



PREPARATION OF GREEN TANNERY DESIGN FOR SIALKOT TANNERY ZONE

FINAL DESIGN REPORT

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CHAPTER 1 INTRODUCTION

1.1 Background

The project aims to design a Green Tannery Design Guidelines for the tanneries to be developed at Sialkot Tannery Zone (STZ), taking into account the recent development in terms of green technology, environmental, safety standards and quality requirements, keeping in view the compliance of LWG. Green Tannery Designs Guidelines will provide guidance for tannery owners, managers, technicians and local authorities regarding appropriate design features to be used, for tannery layouts, environmental measures, and to improve energy efficiency. By implementing these green design features, it would not only help tanners shift towards resource conservation and efficiency but also comply with the required international (LWG) environmental, safety and technical standards.

The Sialkot Tannery Zone (STZ) is a project of Sialkot Tannery Association Guarantee Limited (STAGL) planned to house almost 600 tanneries of varying sizes and types. The zone shall provide common facilities such as Common Effluent Treatment Plant (CETP), Chrome Recovery Plant (CRP), common facilities center, along with other infrastructure and facilities. The master plan, roads, electrical system and drainage system have already been designed and the infrastructure is under construction at site.

1.2 Objective

This report provides sample design and guidelines for development of Green Tanneries in Sialkot Tannery Zone covering green technology, environmental, safety and quality requirements and general compliance with Leather Working Group (LWG) requirements. Under this guideline, following layouts are to be developed:

Table 1-1 Target Tannery Layouts

Sr. No.	Plot Size (Kanals)	Category	Raw to Wet Blue	Wet Blue to Finish	Raw to Finish
1	1	Small	✓	✓	✓
2	2	Medium	✓	✓	✓
3	4	Medium	✓	✓	✓
4	8	Medium	✓	✓	✓

1.3 Data Used

The data used in this report has been collected through meetings, visits, and discussions with, STAGL/STZ and various stakeholders. Other referred documents have been listed at the end of the report.

1.4 Organization of Report

Chapter 1 of the report provides an introduction to the document, Chapter 2 covers the basic information pertaining to the Sialkot Tannery Zone project, while the current challenges and practices in tanning sector are discussed in Chapter 3. Processing capacity of the specific types and sizes of tanneries is detailed under Chapter 4. The green tannery design considerations and requirements are elaborated in Chapter 5 while Environmental, and Occupational Safety & Health overview is provided in Chapter 6. The Chapter 7 covers the Green Tannery Layouts and Chapter 8 concludes the report.

CHAPTER 2

PROJECT INFORMATION

2.1 Background & Objective of Project

The leather industry occupies a place of prominence in Pakistan's economy in view of its massive potential for employment, growth and exports. In fact, backed by a strong raw- material base and a large reservoir of traditionally skilled and competitive labour force, the Pakistan leather industry has made significant strides during the past two decades. Notable leather centers in Pakistan are at Karachi, Multan, Sheikhpura, Kasur, Lahore and Sialkot.

In Sialkot there are around 240 tanneries existing in 10 clusters in and around Sialkot. In the absence of a proper effluent collection system and no treatment facilities, the effluents of these tanneries are being discharged to seasonal nullahs like Aik, Bhed, and Pulkhu. As there is no proper land fill available for tannery waste, heaps of garbage could be seen everywhere.

Realizing the environmental degradation of Sialkot, the tanners took the initiative and agreed that the best solution to counter environmental degradation and to comply with the national and international requirements is to shift the tanneries out of the city in a cluster. For this purpose, Sialkot Tanneries Association Guarantee Limited (STAGL) was formed. STAGL has taken up the challenge of establishment of Sialkot Tannery Zone (STZ).

The STAGL has taken up a mega project of shifting all the tanneries in one well planned STZ, which shall be equipped with all required facilities in one location. This shall have suitable infrastructure of roads, pavements and parking. It shall also be equipped with commercial areas that shall support the tanners for supply of their requirements other than raw material. The STZ shall have complete effluent collection system and a common effluent treatment plant. Other treatment facilities like Chrome Recovery Plant, Fat Extraction Plant, and Common Facility Centre shall be provided within the STZ for convenience of the tanners and for addressing the environmental issues.

The objectives of STZ include:

- To enhance the exportability and International acceptability of the leather sector products of Pakistan through compliance and green productivity.
- To enhance resilience of the communities in around Sialkot Tannery Zone through adaptation measures.
- Mainstreaming Adaptation into urban and rural development planning.
- Capacity Building of targeted communities and leather business owners.
- Sialkot district and Sialkot urban plan implementation, dissemination of information, demonstration of safe, affordable and advance technology for water treatment and water conservation in the pilot Sialkot Tannery Zone.
- Quality Control Monitoring and Evaluation.

2.2 Site Location

The Sialkot Tannery Zone is located in Sialkot District near the Sialkot Airport, covering around 396 Acres of land. The location of STZ is shown in the figure below.

Figure 2-1 STZ Location Plan



STZ is around 5 Km away from the Sialkot International Airport and 15 Km from Sialkot city.

2.3 Master Plan

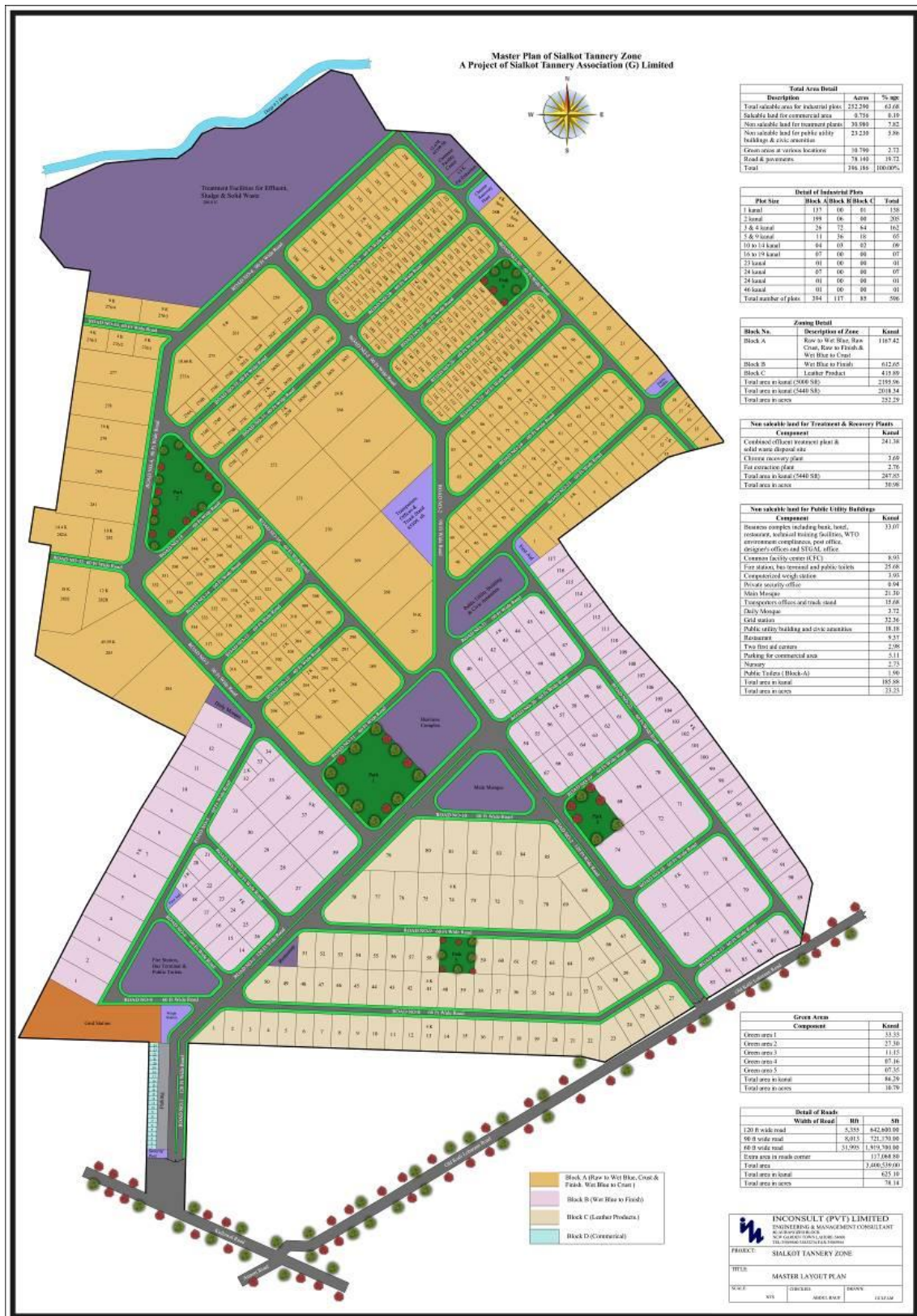
The master plan shows that the entire zone is divided into three major blocks. The details of these blocks along with the plots are tabulated below:

Table 2-1 Zone Blocks and Plots

Plot Size	Block-A	Block-B	Block-C	Block-D	Total
1-Kanal	137	0	1	0	138
2-Kanal	199	6	0	0	205
3-Kanal	2	2	1	0	5
4-Kanal	24	70	63	0	157
5-8-Kanal	9	24	17	0	50
9-12-Kanal	5	15	3	0	23
13-24-Kanal	16	0	0	0	16
46-Kanal	2	0	0	0	2
Total	394	117	85	0	596

The master plan for Sialkot Tannery Zone has already been prepared and is provided below:

Figure 2-2 STZ Master Plan



CHAPTER 3 CURRENT PRACTICES & CHALLENGES

3.1 Tanning Process Overview

For the purpose of this document, the overall leather processing has been divided into three types of main processes which are:

- Raw to Wet-Blue
- Wet-blue to Finished Leather (Finish)
- Raw to Finish

The last process covers the entire leather processing from raw hides to finished products. A more detailed leather processing chart is shown below:

Figure 3-1 Leather Processing Stages

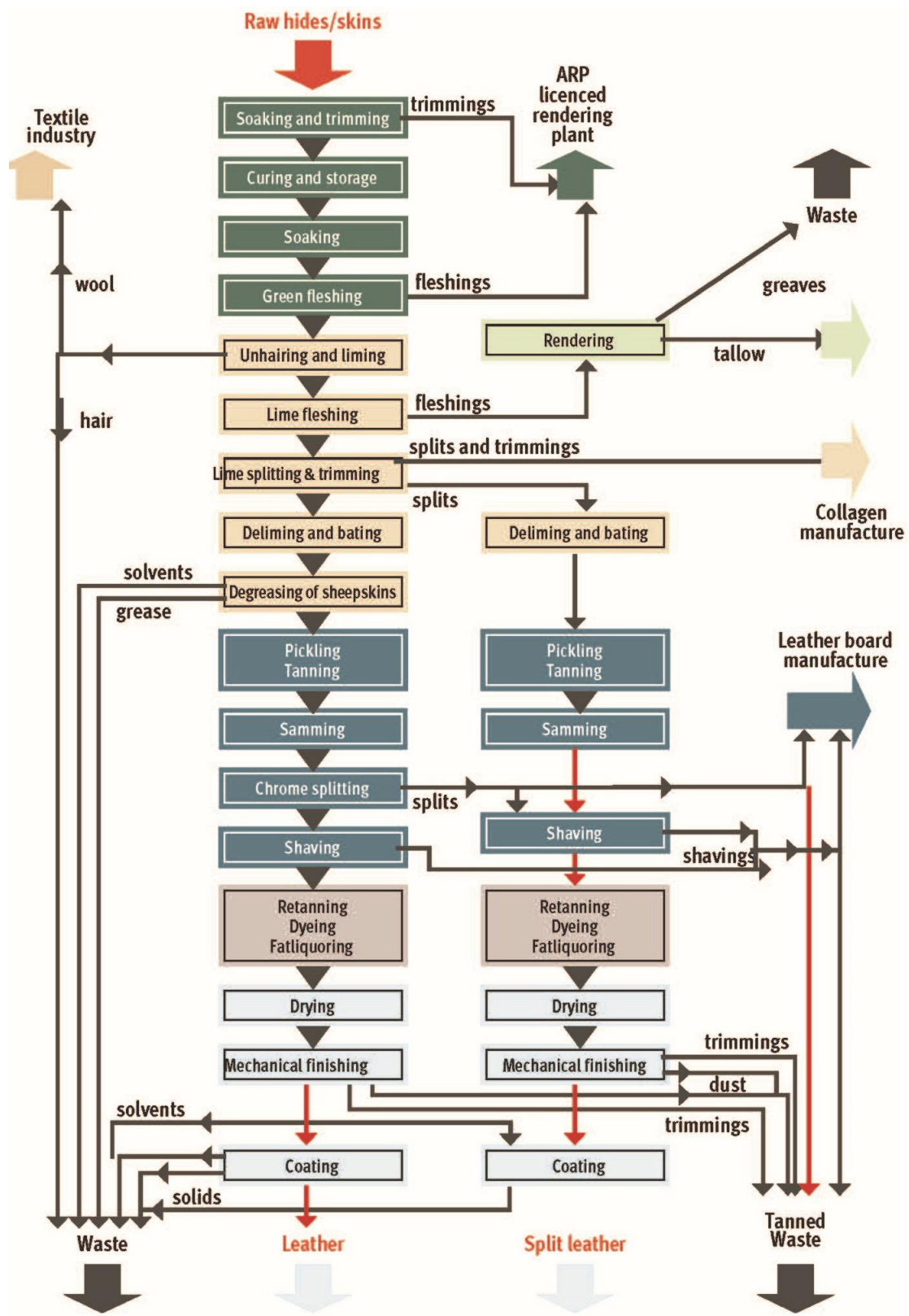


This section provides an overview of the tanning process being generally followed in Pakistan. Mainly, the entire process can be broken down into the following sub-process:

- Trimming
- Soaking
- Unhairing/Liming
- Deliming and Bating
- Tanning/Tanyard (Pickling/Tanning)
- Wet Finishing
- Crust Processing
- Finished Products

The flow chart below shows the generalized detailed process diagram for leather processing with the products, byproducts, and waste generated at each step:

Figure 3-2 Overview of Tanning Process & Linkages¹



¹ Source: The framework for sustainable leather manufacture, Second edition, Jakov Buljian, Ivan Kral, 2018

3.2 Practices in Pakistan and Challenges

Leather sector in Pakistan is a major contributor to the Gross Domestic Product (GDP) with over Rs. 35 Billion in leather exports², other than sportswear and various leather finished goods. The leather manufactured in Pakistan is based on both skins (goat and sheep) and hides (bovine). Major leather clusters are Sialkot, Karachi and Kasur, with some industries in Multan, Lahore, Gujranwala, and Peshawar. The export statistics of leather and leather products from Pakistan are tabulated below:

Time Period	Value of Exports (USD '000)
2013-14	1,275,329
2014-15	1,195,813
2015-16	977,684
2016-17	918,131
2017-18	948,265
2018-19	844,384
2019-20	765,355

Source: Pakistan Tanners Association Website

Pakistan has remained far behind in the race of leather exports. The leather sector that was accounting for 10.41 percent of total exports, with the second largest contribution to foreign exchange of the country during 1990s, had a sinking share in exports in 2009-10, recorded at 5.4 percent of total exports. It is still staggering downward with a negative growth rate of 7.9 percent as per the Economic Survey of Pakistan for the current year. Currently, the share of leather industry in Pakistan's exports is 4.3 percent. If the declining trend keeps its pace, Pakistan may lose a potential source of income.³

Consultant visited tanneries in Sialkot to assess the current practices adopted. The information provided in the subsequent sub-sections is based on the visits and the information available with consultants collected overtime under various assignments related to tanning sector, especially in Sialkot.

3.2.1 Raw Material

The prevalent raw material is bovine hides, as it provides better yield of finished leather. As per the information provided by the tanners, the hides are mostly transported wet salted without being frozen. Some industries procure wet-blue from other areas, however most of them end up re-tanning the wet-blue for desired quality.

Improper storage of the raw hides results in bad odor and spoiling of the hides, thus resulting in inferior quality leather.

3.2.2 Water Use

Water usage (liter) ratio to quantity of leather processed (Kg) is a commonly used indicator for comparison. Documentation available on leather tanning shows that process water ranges from 15m³/ton of wet salted hides to over 80m³/ton. The feedback from local tanners suggests that water consumption in Pakistan is around 50m³/ton of wet salted hides.

² Pakistan Bureau of Statistics, Schedule 14.02 Exports by Commodity/Groups

³ <https://dailytimes.com.pk/419693/pakistans-leather-industry-draws-its-last-breath/>

3.2.3 Tanning

Tanning is an age old practice, therefore various methods of tanning have been used in the world including vegetable tanning, mineral tanning, oil tanning, etc. However, the prevalent method in the world and Pakistan nowadays is Chrome based tanning which uses basic Sulphate complex of trivalent Chromium.

3.2.4 Pollutants

Under the current practices most of the waste generated during the hides/skins processing is discharged with the effluent into the nullahs. The types of pollutants/wastes generated include the following:

- Effluent (containing chrome and various other chemicals)
- Air Pollution (buffing dust, H₂S, NH₃, burning of material for water water)
- Solid wastes
 - Fleshings
 - Hair/Wool
 - Splits, Trimmings
 - Chrome splits
 - Shavings
 - Chrome trimmings

Once Sialkot Tannery Zone (STZ) is operational, the effluent will be treated at the Common Effluent Treatment Plant (CETP). The Chrome liquor is expected to be segregated at tanneries and then used to extract/recycle chromium for re-use at a centralized facility namely the Chrome Recovery Plant (CRP). However currently no such system exists in Sialkot.

3.2.5 Energy Usage

The tanneries use energy in various forms, including but not limited to the following:

- Electrical energy for the machinery including drums
- Fuel for generators
- Natural gas for water heating
- Burning of material (sometimes hazardous) for hot water or hot air

Even though there is huge potential, however use of solar energy is nearly non-existent in the tanneries in Sialkot.

3.2.6 Occupational Safety and Health

Occupational Safety and Health (OSHA) and environmental hazards in tanning sector are a serious concern in developing countries. Various organizations have developed guidelines for OSHA measures and steps to mitigate the hazards. In Pakistan, it was observed during the site visit that the work force rarely uses Personal Protective Equipment (PPE), and there are generally limited measures taken to counter the imminent physical, chemical and biological hazards.

The major OSHA and environmental hazards in tanneries included:

- Vast variety of Chemicals used in tanneries and their improper storage
- Machinery including large sizes drums, sharp blades, etc.
- Slippery wet floors usually in raw to wet-blue processing areas

- Odour due to presence of raw hides and chemicals
- Hydrogen Sulphide
- Loud noise of machinery
- Particulate matter (buffing dust)
- Improper disposal of effluent and solid waste

3.2.7 Compliance

Leather products made in Pakistan are primarily exported to other countries. With time, strict guidelines have been developed internationally to protect the environment and ensure sustainable development of leather products. One major organization is the Leather Working Group (LWG). The objective of this multi-stakeholder group is to develop and maintain a protocol that assesses the environmental compliance and performance capabilities of leather manufacturers and promotes sustainable and appropriate environmental business practices within the leather industry. The group seeks to improve the leather manufacturing industry by creating alignment on environmental priorities, bringing visibility to best practices and providing suggested guidelines for continual improvement⁴.

Compliance to LWG and other standards including OHSAS 18001, Zero Discharge of Hazardous Chemicals (ZDHC), Labor Laws, Environmental laws, etc. needs proper planning and transparency which the existing tanneries usually lack.

3.3 Green Tannery Interventions

Based on the current practices in leather sector in Pakistan and international best practices, these green tannery guidelines are planned to incorporate such measures and interventions that shall allow the tanning sector to be sustainable and comply with the requirements of international requirements. Some of the issues which shall be addressed include:

- Workers Safety and health
- Chemical sustainability (recycling of chrome, de-salting)
- Community safety e.g. waste load reduction
- Reduce waste by making byproducts e.g. storing fleshings for fat extraction
- Energy conservation and efficiency (solar drying, solar water heating, etc.)
- Hair-save unhairing
- Water conservation measures

⁴ <https://www.leatherworkinggroup.com/who-we-are/about>

CHAPTER 4 PROCESSING CAPACITY

4.1 General

This Chapter provides the estimations of annual and daily processing capability of different types of tanneries, water usage, the basis and assumptions of the estimation and the overall criteria to be considered for the preparation of layouts. The assumptions used in this report are as under:

Table 4-1 Basic Assumptions

Parameter	Assumptions
No. of working days per year	250
Average daily operational hours of Tanneries	14 hours
Water requirement per ton of salted hide processing	50m ³
Average hides processed in Small Tannery per day	3,120 kg*
Average hides processed in Medium Tannery per day	7,880 kg*
Average weight of hide (Kg)	26 Kg
Average area of hide (sft)	43 Sft
Thickness of hide (mm)	6 to 8mm
Density of leather (g/cm ³)	0.9 to 1.2
Density of fleshing (g/cm ³)	0.86 to 0.9
Percentage of water used discharged as effluent	70%

*As per ILES Terms of Reference for Green Tannery Design for Sialkot Tannery Zone

4.2 Plot Covered Areas

The study calls for development of guidelines and layouts for four different sizes of plots in Sialkot Tannery Zone. The estimated maximum covered area available for each category of plot is assessed below:

Table 4-2 Tannery Plot Covered Areas

Tannery Size	Plot Size/Dimensions				Minimum Open Area as per Bye Laws			Max. Covered Area per Floor sft	Max. No. of Floors	Max. Covered Area	
	Kanal	Front (ft)	Depth (ft)	Total Area sft	Front (ft)	Back (ft)	Sides (ft)			ft ²	m ²
Small	1	50	100	5,000	20	5	5	3,000	3	9,000	836
Medium	2	70	143	10,010	20	5	5	7,080	3	21,240	1,973
Medium	4	100	200	20,000	20	8	8	14,448	3	43,344	4,026
Medium	8	135	300	40,500	50	20	8	27,370	3	82,110	7,628

4.3 Processing Capacity per Plot

The processing capacity for different type and size of tanneries is deliberated in the subsequent sections.

Table 4-3 Plot wise Processing Capacity - Raw to Wet Blue

S. No	Plot Size			Tannery Size	Raw to Wet Blue					
	Kanal	ft²	m²		Wet Salted Hides			Wet Salted Skins		
					Pcs./Day	Avg. Weight kg	Total Weight kg /Day	Pcs./ Day	Avg. Weight kg	Total Weight kg/Day
1	1	5,000	464	Small	120	26	3,120	1,000	1.2	1,200
2	2	10,000	929	Medium	300	26	7,800	2,000	1.2	2,400
3	4	20,000	1,858	Medium	300	26	7,800	2,000	1.2	2,400
4	8	40,000	3,716	Medium	300	26	7,800	2,000	1.2	2,400

Table 4-4 Plot wise Processing Capacity - Wet Blue to Finish

S. No	Plot Size			Tannery Size	Wet Blue to Finish				
	Kanal	ft ²	m ²		No. of Lots	Pieces /Lot	No. of Pcs./Day	Avg. Area/ Pcs. (SFT)	Total Area (SFT)/Day
1	1	5,000	464	Small	3	117	351	43	15,000
2	2	10,000	929	Medium	5	117	585	43	25,000
3	4	20,000	1,858	Medium	5	117	585	43	25,000
4	8	40,000	3,716	Medium	5	117	585	43	25,000

Table 4-5 Plot wise Processing Capacity - Raw to Finish

S. No	Plot Size			Tannery Size	Raw to Finish					
	Kanal	ft²	m²		Wet Salted Hides			Wet Salted Skins		
					Pcs./Day	Avg. Weight kg	Total Weight kg /Day	Pcs./ Day	Avg. Weight kg	Total Weight kg/Day
1	1	5,000	464	Small	120	26	3,120	500	1.2	600
2	2	10,000	929	Medium	240	26	6,240	2,000	1.2	2,400
3	4	20,000	1,858	Medium	240	26	6,240	2,000	1.2	2,400
4	8	40,000	3,716	Medium	240	26	6,240	2,000	1.2	2,400

4.4 Water Requirement Estimation

Based on the findings and the assumptions provided in the chapter, the water requirement for a batch processing from raw hides to finished leather is calculated and tabulated below. The batch for small tannery is assumed as 3.12 tons and 7.88 tons for medium tannery:

Table 4-6 Processing Water Requirement

Process	Work Day	Comments	Daily Water Usage m ³	
			Small Tannery	Medium Tannery
Soak	1	Overnight	31	78
Lime	2	Overnight	31	78
Fleshing, splitting, deliming	3	Overnight	31	78
Pickling, tanning	3		16	39
Cut into Sides, Sammying, Sorting	4		0	0
Shaving, Weigh	6		0	0
Re-tanning	7		31	78
Other water usage	7		16	39
Setting Out, vacuum dry	8		0	0
Hang Dry	9	Over Night	0	0
Staking, Toggling	10		0	0
Crust Sort	11		0	0
Finishing FG	12		0	0
Finishing CG	13-16		0	0
Sort and measure FG	13-19		0	0
Pack FG	17		0	0
Sort and measure CG	18		0	0
Pack CG	20		0	0
Total Water Usage per batch			156	390

4.5 Process Machinery

A list of typical machinery/equipment used for leather processing starting from raw hides to finish leather (Raw to Finish) is shown below:

Table 4-7 Typical Machinery Raw to Finish

Sr. No.	Description	Unit load kW
1	Trimming	0.35
2	Desalting	3.70
3	Fleshing machine 1600 mm	12.00
4	Soaking Drum	15.00
5	Liming/Unhairing Drum	15.00
6	Tanning drum	15.00
7	Sammying machine	7.00
8	Splitting machine 3000mm	23.00
9	Shaving machine 1500 mm	38.50
10	Retanning/Dyeing drums 2.5*2 .0 m	11.00
11	Setting out machine 1600 mm	13.50
12	Drying Overhead chain conveyor (Rooftop)	3.50
13	Rotary staking machine 1500 mm	14.25
14	Automatic toggling machine	12.55
15	Buffing + De-dusting	43.75
16	Dry shaving machine 1500 mm	62.00
17	Polishing machine 600 mm	7.50

Sr. No.	Description	Unit load kW
18	Automatic dry milling drums	39.00
19	Spraying line 600 mm	18.00
20	Roller coating machine 1800 mm	3.18
21	Rotary ironing machine	8.60
22	Hydraulic platen press 850	94.00
23	Through feed ironing & embossing 2600mm	37.50
24	Area measuring machine 1800mm	0.40

A detailed list of machinery with their dimensions, weight, power rating and pictures is provided in Annex-01.

4.6 Human Resource

Estimation for human resource required for each type of tannery was made based on input received from stakeholders and other data available. The table below shows the estimated number of people required for each type and size of tannery:

Table 4-8 Estimation of Man Power

S. No.	Category of Staff	Various Categories of Tanneries Engaged in Processes from					
		Raw to Wet		Wet to Finish		Raw to Finish	
		Small	Medium	Small	Medium	Small	Medium
A	Management Staff						
1	Owner/General Manager	1	1	1	1	1	1
2	Leather Technologist	0	1	0	1	0	1
3	Environmentalist	0	1	0	1	0	1
4	Marketing Manager	0	1	0	1	0	1
5	Purchase Officer	1	1	1	1	1	1
6	Account Officer	1	1	1	1	1	1
7	Admin. Officer	0	1	0	1	0	1
8	Security Guard	1	2	1	2	1	2
Sub-total of A		4	10	4	10	4	10
B	Production Staff						
1	Incharge Beamhouse	1	1	0	0	1	1
2	Incharge Tanhouse	0	1	1	0	1	1
3	Incharge Wet Finishing	0	0	0	1	1	1
4	Incharge Finishing	0	0	1	1	1	1
5	Store Incharge	1	1	1	1	1	1
6	Workshop Incharge	1	1	1	1	1	1
7	Machine Operator	5	10	8	12	10	14
8	Mechanical Technician	1	1	1	1	1	1
9	Electrical Technician	1	1	1	1	1	1
10	Helper Technician	0	1	0	1	1	1
11	Helper Worker	4	8	4	8	6	10
12	Cleaner	1	2	1	2	2	2
13	Misc.	1	2	1	2	2	2
Sub-total of B		17	30	21	32	30	38
Total of A+B		21	40	25	42	34	48

CHAPTER 5

DESIGN CONSIDERATIONS & AREA REQUIREMENTS

5.1 Overview

This chapter covers the design considerations and parameters which shall form the basis of typical design for green tanneries of the agreed plot sizes. The considerations will cover the entire process of the leather processing and facilities associated with the tanneries including but not limited to storage, wet processing, human resource, water, OSHA, materials, etc.

