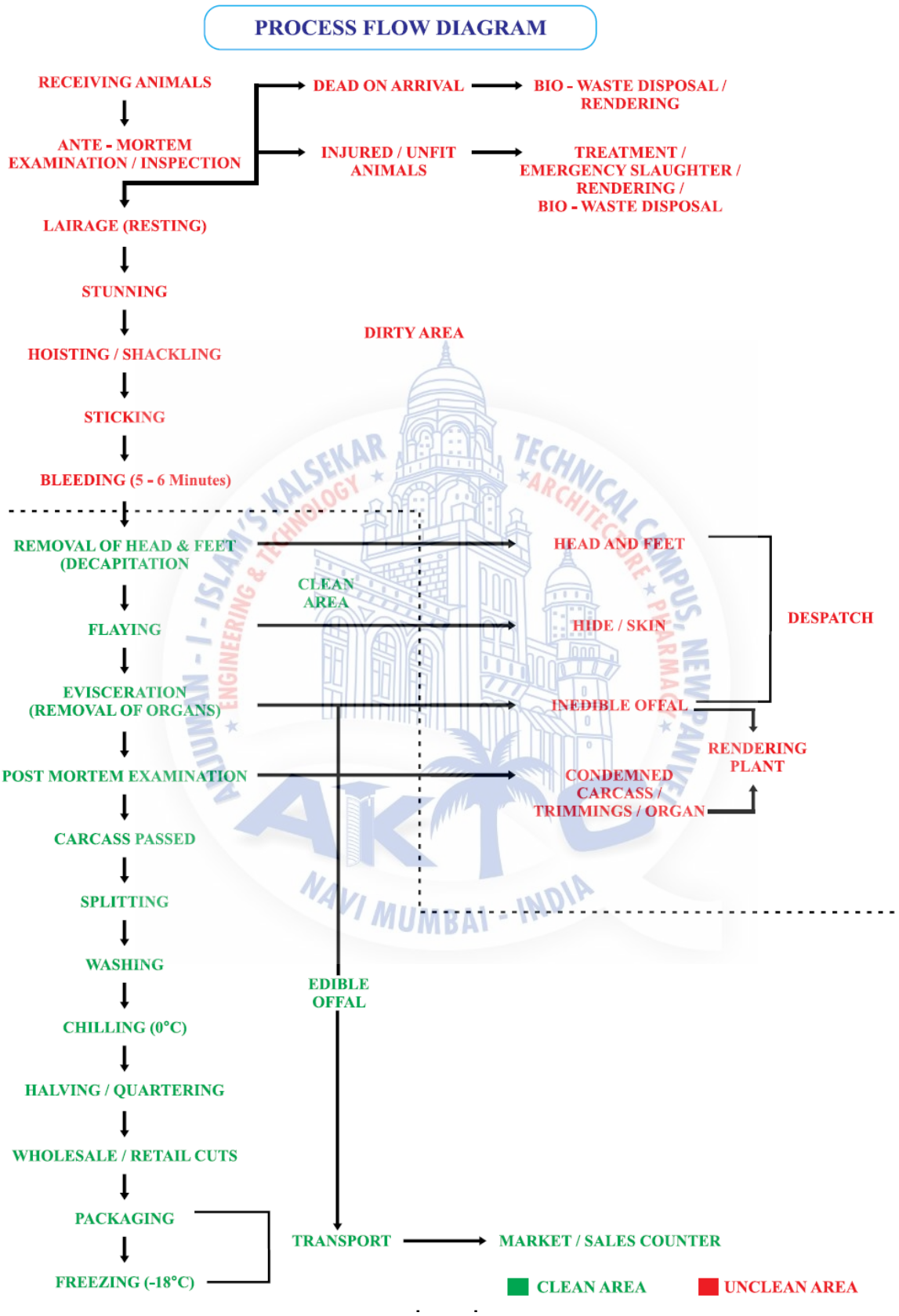


Figure 130: Process flow diagram

4.2.3. CONCLUSIONS:

❖ **TABLE DISCRIPTION:**

	EXISTING:	**AS PER STANDARDS:**
ZONNING	• Flow is disturbed • Zoning is inappropriate • Back flow create chaos	• Flow of process • Zoning is appropriate • No back flow
SLAUGHTERING PROCESS	• Manually processed is done • No separation of clean and dirty area • Slaughtering line are manually operated • Back flow of process	• Standards are as per machine slaughtering • Separation of CLEAN and DIRTY area • Slaughtering line are automatically operated • No back flow of process

Table 7: Comparative conclusions

***NOTE**

- There are **NO PROCESSING UNITS** in Deonar for Cattles and Goats/ Sheeps

CHAPTER 5: AREA STATEMENT

- **AREA DEPENDS ON**
  - Maximum slaughtering per day
  - A regular full time operation
  - Range of operation (slaughtering / dressing / deboning/ packing)
  - Disposal and treatment of waste
  - By-products utilization
  - Types of machinery used

- **AREA REQUIREMENT:** *LU = Livestock Unit
  - **ABATTOIR SIZE REQUIRED:**

Small Abattoir	< 100 LU/day	35,000 LU/ year	1 - 2 acres
Medium Abattoir	100- 200 LU/day	50,000 LU/ year	3 - 4 acres
Large Abattoir	> 200 LU/day	100,000 LU/ year	5 - 6 acres

Table 8: Area- Livestock unit

- **Pen size (Lairage):**
  - Cattle (loose): 2.30 – 2.80 sq.mts.
  - Cattle (tied): 3.20 sq.mts.
  - Pig: 0.60 sq.mts.
  - Goat and Sheep: 0.70 sq.mts.