5.2 Building Height Limit

In order to cover all aspects and adhere to the bylaws and local requirements, the following are proposed:

- Max no. of floors: 3 floors (Ground floor + 2 floors)
- Provision on Roof Top Hide/skin drying and/or solar hot water system
- Min. floor level of GF from Road Level 2 feet
- Min. ground floor ceiling height 16 feet upto 2 Kanal, 18 feet beyond 2 Kanal
- Max. first floor ceiling height 12 feet
- Max. second floor ceiling height 12 feet
- Mumty height up to 8 feet
- Max. height of any structure on roof top 8 feet
- Provision of roof thickness 2 feet
- Max. height of building from road level 55 feet

Only the ground floor of tanneries in STZ shall be used for wet processes, where applicable. The decision on the number of floors to be constructed within the industrial plot shall be on the sole discretion of the owner of the plot, however compliance to the maximum building height is mandatory to comply with aviation requirements for the Sialkot Airport in the vicinity.

5.3 Building Structure

The foundation concrete strength for drums and machines, where required, shall be based on the actual soil investigations carried out by industry developers for each site. The building structure design shall be based on building code and seismic zone 2B (as per Pakistan Building Code Seismic Provisions).

The structure will be frame structure with RCC foundations, slabs and beams, however Post Tension (PT) Structure can be provided which will result in saving of around 15% by reduction in footing, slab and beam RCC. A comparative analysis for a normal RCC structure with PT structure for a building measuring 40 feet by 70 feet and covering 3 floors is provided below:

Table 5-1 RCC and Post Tension Structure

Description	Normal RCC Structure	PT Structure
Building Dimension	40'x75'	40'x75'
Number of Slabs	3	3

Description	Normal RCC Structure	PT Structure
Covered Area per Floor	3000	3000
Total Covered Area (Sft)	9,000 Sft	9,000 Sft
Typical Slab Thickness	7.5 inches	6 inches
Typical Beam Sizes	12"x24"	15"x21"
Center Column	Considered	Clear Span

Table 5-2 Cost Saving in Post Tension Structure

Item	Normal RCC Structure			PT Structure		
	Quantities	Unit Price*	Total Price per SFT	Quantities	Unit Price	Total Price per SFT
Steel Reinforcement	4.2 kg/sft	Rs. 120	Rs. 504	2.0 kg/sft	Rs. 120	Rs. 240
Slab & Beams Concrete	1.1 cft/sft	Rs. 300	Rs. 330	0.74 cft/sft	Rs. 300	Rs. 222
Total Structure Cost per SFT			Rs. 834			Rs. 702
Total Saving in Post Tension per Sft Area						Rs. 132
Net Saving for 9,000 Sft Covered Area						Rs. 1,188,000
Net Saving as Percentage of RCC Structure Cost						15.8%

**Note: These prices/rates are for July 2020 and need to be re-evaluated as per current trends*

This shows that PT structure can provide saving of around 16% when compared to normal RCC slabs. The calculation above does not include the cost of the columns avoided in PT Structure, which can further increase the saving.

5.4 Building Orientation & Fenestration

The first element of green building design is proper orientation and fenestration (arrangement of windows). Since the orientation of plots in Sialkot Tannery Zone varies and the gate locations have been already specified, the building orientation cannot be majorly dictated in design. However, proper orientation and placement of windows can result in good natural lighting and ventilation without too much heat transfer. Since Sialkot is located around latitude 32N, this means that windows should primarily be facing north if possible. North facing windows will provide diffused natural light without the heating factor and windows would not even require shading. South facing windows can be installed however will require a horizontal shading device to block direct sunlight. Windows should be avoided on east and west sides, if possible.

Walls facing east and west and roof open to direct sunlight may be provided with insulation material to avoid heating of the building façade facing these directions. Insulation material can be extruded polystyrene foam, thermo-pore or other insulation products available.

5.5 Storage Areas

The storages should be well illuminated and properly ventilated. Requirements for different types of storages are discussed below. Ideally all storage areas should be on ground floor, however due to area limitations, chemical and other material storages other than hides may be constructed on upper floors. Requirements for different types of storages are discussed below. In case the main storage areas are not close to the production area, smaller daily use stores should be planned near the production area for easy access to the required materials.

5.5.1 Raw Material Storage

The first step in the tannery is storage of raw/wet-salted hides/skins coming in to be processed. Average weight of wet-salted hides is around 26 kg as mentioned in the terms of reference of this assignment, and the density is around 1g/cm³. This leads to a volume of around 1 cft (ft³).

This calculation can be cross checked using the number of wet-salted hides transported in a 20 feet long logistics container. Internal volume of a 20 feet container is approximately 32.5m³ and it holds around 1300 wet-salted hides⁵, which translates to around 1.1 ft³ volume per wet-salted hide.

The calculation for area required for storage is as under

Table 5-3 Raw Material Storage Area

Categories	Small Tannery			Medium Tannery		
	Raw to Wet Blue	Wet Blue to Finish	Raw to Finish	Raw to Wet Blue	Wet Blue to Finish	Raw to Finish
Processing Capacity	3,120 Kg	15,000 Sft	3,120 Kg	7,800 Kg	25,000 Sft	6,240 Kg
Storage Backup (Days)	5 days	5 days	5 days	10 days	10 days	10 days
Height of raw material piles	6 feet	4 feet	6 feet	6 feet	4 feet	6 feet
Volume of Raw material / piece	1.1cft	0.35cft	1.1cft	1.1cft	0.35cft	1.1cft
Storage Area required (Sft)	115	154	115	572	513	458

The storage for wet-salted hides should be properly ventilated and should have a drain system equipped with mesh/screen to catch any fleshings/fats from flowing into the drainage system. For tanneries of smaller size, the raw material storage should preferably be planned at the front side of the building to allow easy offloading of material.

5.5.2 Finished Product Storage

Table 5-4 Finished Product Storage Area

Categories	Small Tannery			Medium Tannery		
	Raw to Wet Blue	Wet Blue to Finish	Raw to Finish	Raw to Wet Blue	Wet Blue to Finish	Raw to Finish
Thickness of Finished Product	2.5mm	1mm	1mm	2.5mm	1mm	1mm
Storage Backup (Days)	10 days	10 days	10 days	10 days	10 days	10 days
Volume of Finished Product	0.35cft	0.14cft	0.14cft	0.35cft	0.14cft	0.14cft
Storage Area required (Sft)	197 Sft	231 Sft	80 Sft	572	513	458

The finished storage should ideally be close to the machinery where the last stage processes are to be carried out. This shall allow easy movement and avoid contamination of finished product.

⁵ <https://speedtradespzoo.com/>

5.5.3 Chemical Storage

In processing of hides/skins to form leather, various chemicals are used at different stages. Some of the main chemicals used are as under:

- NaCl (Sodium Chloride for salting of hides)
- Ca(OH)₂ (Calcium Hydroxide) for liming
- Na₂S (Sodium Sulphide) for hair removal
- Ammonium Salts
- Acids (e.g. Sulphuric Acid)
- MgO/NaHCO₃ (Magnesium Oxide and Sodium Bicarbonate)
- Cr₂O₃ (Chromium III Oxide) for tanning
- Various other Enzymes and salts

These chemicals need to be properly stored to avoid any health hazard or accidents. Chemical storage and handling guidelines are tabulated in the table below.

Table 5-5 Chemical Storage & Handling Guidelines

Sr.	Description
1	The floor of the chemical store should be flat (to allow easy handling of chemical containers) and non-permeable to prevent contamination of soil and ground-water from chemical spills.
2	The chemical store should have at least two clearly marked emergency exits (e.g. doors, windows). Access to these exits has to be kept free at all times to allow easy escape of personnel trapped inside the store in an emergency. The emergency exits should be marked with visible sign boards.
3	Working space for personal movement should be provided
4	Firefighting equipment e.g. fire extinguisher should be kept ready at easily accessible locations. These locations should be clearly marked. One fire extinguisher should be placed outside the chemical store.
5	Racks and shelves increase the available storage space. Smaller chemical containers (e.g. samples of dyes, fatliquors) can be stored on these.
6	Barrels containing liquid hazardous chemicals have to be stored on catch pits.
7	Group and store different chemicals according to their type and compatibility. For easier stock keeping, provide boards indicating name, maximum, minimum and current stock for each group.
8	Sufficient width for movement of persons and material should be ensured (about 0.8 meters for persons, more than 1 meter for handling of chemicals, more than 2 meters for movement of pallet or fork lift trucks). The passageways should be marked on the floor.
9	To keep humidity, temperature or any vapors/fume concentration low, natural and artificial ventilation have to be provided. It is important that exhausts at floor level for removal of heavy vapors and exhausts/vents at a higher wall level for removal of light vapors are provided.
10	Shelves for storage of small items and working table for temporary storage
11	Affix cautionary and warning signs in the chemical store, prescribing certain precautionary and preventive measures.
12	Adequate storage facilities are a prerequisite for safe storage. Generally, the chemical store should always be physically separated from production areas, occupied buildings, other storage areas (e.g. raw material, semi-finished and finished leather), workshops or areas with potential sources of ignition such as generators, electrical control panel or transformers.
13	Emergency drains should be available and connected to the effluent drain.
14	A washbasin, eye/face rinsing station or safety shower should be available in or near

Sr.	Description
	the chemical store for personal hygiene and emergencies.
15	At all times, unauthorized personnel must be prevented from entering the chemical store. The main doors should be locked. In addition, a sign board prohibiting unauthorized entry should be displayed at the entrance to the chemical store.
16	Electrical installations in the store such as switches, switch boards, light fittings, cables have to be insulated and "explosion proof". Ideally, switches should be placed outside the chemical store.
17	The storage area should have a ramp outside to facilitate access and use of trolleys for transfer and movement of chemical containers.
18	Emergency drains should be available and connected to the effluent drain.
19	A washbasin, eye/face rinsing station or safety shower should be available in or near the chemical store for personal hygiene and emergencies.
20	Industries should use Hazard Communication Standard (HCS) and Global Harmonized System of Classification and Labelling of Chemicals (GHS)

The chemical storage racks and platforms should be raised at least 6 inches above the floor level of the chemical store, with proper connectivity to drainage system. The area requirement based on the following assumptions:

- Width of racks for storage: (3 feet x 2) = 6 feet
- Room for handler: (3 feet x 2) = 6 feet
- Room for forklift: = 6 feet
- Total width of chemical storage: =18 feet

Table 5-6 Chemical Store Size

Sr. No.	Tannery Size	Minimum Width of Chemical Store	Minimum Length of Chemical Store	Total Area (Sft)
1	Small Tannery	18 feet	15 feet	270 Sft
2	Medium Tannery	18 feet	20 feet	360 Sft

All the storage areas include room for maneuvering of fork lift for handling of raw material, chemicals and finished product.

5.6 Production Area

5.6.1 Production Halls

The production space required for the tanneries can be broadly divided into two categories i.e. Wet processing and dry processing. The wet processing involves extensive use of water and covers soaking, liming, pickling, tanning, retanning etc. Whereas other processes which require little to no water are to be covered under dry processes.

The wet processes need to be planned to be only carried out at the ground floor level, whereas the dry processes can be carried out at any level. The typical machinery required for each process is listed below:

Table 5-7 Process Machinery

Sr. No.	Description	Small Tannery			Medium Tannery		
		R-W	W-F	R-F	R-W	W-F	R-F
1	Trimming Machines (hand held)	2		2	4		4
2	Desalting	1		1	1		1
3	Fleshing machine 1600 mm	1		1	1		1
4	Soaking Drum	1		1	1		1
5	Liming/Unhairing Drum	1		1	1		1

Sr. No.	Description	Small Tannery			Medium Tannery		
		R-W	W-F	R-F	R-W	W-F	R-F
6	Tanning drum	1		1	2		2
7	Sammying machine	1		1	1		1
8	Splitting machine 3000mm	1		1	1		1
9	Shaving machine 1500 mm	1		1	1		1
10	Retanning/Dyeing drums 2.5*2 .0 m		2	2		4	4
11	Setting out machine 1600 mm		1	1		1	1
12	Drying Overhead chain conveyor (Rooftop)		1	1		1	1
13	Rotary staking machine 1500 mm		1	1		1	1
14	Automatic toggling machine		1	1		1	1
15	Buffing + De-dusting		1	1		1	1
16	Dry shaving machine 1500 mm		1	1		1	1
17	Polishing machine 600 mm		1	1		1	2
18	Automatic dry milling drums		1	1		1	2
19	Spraying line 600 mm		1	1		1	1
20	Roller coating machine 1800 mm		1	1		1	1
21	Rotary ironing machine		1	1		1	1
22	Hydraulic platen press 850		1	1		1	1
23	Through feed ironing & embossing 2600mm		1	1		1	1
24	Area measuring machine 1800mm		1	1		1	1

The number of machines in the table above are the basic requirement for the processes covered under this study, however each tannery may require different number of machines based on their business model. Based on the machinery identified in the table above and their dimensions provided in Annex-01, the following areas have been calculated for overall production:

Table 5-8 Production Halls Area

Categories	Production Halls Area in Ft ²		
	Raw to Wet Blue	Wet Blue to Finish	Raw to Finish
Small Tannery	2,772	5,508	8,153
Medium Tannery	6,930	9,181	16,305

The above mentioned area is the total estimated area required for the production process only and may be divided into different floors with wet processes on the ground floor. Other allied spaces such as storages, washrooms, offices are not included in this calculation.

5.6.2 Fleshing

The fleshing machine needs to be equipped with a pit to store the fleshing and other solids. Placement of fleshing machine near a wall with cavity leading to a collection pit may be provided or the fleshing machine may be raised and provided with a removable collection container under the machine. The collection pit on the outer side of the wall or removable container shall allow easy access for removal and transportation of the fleshing.

5.6.3 Drums

All the drums including soaking, liming, tanning, retanning shall be installed at the ground floor level and shall be raised, and maybe provided with a platform for easy access. The machines and drums should have at least 3 feet space on sides and back, unless not specified otherwise, for ventilation and to provide room for maneuvering.

Figure 5-1 Typical Drum with Platform⁶



5.6.4 Stream Segregation & Solid Wastes

In the wet processing area, will be different types of effluent, namely:

- General Effluent (soaking, washing, etc.) to be discharged into effluent drains
- Katcha Effluent (liming) to be discharged into katcha drains after passing through septic tank
- Chrome Effluent (chrome tanning) to be stored in septic tank for transportation to Chrome Recovery Plant (CRP).

The effluent from each category is to be treated differently in order to decrease the load on Common Effluent Treatment Plant (CETP) and to reduce the pollution load otherwise. The CRP shall enable industries to get recycled chrome from the chrome liquor they provide for recovery.

To allow the proposed stream segregation, the drums used in tanneries need to be specified for each category. Resultantly, the drums used for liming cannot be used to tanning, and vice versa. This will enable the tanneries to easily segregate the effluent streams. These streams will also be provided with screens/filters to stop large sized solid wastes from discharging into the drains and eventually into the treatment plant. The layouts provided in this report show one option of stream segregation. The screens should be able to filter the following:

- Hair (0.5mm to 1.0mm)⁷
- Fleshing and fat
- Trimmings
- Shavings

These solid wastes can be utilized in glue, adhesives, and gelatin. Further, reconstituted collagen can be produced from chrome shaving wastes by treating with hydrogen peroxide. The trimmings can

⁶ <http://www.fsw.cc/wood-vs-plastic-whats-best-leather-drum-dyers/>

⁷ The framework for sustainable leather manufacture, Second edition, Jakov Buljjan, Ivan Kral, 2018

also be used in fertilizers and other feeds.⁸ However, space shall be allocated for handling of industrial and other domestic solid waste generated.

5.6.5 Buffing & De-dusting

Buffing of leather results in generation of particulate matter which is hazardous to health. Buffing in open hall will result in release of particulate matter into the air resulting in breathing issues and other health complications. Therefore buffing and dedusting should be carried out in special enclosed rooms equipped with dust collectors and good ventilation system.

5.6.6 Roof Top & Solar Application

The drying of hides is proposed to be conducted on the roof top under shed, or through solar hot air system installed at the roof top. In case the space allows, the tanners may install solar water heater as well for supply and use of hot water for the process. Calculations showing the solar potential and the following are provided in Annex-02:

- Solar Water Heating Schematic Drawings
- Solar Air Drying Schematic Drawing

These drawings are typical schematic drawings and need to be reviewed and designed as per actual site conditions. These systems can generally meet the requirements of hot water or hot air however due to area limitations on the roof top, the tanneries might need to opt for hybrid systems with solar and conventional systems.

5.7 Non-Production Area

Non production area includes the following:

- All types of storages
- Washrooms
- Changing rooms
- Offices
- Parking
- Laboratory & Workshop
- Lift & Stairs
- Pre-treatment facilities

Storage has been discussed in detail under section 5.5. The space requirement assessment for other areas is discussed below.

5.7.1 Washrooms & Changing Room

The international standards⁹ require a washroom for every 15 persons working at an industrial setting. The average space generally required for one toilet/washroom is between 30 to 40 square feet. Further, the changing room space required is around 15 square feet. A combined space allocation of 45 Sft may suffice for toilet and changing room. The table below shows the estimated number of

⁸ Hashmi GJ, Dastageer G, Sajid MS, Ali Z, Malik MF, Liaqat I. 2017. Leather Industry and Environment: Pakistan Scenario. International Journal of Applied Biology and Forensics 1(2):20-25

⁹ Time Saver Standards for Building Types 2nd Edition

washrooms required for each type of industry. The management staff may require one toilet attached to the room of industry owner/manager.

Table 5-9 Washroom and Changing Room Area

S. No.	Category of Staff	Various Categories of Tanneries Engaged in Processes from					
		Raw to Wet		Wet to Finish		Raw to Finish	
		Small	Medium	Small	Medium	Small	Medium
A	Management Staff	4	10	4	10	4	10
	Male Washrooms	2	2	2	2	2	2
	Female Washrooms	1	1	1	1	1	1
B	Production Staff	17	30	21	32	30	38
	Male Washrooms	1	2	2	2	2	3
	Female Washrooms	1	1	1	1	1	1
	Total Washrooms	5	6	6	6	6	7
	Washroom & Changing Room Area (45 Sft)	225	270	270	270	270	315

5.7.2 Offices

Table below shows the calculation for office area requirement. It is to be noted that not all the offices mentioned below need to be enclosed spaces, some of the offices can be space allocated in production halls. Further, tannery owners may have different requirements based on their business plans.

Table 5-10 Office Area Requirement

S. No.	Category of Staff	Area in SFT					
		Raw to Wet		Wet to Finish		Raw to Finish	
		Small	Medium	Small	Medium	Small	Medium
A	Management Staff						
1	Owner/General Manager	225	300	225	300	225	300
2	Leather Technologist	0	150	0	150	0	150
3	Environmentalist	0	150	0	150	0	150
4	Marketing Manager	0	225	0	225	0	225
5	Purchase Officer	100	150	100	150	100	150
6	Account Officer	100	100	100	100	100	100
7	Admin. Officer	0	60	0	60	0	60
8	Security Guard	0	0	0	0	0	0
Sub-total of A		425	1,195	425	1,195	425	1,195
B	Production Staff						
1	Incharge Beamhouse	60	80	0	0	60	80
2	Incharge Tanhouse	0	80	60	0	60	80
3	Incharge Wet Finishing	0	0	0	80	60	80
4	Incharge Finishing	0	0	60	80	60	80
5	Store Incharge	60	60	60	60	60	60
6	Workshop Incharge	60	60	60	60	60	60
7	Machine Operator	0	0	0	0	0	0
8	Mechanical Technician	0	0	0	0	0	0
9	Electrical Technician	0	0	0	0	0	0
10	Helper Technician	0	0	0	0	0	0
11	Helper Worker	0	0	0	0	0	0
12	Cleaner	0	0	0	0	0	0
13	Misc.	0	0	0	0	0	0

S. No.	Category of Staff	Area in SFT					
		Raw to Wet		Wet to Finish		Raw to Finish	
		Small	Medium	Small	Medium	Small	Medium
Sub-total of B		180	280	240	280	360	440
Total of A+B		605	1,475	665	1,475	785	1,635

One specific requirement of the stakeholders is availability of an office space at the front of the building. This is required to cater guests and other visitors without having them go through the production facility.

5.7.3 Laboratory & Workshop

In tanneries, laboratories are required for testing of the leather at different stages to ensure a quality product is achieved. Further, a workshop is needed in every industry for minor repairs and maintenance of machinery and parts. Based on discussion, the following optimal spaces for lab and workshops have been proposed:

Table 5-11 Lab & Workshop

Categories	Area in ft ²		
	Raw to Wet Blue	Wet Blue to Finish	Raw to Finish
Small Tannery – Lab	80	80	80
Small Tannery – Workshop	225	225	225
Medium Tannery Lab	100	100	100
Medium Tannery – Workshop	225	225	225

5.7.4 Lift & Stairs

Since the buildings can be constructed up to ground plus two floors, stairs and a cargo lift will be required for movement of people and transfer of material from one floor to other.

With a tread width of 4 to 5 feet, nominal width of stair case shall be 10 feet and a depth of 15 feet, the area requirement of stairs on each floors shall be 150 Sft. For 3 floors, the covered area translates to 450 Sft.

Similarly, the area required for cargo lift for movement of materials is tabulated below:

Table 5-12 Cargo Lift Covered Area

Categories	Cargo Lift Covered Area			
	Lift Width	Depth	Lift Area (Sft)	Covered Area for 3 Floors (Sft)
Small Tannery	10 feet	10 feet	100	300
Medium Tannery	10 feet	10 feet	100	300

5.7.5 Water & Pretreatment Tanks

The industries shall be equipped with the following depending upon their type:

- Underground Water Tanks (UGWT)
- Overhead Water Tanks (OHWT)
- Septic tank for sewage
- Katcha effluent pit (Raw processing industries)
- Chrome collection pit and tank (Tanning industries)

The sizing of underground and overhead water tanks based on two days back is provided below:

Table 5-13 Water Tank Sizes

Sr. No.	Tannery Area (Kanal)	Daily Water Use (m ³)	Water Backup (No. of Days)	Proposed UGWT Volume (m ³)	Approx. UGWT Size (LxWxH in feet)	Proposed OHWT Volume (m ³)
1	Area ≤ 1K	12	2	24	10'x10'x9'	12
2	1K <Area ≤ 2K	18	2	36	12'x12'x9'	18
3	2K <Area ≤ 4K	20	2	40	13'x12'x9'	20
4	4K <Area ≤ 8K	30	2	60	20'x12'x9'	30

It is proposed that tanneries with only one tanning drum may be allowed to construct chrome liquor pit rather than constructing a complete underground collection tank. However tanneries with more than one tanning drum should have chrome collection tanks as mentioned below:

Table 5-14 Chrome Pit & Tank

Sr. No.	Number of Chroming Drums	Size of Chroming Effluent Collection Tanks	Approximate Pit/Tank Dimensions (Feet)
1	1 drum	No tank, only collection pit	
2	2 drums	8m ³ collection tank	7'x7'x6'
3	3 drums	12m ³ collection tank	9'x8'x6'
4	4 drums	16m ³ collection tank	10'x10'x6'
5	5 drums	20m ³ collection tank	12'x10'x6'

The drawings and details of these tanks and pits are provided in the subsequent chapters. An overall pit and tank requirement matrix is provided below:

Table 5-15 Pit & Tank Provision

Agreed Tannery Area (Kanal)	UGWT Volume (m ³)	OHWT Volume (m ³)	Soaking Effluent Pit	General Effluent Pit	Spent Chrome Pit	Chrome Effluent Tank
Area ≤ 1K	24	12	*	**	***	****
1K <Area ≤ 2K	36	18	*	**	***	****
2K <Area ≤ 4K	40	20	*	**	***	****
4K <Area ≤ 8K	60	30	*	**	***	****

*one pit for effluent discharging from the soaking/liming process should be installed where the tannery is involved in the process of raw hides/skins. The effluent from the pit shall be discharged to Katcha drain.

**one pit for effluent discharging from the processes other than soaking, liming, tanning and retanning should be installed where the tannery is involved in the process from wet blue onward.

***one pit for effluent discharging from the process of tanning/re-tanning should be installed in each tannery where the tannery is involved in the tanning and/or re-tanning process.

****Spent chrome collection tank of various sizes shall be installed in each tannery involved in the tanning and/or re-tanning process where the number of drums is 2 or less than equal to 5.

5.8 Lighting

Poor lighting leads to low productivity and poor quality, particularly in finishing operations, as workers will start suffering from eye strain, fatigue and headache. Better lighting does not mean that more light bulbs have to be fixed. In many cases, rearrangement of existing lighting and proper maintenance and cleanliness of reflectors/ fittings will result in improvements.

The lighting should make full use of natural daylight by installing windows of appropriate size and location. Windows should be clean all the time. Good natural lighting saves the electricity cost of artificial lighting. Further, it is proposed that LED Lighting should be used due to its higher efficiency.

Painting ceilings and inner walls in lighter colors also provides better reflection and distribution of existing light sources besides resulting in better visual conditions and a pleasant work environment. Direct and indirect glare should be avoided, particularly in areas involving multi-roller machines and finishing machines directly operated by the workers (e.g. staking machine, glazing jack). Glare can distract the workers' concentration, possibly resulting in poorer quality or even accidents.

The lighting installed should be of proper type and rating and should meet the illumination requirement of the area. The following types of floors are proposed:

Table 5-16 Lighting Lumens & IP Rating

Area of operation	Lux range (lumens/m2)	Protective measures for fittings	Index of Protection for fittings
Storage			
Store for Raw Leather	150...200	Corrosion resistant	IP 54
Store for Chemical	400...750	Corrosion resistant	IP 54
Store for Spare Parts	400...750		IP 34
Store for Finished Leather	150...200		IP 20
Area for Measuring	300...500		IP 20
Area for Sorting	750...1000		IP 20
Area for Packing	300...500		IP 20
Processing			
Soaking	150...300	Corrosion resistant	IP 55
Liming	150...300	Corrosion resistant	IP 55
Unhairing	150.. 300	Corrosion resistant	IP 55
Scudding	150...300	Corrosion resistant	IP 55
Tanning	150...300	Corrosion resistant	IP 55
Dyeing/ Fat liquor	300...500	Corrosion resistant	IP 55
Setting	300...500	Corrosion resistant	IP 55
Sammying	300...500	Corrosion resistant	IP 55
Splitting	300...500	Corrosion resistant	IP 34
Shaving, wet	300...500	Corrosion protected	IP 34
Shaving, dry	300...500		IP 55
Toggle drying	300...500		IP 54
Buffing	300...500		IP 55
Staking	750... 1000		IP 54
Spraying/ roller coating	750... 1000		IP 55
Plating / Embossing	750...1000		IP 20
Glazing / Ironing	750...1000		IP 20
Utilities			
Supply transformer	150,..200	Corrosion protected UV protected	IP 55
Main electrical panel	150...300		IP 20
Boiler room	300...500	Corrosion resistant	IP 34
Fuel storage facility	150...200	Corrosion protected UV protected	IP 55
Maintenance workshop	300...500		IP 20

These lighting recommendations are based on the type of activities and environment expected in each area or process. These may be revised depending upon the requirements of the end-users.

Table 5-17 Lighting Types

Type of lamp	Min. Efficacy (lumens per Watt)	Remarks	Wattage Available
LED Bulbs	80	Easily available and easy replacement	5, 7, 10, 12, 18, 24
LED Downlight	70	Most suitable for offices and rooms with false ceiling	5, 7, 10, 12
LED Panel (2x2)	70	Most suitable for offices and rooms with false ceiling	24, 36, 48
LED Tube Light	106	Higher efficiency, suitable for wall mounting as well. Available in 2 feet and 4 feet sizes	10, 20
LED Baton Light	106	Higher efficiency, suitable for wall mounting as well. Available in 2 feet and 4 feet sizes	10, 20
LED Flood Light/Outdoor	100	High illumination usually for outdoor lighting, available in different IP rating	Wide range usually up to 500W
LED Highbay Lighting	100	High illumination usually for indoor lighting for high ceiling height areas	Wide range usually up to 500W

5.9 Electrical Installations

Tanneries have highly corrosive conditions (e.g. high levels of humidity, presence of corrosive chemicals in liquid and gaseous form). These affect the electrical installations all over the tannery but particularly on and around machines.

It should be ensured that metal casings of electrical equipment (motor, starter boxes) should be earthed. The earthing cables have to be connected to an earthing conductor placed in an earthing pit. It is recommended that the following color coding of cables/ wires standard adopted from standards BS-7671 shall be followed in the tanneries for clear identification of the type of wire and connection:

Table 5-18 Electrical Wiring

Type of electric supply and voltage	Conductor	Standard color
AC, 415 Volts, 50 Hz three phase supply	Phase L1	⇒ Red
	Phase L2	⇒ Yellow
	Phase L3	⇒ Blue
	Neutral	⇒ Black
	Protective conductor/Earth	⇒ Green and Yellow
AC, 240 Volts, 50 Hz	Phase	⇒ Red
Single phase supply	Neutral	⇒ Black
	Protective conductor / Earth	⇒ Green and Yellow
DC two wire system	Positive voltage	⇒ Red
	Zero voltage	⇒ Black
	Protective conductor / Earth	⇒ Green and Yellow
DC three wire system	Positive voltage	⇒ Red
	Zero voltage	⇒ Black
	Negative voltage	⇒ Blue
	Protective conductor / Earth	⇒ Green and Yellow

- Ensure that the electrical wires and cables are color coded to allow their easier identification in case of repair and maintenance work.
- The color coding standards shall be in accordance with the supply of electricity and voltage as indicated in the above table.
- For machines located in wet-processing and dusty areas (dry shaving, buffing), ensure that the index of protection (IP) of the motors must meet IP 55 index of protection.
- It should be ensured that the terminal boxes of the motors should be covered.
- Variable Frequency Drives (VFD) and/or Variable Speed Drives (VSD) should be considered for motors especially for drums. However compatibility of motors with VFD/VSDs should be checked before use, as old motors or motors other than 3-phase motors may not be workable or advantageous to use with VFDs.

5.10 Ventilation & Insulation

Buildings should make use of natural ventilation and air circulation to achieve low cost overall ventilation first, taking advantage of horizontal air movement around and through buildings or the tendency of hot air to rise.

Keeping in view the nature of work which shall include chemicals, release of harmful gases, and buffing dust, it is imperative to install fans, where natural air ventilation and circulation are not sufficient. Tanneries should consider installation of H₂S detection devices in the potential risk areas. The buffing and de-dusting should be carried out in enclosed rooms with dust collectors and proper ventilation.

The following is suggested as a solution in the tannery with regard to the removal of the dust generated in the tannery.

- Tanneries with only one-dust emitting machine should use a unit dust collector of the combined cyclone and bag filter type.
- Tanneries with more than one dust emitting machine should use a centralized dust collection system for economy.
- For centralized dust collection in a tannery having dusty operations (e.g. dry shaving, buffing), a combination system with a cyclone pre-filter followed by a bag filter or wet-scrubber can be used. In order to avoid the liquid waste or sludge generated by use of wet scrubbers, use of dry scrubbers can be useful.

While ventilation is one way to remove heat from the work place, improving the heat reflection of walls and roofs by plastering or whitewashing; improving the insulation of the roof by using insulating material or double layer roof; using shades for the wall openings to deflect heat from direct sun shine; planting trees and shrubs around the premises which not only provide shade but also become a natural filter for outside dust, besides giving the tannery a pleasant appearance.

5.11 Fire Fighting

In order to ensure fire safety, centralized firefighting systems should be installed however no such trend has been seen in the tanneries visited in Pakistan. However to comply with national and international requirements, firefighting equipment/materials should be made available in each tannery. Typical equipment/materials are provided as under:

Table 5-19 Typical Firefighting Equipment

Type of Fire	Locations in Tannery	Type of Suitable Fire Fighting Equipment				
		Water	Foam	Dry Chemical Powder	Carbon dioxide	Sand
Leather, Leather Dust, Wood	Dry shaving area, Buffing area, Dryieng area, Finished leather store	Suitable		Suitable	Suitable	Suitable
Petrol, Oil, Solvents, Chemicals	DG room, Chemical store, Spraying area, Dyeyard, Boiler room, Fuel storage		Suitable	Suitable	Suitable	
Cooking and welding Gas	Canteen, Workshop	Suitable	Suitable	Suitable	Suitable	
Electricity and electrical appliances	Electrical Control Panel, Transformer			Suitable	Suitable	









All exits should be provided with an illuminated display marked with text “EXIT”. And all emergency exit doors should be equipped with panic hardware. Adherence to Bylaws should be ensured.

5.12 Floor Marking

Floor markings play an important role in creating and maintaining an efficient and safer work place/facility. With consistent floor marking color coding system in the entire facility, workers are able to associate colors with specific areas or actions such as hazardous areas, traffic paths, storage areas, etc.

OSHA has regulations regarding clear marking of aisles and passageways however there are no Government regulations regarding floor markings in industries. Further, OSHA regulations do not dictate which colors to use for marking, however for reference, 3M floor markings are tabulated below:

Figure 5-2 Typical Floor Markings¹⁰

Pattern	Color	Examples Where to Use
	Yellow	Aisles, walk-ways and traffic lanes, work cells
	Orange	Material or product inspection or temporary storage locations
	Red	Safety/first aid, defect/scrap area, red tag area
	Green	Materials and manufacturing, finished goods
	Blue	Materials and manufacturing, raw materials
	Black	Materials and manufacturing, work in progress
	Black/ Yellow	Areas of potential health risks, extra caution needs to be taken
	Black/ White	Areas to stay out of for operational purposes

¹⁰ 3M Industrial Tapes for Floor Marking

Using too many colors can be difficult for the employees to remember, therefore simplified color scheme should be adopted. The following are suggested:

Yellow:	Aisles, walk-ways and traffic lanes, work cells
Red:	Safety/first aid equipment
Black & Yellow Stripes:	Hazardous areas with potential health risks including physical/mechanical, chemical, and electrical hazards
Width:	The width of the markings should at least be 2 inches or more
Thickness:	Thickness should be ensured to stand normal wear and tear of walking, forklift tyre movement and turning.
Material:	Preferably industrial marking tape (3M or equivalent) should be used, however epoxy floor paints may be used.
Other Markings:	Emergency equipment, eye washing areas, hazardous equipment, electrical panels, potentially hazardous electrical installations, fire exits, etc. should be clearly marked in legible text in addition to the floor markings.

5.13 Building Material

Since tanneries use wide variety of chemicals including acids, salts, and hazardous/corrosive effluents and fumes are generated, the building materials need to be selected to withstand the conditions in tanneries including corrosion, rusting, and weathering.

The cement used in construction should be Sulphate Resistant (SR cement) especially in the drains and areas exposed to chemicals, to withstand the Sulphates and salinity of the effluents discharged.

The exposed metal like grills, metal stairs, railing, tanks, window frames, sheds etc. should either be of corrosion resistant material like stainless steel, aluminum or should be properly coated with protective layers to be able to withstand the conditions in tanneries.

5.14 Solar Potential

The potential for Solar drying, solar water heating, and solar panels for electricity has been discussed in the report and detailed in the Annex-02.

For water heating, it has been assessed that a 10,000 liter solar water heating system requires around 2,200 Square feet area without any shades. The system weight will be around 4,100 kg. The structure design shall allow provision for installation of solar water heating or other solar energy systems on the roof top. A quotation for a typical system is attached for information as Annex-03.

The installation and performance of solar systems will be dictated by the orientation of the building and availability of total unshaded area on the roof top. For placement in Sialkot, the ideal direction for fixed panels is facing the South. This shall allow maximum utilization of the solar energy.

Installation of such systems shall enable the tanners to lower their recurring energy costs. It will further reduce the pollution load by replacing the practice of burning hazardous material to meet energy usage.

CHAPTER 6

ENVIRONMENT AND OCCUPATIONAL SAFETY & HEALTH

6.1 Overview

The environmental and occupational safety & health (OSH) aspects have been discussed in the preceding chapters pertaining to different areas of the tanneries. This chapter provides a brief description of the potential environmental and OSH issues and the measures proposed to overcome.

6.2 Potential Risks & Design Measures

The risk matrix along with the probable mitigation measures are identified in the table below. The mitigation measures proposed in this matrix are the design measures to be taken to mitigate the risks, however each tannery should make an environmental and OSH management plan prior to operationalization of the tannery.

Table 6-1 Risks and Design Mitigation Measures

Risk	Design Measures
Odor	Proper ventilation of the storage areas
Raw material handling	Use machinery to lift heavy loads, use PPE, designation path for movement of machinery to avoid accidents
Water Use	Consider re-use of water (pickling water for tanning, etc.) Install water meters for industries to monitor and charge water usage Further the industries shall be charged treatment cost based on the effluent generated, which shall in return promote water conservation.
Chemicals Storage & Handling	Details under Section 5.5.3
Fire and Accidents	Emergency exits provided for each floor, firefighting details under section 5.11. To avoid accidents floor marking discussed under 5.12, washing areas provided in case of contact with hazardous chemicals, emergency exits to be marked with signs. First aid kits to be made available by the tanneries. Fire alarms, smoke, heat and hazardous gas detectors should be installed.
Slipping Hazard	Wet processing areas designated, to be used with proper PPE
Ventilation - Fumes & Dust and other Air Pollution	Natural and mechanical ventilation proposed, buffing and dedusting to be enclosed and equipped with dust collectors and proper ventilation. To avoid burning of hazardous material for energy, solar potential discussed in detail under 5.14 and Annex-02 Tanneries should consider installation of H ₂ S detection devices in the potential risk areas.
Water Pollution	Streams segregated to allow for pretreatment within tannery, further chrome liquors separated to allow recovery through Chrome Recovery Plant. Other effluents channelized and to be treated at treatment plant.

Risk	Design Measures
Solid Waste	Fleshing to be collected in fleshing pit for potential fat extraction. Screens and grit chambers proposed in effluent pits to stop discharge of solid wastes into the waste water stream. Discussed under 5.6.4.
Corrosion	Building materials proposed under Section 5.13 to avoid potential corrosion and damage by chemicals used in the tanneries.

6.3 OSH & Instructions

The following items and information should be made available for the workers:

- Personal Protective Equipment (PPE) related to the workers field of work
- Instruction manual for operation of machinery under use of the worker
- Instructions for proper storage and handling of materials (hides, product, chemicals etc.)
- Material Safety Data Sheets for all chemicals and other products
- Instructions for emergency situations (fire, accidents, spills, etc.) and evacuation plans
- List of emergency contacts

6.4 Leather Working Group Compliance

In order to comply with LWG requirements, the tanneries are required to follow strict procedures regarding housekeeping, operations, sourcing, environment, OSH and other aspects of the industry. The LWG housekeeping guidelines are attached as Annex-04 and a Self Assessment Questionnaire is provided in Annex-05.

This document provides guidelines related to the design parameters however the other aspects are to be complied with by the industries. Some of the good practices pertaining to the operational processes are also discussed in the Self-Assessment Questionnaire for the tanneries to evaluate and adopt.

6.5 Material Handling

The process at tanneries requires handling and movement of raw material and products between different areas and machines. Improper handling of raw material and products can result in lower quality end product and potential hazards and accidents. Some of the basic material handling guidelines are covered in this section, further, the industries have to develop guidelines for all aspects of tannery operation to ensure compliance with national and international requirements and standards.

- Location of storage of raw material should be based on the conditions including approach, connectivity, ease of access, ventilation and various other factors. Considering these factors, the raw material stores have been proposed to be at the front of the industries.
- Material and technology for the storage and transportation medium should be selected carefully to avoid cross contamination, damage to environment and workers.
- The handlers should observe the OSH and fire safety precautions set in the Environmental Management Plan (EMP) and should use proper PPEs.
- Hazardous material should be labelled properly and stored at the designated locations.
- Any explosive or flammable materials should be kept away from source of fire or excessive heat.
- Sensitive material such as hides and other products should be kept away from direct sun light or prolonged exposure to heat and the areas should be properly ventilated.

- The floors and passageways should be properly marked and kept free from any obstacles or hindrances. Slippery areas should be marked/notified.
- Hazardous materials should be protected from direct sunlight and rain, and should be stored on raised platforms to avoid contamination.
- Washing facilities should be provided especially near chemical stores.
- Edibles should not be transported along with hazardous materials or chemicals.
- Spills should be cleaned immediately using appropriate materials such as sand or saw dust. Use of saw dust should be avoided if cleaning flammable materials. Spills should be cleared as per directions on the spilled chemicals Material Safety and Data Sheet (MSDS).
- The stacking or storing of materials should allow room for movement and access using forklift.

In addition to the above mentioned items, the industries should regularly update their guidelines and plans and should plan and carry out regular monitoring inspections.

CHAPTER 7 GREEN TANNERY DESIGNS

7.1 General

This chapter provides draft outline of the designs for the selected types and sizes of tanneries. Based on the findings and discussions of the preceding chapters, the covered areas required for each type of tannery are as under:

Table 7-1 Total Area Requirement

Sr. No.	Description	Small			Medium		
		Raw to Wet Blue	Wet Blue to Finish	Raw to Finish	Raw to Wet Blue	Wet Blue to Finish	Raw to Finish
1	Production hall	2,772	5,508	8,153	6,930	9,181	16,305
2	Raw hides storage area	115	154	115	572	513	458
3	Semi-finished/ finished storage	197	231	80	572	513	458
4	Chemical storage area	270	270	270	360	360	260
5	Laboratory	80	80	80	100	100	100
6	Workshop	225	225	225	225	225	225
7	Offices Management staff	425	425	425	1,195	1,195	1,195
8	Offices Production staff	180	240	360	280	280	440
10	Washrooms & Changing room	225	270	270	270	270	315
11	Lift	300	300	300	300	300	300
12	Stairs	450	450	450	450	450	450
	Total area sft	5,239	8,153	10,728	11,254	13,387	20,506

The above mentioned area do not cover café/dining hall, as it is assumed that restaurant in STZ will be utilized for this purpose. The total allowed covered area for 3 floors for each size of tannery is as under:

1 Kanal:	9,000 Sft
2 Kanal:	21,240 Sft
4 Kanal:	43,344 Sft
8 Kanal:	97, 104 Sft

This shows that a 1 Kanal plot cannot house the small tannery process from Raw to Finish. Therefore this design will not be included in the green tannery design, only small tannery raw to wet and wet to finish will be planned for 1 Kanal size.

7.2 Zoning & Process Flow

Feedback from the tanners suggested that the raw material store should be at the front of the building. Further, the chemical store is also required to be easily accessible, therefore these facilities have been planned on ground floor along the wet processing zone. The basic external zoning plan is shown in the figure below:

Figure 7-1 External Zoning Plan

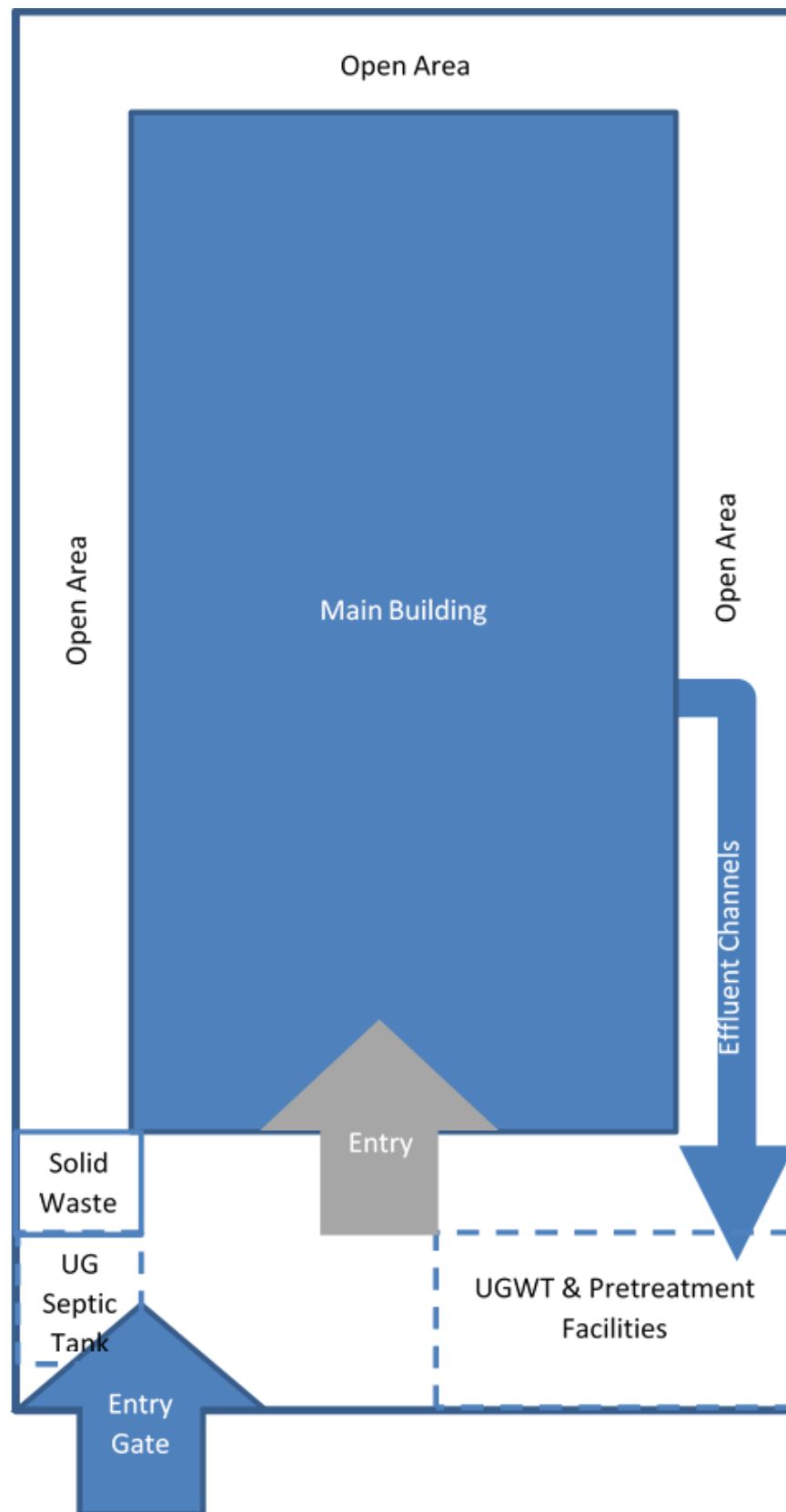
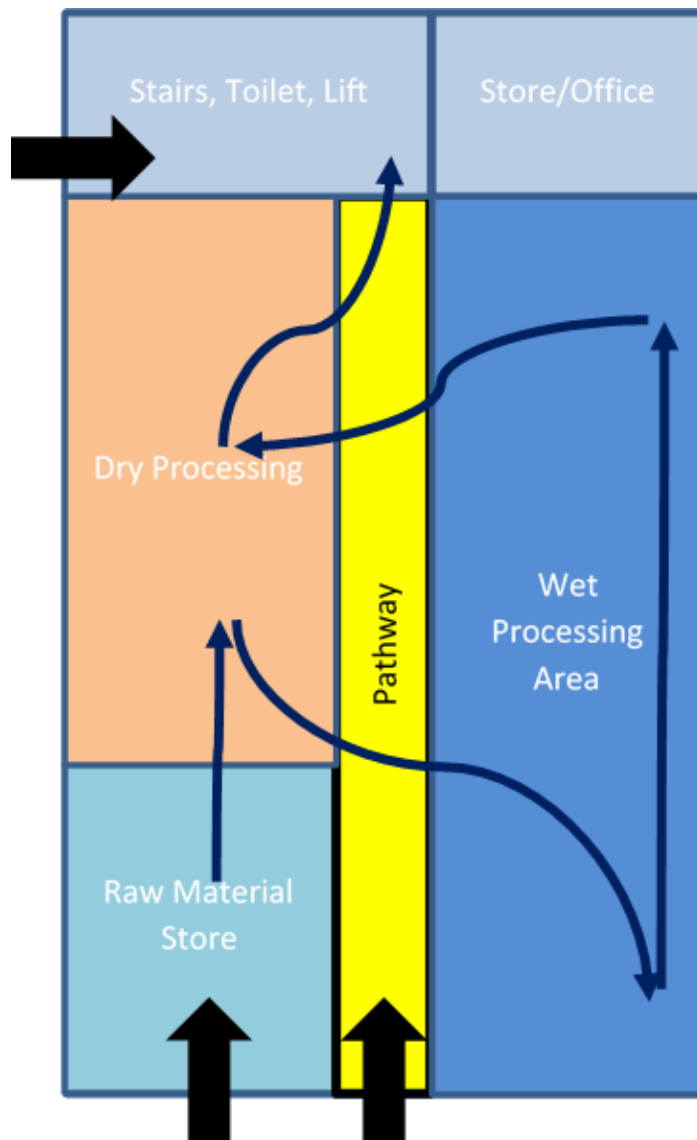


Figure 7-2 Internal Zoning Plan & Process Flow (Ground Floor)



The zoning plan shows that the production flow starts from raw material store then after wet processing moves on to the next floor for further processing via the dry processing area. This provides ease of processing and avoids needless movement to and fro between different areas of the industry. The marked pathway acts as a buffer zone between the storage, wet processing and dry processing, allowing easy movement of material and workers. The overall flow shall remain the same for raw to wet, wet to finish and raw to finish processing. The detailed internal planning for each type and size of industry is discussed in subsequent sections. The 3D views provided in the subsequent sections are for understanding and reference only.

7.3 Small Tannery

The small tannery is planned to be constructed on an area of 1 Kanal. The following two types of small tanneries are to be planned:

- Raw to Wet Blue
- Wet Blue to Finish

Based on the area requirements, process flow, and zoning plan, the layout for the ground floor of Small Tannery spanning over area of 1 Kanal are provided below:

Figure 7-3 Small Tannery Raw to Wet Blue

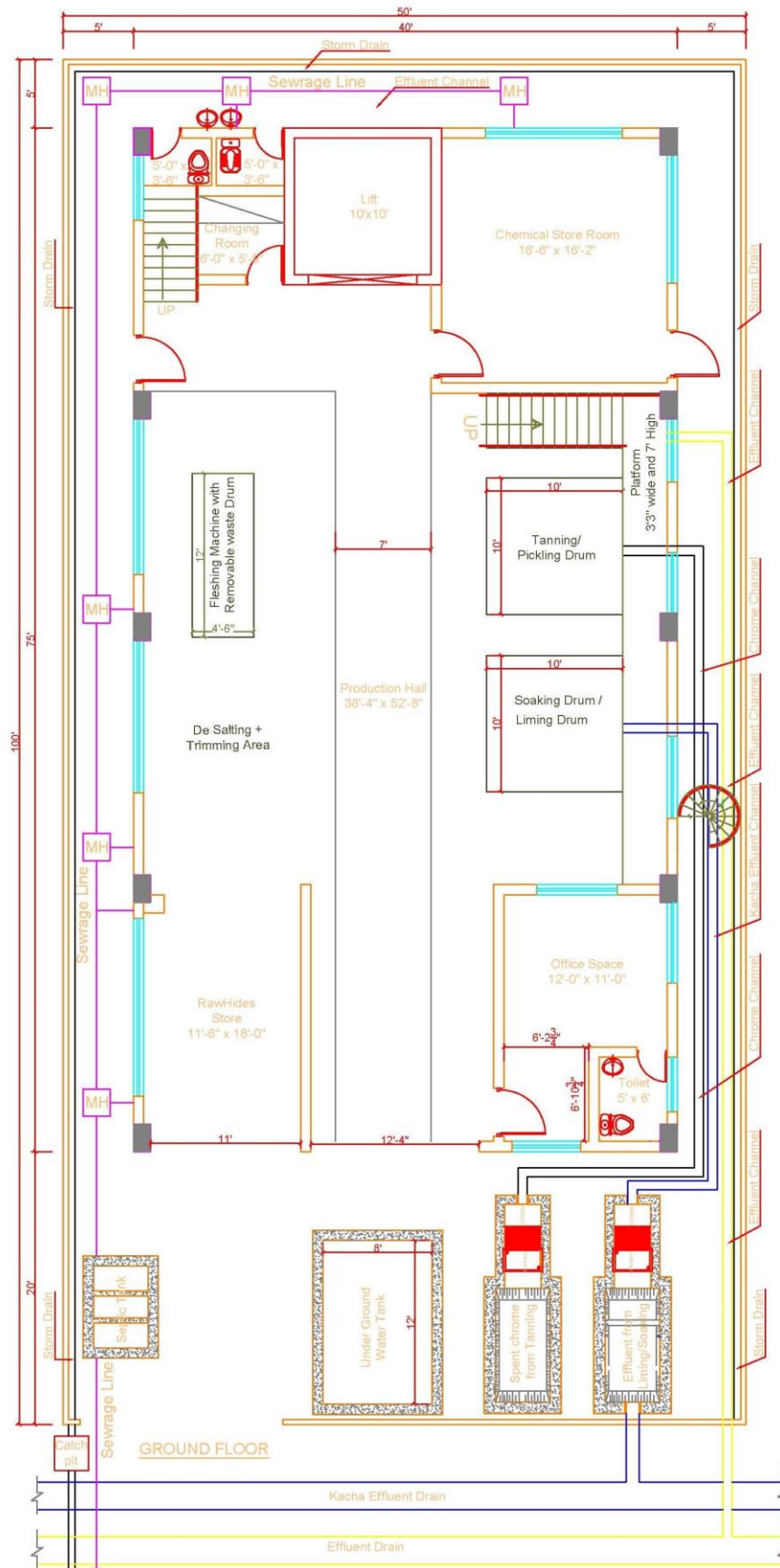
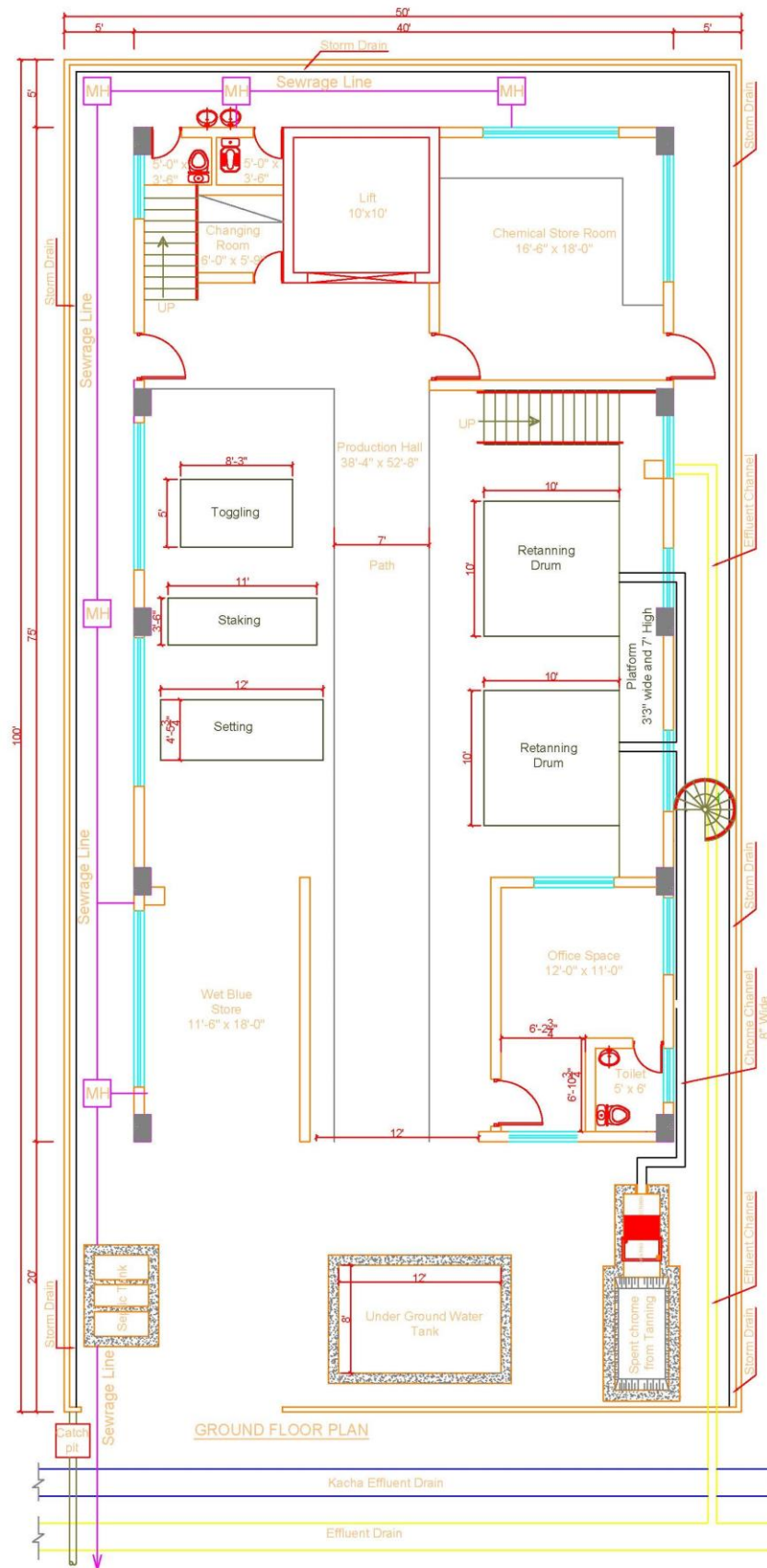


Figure 7-4 Small Tannery - Wet Blue to Finish



The above plans are for the ground floor, whereas the complete plan consists of the following:

- Ground Floor (double height) with external utilities
- Mezzanine Floor
- First Floor (machinery and finished product store)
- Second Floor for future extension
- Roof Top (drying shed, solar application, water tank)

The complete layouts for each floor for Small Tannery Raw to Wet Blue, Wet Blue to Finish are provided as Annex-06. Option for utilization of area above raw material store is also included.