- **FOR SINGLE LINE SHEEP/ GOAT: 1600 SLAUGHTERING PER DAY**

SPACE	MINIMUM AREA REQUIRED
Workshop	30 SQ.M
Plant Room	210 SQ.M
Work Space	1010 SQ.M
Chilled Carcass Wrapping	48 SQ.M
General Store	60 SQ.M
Blast Freezer 1	60 SQ.M
Packing Material Unit	52 SQ .M
Dispatch	20 SQ .M
Space Open To Sky	109 SQ .M
Knives Sharpening	7 SQ .M
Foot Path	13 SQ .M
Gambrels Washing Area	9 SQ .M
Changing Room	35 SQ .M
Gents Toilet	17 SQ .M
Laundry	17 SQ .M
Ladies Toilet	17 SQ .M
Showers	13 SQ .M
Changing Room	35 SQ .M
Boot Room	13 SQ .M
Board Room	7 SQ .M
Doctor Office	7 SQ .M
Working Space	76 SQ .M
Office	11 SQ .M
Laboratory	104 SQ .M

Plate Freezer	73 SQ .M
Fresh Packing	106 SQ .M
Processing	140 SQ .M
Portioning	223 SQ .M
Chilling Room 1	112 SQ .M
Chilling Room 2	112 SQ .M
Chilling Room 3	112 SQ .M
Cold Storage	84 SQ .M
Frozen Packing	59 SQ .M
Tray Wash	66 SQ .M
Frozen Carcass Packing	45 SQ .M

Table 9: Area statement

Ref:

- BSI- Indian standards
- HACCP#ISO 202000
- APEDA Export rules

***Note:**

All the cold storages and freezer in above table are of capacity: 30 -40 metric tones and double or triple height areas.

CHAPTER 6: CONCLUSIONS

- The project will make sure, the welfare of animals and their slaughtering in the righteous manner. Apart from this, the issues regarding the slaughtering of animal, belief system and political reasons will be catered as the proper inspection of animals will be done.
- It will also ensure the increase in export and more production for the localized user, hence cost of Meat would Decrease because of more production and help nation to import the export value
- Land rates , environmental issues, psychological disturbance will be catered too, by proper channelizing of suitable facilities and proper planning to control the negative impacts
- Apart from all the above points, by channelizing of space and induced of technology will control the waste production and increase in outcome in all aspects

❖ BIBLOGRAPHY AND REFRENCES

❖ INTERNET:

1. https://en.wikipedia.org/wiki/Slaughterh
2. http://www.g-e-f-a.de/fileadmin/termine_
3. http://www.fnbnews.com/Top-News/meat-ind
4. http://plunderofindia.org/2015/04/15/env
5. https://issuu.com/shreevardhmanparivar/d
6. http://investonecorps.com/ai/slaughter-h
7. http://www.onegreenplanet.org/environment/how-slaughterhouses-are-polluting-the-planet/
8. http://www.fao.org/wairdocs/lead/x6114e/x6114e03.htm
9. http://indianexpress.com/article/india/india-news-india/mumbai-based-slaughter-house-deonar-abattoir-to-get-major-facelift-by-bmc-3042350/
10. http://www.preservearticles.com/201101143291/advantages-and-disadvantages-of-centralisation-of-authority.html
11. http://www.karmayog.com/floods/mumbai_m-e_ward_plan.htm
12. http://apeda.gov.in/apedawebsite/index.html
13. http://www.slideshare.net/VinaliPatil/slaughter-house-industry-in-india-33076841
14. http://www.slideshare.net/mahabubcvasu/methods-of-slaughtering-processing-postmortem-changes-of-meat
15. http://animalsaustralia.org/features/not-so-humane-slaughter/
16. http://www.ewg.org/meateatersguide/interactive-graphic/meat-processorsslaughterhouses/
17. http://www.slideshare.net/kuwaitwaste/dr-abu-bakr-el-tohami-impact-of-slaughter-houses-production-and-waste-disposal
18. http://www.slideshare.net/AShestopalov/slaughterhouse-7177609
19. http://www.slideshare.net/humanupgrade/slaughterhouse-evaluation
20. http://www.slideshare.net/humanupgrade/slaughterhouse-evaluation?from_action=save

21. http://www.humanesociety.org/news/resources/research/stats_slaughter_totals.html?referrer=https://www.google.co.in/
22. http://www.thehindu.com/opinion/op-ed/the-economics-of-cow-slaughter/article7880807.ece
23. https://www.quora.com/How-many-animals-are-slaughtered-in-India-every-day-for-food
24. http://www.indexmundi.com/agriculture/?country=in&commodity=cattle&graph=total-slaughter-growth-rate
25. http://www.slideshare.net/zubeditufail/eia-report-sgs-slaughter-house
26. https://businessimpactenvironment.wordpress.com/2012/01/08/slaughter-house-polluting-the-environment/
27. https://www.researchgate.net/publication/229115465_Effect_of_slaughterhouse_wastes_on_the_water_quality_of_Ikpoba_River_Nigeria
28. http://file.scirp.org/Html/10-6702198_46296.htm
29. http://www.onegreenplanet.org/environment/how-slaughterhouses-are-polluting-the-planet/
30. http://indianexpress.com/article/india/india-news-india/mumbai-based-slaughter-house-deonar-abattoir-to-get-major-facelift-by-bmc-3042350/
31. https://www.meteoblue.com/en/weather/forecast/modelclimate/mumbai_india_1275333

❖ **BOOKS:**

- BSI – Indian Standards
- Short note On Deonar Abattoir
- Abattoir Design And Construction
- Guideline And Type Designs For a slaughter House

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