Figure 7-5 Small Tannery 3D View



1 KANAL TANNERY
SIALKOT TANNERY ZONE

 IN CONSULT (Pvt) Ltd.
80-AURANGZEB BLOCK
NEW GARDEN TOWN LAHORE
Tel: 042-35869560, 35832234
Web: www.incon.com.pk
Email: info@incon.com.pk

7.3.1 Variation from Byelaws

This design has been prepared to comply with the STZ bylaws however during the planning phase, it was observed that a space of 10 feet is required to be left open at front of one Kanal plots. However, the green tannery design guidelines requires that the external utilities including chrome effluent pit, underground water tank, liming effluent pit, and septic tank to be built, further the raw material truck also needs space to allow easy offloading of the materials. This requires an open space of at least 20 feet at the front. Therefore this aspect of the bylaws needs to be amended.

7.4 Medium Tannery

Following processes are to be covered under the medium tannery covering 2, 4, and 8 Kanals:

- Raw to Wet Blue
- Wet Blue to Finish
- Raw to Finish

7.4.1 Medium Tannery – 2 Kanals

Two Kanals medium tannery follows the same zoning plan as for the 1 Kanal small tannery, similarly the front open area mandated by the Bylaws is 15 feet whereas the layout prepared under these guidelines requires an open area of at least 20 feet.

Layout of ground floor for 2 Kanals medium tannery covering the process is provided in Figure 7-5, the complete layouts are provided in Annex-07 for all the three processes.

7.4.2 Medium Tannery – 4 Kanals

Four Kanals medium tannery follows the same zoning plan as for the 1 and 2 Kanal small tannery, similarly the front open area mandated by the Bylaws is 15 feet whereas the layout prepared under these guidelines requires an open area of at least 20 feet. However the lift access and other amenities have been modified keeping in view the area available and ease of access.

Layout of ground floor for 4 Kanals medium tannery covering the process is provided in Figure 7-6, the complete layouts are provided in Annex-08 for all the three processes.

Figure 7-6 Medium Tannery 2 Kanal 3D View



2 KANAL TANNERY
SIALKOT TANNERY ZONE

IN CONSULT (Pvt) Ltd.
80-AURANGZEB BLOCK
NEW GARDEN TOWN LAHORE
Tel: 042-35869560, 35832234
Web: www.incon.com.pk
Email: info@incon.com.pk

Figure 7-7 Medium Tannery 2 Kanal Raw to Finish Ground Floor

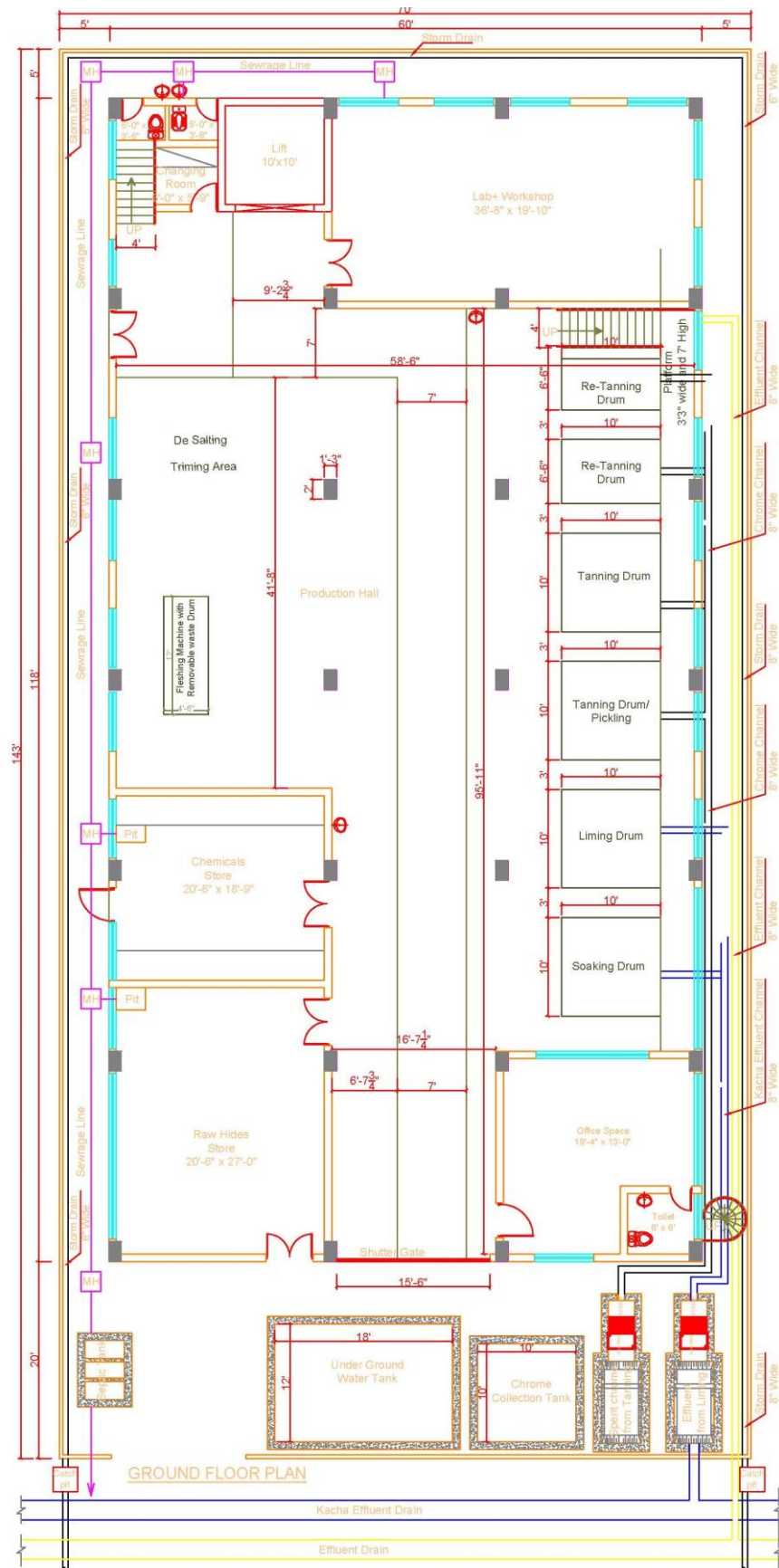


Figure 7-9 Medium Tannery 4 Kanal 3D View



**4 KANAL TANNERY
SIALKOT TANNERY ZONE**

IN CONSULT (Pvt) Ltd.
80-AURANGZEB BLOCK
NEW GARDEN TOWN LAHORE
Tel: 042-35869560, 35832234
Web: www.incon.com.pk
Email: info@incon.com.pk

7.4.3 Medium Tannery – 8 Kanals

The above planning is suitable for 1, 2 and 4 Kanal tanneries however the keeping in view the above design considerations, the available covered area, and to rationalize the cost to be spent in covering the area, the following is proposed for 8 Kanal tanneries:

Figure 7-10 Zoning Plan 8 Kanal

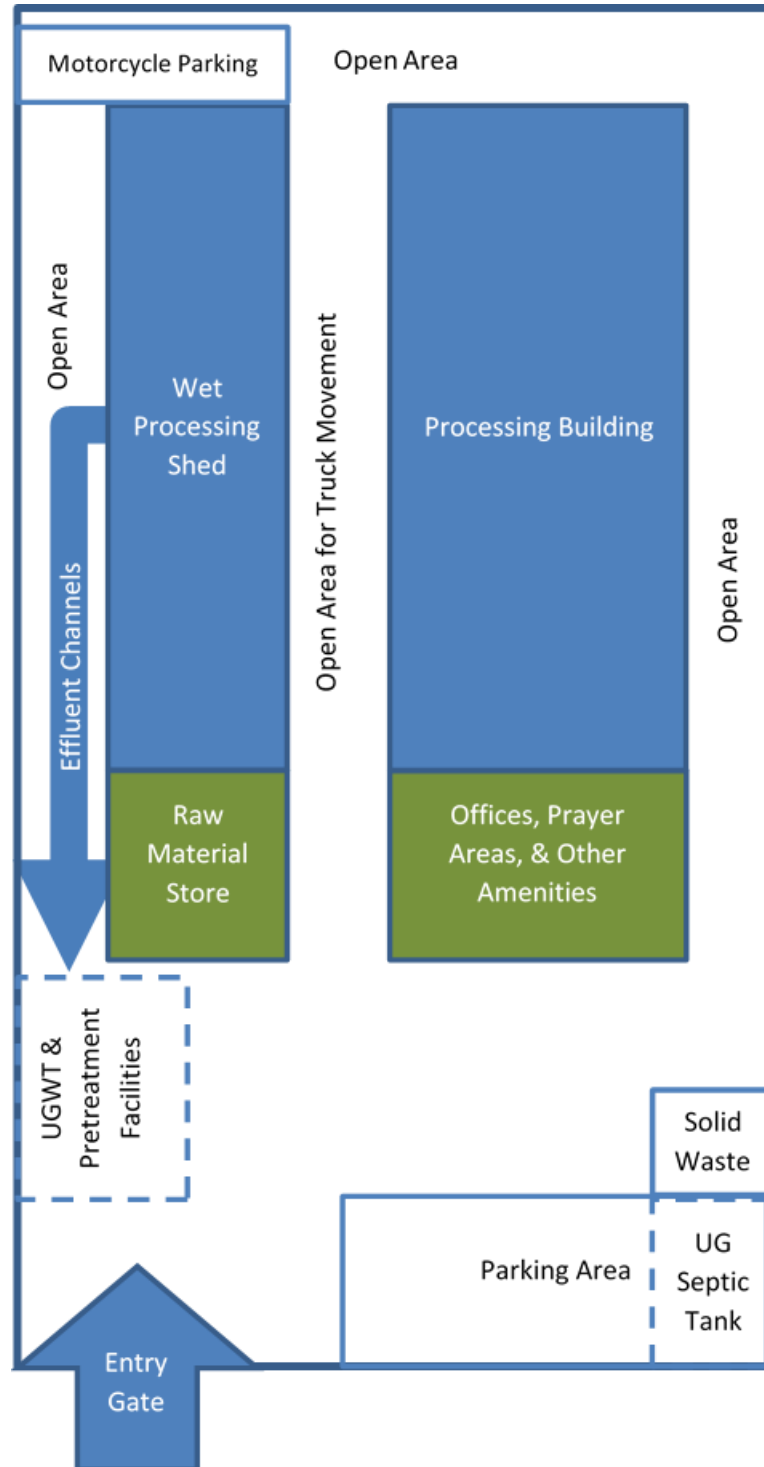
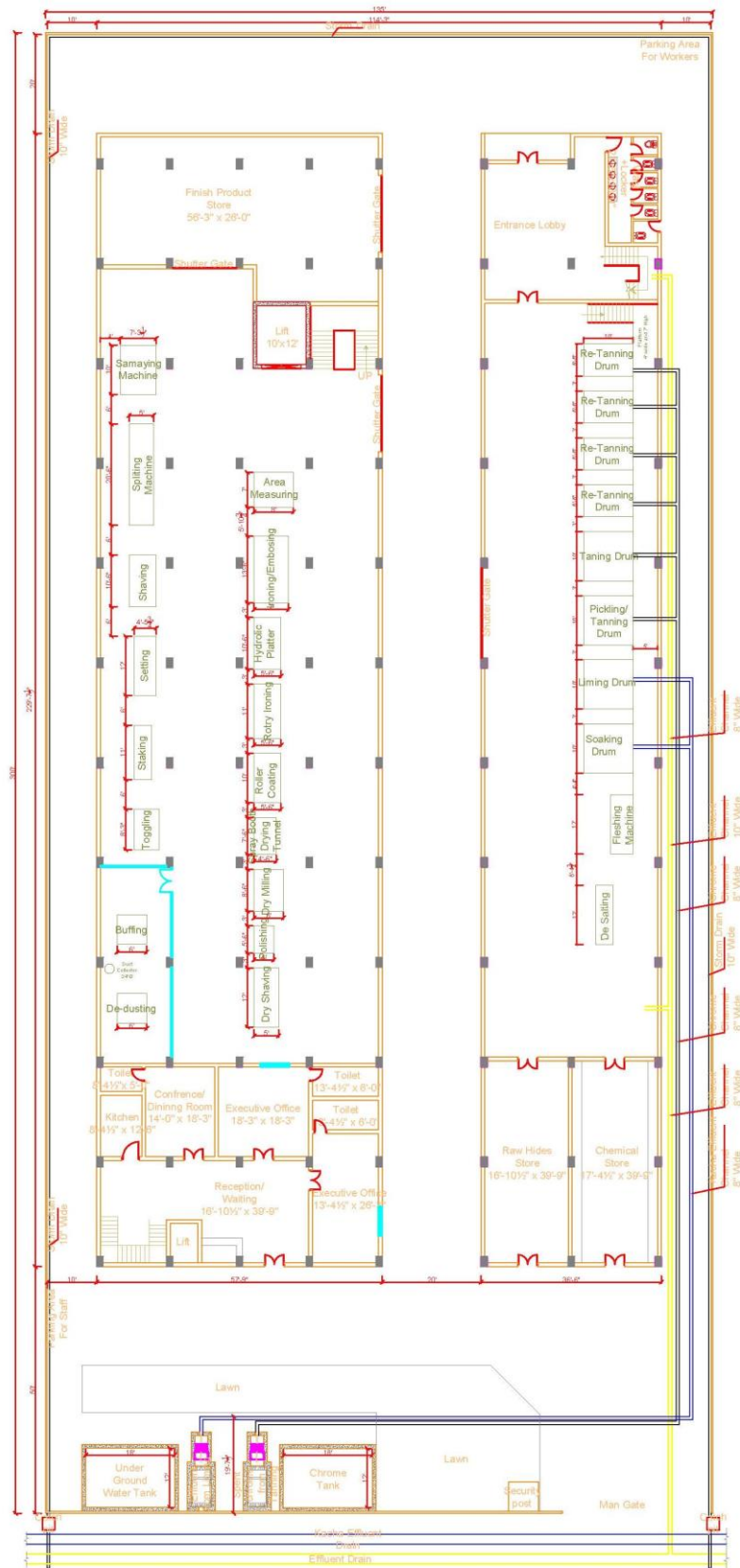


Figure 7-11 Medium Tannery 8 Kanal Raw to Finish



The 8 Kanal design in the figure above proposes two halls separated by an open passage way. The passageway can be used for transportation of material to and from the industry. Further, the fronts of the hall proposed for wet processing is planned to be utilized as raw material storage for easy access to incoming vehicles/trucks. The area in front of the larger hall is proposed to be used for offices, meeting rooms, and other administrative amenities. The open area between the halls may be covered if required by the developer of the industry and solely on discretion of the owner. The design provides flexibility to the industry for usage of either halls as wet processing zone.

Open passageway provides great opportunity for natural ventilation and source of natural lighting in the processing areas. However, the cavity/passageway between the processing zones can be covered if required by the industry. Further, the drains for each type of effluent are shown, which provide stream segregation and ability for recycling of waste water and chemicals. Layouts for 8 Kanal tannery are provided in Annex-09.

The layouts provide a basic guideline for the tanners for the facilities and amenities to be included in the design. Each individual industry is required to get soil investigation carried out and the structure should be designed as per planned usage and requirement of Bylaws. The designs planned to be constructed need to be approved by the STZ management as stipulated in the Bylaws. The electrical plans for each size of tannery are provided under Annex-10.

Figure 7-12 Medium Tannery 8 Kanal 3D View



7.5 Pretreatment Facilities

Drawings for pretreatment including hair saving, effluent pits and screens for effluent with screens and grit chambers are provided for reference in Annex-11, including the following:

- Hair Saving Screen
- Chrome Pit
- Chrome Segregation Chamber Screens
- Dust Collector

These drawings are typical examples for one possible design for the facilities and pits and tanks, the tanners are required to develop effluent and pits as per their requirement and site conditions.

CHAPTER 8

CONCLUSIONS

8.1 Conclusions

The layouts prepared by the consultant have been discussed with various stakeholders. It was observed that each industry has its own requirement and specification pertaining to the layout of different facilities such as number of drums, office space, storage area, etc. It is important to highlight that these green tannery guidelines are a guiding principal for development and detailed design of tanneries and the specific tanneries need to consider the following before construction:

- Review the design and make changes as per specific requirement of the tannery operations while meeting the requirements of Bylaws and green tannery guidelines
- Members planning to construct tanneries should get the geotechnical investigation carried out for their specific location and get the structure designed as per requirement of Bylaws.
- Process flow, water use, stream segregation and other guidelines should be kept under consideration when designing specific tanneries for construction.
- Compliance of LWG is not only limited to design, tanners need to constantly make self-assessments and follow the guidelines made available by LWG including operation, maintenance and housekeeping.
- All designs of tanneries to be constructed need to be approved as per the stipulated clauses of the Bylaws of the relevant authorities.

These guidelines cover three types of processes including the following:








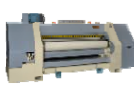



- Raw to Wet Blue
- Wet Blue to Finish
- Raw to Finish

Tanneries may not specifically fall under any of these process lines and can vary for instance wet blue to crust, raw to wet white, etc. However, the basic principles shall apply and adherence to Bylaws and other guidelines should be practiced. The guidance provided in the document can be used in reducing the environmental footprint of any tannery and should be used in accordance with the prevailing local and specific guidelines.

Annex-01

List of Typical Tannery Machinery






**Identification of Typical Machinery
required under various process in Tannery operation from Raw to Finish**

Operation	Process/ Sub process	Typical Machinery/ Ancillary Equipment/ works requirement	Typicall dimensions (mm)			Picture	Weight in kg.	KW
			Width	Depth	Height			
Raw Materiel & Handling	Trimming	Pneumatic trimmer/ knife					2	0.35
	Desalting	Desalting machine	working width 2100 mm					4
Beamhouse Operation	Soaking	Italprogetti has proposed in their document " Typical Tannery Design Guidelines for STZ". various sizes of drums with different material including wood, SS and or poly propylene	3m Dia. & 3m Length				7,500	15
	Liming / Unhairing							
	Soaking / Liming / Unhairing	Power driven mechanical paddle 10m ³ or similar (Optional)	3.8m Dia. & 3.8m Length				10,000	19
	Fine Rotary Screen with hair dewatering	Water with maximum 200 mg/l TSS, opening slot 1000 (µm) assumed	2950.00	1800.00	1750.00		1,000	2
	Fleshing	Fleshing machine 1600 mm, or similier	4000.00	1300.00	1900.00		3,300	12
Chrome Tanning	Pickling/ Tannig/ Deliming/ Bating/ Degreasing	As proposed in the Italprogetti report " Typical Tannery Design Guidelines for STZ"	3m Dia. & 3m Length				7,500	15
Post-taning	Sammying	Through feed sammying machine 1800 mm	2200.00	3050.00	1800.00		4,500	7
	Spliting	splitting machine 3000mm or similar	6600.00	1470.00	1830.00		7,600	23
	Shaving	Wet shaving machine 1300 mm or similier	3100.00	1700.00	1800.00		5,080	39
		Wet shaving machine 1500 mm or similier	3600.00	1700.00	1800.00		5,300	39
		Wet shaving machine 1800 mm or similier	3600.00	1700.00	1800.00		5,800	54
	Re-chroming/ Re-taning	Polypropylene drums 2.5*2 .0 m complete with chemical preparation tank	2.5m Dia. & 2m Length				less than 7500	11
		Polypropylene drums 2.2*1.5 m complete with chemical preparation tank	2.2m Dia. & 1.5m Length				less than 7500	5
		Polypropylene drums 3.0*2.0 m complete with chemical preparation tank	3.0m Dia. & 2.0m Length				less than 7500	15

**Identification of Typical Machinery
required under various process in Tannery operation from Raw to Finish**

Finishing	Setting	Setting out machine 1600 mm or similr	3700	1400	1600		3,700	33	
		Setting out machine 2700 mm or similr	4910	1600	2200		7,700	41	
	Drying	Vaccum dryer 4 tables	5000	2500	Standarded		18,500	35	
		Overhead chain conveyor	Length as per site requirement					45	2
			Length as per site requirement					50	4
	Staking	Rotary staking machine 1500 mm or similr	3450.00	1180.00	16.00		3,500	14	
		Vibratory staking machine 3200 mm or similr	3820.00	2970.00	1610.00		18,000	30	
	Toggling	Automatic toggling machine 1600 mm or similr	2500.00	1500.00	1500.00		6,500	13	
	Buffing	Traditional buffing machine 800 mm	1700.00	1700.00	1400.00		1,500	12	
		Through-feed buffing machine 1500 mm or similr	1800.00	2200.00	2500.00		3,400	28	
	De-dusting	Dedusting line machine 1300 mm	2100.00	1500.00	1400.00		1,200	16	
		Dedusting line machine 1800 mm	2600.00	1500.00	1400.00		1,400	19	
	Dry shaving	Dry Shaving machine 1500 mm	3700.00	1500.00	1580.00		6,750	62	
	Polishing	Polishing machine(stone + wool roller) 600 mm	1250.00	1700.00	1350.00		1,100	8	
		Polishing machine 1800 mm	2910.00	2170.00	1625.00		3,800	23	
	Dry Milling Drums	Automatic dry milling drums 2.6m*1.8 m	2600.00	1800.00			less than 5500	39	
		Automatic dry milling drums 3.0m*2.0 m	3200.00	2100.00			5,500	25	
	Spraying booth and Drying Tunnel	Spraying line 1800 mm or similr complete with drying tunnel	2270.00	1400.00	2000.00		4,300	18	
		Spraying line 2200 mm or similr complete with drying tunnel	3000.00	2500.00	2000.00		3,000	22	

**Identification of Typical Machinery
required under various process in Tannery operation from Raw to Finish**

Roller Coating	Roller coating machine 1800 mm or similar	3025.00	1680.00	1800.00		2,500	3
	Roller coating machine 2200 mm or similar	3425.00	1680.00	1800.00		3,000	3
Rotary Ironing	Rotary ironing machine	3400.00	1650.00	1600.00		5,200	9
Hydrolic Platen Presses	Hydraulic Platen Presses 850 ton- plates 1370*660mm	3200.00	1650.00	2440.00		18,000	37
	Hydraulic Platen Presses 850 or 1000 ton- plates 1370*1000mm	3200.00	1650.00	2440.00		22,000	45
Ironing or Embossing	Through feed ironing and embossing press 2600 mm	4110.00	2200.00	1950.00		8,200	47
Area measuring	Area measuring machine 1800 mm or similar	2075.00	2130.00	1530.00		2,500	3
	Area measuring machine 2200 mm or similar	2555.00	2130.00	1530.00		2,500	3

Solar Data & Typical Drawings for Solar Hot Water & Solar Hot Air Systems

Sialkot Solar Data

Monthly Average All Sky Insolation Incident on a Horizontal Surface (kW-hr/m²/day)

Description	Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg.
Monthly Avg. (based on 20 Years) Insolation Incident on a Horizontal Surface	kWh/m ² /day	3.0	4.0	5.2	6.4	7.2	7.0	6.0	5.6	5.5	5.0	3.8	3.2	5.2
Maximum Average Ambient Temperature	Degree C	18.5	21.0	25.7	32.8	38.0	39.9	34.9	33.6	33.6	31.7	26.1	20.1	29.7
Minimum Average Ambient Temperature	Degree C	5.0	7.1	11.8	17.3	22.0	25.1	25.1	24.8	22.3	16.0	9.6	5.6	16.0
Average Ambient Temperature	Degree C	11.8	14.1	18.8	25.1	30.0	32.5	30.0	29.2	28.0	23.9	17.9	12.9	12.9
Maximum Average Water Temperature	Degree C	14.8	16.8	20.6	26.2	30.4	31.9	27.9	26.9	26.9	25.4	20.9	16.1	23.7
Minimum Average Water Temperature	Degree C	4.0	5.7	9.4	13.8	17.6	20.1	20.1	19.8	17.8	12.8	7.7	4.5	12.8
Average Water Temperature	Degree C	9.4	11.2	15.0	20.0	24.0	26.0	24.0	23.4	22.4	19.1	14.3	10.3	18.3
Average temperature of the hot water from the system	Degree C	39.47	45.00	47.42	61.96	67.96	69.95	66.73	65.05	63.57	55.66	45.85	42.11	55.89
Water Requirement for Deliming in 3x3 Metre Drum requiring 37 Degree Celsius Water Temperature (Small Tannery)														
Drum 1: Soaking & Liming														
Hot Water	Litres	5,727	4,761	4,235	2,525	1,845	1,562	1,898	2,042	2,217	3,057	4,490	5,238	3,108
Cold Water	Litres	513	1,479	2,005	3,715	4,395	4,678	4,342	4,198	4,023	3,183	1,750	1,002	3,132
Sub-total Volume of Water Required	Litres	6,240	6,240	6,240	6,240	6,240	6,240	6,240	6,240	6,240	6,240	6,240	6,240	6,240
Drum 2: Deliming & Bating														
Hot Water	Litres	5,727	4,761	4,235	2,525	1,845	1,562	1,898	2,042	2,217	3,057	4,490	5,238	3,108
Cold Water	Litres	513	1,479	2,005	3,715	4,395	4,678	4,342	4,198	4,023	3,183	1,750	1,002	3,132
Sub-total Volume of Water Required	Litres	6,240	6,240	6,240	6,240	6,240	6,240	6,240	6,240	6,240	6,240	6,240	6,240	6,240
Drum 3: Tanning														
Hot Water	Litres	3,600	2,993	2,662	1,587	1,160	982	1,193	1,283	1,393	1,921	2,822	3,292	1,953
Cold Water	Litres	322	930	1,260	2,335	2,763	2,941	2,729	2,639	2,529	2,001	1,100	630	1,969
Sub-total Volume of Water Required	Litres	3,922	3,922	3,922	3,922	3,922	3,922	3,922	3,922	3,922	3,922	3,922	3,922	3,922
Total Volume of Hot Water Required in all 3 Drums	Litres	15,055	12,515	11,131	6,637	4,850	4,105	4,990	5,367	5,827	8,035	11,803	13,767	8,169

 Calculated

Sialkot Solar Data

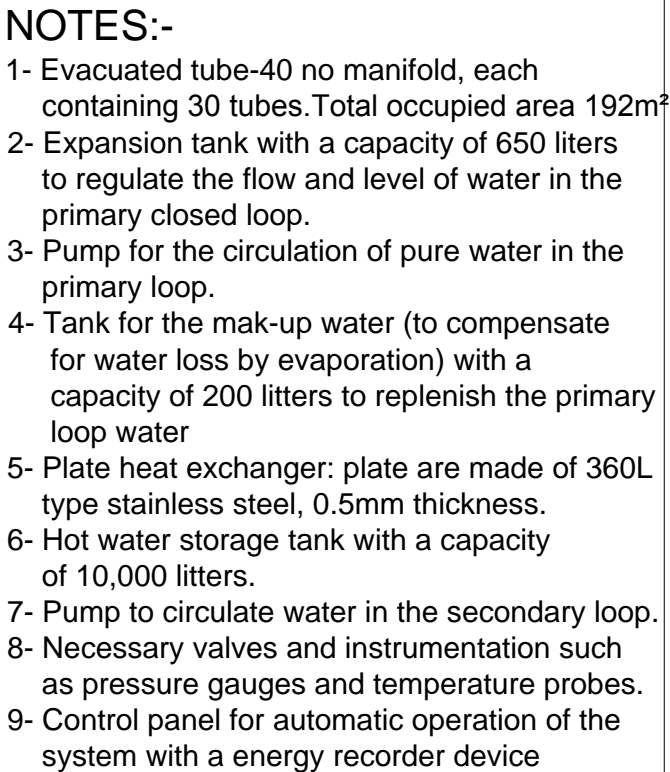
Monthly Average All Sky Insolation Incident on a Horizontal Surface (kW-hr/m²/day)


Assumptions

Avg. Water Temp for every 1 Degree Celsius Increase in Air Temp	0.80
Water Temperature (Degree Celsius) assumed for Various Processes including	
Soaking Process	23-25
Liming Process	25-27
Deliming and Bating Process	35-37
Preparation to tanning "Weak Pickle"	20-22
Processing Capacity of Wet Salted Weight per day in small tannery (Kg)	3120
Processing Capacity of Leather Material for tanning in small tannery (Kg)	1961
Quantity of Water for Liming in Leather to Water ratio of 2:1 in Kg	6240
Quantity of Water for Tanning in Leather to Water ratio of 2:1 in Kg	3922
Density of Water Assumed in kg/m ³	1000
Quantity of Water Required for Liming in Litres	6240
Quantity of Water Required for Tanning in Litres	3922
Maximum Hot Water Temperature to be Attained	37

Source: NASA <https://power.larc.nasa.gov/data-access-viewer/>

Descriptions	Monthly average 20 years all sky insulation incident on a horizontal surface (kW-hr/m ² /day)														
	Unit	Jan	Fab	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg.	
Monthly isolation incident on a horizontal surface	kW-hr/m ² /day	3.0	4.0	5.2	6.4	7.2	7.0	6.0	5.6	5.5	5.0	3.8	3.2	5.2	
Max. average ambient temprature	Degree C	18.5	21.0	25.7	32.8	38.0	39.9	34.9	33.6	33.6	31.7	26.1	20.1	29.7	
Min. average ambient temprature	Degree C	5.0	7.1	211.8	17.3	22.0	25.1	25.1	24.8	22.3	16.0	9.6	5.6	16.0	

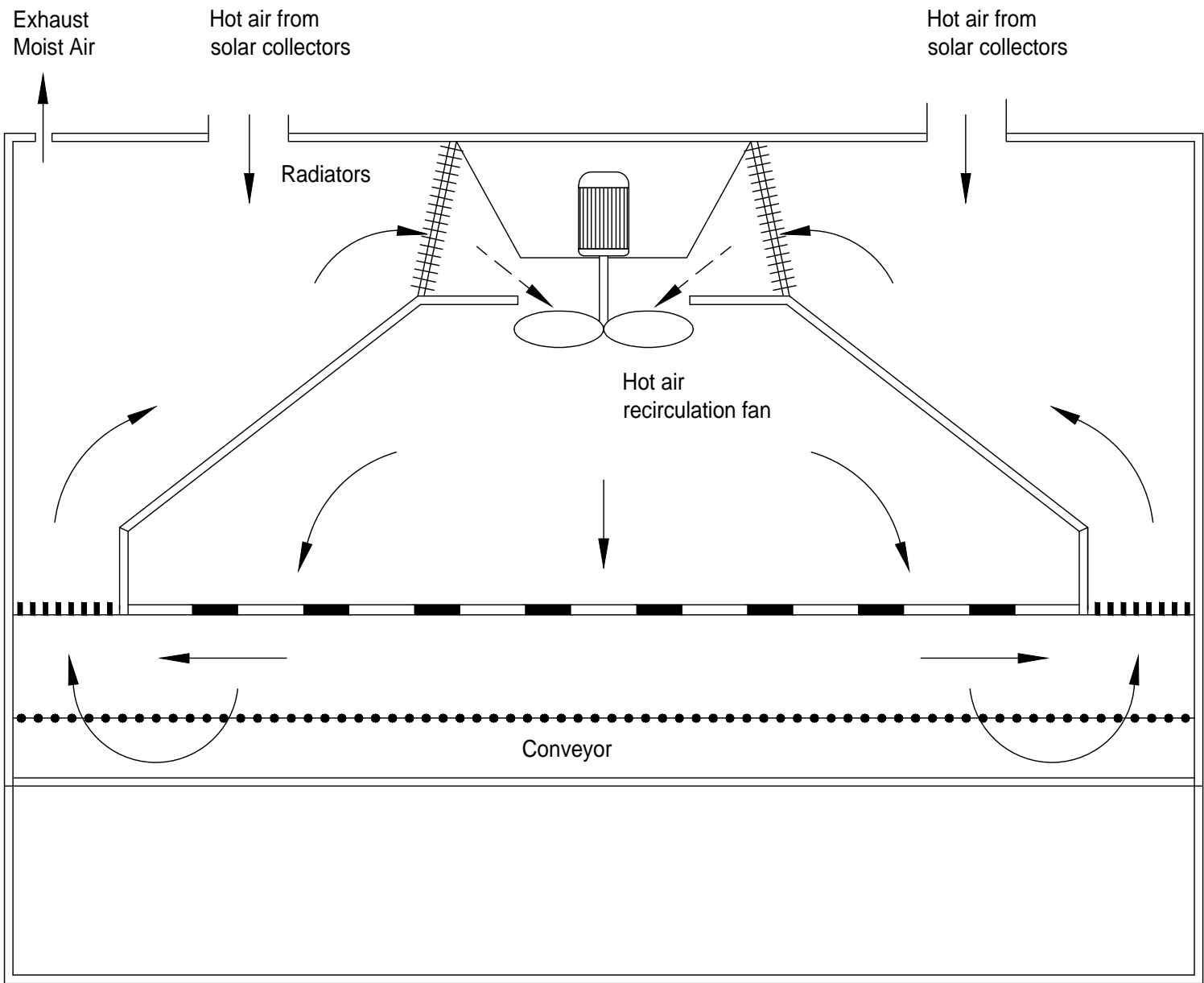


REV.	DESCRIPTION	BY	DATE
	IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54600 TEL:5869560-5832234 FAX:5869561		
	PROJECT : SIALKOT TANNERY ZONE		
BUILDING TITLE: GREEN TANNERY DESIGN			
DRAWING TITLE: 10,000 LITER SOLAR WATER HEATING SYSTEM			
SCALE :	SHEET # :	DWG. # :	
NTS.	1 OF 1	STZ-GTD-SH-01	
DESIGN BY :	DRAWN BY :	DATE :	
MSA	GULFAM	30-04-2020	

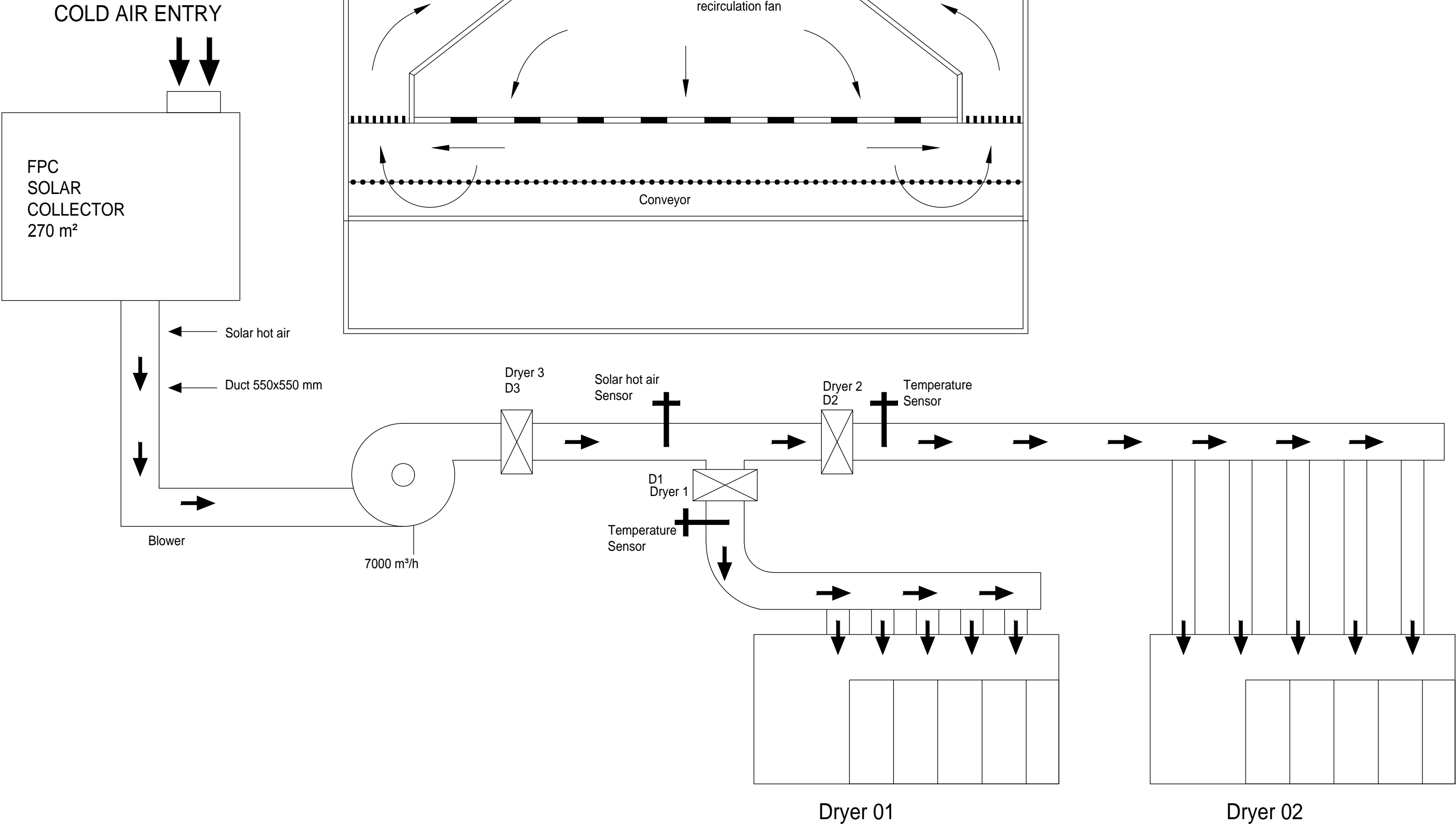
Sialkot solar data

Descriptions	Monthly average 20 years all sky insulation incident on a horizontal surface (kW-hr/m²/day)														
	Unit	Jan	Fab	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg.	
Monthly isolation incident on a horizontal surface	kW-hr/m²/day	3.0	4.0	5.2	6.4	7.2	7.0	6.0	5.6	5.5	5.0	3.8	3.2	5.2	
Max. average ambient temprature	Degree C	18.5	21.0	25.7	32.8	38.0	39.9	34.9	33.6	33.6	31.7	26.1	20.1	29.7	
Min. average ambient temprature	Degree C	5.0	7.1	211.8	17.3	22.0	25.1	25.1	24.8	22.3	16.0	9.6	5.6	16.0	

CONCEPTUAL DIAGRAM OF SOLAR HOT AIR GENERATION




Cross Section view of an autospray drier with the introduction of solar hot air



MAIN COMPONENT OF SYSTEM

- 1- Roof sheet comprising GI material of 0.45 to 0.56 mm thickness
- 2- Solar collectors corrugated black painted aluminium base material, with space for air flow & glass cover on top over an area of 270m² .Solar collectors are made of 144 aluminium boxes, each measuring about 1.875 m². Air heating is performed in 6 compartments, with each compartment comprising 24 solar collectors. Thickness of aluminium collector boxes ranges from 0.45 to 0.56 mm
- 3- Centrifugal hot air blower of max. flow rate of capacity 7000 m³ /h
- 4- Alluminium ducts, insulated using with insulating material of appropriate thickness.
- 5- Steam flow meter
- 6- Control panel for on/off switches, including energy recoder device.
- 7- Pneumatically operated steam control valve which is the inbuilt in the autospray driers.

REV.	DESCRIPTION	BY	DATE
 IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54600 TEL:5869560-5832234 FAX:5869561			
PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY DESIGN	
DRAWING TITLE:		SOLAR AIR HEATING SYSTEM FOR LEATHER DRYING IN AUTOSPRAY	
SCALE :	SHEET # :	DWG. # :	
NTS	1 OF 1	STZ-GTD-SH-02	
DESIGN BY :	DRAWN BY :	DATE :	
MSA	GULFAM	30-04-2020	

Annex-03

Sample Quotation for Solar Hot Water System

GUANGZHOU RUISENG SAVING ENERGY TECHNOLOGY CO.,LTD

No.32 Hongqi Road Industrial Zone, Zhongluotan Town Baiyun District, Guangzhou City

WWW.ri-sun.en.alibaba.com

TEL: 86-13929015813

QUOTATION

TO:

FROM: Vicky

DATE:2020/4/18

10,000L hot water for leather factory project			
ITEM NO.	QTY	EXW PRICE	AMOUNT
High pressured heat pipe solar collector 30tubes 1.Copper inner tank 2.Aluminum outer tank 3.30mm insulation water tank 4.30pcs 58*1800mm glass tubes 5.Alumium supports	40pcs	US\$428.00	US\$17,120.00
High pressured insulation tot water tank 10,000L 1.Stainless steel 304 outer tank 2.Stainless steel 304 inner tank 3.50mm polyurethane insulation foam	1pcs	US\$6,714.00	US\$6,714.00
Heat Pump 10P 1.Input power: 9.5KW 2.Heating capacity: 32680Kcal/h 3.Power: 380V/60hz 4.Water capacity: 820L/h 5.Hot water output: 55 degree	1pcs	US\$2,219.00	US\$2,219.00
Circulation water pump WILO 123EH	2pcs	US\$134.00	US\$268.00
Plate heat exchanger	1pcs	US\$384.00	US\$384.00
Controller box for whole system	1pcs	US\$450.00	US\$450.00
TOTAL			US\$27,155.00
			

REMARKS

1. THE PRICE IS BASED ON EXW PRICE.

2.Packing: normal export carton;

3.Delivery: 30days after received the full payment;

4.Payment:30% deposit by T/T before production,70% remaining balance by T/T before loading;

Annex-04

LWG Housekeeping Guidelines



**LEATHER
WORKINGGROUP**

Improving Environmental Stewardship

HOUSEKEEPING GUIDE

LEATHER WORKING GROUP

March 2019

IN THIS GUIDE

Access Routes Page 4

Work in Progress Page 5

Chemicals—Production Areas Page 6

Equipment Page 7

General Cleanliness Page 8

Grounds/Outside Areas Page 9

Drum Guarding —Ground Level Page 10

Drum Guarding—Overhead Page 11

Chemicals—Main Storage Area Page 12—13

Scoring Page 14

Expectations Page 15

A Word on Housekeeping

The last few years have seen an increasing concern over the level of good housekeeping in leather manufacturing facilities. The topic is subjective and is not auditable in the same way that other environmental impacts are, where there are measurable criteria and data to govern the result in an audit.

However, it is expected that all Leather Working Group certified facilities are operating to the highest standards in the industry and it is not appropriate for any LWG rated member to have unsafe machinery, electricals, working areas or poorly maintained premises.

A lack of care and attention in these areas could be indicative of a lack of care, as an organisation, in the environmental impacts and awareness of a tannery.

There are real advantages to good housekeeping:

- Well maintained and clean machinery will run more efficiently resulting in less energy use, longer machinery life and cost savings.
- First impressions count! Before a brand customer looks at your environmental credentials, they will be looking at your levels of cleanliness, maintenance, safe working practices, access routes, working and rest areas, etc.
- Productivity from workers will be improved if they are working in a pleasant, safe, environment

This Guide has been produced to coincide with the mandatory use of the Environmental Audit Protocol 6.6, effective 1st April 2019, when housekeeping in Section 13 becomes a critical scoring section. The implication of this means that a low housekeeping score in future could result in a lower medal rating for leather manufacturers.

The LWG Technical Sub Group have spent time working to redesign the questions in Section 13 to minimise the subjectivity of housekeeping and to make it more objective for auditors and leather manufacturers. This Guide illustrates question by question what is expected in order to score well.

Please take time to make sure that your facility meets the standards outlined in this Guide – it is designed to mirror the questions in the protocol, as well as giving you a list of the minimum expected requirements at the back of the booklet. This should be a mindset and not something that is done just in time for an audit before letting things slip again. Good housekeeping should be a routine part of tannery life.

Deborah Taylor
Manager, LWG

Question 3

Access Routes

Walkways, fork-truck routes, etc.

MARKED ACCESS ROUTES

Total score available: 15pts

Access routes are *clearly marked* (e.g. with clearly defined visible lines) and are *free from obstruction*



Note: Wet processing areas will be exempt from line marking, but should still be free from obstruction

UNMARKED ACCESS ROUTES

Total score available: 10pts

Access routes are *not marked* but are *free from obstruction*



Question 4

Work in Progress

MARKED WIP AREAS

Total score available: 15pts

WIP is in areas that are **clearly marked** (e.g. with clearly defined visible lines) and free from obstruction



UNMARKED WIP AREAS

Total score available: 10pts

WIP is in areas that are **not marked** but are free from obstruction



Question 5

Chemicals: Production

MARKED CHEMICAL AREAS

Total score available: 15pts

Chemicals are in areas that are **clearly marked** (e.g. with clearly defined visible lines) and are **free from**



UNMARKED CHEMICAL AREAS

Total score available: 10pts

Chemicals are in areas that are **not marked** but are **free from obstruction**



Question 6

Equipment

EQUIPMENT AREAS

Total score available: 2pts

Equipment is stored in *clearly defined* areas,



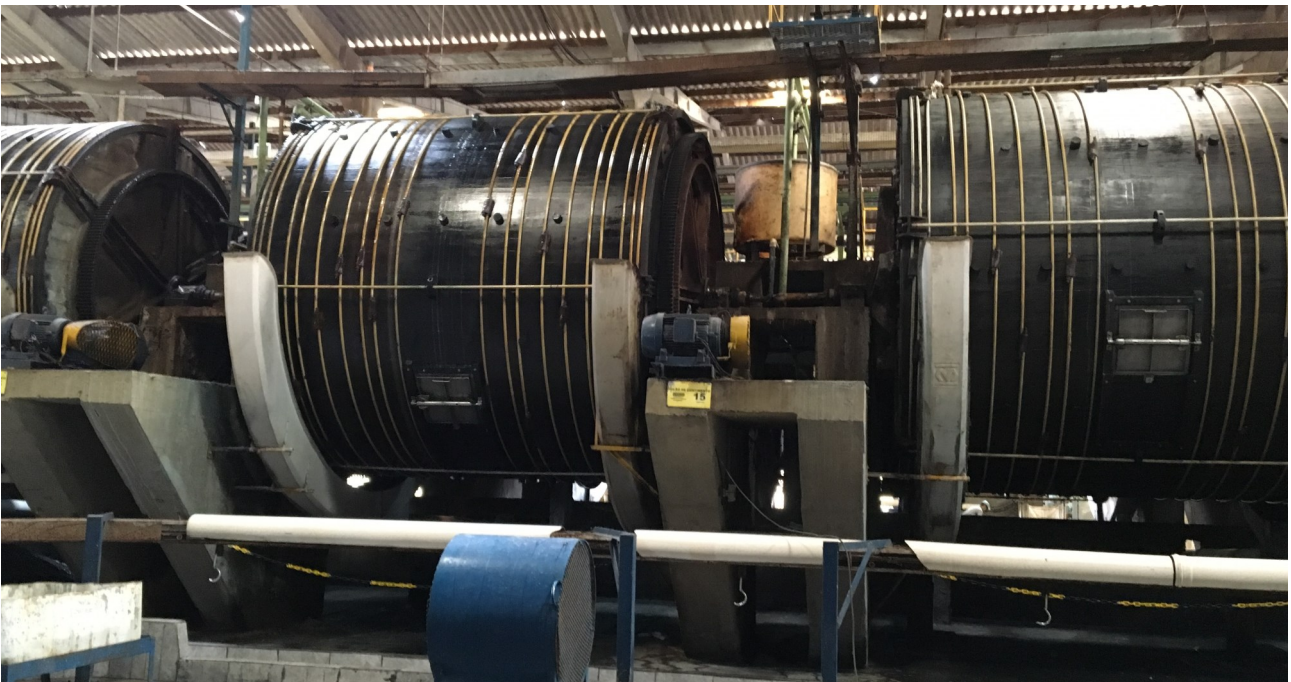
Question 7

General Cleanliness

MACHINERY GENERAL CLEANLINESS

Total score available: 15pts

Is the machinery in the department (dryers, drums, roller-coaters etc.) **clean** and in good **order**?



Question 8

Grounds/Outside Areas

Or other internal areas, if not applicable

GROUNDS & OUTSIDE AREAS

Total score available: 5pts

The grounds/the outside areas (or other internal area if not applicable) are **clean** and **tidy**



DRUMS / VESSEL GUARDING—GROUND LEVEL

Q9: Total score available: 10pts

Are *drums/vessels* appropriately and sufficiently guarded at ground level? Does the guarding include an *auto cut-off* mechanism?

CAGE GUARDING



PANEL GUARDING



The minimum required method of guarding must physically prevent contact with any moving drum and be secured from a fixed position.

Questions 10a & 10b

Drum Guarding: Overhead Areas

PLATFORMS & OVERHEAD AREAS

Q10a: Total score available: 10pts

Are *platforms and overhead working areas* (including drum access) appropriately & sufficiently guarded
Does the guarding include an **auto cut-off** mechanism?

CAGE GUARDING



PANEL GUARDING



The minimum required method of guarding must physically prevent contact with any moving drum, risk of falling from height and be securely fixed.

Question 11

Chemicals: Main Storage

LABELLING

Total score available: 2pts

Are chemicals clearly labelled?

IBC STORAGE

Total score available: 2pts

IBCs are not stored more than 3 units high

CHEMICAL INCOMPATIBILITY

Total score available: 2pts

Incompatible chemicals are not stored together (refer to an incompatibility chart)

RACKING—LIQUID & POWDER

Total score available: 1pt

If racking is used, all liquid chemicals are NOT stored above powder chemicals

RACKING—WEIGHT & CONDITION

Total score available: 1pt

1pt - If racking is used, is it correctly weight labelled and in good condition / fit for purpose?

HEALTH & SAFETY

Total score available: 2pts

Health & safety information is available for workers in the area



Scoring

Section 13 (Housekeeping) becomes a critical scoring section with the LWG Main Environmental Audit Protocol. The Section is scored out of a total of 100pts. The breakdown of the point scoring by question can be seen below:

Question	Area	Available Score
Q1	Procedure	2
Q2	Traffic Management	6
Q3	Access Routes	15
Q4	Work in Progress (WIP)	15
Q5	Chemicals	15
Q6	Equipment	2
Q7	General Cleanliness	10
Q8	Grounds/Outside Areas	5
Q9	Drums/Vessel Guarding	10
Q10	Platform/Overhead Areas	10
Q11	Main Chemical Storage Area	10
TOTAL		100

Expectations

The Leather Working Group expects a minimum standard of housekeeping within all its audited tanneries, across all areas and departments covered in Section 13 of the Main Environmental audit Protocol. These standards can be seen below:

- Even, clean, sealed, solid floors of concrete or similar (not dirt)
- Clean or painted walls
- Water tight roof, walls and doors
- Adequate ventilation and light for working
- Machines where the guarding prevents access to the internal mechanisms
- Floors that are clearly marked with visible safe working or walking zones
- Chemicals properly stored in clearly defined zones both in the stores and operational areas
- Electrical wiring, that is not accessible and is regularly checked
- Hand rails and guarding on mezzanines and raised areas
- Safety cut off switches for critical machine access points
- Safe, well maintained machines in all areas
- Clean machines with regular cleaning regimes
- Clean drains and free flow of water within them
- Tidy, well maintained external areas of the factory
- Neatly stored and clearly defined waste material stores
- Management of odour and noise at its boundaries
- No un-controlled open burning of materials on the site
- Clear signage in all areas for safety, production and operational items
- All employees in all areas to be wearing appropriate footwear
- All employees to have access to and be wearing, where needed, personal protective equipment
- Clearly defined areas for rest breaks, recreation and employee clothing storage
- No storage of chemicals (salt for example) on unsealed floors
- Well designed, and maintained effluent treatment plant with adequate guarding and safety assessments
- Well trained and assessed employees and staff
- Well managed and stored raw material and structured work in progress storage and management
- Well maintained and calibrated measurement equipment such as pH meters, thermometers, substance gauges etc.
- Adequate and well maintained fire and safety equipment
- The management and assessment of exposure to high risk materials like solvents



Improving Environmental Stewardship



www.leatherworkinggroup.com

info@leatherworkinggroup.com

Annex-05

LWG Housekeeping Guidelines



ARE YOU READY FOR AN AUDIT?

SELF ASSESSMENT QUESTIONNAIRE

Issue 1.0

Introduction to Tannery of the Future – Are You Ready For An Audit?

The Tannery of the Future Foundation created the original checklist, released in 2015, to increase transparency and sustainability in the international leather supply chain. The self-assessment tool was intended to be easily accessible for leather manufacturers and their buyers: traders, wholesalers, brands and retailers.

In 2019, Leather Working Group and the Tannery of the Future Foundation agreed to develop the checklist as part of a robust system of environmental improvement and stewardship for the leather industry. By merging the Tannery of the Future Checklist with the Leather Working Group's "Are You Ready For An Audit?" program, it is anticipated that the guidance and mechanism for better environmental and sustainable leather manufacturing will become accessible to more leather manufacturers around the globe.

Why this sustainability questionnaire?

- This questionnaire aims to provide leather manufacturers across the world with an accessible introduction to the environmental and sustainability issues that are relevant to the industry.
- Leather Manufacturers are given an initial indication of how they are performing environmentally and which areas they could improve upon to become more responsible manufacturers. There are references to sources of more in-depth information and guidance.
- In addition, this self-assessment questionnaire serves to raise awareness. All companies and individuals purchasing leather or leather products gain insight into the leather-related environmental good practice.

How to use this self-assessment questionnaire?

Leather Manufacturers should use this document to begin to assess how environmentally they are performing and to evaluate what policies, procedures and data records should be in place to ensure responsible tannery operations. Each section identifies the basics required and allows a leather manufacturer to self-assess how well they meet the requirements and where there are areas for improvement.

The questionnaire primarily addresses environmental issues, however there is additional best practice information relating to social elements contained at the back of the document. After completion of all topic areas, the leather manufacturer will be able to pinpoint and prioritise overall environmental and sustainability areas for further improvement, where necessary, before embarking on the on-line assessment or progressing to a full LWG environmental audit. By completing this self-evaluation, the tannery will be able to assess its environmental capabilities in order to consider formal certification of environmental performance through the Leather Working Group.

NB: This tool is designed as a first step towards understanding what is required to operate in a sustainable and responsible way. It does not result in certification and is not equivalent to a full LWG environmental audit.

Instructions for tanneries:

Part A: Each section in this part contains essential elements that will be assessed in an LWG environmental audit. By evaluating whether your organisation fulfils these criteria, you will be able to identify how ready you are for a full LWG Environmental Audit and what areas are in need of development. At the end of Part A there is a Critical Evaluation table to help you to assess your preparedness following completion.

Part B: Additional good practice elements that are not critical to successfully pass an LWG Environmental Audit but will assist in achieving a high score and potential medal award.

Part C: This section contains elements that fall outside of the scope of the Leather Working Group but do form the basis of good Corporate and Social Responsibility (CSR).

If you experience difficulties completing this checklist, please contact: TOTF@leatherworkinggroup.com.

The links to websites contained in this checklist are provided solely as a source of information on topics that may be useful to the individuals and organisations using this document. The mention of names of specific organisations does not imply any intention to infringe proprietary rights, nor should this be construed as an endorsement or recommendation on the part of the Leather Working Group.

Glossary of Terms

Term	Definition
LWG	Leather Working Group
NGO	Non-Governmental Organisation / Non-Profit Organisation
EAP	Environmental Audit Protocol
ETP / WWTP	Effluent Treatment Plant / Wastewater Treatment Plant - Equipment and processes solely dedicated to cleaning the leather manufacturing facility wastewater, located on the leather manufacturing facility site or nearby.
CETP	Common Effluent Treatment Plant - A wastewater treatment facility that receives effluent discharge from multiple tanneries and other industrial facilities.
METP	Municipal Effluent Treatment Plant – Government operated equipment and processes for processing wastewater from multiple sources, industrial and domestic.
EMS	Environmental Management System – A framework through which environmental performance can be monitored, improved and controlled.
CMM	Chemical Management Module – LWG’s voluntary, add-on module designed to assess management of chemicals, compliance of chemicals, and health & safety of chemicals within a leather manufacturing facility.
Critical Section	A section of the LWG audit protocol in which the assessed facility must score above a specific threshold to achieve a medal rating. E.g. they must score above 65/100 in ALL critical sections to achieve a bronze medal rating, 75 for a silver, and 85 for a gold.
Effluent	Wastewater – treated or untreated – that flows out of a treatment plant, sewer, or industrial facility.
MRS�	Manufacturing Restricted Substance List – A list of chemicals that should not be used in the manufacture of leather.
RSL	Restricted Substance List – A list of chemicals that must not be present in the finished material. Brands provide RSLs to their suppliers and update the lists as needed, based on company-specific requirements or governmental regulations, etc.
CSR	Corporate Social Responsibility
OECD	Organisation for Economic Co-operation and Development
REACH	Registration, Evaluation, Authorisation & Restriction of Chemicals
CPSIA	Consumer Product Safety Improvement Act
NPE	Nonylphenol Ethoxylates (a toxin to aquatic life and potentially harmful to animals and humans)

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PART A: CRITICAL EVALUATION SECTION

This section contains self-evaluation questions that are all important indicators of whether a tannery is operating in a responsible and sustainable way.

At the end of the section there is a table to record a summary of answers and the assess whether your tannery is ready to consider progressing to a full environmental audit with LWG.

Please answer honestly according to your current procedures and operations. You can use the “Plan for Improvement” boxes to comment on any actions you should take and then use this as a tool to become better informed and to reduce and actively manage your impact on the environment.

A1. General Information

1.1 Company Name:	
1.2 Company Address:	
1.3 Email Address:	
1.4 Telephone number:	
1.5 Principal Contact Name and Position:	
1.6 Type of Tannery Activities (e.g. raw hide to crust):	

A3. Tannery Data

The ability to record the origin of supply is important when demonstrating good environmental practice. It is important to consider the environmental impact of your buying decisions and to minimise that impact.

Self-evaluation questions:

		Yes	No	N/A
A	If your organisation buys raw material, do you consider the environmental implications of your tanning processes?			
B	If your organisation buys raw material, do you consider and attempt to minimise the environmental impact associated with the condition of the material (i.e. salted or fresh hides)?			
C	If your organisation buys part-processed material (i.e. wet blue, wet white, crust), do you consider the environmental responsibility of the suppliers you purchase material from.?			
D	Do you keep accurate records of material bought and sold?			

Plans for improvement:

--

For advice on possible improvements and more information:

1. Leather Working Group environmental audit protocol, <https://www.leatherworkinggroup.com/how-we-work/audit-protocols/main-protocol>
2. Leather Working Group Guidance for tanners on CrVI prevention, <https://www.leatherworkinggroup.com/contentfiles/LWG-596.pdf?v=1>


A4. Traceability

Consumers and brands consider it important to understand the origin of hides and skins. Leather manufacturers should aim to demonstrate transparency of supply and as far as possible that there is no connection between leather products and areas of deforestation. Leather manufacturers should adopt traceability methods, e.g. physical marking of hides/skins, robust paperwork, etc. to provide evidence of supply traceability.

Self-evaluation questions:

		Yes	No	N/A
A	Does your company have a policy / procedure for the purchase of material?			
B	Does the company policy require your suppliers to provide information about the origin of the material being supplied?			
C	Does your policy require your suppliers to declare that material is not sourced from endangered / environmentally sensitive regions of the world?			

Plans for improvement:



For advice on possible improvements and more information:

1. Leather Working Group guidance on Traceability, <https://www.leatherworkinggroup.com/contentfiles/LWG-822.pdf>
2. Deforestation: [Greenpeace's 'Slaughtering the Amazon' report](#) – Greenpeace has also worked with well-known brands to ensure that the leather they source is not linked to deforestation.
3. [The Rainforest Alliance Certified Cattle](#) ensures biodiversity conservation.

A5. Environmental Management Systems

A good management system will assist an organisation in defining and controlling its operations. The Environmental Management System (EMS) is specifically structured towards the environmental aspects of operation. A good EMS, properly executed, will help an organisation with continual improvement of its environmental performance.

Self-evaluation questions:

		Yes	No	N/A
A	Does your organisation have an environmental policy in place?			
B	Does your organisation have a set of written procedures addressing the environmental aspects of the company's operations?			
C	Has the organisation implemented the procedures in place?			
D	Does the organisation regularly review its environmental performance?			
E	Is there a senior member of the management team responsible for environmental issues?			
F	Has the company carried out an evaluation of the organisation's operations and how they might affect the environment?			

Plans for improvement:

For advice on possible improvements and more information:

1. Leather Working Group environmental audit protocol, <https://www.leatherworkinggroup.com/how-we-work/audit-protocols/main-protocol> - guidance notes
2. ISO 14001 <https://www.iso.org/iso-14001-environmental-management.html>

A6. Restricted substances

Consumers of leather products want to use them without putting their health at risk. Restricted substances are substances that are not permitted to be present in the final leather product above a certain designated level. While there are mandatory restrictions on these substances such as REACH in the EU and CPSIA in USA, many brands have drawn up their own Restricted Substances Lists (RSLs) to set limits on the occurrence of certain chemicals in leather products. Therefore, limits may be determined by legislation or by the customer and many brands/buyers have their own specific RSL, so it is important to ensure you ask your customer for more information.

Self-evaluation questions:

		Yes	No	N/A
A	Are you aware of the potential negative effects for consumers of some residual chemicals in your leather?			
B	Have you developed a procedure to manage the restricted substances specifications?			
C	Do you have a list of restricted substances and their limits in your products or have your customers specified their restricted substances specifications?			
D	If you have your own restricted substances specifications for your products, can you ensure that they are up-to-date and can meet all of your customers' specifications			
E	Do you test your leather in accordance with such an RSL?			
F	Do you ensure that the labs you use are competent to undertake the testing required?			
G	Do you update the restricted substances specifications and review your procedures and results periodically			

Plans for improvement:

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Examples of RSLs may be seen at:

1. Apparel and Footwear International RSL Management Group, Restricted substances list, Version 4 2019, https://www.afirm-group.com/wp-content/uploads/2019/02/2019_AFIRM_RSL_2019_0225_EN.pdf
2. List of Restricted Substances in Shoes, CADS RSL 6 – Version 2019, <https://www.cads-shoes.com/en/documents>

For advice on possible improvements and more information:

1. Leather Working Group environmental audit protocol, <https://www.leatherworkinggroup.com/how-we-work/audit-protocols/main-protocol>
2. LWG Chemical Management Audit Protocol and guidance notes, <https://www.leatherworkinggroup.com/how-we-work/audit-protocols/chemical-management-module>
3. Leather Working Group Guidance for tanners on CrVI prevention, <https://www.leatherworkinggroup.com/contentfiles/LWG-596.pdf?v=1>
4. EU regulation on Registration, Evaluation, Authorization and Restriction of Chemicals, <https://echa.europa.eu/regulations/reach/understanding-reach>
5. USA's The Consumer Product Safety Improvement Act (CPSIA), <https://www.cpsc.gov/Regulations-Laws--Standards/Statutes/The-Consumer-Product-Safety-Improvement-Act>
6. Websites of international leather brands, which often publish their RSLs.
7. Your chemicals suppliers.

A7. Energy consumption

Consumption of fossil-fuel based energy sources results in the emission of greenhouse gases which could affect the environment and contribute to global warming. Energy consumption in leather manufacturing facilities is due to the use of electricity, fossil fuels, biomass, etc. Energy efficient manufacturing results in more production per unit of energy used.

Self-evaluation questions:

		Yes	No	N/A
A	Do you measure all forms of energy consumption, e.g. electricity, diesel, fuel oils, coal, biomass, etc.?			
B	Do you evaluate the energy consumed against the volume of material produced?			
C	Do you take measures to reduce energy consumption?			

Plans for improvement:

For advice on possible improvements and more information:

1. UNIDO Leather panel website, <https://leatherpanel.org/content/energy-savings-tanneries-through-solar-energy-use-solar-water-heating-and-electrical>
2. Guidance notes on LWG Audit protocol, <https://www.leatherworkinggroup.com/contentfiles/LWG-440.pdf?v=1>
3. Framework for sustainable leather processing, <https://leatherpanel.org/content/framework-sustainable-leather-manufacture-second-edition>
4. Some comparisons of thermal energy consumption in a temperate versus a subtropical zone, <http://leatherpanel.org/content/some-comparisons-thermal-energy-consumption-temperate-versus-subtropical-zone>
5. Best Available Techniques (BAT) Reference Document for the Tanning of Hides and Skins: Industrial Emissions Directive 2010/75/EU:(Integrated Pollution Prevention and Control), <https://ec.europa.eu/jrc/en/publication/reference-reports/best-available-techniques-bat-reference-document-tanning-hides-and-skins-industrial-emissions>

A9. Air and noise emissions

In most countries, significant air and noise emissions from industrial sources, e.g. factory boilers, spraying machines, PU coating machines, etc are subject to some form of regulatory control. Good practice dictates that operating facilities not only comply with regulatory requirements, but that they also undertake preventative maintenance programmes and establish relevant management procedures to minimise polluting emissions.

Self-evaluation questions:

		Yes	No	N/A
A	Has an air-emission inventory been completed?			
B	Based on the inventory, are you conducting periodic testing of air emissions?			
C	Are emission reduction devices for significant air emissions fitted where it is possible to reduce emissions?			
D	Do you have a preventative maintenance programme and cleaning schedule for the emissions reduction devices?			
E	Do you regularly measure the ambient air quality of the production facilities?			

Plans for improvement:

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For advice on possible improvements and more information:

1. Guidance notes on LWG Audit protocol, <https://www.leatherworkinggroup.com/contentfiles/LWG-440.pdf?v=1>
2. UNIDO's Leather Panel is a good source of information on the technical sustainability of tanneries, with a focus on developing countries. These documents are prepared by a vast network of leather experts around the world. Framework for sustainable leather processing, <https://leatherpanel.org/content/framework-sustainable-leather-manufacture-second-edition>
3. Best Available Techniques (BAT) Reference Document for the Tanning of Hides and Skins: Industrial Emissions Directive 2010/75/EU:(Integrated Pollution Prevention and Control), <https://ec.europa.eu/jrc/en/publication/reference-reports/best-available-techniques-bat-reference-document-tanning-hides-and-skins-industrial-emissions>
4. EU Council Directive 199/13/EC on Determination of VOC emissions
5. IUE 8 - Recommendations for Odour Control in Tannery, http://www.iultcs.org/pdf/IUE_8.pdf

A12. Emergency plans

Emergency situations might occur at any point even though precautions are in place. Proper management should always be prepared to deal with any sort of emergency and the employees should be adequately trained.

Consumers and brands require that leather products are made in safe working conditions, which includes safe buildings. Emergency plans are required to guarantee building safety and evacuation. Everyone in the company should be familiar with the emergency plans and they should be rehearsed frequently.

Self-evaluation questions:

		Yes	No	N/A
A	Have you identified all possible emergency situations that could occur in your tannery?			
B	Do you have an up-to-date emergency plan to deal with each of the emergency situations identified in A above?			
C	Do you have list of emergency contacts which is accessible to all employees?			
D	Do you have readily available personal protective equipment (PPE) required to deal with emergencies?			
E	Do you have evacuation procedures that are available to all?			
F	Do you have an emergency response team trained to deal with emergencies?			
G	Have you conducted risk assessments for potential exposure to Hydrogen Sulphide Gas in areas of risk, e.g. beamhouse, effluent drains, tanks and other workplaces?			
H	Have you provided appropriate H ₂ S detection devices in all potential risk areas?			
I	Have the risk assessments been undertaken by a competent, qualified assessor?			

Plans for improvement:

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For advice on possible improvements and more information:

1. UNIDO on-line course - How to deal with hydrogen sulphide gas, <https://capacitydevelopment.unido.org/moodle/course/view.php?id=14>
2. Online interactive risk assessment (OIRA) tool for leather and tanning industry, https://oiraproject.eu/en/search-site?search_block_form=leather
3. Safety and PPE poster from TEGEWA, https://www.tegewa.de/en/wp-content/uploads/sites/2/2019/07/Plakat_Safetyneu_chin-1.pdf

A13. Housekeeping

Good housekeeping minimises the risk of environmental incidents (e.g. spillages) and health and safety incidents (e.g. tripping) occurring on the work floor. Well maintained and clean machinery will run more efficiently resulting in less energy use, longer machinery life and cost savings.

Self-evaluation questions:

		Yes	No	N/A
A	Do you have a procedure for housekeeping both inside and outside the tannery (within the tannery boundary)?			
B	Do you have a procedure for traffic management both inside and outside the tannery (within the tannery boundary)?			
C	Do the production and other areas have clearly defined obstruction-free access routes?			
D	Are chemicals labelled and stored safely in designated places?			
E	Do all personnel use appropriate personal protective equipment (PPE)?			
F	Are the moving parts of the machines adequately guarded with auto-cut off mechanisms, wherever necessary?			
G	Are all platforms and overhead working areas (including access stairs) appropriately and sufficiently guarded?			
H	Do the electrical systems (wires and distribution panel boards) appear to be suitably enclosed so as to prevent electrocution?			

Plans for improvement:

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For advice on possible improvements and more information:

1. Guidance notes on LWG Audit protocol, <https://www.leatherworkinggroup.com/contentfiles/LWG-440.pdf?v=1>
2. IUE 11 – Occupational Health and Safety in the use of Chemicals in Tanneries, http://www.iultcs.org/pdf/IUE_11.pdf

A14. Manufacturing processes

Control of manufacturing processes, adopting best practices, use of measuring equipment and regular calibrations, etc. will contribute to consistency of quality, reduction of re-works and waste, resulting in reduced resource requirement, e.g. energy and water, and therefore contribute to improved environmental performance.

Self-evaluation questions:

		Yes	No	N/A
A	Do you have safety data sheets for all chemicals used and have them available in local language, readily available to workers?			
B	Is the chemical storage area adequately ventilated, bunded and provided with fire extinguishers?			

Plans for improvement:

For advice on possible improvements and more information:

1. Framework for sustainable leather processing, <https://leatherpanel.org/content/framework-sustainable-leather-manufacture-second-edition>
2. Best Available Techniques (BAT) Reference Document for the Tanning of Hides and Skins: Industrial Emissions Directive 2010/75/EU:(Integrated Pollution Prevention and Control), <https://ec.europa.eu/jrc/en/publication/reference-reports/best-available-techniques-bat-reference-document-tanning-hides-and-skins-industrial-emissions>

Summary of Responses

Section	Total Number of Answers Yes or N/A	Total Number of Answers No
A1. General Information		
A2. Operating Permits		
A3. Tannery Data		
A4. Traceability		
A5. E. M. S.		
A6. Restricted Substances		
A7. Energy Consumption		
A8. Water Consumption		
A9. Air & Noise Emissions		
A10. Waste Management		
A11. Effluent Treatment		
A12. Emergency Plans		
A13. Housekeeping		
A14. Manufacturing Processes		
Total		

Critical Evaluation

Please use the following guide to evaluate preparedness for an LWG Environmental Audit:

If you answered “Yes” or “N/A” to all the above questions	You are likely to be ready for an LWG Environmental Audit
If you answered “No” to less than 3 questions	You should be capable of an LWG Environmental Audit as long as you answered “Yes” to all legal permit questions
If you answered “No” to less than 5 questions	You may be capable of an LWG Environmental Audit as long as you answered “Yes” to all legal permit questions. Please seek advice on responses.
If you answered “No” to more than 5 questions	You are not yet ready and should continue to work on the improvements as identified in your plans for improvement completed above.

Supplementary Self-Evaluation Questions:

Do you require any additional support from external parties in setting up plans or actions, and in the subsequent implementation phase?

What is your vision for the future?

Completion of this self-evaluation tool does not guarantee that a tannery will be able to successfully achieve a Leather Working Group Environmental Audit Certificate, however it should provide an indication of whether a tannery is sufficiently prepared to proceed.

Date Completed:

Name of Evaluator:

Signature:

The self-evaluation questions on the following pages in Part B are not crucial for the purposes of assessing preparedness for a full LWG Environmental Audit but will assist you in scoring well and improving your chances of a medal award. They are good practice elements that leather manufacturers should be following or working towards:

B2 Beamhouse processes

Control of manufacturing processes, adopting best practices, use of measuring equipment and periodical calibrations, etc. will contribute to positive improvement of environmental impact in beamhouse operations of leather processing.

Self-evaluation questions:

		Yes	No	N/A
A	Are the wetting agents used biodegradable and NPE free?			
B	Is the amount of bactericide well controlled by dip slide method?			
C	Are the liquid and solid chemicals including water controlled by adequate measurement?			
D	Are the solid wastes from the beamhouse operations, namely, trimmings, fleshings, hair, put to use in the by-products industry?			
E	Is your sulphide consumption in liming/unhairing <2% offer on 60% Na ₂ S			
F	Is there a technology in place to reduce the ammonium salts in the de-liming process			

Plans for improvement:

For advice on possible improvements and more information:

1. Framework for sustainable leather processing, <https://leatherpanel.org/content/framework-sustainable-leather-manufacture-second-edition>
2. Best Available Techniques (BAT) Reference Document for the Tanning of Hides and Skins: Industrial Emissions Directive 2010/75/EU:(Integrated Pollution Prevention and Control), <https://ec.europa.eu/irc/en/publication/reference-reports/best-available-techniques-bat-reference-document-tanning-hides-and-skins-industrial-emissions>

B3. Post tanning processes

Control of manufacturing processes, adopting best practices, use of measuring equipment and periodical calibrations, etc. will contribute to positive improvement of environmental impact in post tanning operations of leather processing.

Self-evaluation questions:

		Yes	No	N/A
A	Are the solid wastes from the tanning operations, e.g. flesh splits, shavings and trimmings put to use in the by-products industry?			
B	Are the liquid and solid chemicals including water controlled by adequate measurement?			
C	Are the processes always controlled at key points to ensure efficiency and exhaustion (time, temperature, pH, etc.) always?			
D	Is the moisture content in the leather carefully controlled?			
E	Is the buffing operation controlled with a high level of extraction and automatic compacting for disposal			

Plans for improvement:

For advice on possible improvements and more information:

1. Framework for sustainable leather processing, <https://leatherpanel.org/content/framework-sustainable-leather-manufacture-second-edition>
2. Best Available Techniques (BAT) Reference Document for the Tanning of Hides and Skins: Industrial Emissions Directive 2010/75/EU:(Integrated Pollution Prevention and Control), <https://ec.europa.eu/jrc/en/publication/reference-reports/best-available-techniques-bat-reference-document-tanning-hides-and-skins-industrial-emissions>

B5 Complaints and public relations

Processes to manage and deal with site related complaints such as noise or odour are necessary.

Self-evaluation questions:

		Yes	No	N/A
A	Do you maintain your facility so that there is no complaint from neighbours or the public about nuisance/visual impact?			
B	Is there a defined, written procedure that ensures all complaints are investigated and acted upon (including records being maintained)			
C	Do you maintain your facility so that there is no regulatory enforcement actions or prosecutions outstanding in relation to complaints?			

Plans for improvement:

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PART C: BEST PRACTICE GUIDANCE ON CORPORATE SOCIAL RESPONSIBILITY

The following questions do not form part of the Leather Working Group Audit Process. However, it is recognised that a responsible organisation should be implementing or working towards compliance in the following areas:

C1 International Labour Organisation (ILO) Fundamental Convention

Consumers and brands consider it important that all workers have equal rights, that they can freely choose to do their work and are allowed to voice their opinion on work-related matters. They also consider it important that children should have opportunities focused on their future: they want them to be safe, healthy and able to go to school. The International Labour Organisation (ILO) has developed eight widely-recognised conventions. Considered by the ILO to be fundamental, the conventions cover four areas:

1. the elimination of discrimination in respect of employment and occupation;
2. the elimination of all forms of forced or compulsory labour;
3. the effective abolition of child labour;
4. freedom of association and effective recognition of the right to collective bargaining.

These four subjects can be found in all credible social standards (see list in question B below for examples) and the labour chapter of the UN Global Compact.

Self-evaluation questions:

		Yes	No	N/A
A	Do you have an existing, valid social audit?			
B	If yes, please select the audit system from below:			
	BSCI			
	SA8000			
	SMETA (SEDEX 2 pillar / 4 pillar			
	WRAP			
	WCA			
	FLA			
	Other (please specify):			

Plans for improvement:

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For advice on possible improvements and more information:

Labour Chapter of the UN Global Compact,

https://www.unglobalcompact.org/docs/issues_doc/labour/the_labour_principles_a_guide_for_business.pdf

C2 Equality of opportunity and treatment

The ILO labour standard on the elimination of discrimination requires that all people, including vulnerable groups in society, be given equal opportunities and treatment. Enterprises should not discriminate against workers, or in the hiring process, in terms of race, colour, sex, religion, political opinion, nationality or social origin. As an employer trying to combat or prevent discrimination, it is especially important to ensure that employment-related decisions (including salary-related decisions) are based on relevant and objective criteria. Targeted HR management and policies can help to prevent discrimination.

Self-evaluation questions:

		Yes	No	N/A
A	Do you pay men and women equally, i.e. equal pay for equal work?			
B	Do you give equal opportunities to your workers and not discriminate when: Hiring Undertaking daily activities in the workplace Dismissing Providing training opportunities Promoting employees Paying social benefits			
C	Do you take care to avoid discrimination against vulnerable groups, e.g. disabled workers, pregnant women, young workers or migrant workers?			
D	Do you discourage discriminatory behaviours, particularly when workers are hired, promoted, dismissed or assigned benefits?			

Plans for improvement:

--

For advice on possible improvements and more information:

1 Efforts to improve could include:

- Written procedures on disciplinary actions in the workplace, based on law, available to all workers or relevant stakeholders
- Workers and their representatives should be consulted on disciplinary actions and how they are enforced
- A record-keeping system that maintains an overview of disciplinary actions that have been taken
- Regular training for managers and workers on disciplinary actions that can be applied in the workplace
- Regular training for managers and workers on the risks of discrimination and how to overcome them

- 2 The ILO has developed [a step-by-step guide](#) to performing job evaluations in a gender-neutral fashion (for example, to assess whether the salary distribution in your organisation is gender-biased). When modified slightly, this approach can be used to assess whether other forms of discrimination, such as in relation to age or race, are influencing employment practices.
- 3 Employers can establish safe and good [working conditions](#) for women by introducing relatively minor changes. For example, by arranging for separate dressing rooms, sanitary facilities and transport to/from home. Good arrangements concerning pregnancy and day-care for children are also important. For more measures, see [the Women's Empowerment Principles in the Global Compact](#).
- 4 [The Gender Equality Seal](#) is an auditable standard and certification system developed by the UNDP to measure business conduct in relation to gender equality. It is important to note that not only are employers responsible for achieving a good gender-balance in their workforce, but that this also leads to better financial performance, as has been shown in research by the IFC.
- 5 The ILO also provides information on other discrimination-related subjects, such as [how to respect the rights of indigenous and tribal people in the workplace](#), [how to deal with managing disability in the workplace](#), and a [HIV/Aids workplace policy and programmes training manual](#)

C3 Compulsory labour

Organisations should not participate in any form of forced servitude, trafficked or non-voluntary labour. Work should be freely chosen. This topic covers both bonded and forced labour.

Self-evaluation questions:

		Yes	No	N/A
A	Are workers free to move around the workplace?			
B	Are workers free to leave the premises when they want?			
C	Are workers free to quit and receive their last salary and retrieve deposits when they wish to?			
D	Are workers free from fines or wage deductions as disciplinary measures?			
E	Are deposits (salary, passports or other legal documents) requested from your workers?			
F	If loan or credit schemes are provided for your workers, is there a link to workers' indebtedness?			
G	Are specifications on loans and possible advance payments respected and documented?			

Plans for improvement:

--

For advice on possible improvements and more information:

- 1 Forced labour: to combat and prevent forced labour and human trafficking, follow [the ten ILO principles](#) (page 3 of the publication 'Strengthening Employers' Activities against Forced Labour') and use the [UN GIFT eLearning course](#). The ILO handbook for combating forced labour describes forced labour and provides advice on this issue.
- 2 The [ILO Handbook](#) for combating forced labour describes forced labour and provides advice on this issue.

C4 Age of workers

Enterprises should not hire any worker below the legal minimum age and should provide special protection to any workers that are not yet adults. Not all children's work is considered child labour. The ILO's definition of child labour is as follows: work that is mentally, physically, socially or morally dangerous and harmful to children and/or interferes with their schooling. In its recommendations, the ILO specifies minimum ages for different types of activities. For the lightest type of work, the minimum age is 12.

Self-evaluation questions:

		Yes	No	N/A
A	Do you keep records of the ages of all workers?			
B	Is the youngest person working in your tannery older than the legal minimum age (this includes workers serving beverages and undertaking other small tasks)?			
C	Is the youngest person working in your tannery at least 13 years old (or at least 12 years old in countries that do not set a minimum age of 14)?			
D	Do you have restrictions for workers under the age of 18 regarding heavy work, the use of dangerous machinery, exposure to hazardous chemicals and waste?			

Plans for improvement:

--

For advice on possible improvements and more information:

- 1 The International Finance Corporation (IFC) provides a [Guidance Document](#) for countering child labour. The IFC's recommendations include: provide training and awareness programmes for workers of all levels; reward staff for their efforts to eliminate harmful child labour; create a mechanism by which workers and others can report violations with the assurance of confidentiality; and partner with other companies and organisations.
- 2 You can use the comprehensive set of [Children's Rights and Business Principles \(2012\)](#) to guide your company on the full range of actions that can be taken in the workplace, marketplace and community to respect and support children's rights.
- 3 The book '[Stepping Stones for creating child labour free zones](#)' provides practical information on the development of child labour-free zones; in which all parties cooperate to send children to school.
- 4 [The Children's Rights Impact Assessment](#) (2013) is a tool that can help you identify and manage the impact on children's rights. The checklist contains a set of questions and indicators covering the 10 Children's Rights and Business Principles, addressing different aspects of company policies and operations and the impact on children's rights.

C5 Workers' representation

Enterprises should respect the right of workers to form unions or other kinds of workers' associations and to engage in collective bargaining.

Self-evaluation questions:

		Yes	No	N/A
A	Are your workers free to join trade unions and other associations?			
B	Have your workers democratically elected a workers' representative?			
C	Does your management have regular meetings with workers or the workers' representative on work-related issues?			
D	Do you provide a suggestion box for your workers?			
E	If no trade union or workers' representatives are present, are workers involved in decision-making processes in other ways?			
F	Are NGOs free to discuss work-related issues with your workers?			

Plans for improvement:

--

For advice on possible improvements and more information:

- 1 [IndustriALL Global Union](#) represents 50 million workers in 140 countries and strives for better working conditions and trade union rights worldwide. IndustriALL represents workers in various sectors, including the textiles, garments, leather and footwear sectors.
- 2 Freedom of association and the right to organise and bargain collectively are fundamental human rights, the exercise of which has a major impact on work and living conditions. It is important that you allow your workers (or the workers of your suppliers) to unite and discuss work-related issues with management. [The Dutch trade union FNV](#) urges companies to inform workers of their rights (for example, by inviting NGOs to speak on the topic), allow alternative forms of worker organisation, if needed, and make it explicit that participants will not be disadvantaged in any way.

C6 Wages and benefits

Consumers and brands want to be sure that the people who make their leather products earn enough to take care of themselves and satisfy their basic needs; that is, that they receive a living wage. Enterprises should respect the right of workers to receive fair remuneration and hire workers on the basis of documented contracts based in law. Permanent work should give workers permanent labour rights. Enterprises should provide official contracts for such work and only use outsourcing, day labourers, 'independent contractors' or short-term contracts when the work is genuinely temporary.

Self-evaluation questions:

		Yes	No	N/A
A	Do you pay the minimum wage (or more), as set by the government for every worker and in line with the minimum reference for a 48 hour working week?			
B	Do you ensure that wages are paid in the local, valid currency and that payments occur at the time and frequency that has been agreed with workers?			
C	Are the wages you pay sufficient for your workers to meet their basic needs (living wage)?			
D	Do you pay contributions for all workers to social insurance funds such as:			
	- Health insurance			
	- Retirement benefits			
	- Unemployment benefits			
	- Accident insurance			
E	Are pregnant women entitled to maternity leave and benefits?			
F	Do you compensate workers when they are ill?			
G	Do you provide permanent contracts to all workers who do permanent work?			
H	When you provide accommodation to your workers, is this considered to:			
	- Be appropriately constructed and located (separate from the production area)?			
	- Be clean, safe (including access to emergency exits and appropriate fire-fighting equipment) and adequately lit?			
	- Provide a good level of privacy (for example, segregated sleeping quarters by gender)?			
	- Provide clean drinking water?			
	- Provide clean washing facilities and toilets?			
I	Do you provide day-care for children below school age for your workers?			

Plans for improvementL

For advice on possible improvements and more information:

- 1 Living wage: Wageindicator.org offers a map of the world indicating local living wages.
- 2 Appropriate housing: the International Labour Organisation (ILO) provides [information on appropriate housing for workers](#), as does the International Finance Corporation (IFC).

C7 Working hours

Consumers and brands want to be sure that the people who make their leather products have a decent standard of living and are treated well. Enterprises should observe the law regarding hours of work and the ILO norms prescribing the number of working hours that are acceptable for workers in industries such as tanneries, so that workers remain healthy and productive.

Self-evaluation questions:

		Yes	No	N/A
A	Do your workers work eight hours or less per day?			
B	Do your workers work 48 hours or less per week?			
C	Do workers have at least one day off after six days of work?			
D	Is overtime voluntary?			
E	Is overtime properly compensated, e.g. paid at a premium rate or as time off?			
F	Do you keep records of hours worked by all workers (day labourers, temps and permanent staff)?			

Plans for improvement:

For advice on possible improvements and more information:

- 1 The International Labour Organisation (ILO) recommends a maximum of 48 hours of work per week, limited overtime, sufficient rest time, holidays and sick-leave. [The ILO Helpdesk for Business](#) provides information on working time.

C8 Grievance mechanisms and worker voice

It is important that workers have the ability to express concern or grievance in relation to their work or the working environment.

Self-evaluation questions:

		Yes	No	N/A
A	Do you have an anonymous grievance procedure for workers? land?			
B	If yes, does it take the form of (mark all that apply):			
	Anonymous suggestion box			
	Open door policy			
	Worker clinics / focus groups			
	Supervisor communication			
	Worker committees			
	Union communication			

Plans for improvement:

Patient Information	
Full Name	
Date of Birth	
Gender	
Address	
City	
State	
Zip	
Phone	
Medical History	
Allergies	
Current Medications	
Past Medical History	
Family History	
Social History	
Physical Examination	
Vital Signs	
Laboratory Tests	
Imaging Studies	
Diagnosis	
Treatment Plan	
Follow-up	

For advice on possible improvements and more information:

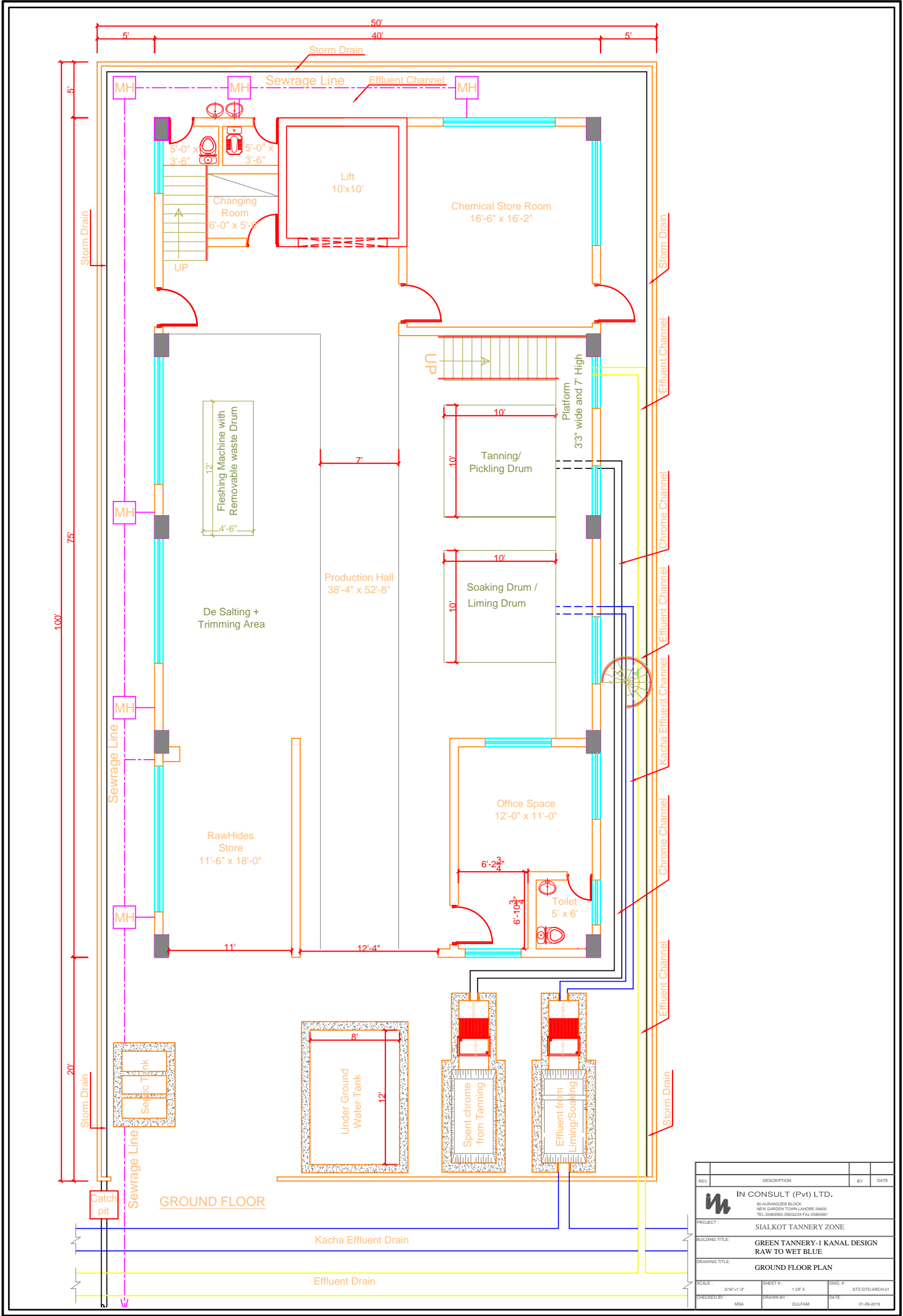
- 1 Sedex Members Ethical Trade Audit (SMETA) Measurement Criteria, <https://cdn.sedexglobal.com/wp-content/uploads/2019/05/SMETA-6.1-Measurement-Criteria.pdf>
- 2 UN's Guiding Principles on Business and Human Rights, https://www.ohchr.org/Documents/Publications/GuidingPrinciplesBusinessHR_EN.pdf

[Business Transactions](#) makes bribery of officials in international business transactions punishable in 38 countries. The Convention describes the concept of corruption, instruments to combat corruption and supervision. [The OECD Guidelines for Multinational Enterprises](#) provides advice on combating bribery (chapter VII).

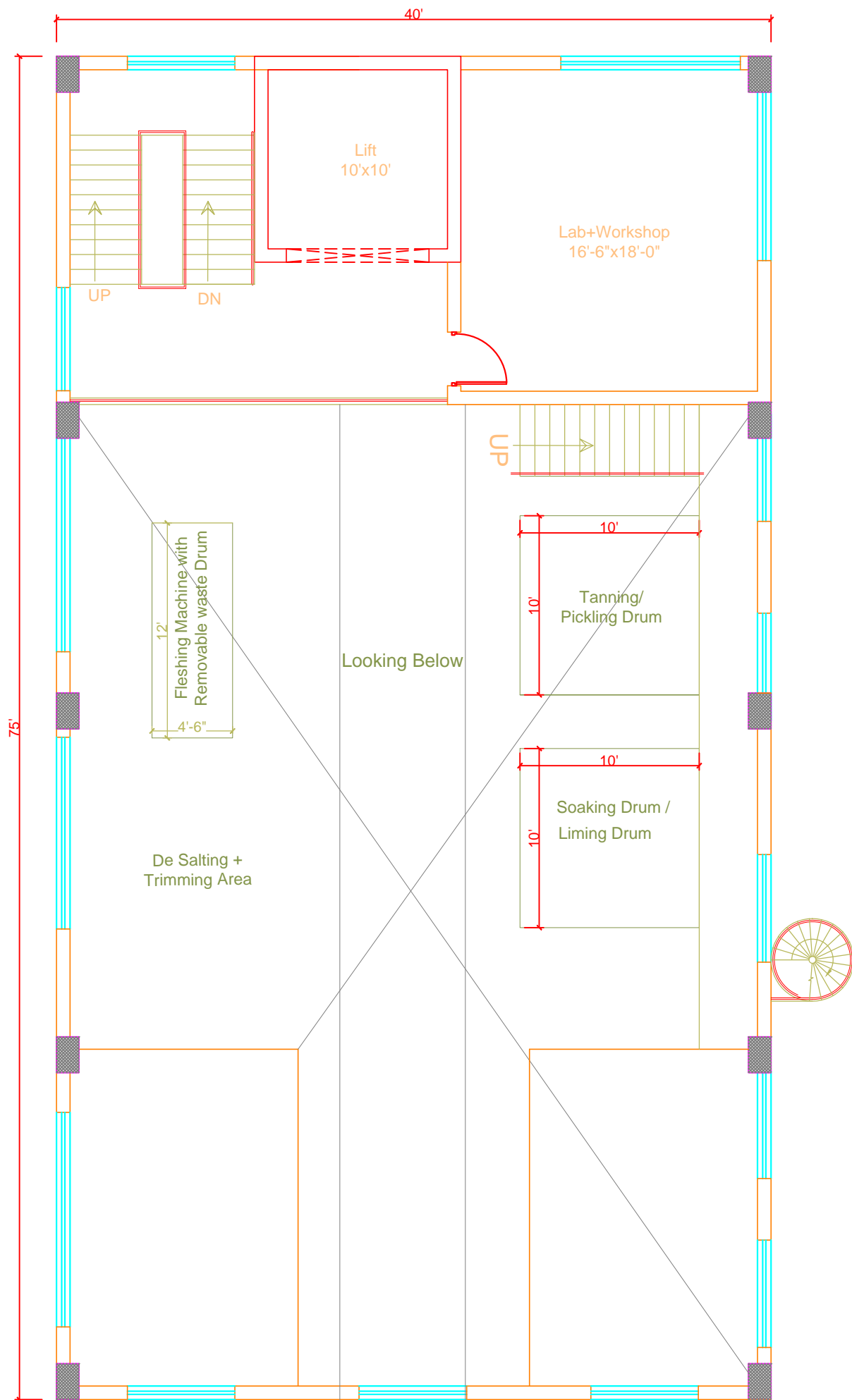
- 3 Furthermore,
 - a. You could adopt [the Whistleblowing Guidelines](#) outlined by the ICC to create a policy for reporting fraud.
 - b. You could add [the ICC Anti-Corruption Clause](#) to contracts and agreements.
 - c. You could join [the Partnering Against Corruption Initiative \(PACI\)](#).
- 4 [The Business Anti-Corruption Portal](#) provides several [guidelines, country profiles and tools, such as this E-learning course](#).
- 5 Taxes: the NGOs VBDO and Oikos have formulated six guiding principles for good tax governance. The Business and Human Rights Resource Centre provides more [information on tax avoidance](#), including examples of how companies deal with this issue. [The Fair Tax Mark](#) is a label for companies that want to show that they are open and transparent about their tax affairs and pay the right amount of tax at the right time, in the right place.
- 6 Competition: you are expected to refrain from practices that restrict competition, such as fixed price agreements, open tender arrangements, or the division of markets, customers, suppliers, geographical zones or activities. For more information, please visit [the website of the WTO](#).

Annex-06A

Layouts for 1 Kanal Raw to Wet Blue

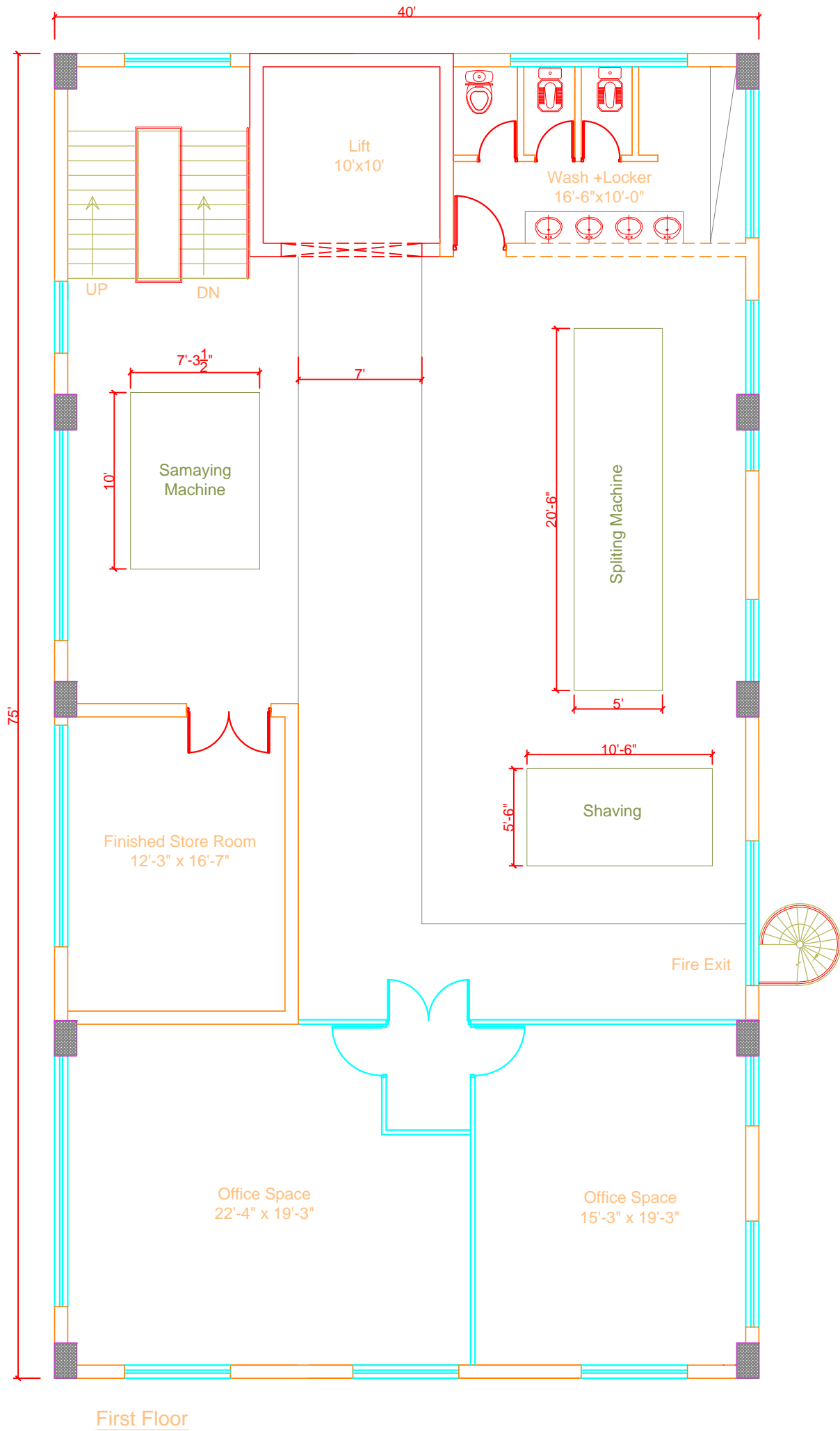


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6	SIALKOT TANNERY ZONE		
7	BUILDING TITLE:		
8	GREEN TANNERY-1 KANAL DESIGN		
9	RAW TO WET BLUE		
10	DRAWING TITLE:		
11	GROUND FLOOR PLAN		
12	SCALE:		
13	3/16"=1'-0"		
14	CHECKED BY:		
15	MSA		
16	DRAWN BY:		
17	GULFAM		
18	DATE:		
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21	1 OF 5		
22	DRWG #:		
23	STZ-GTD-ARCH-01		

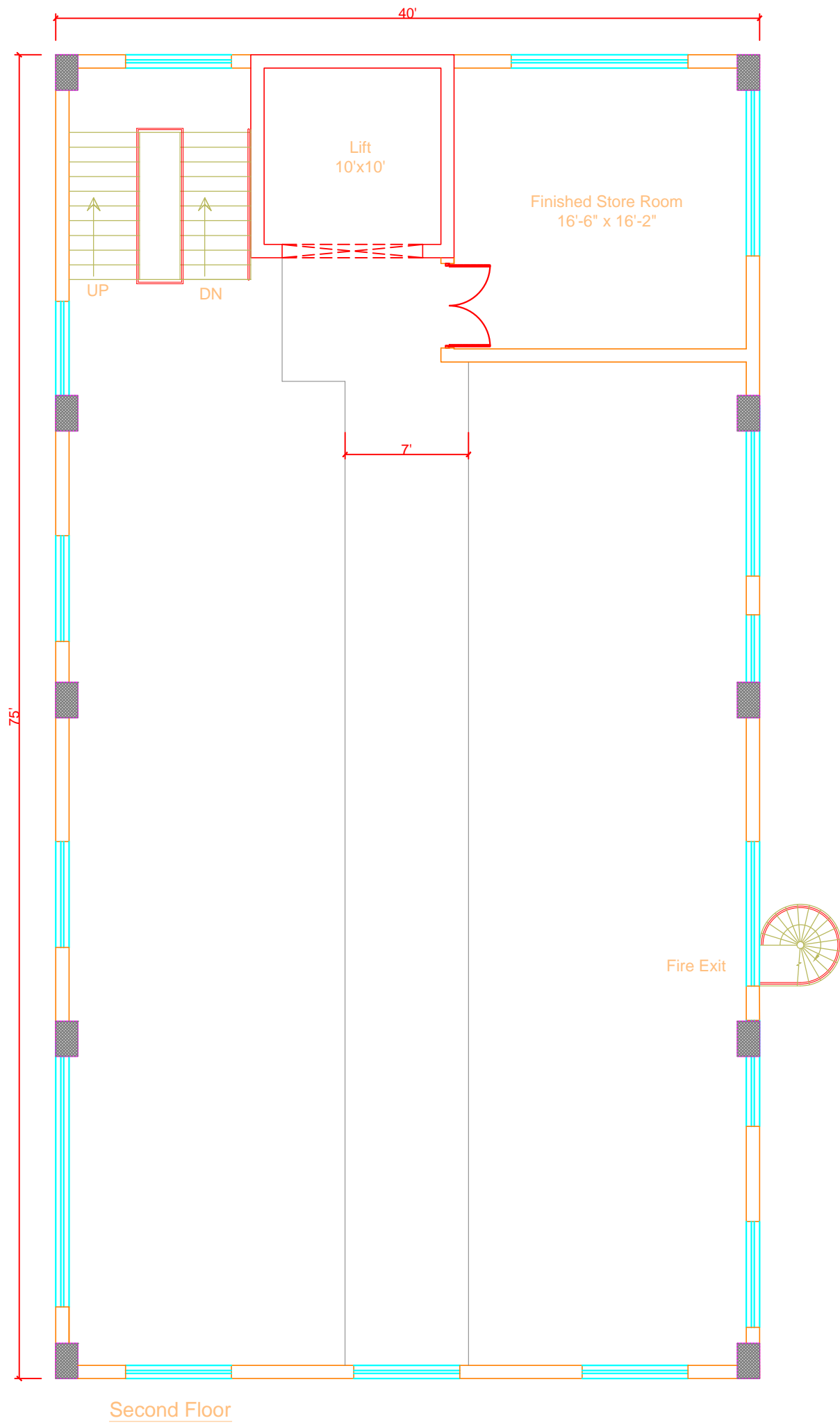


MEZZANINE FLOOR

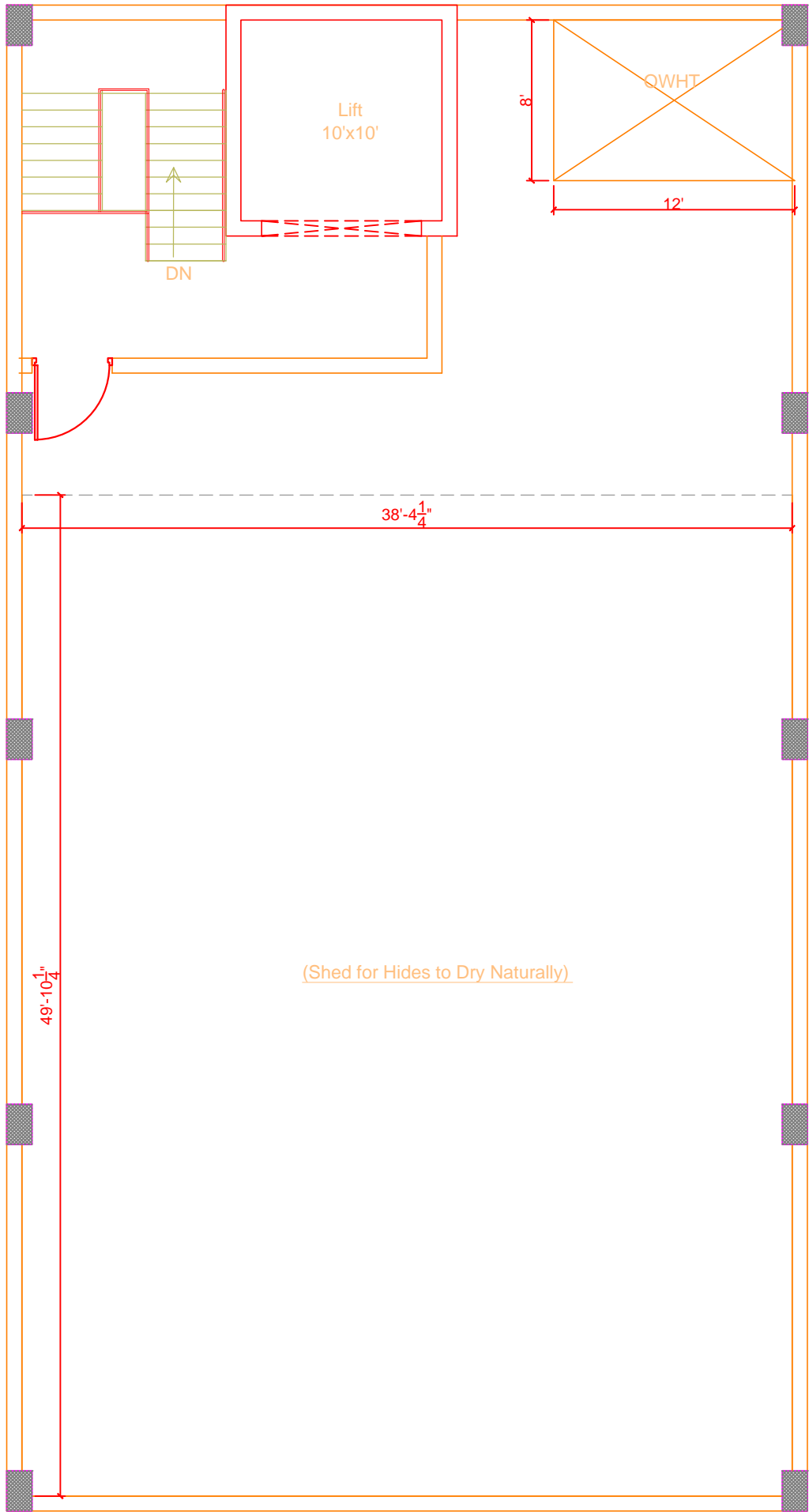
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BUILDING TITLE:		GREEN TANNERY-I KANAL DESIGN RAW TO WET BLUE	
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MSA	GULFAM	01-09-2019	




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BUILDING TITLE:		GREEN TANNERY-I KANAL DESIGN RAW TO WET BLUE	
DRAWING TITLE:		FIRST FLOOR PLAN	
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CHECKED BY :	DRAWN BY :	DATE :	
MSA	GULFAM	01-09-2019	



REV.	DESCRIPTION	BY	DATE
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BUILDING TITLE:		GREEN TANNERY-I KANAL DESIGN RAW TO WET BLUE	
DRAWING TITLE:		SECOND FLOOR PLAN	
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CHECKED BY :	MSA	DWG. # :	STZ-GTD-ARCH-01
		DATE :	01-09-2019

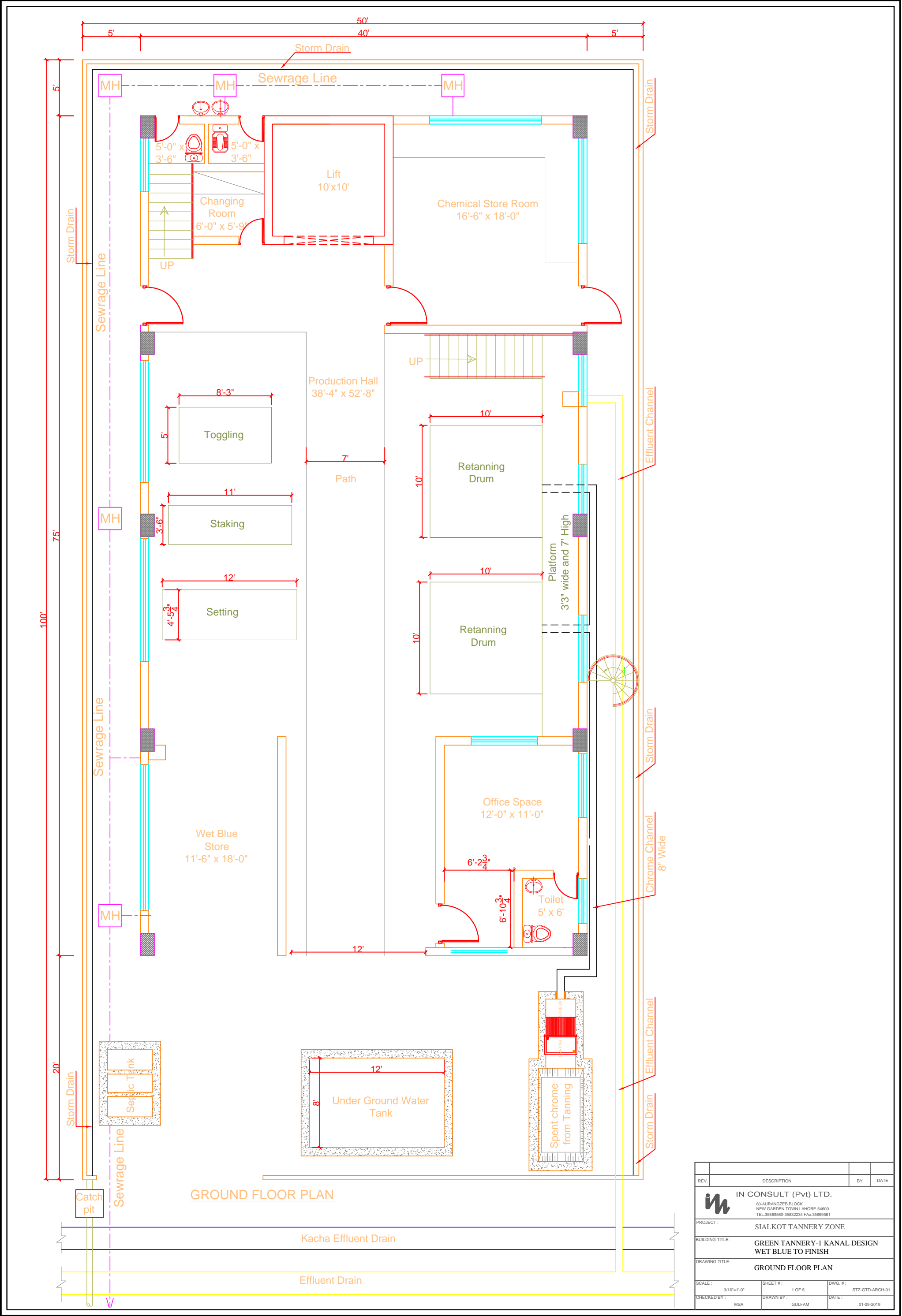


Roof Plan
(Shed for Hides to Dry Naturally)

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BUILDING TITLE:		GREEN TANNERY-I KANAL DESIGN RAW TO WET BLUE	
DRAWING TITLE:		ROOF PLAN	
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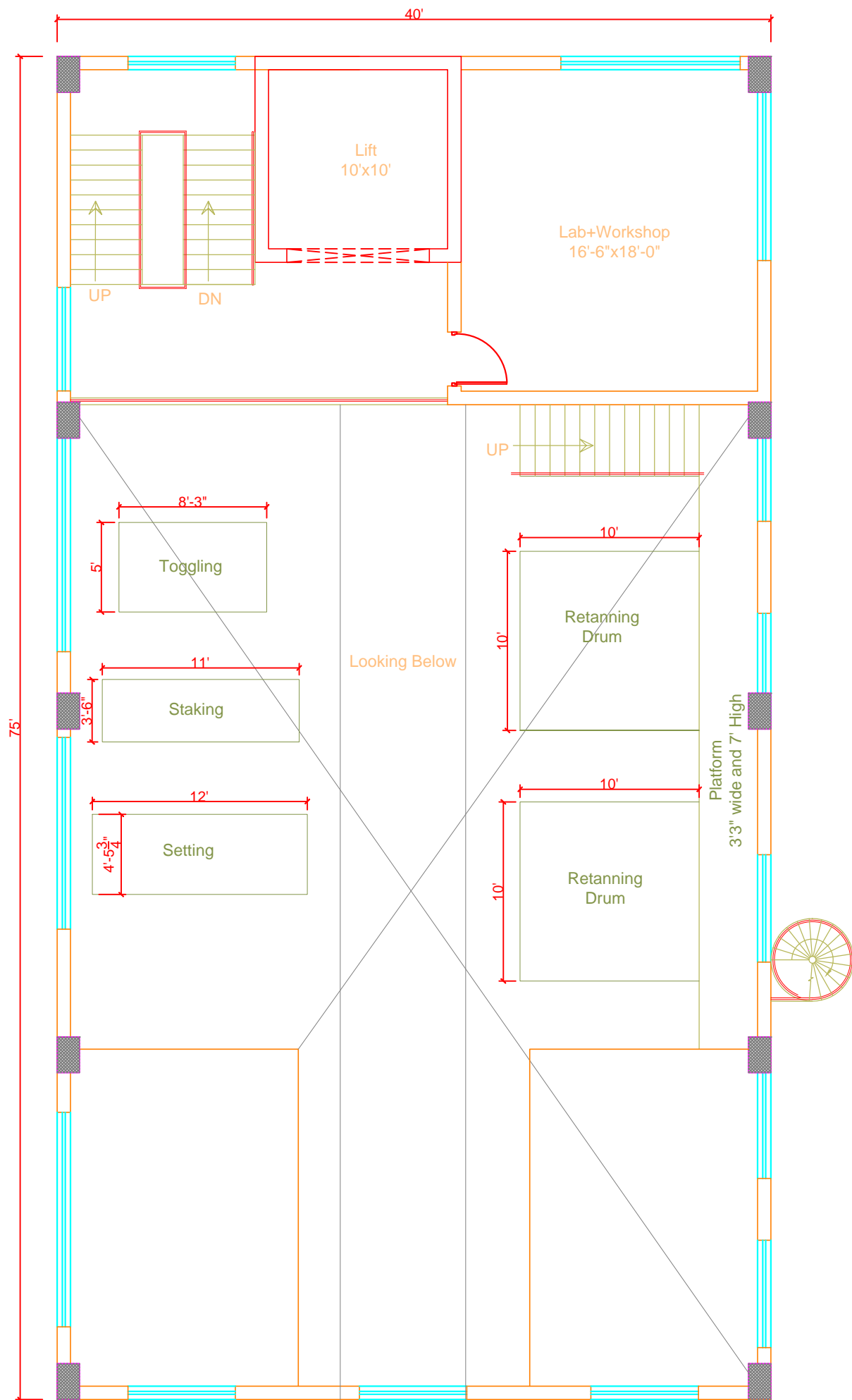
Annex-06B

Layouts for 1 Kanal Wet Blue to Finish



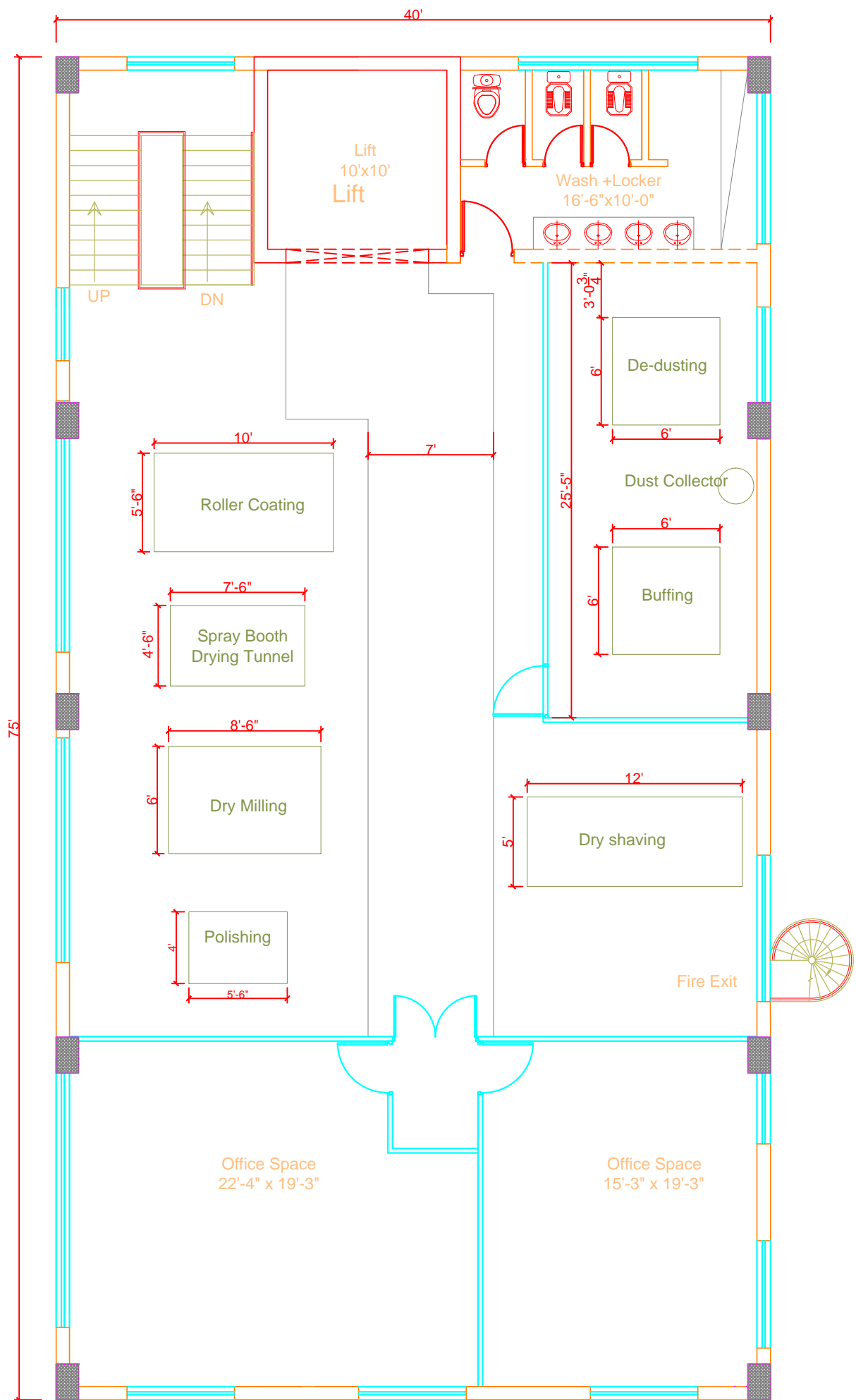
GROUND FLOOR PLAN

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BUILDING TITLE:		GREEN TANNERY-I KANAL DESIGN WET BLUE TO FINISH	
DRAWING TITLE:		GROUND FLOOR PLAN	
SCALE :	SHEET # :	DWG. # :	
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CHECKED BY :	DRAWN BY :	DATE :	
MSA	GULFAM	01-09-2019	



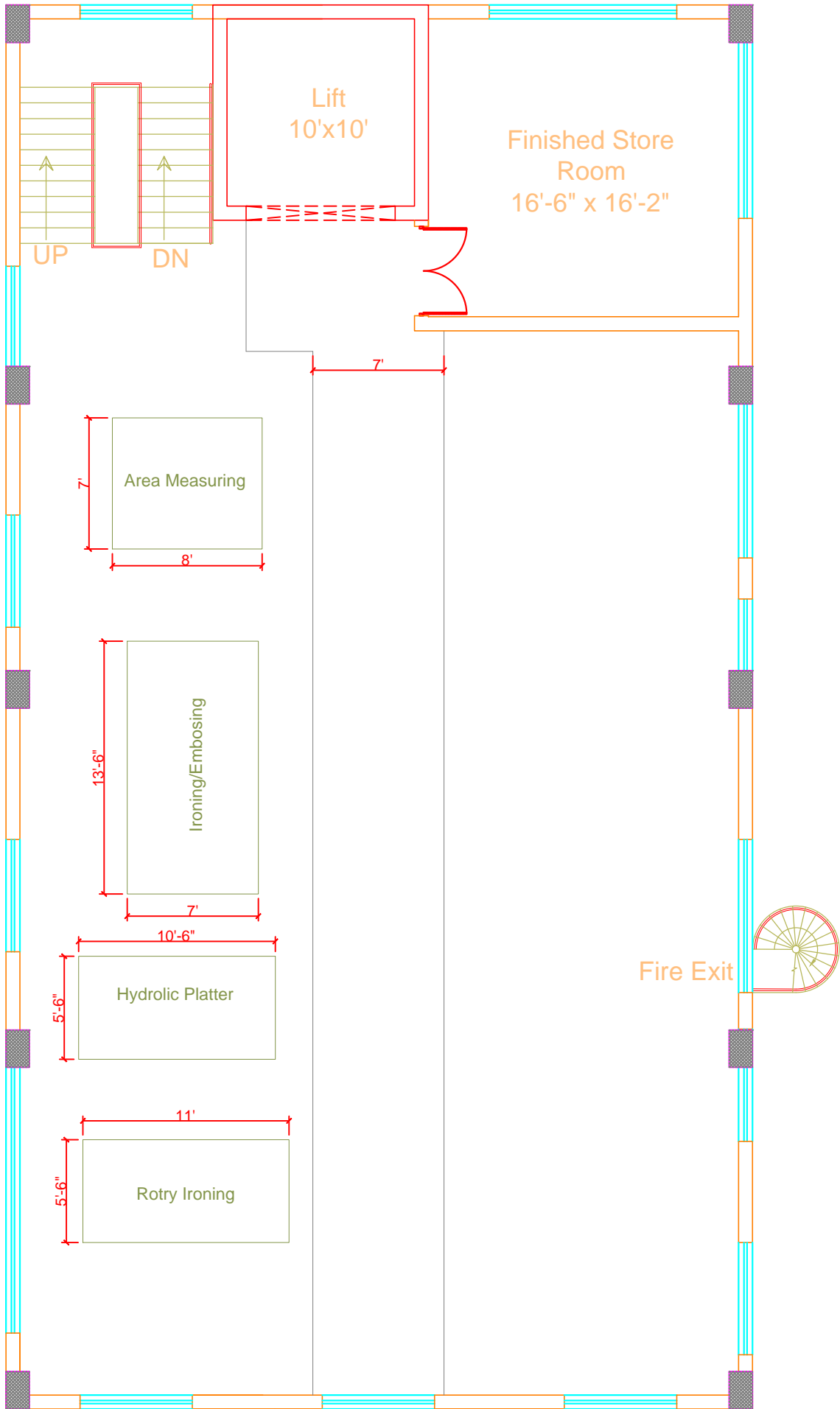
MEZZANINE FLOOR PLAN

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BUILDING TITLE:		GREEN TANNERY-I KANAL DESIGN WET BLUE TO FINISH	
DRAWING TITLE:		MEZZANINE FLOOR PLAN	
SCALE :	SHEET # :	DWG. # :	
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FIRST FLOOR PLAN

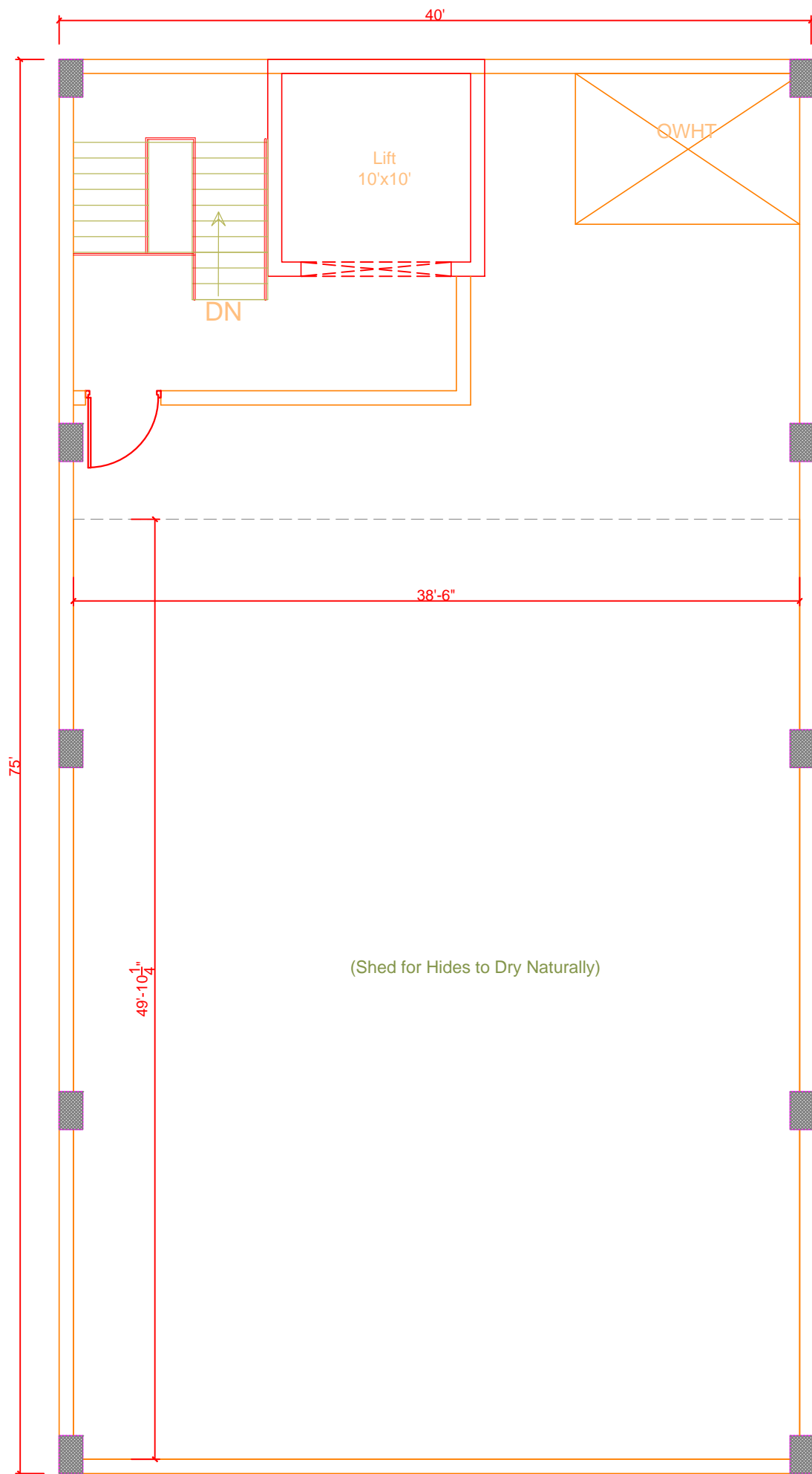
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DRAWING TITLE:		FIRST FLOOR PLAN	
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CHECKED BY :	MSA	DWG. # :	STZ-GTD-ARCH-01
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SECOND FLOOR PLAN

WET BLUE TO FINISH

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BUILDING TITLE:		GREEN TANNERY-I KANAL DESIGN WET BLUE TO FINISH	
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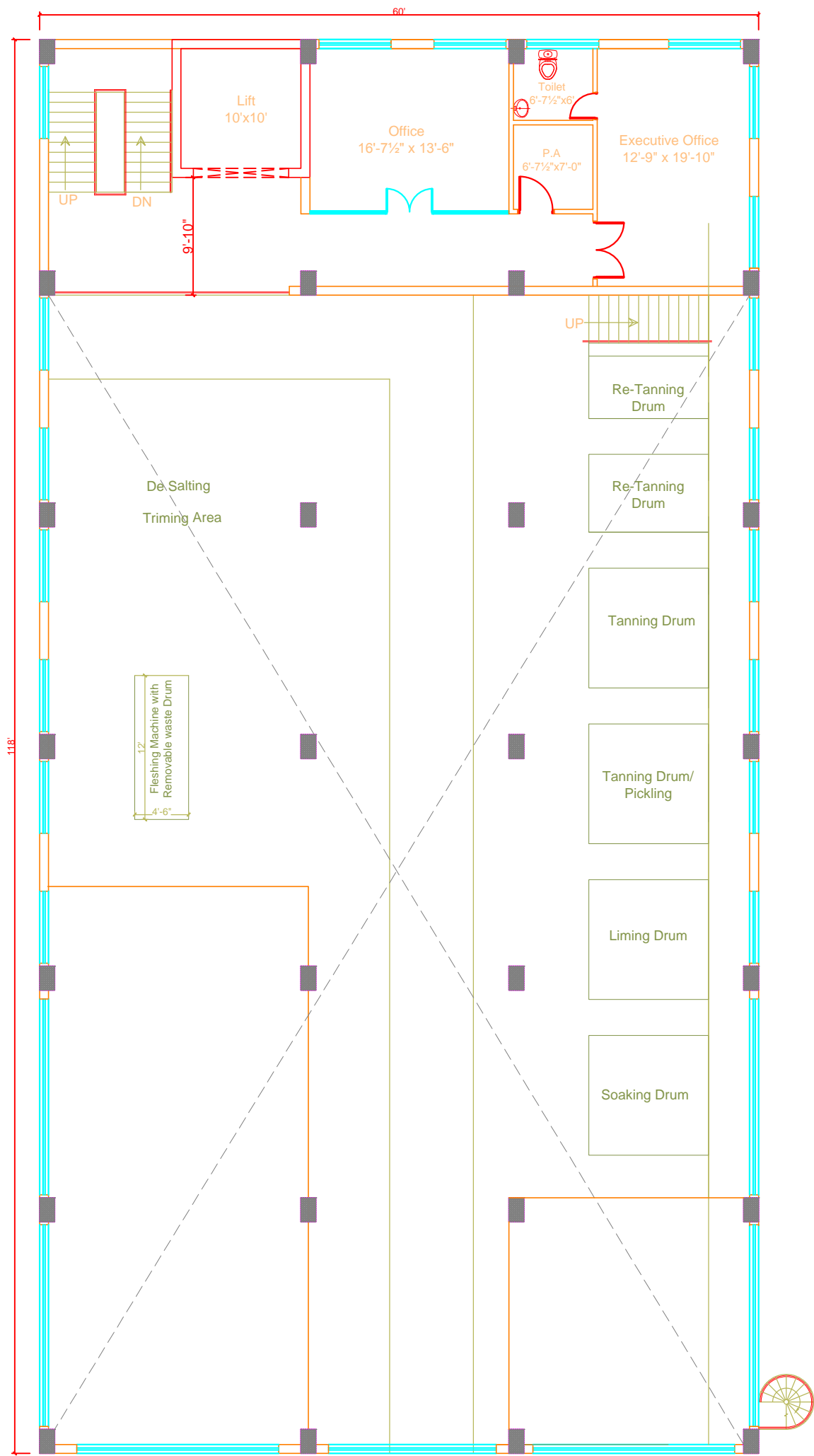


ROOF PLAN
(Shed for Hides to Dry Naturally)

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BUILDING TITLE:		GREEN TANNERY-I KANAL DESIGN WET BLUE TO FINISH	
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SCALE :	SHEET # :	DWG. # :	
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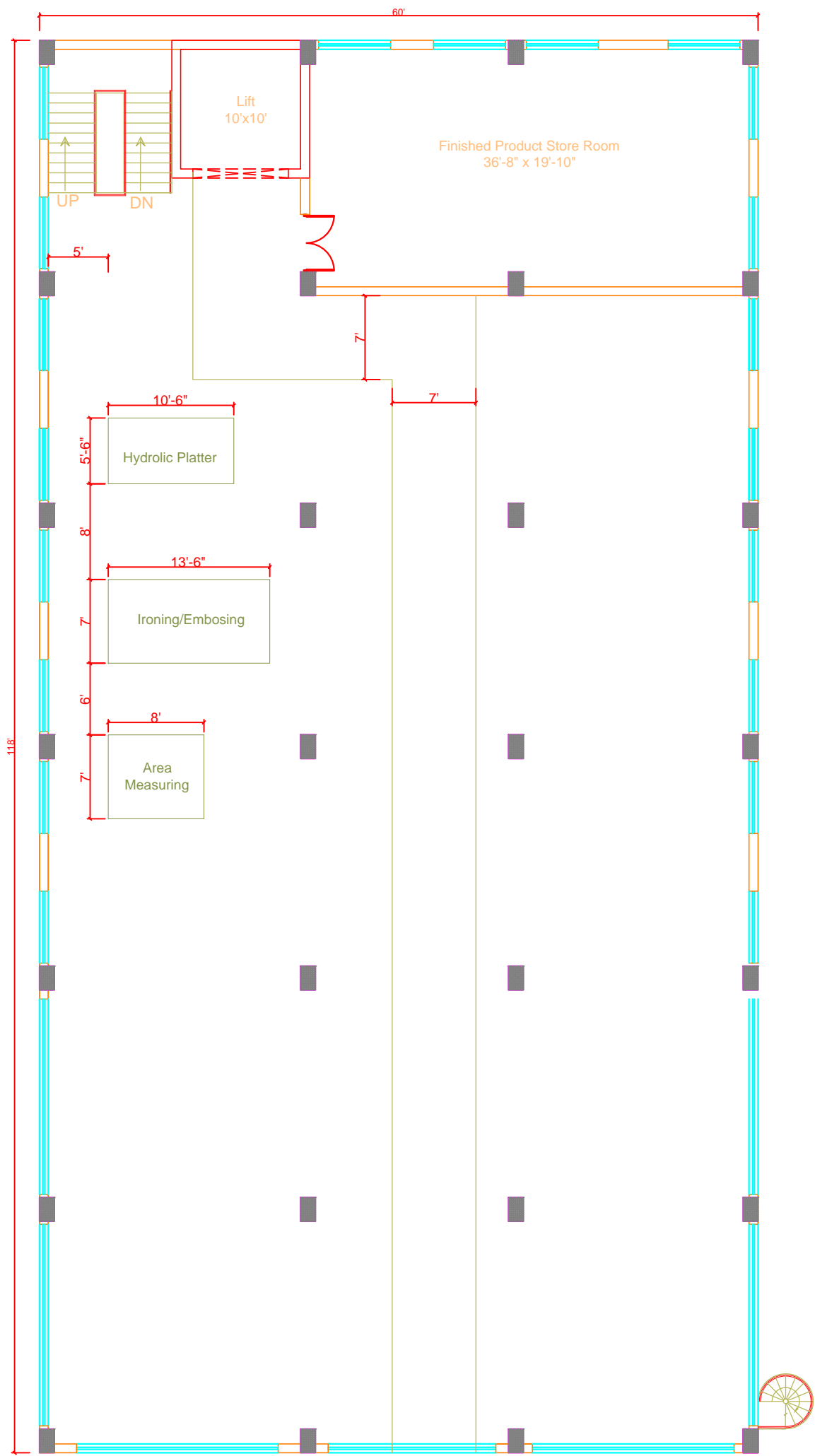
Annex-07A

Layouts for 2 Kanal Wet Blue to Finish




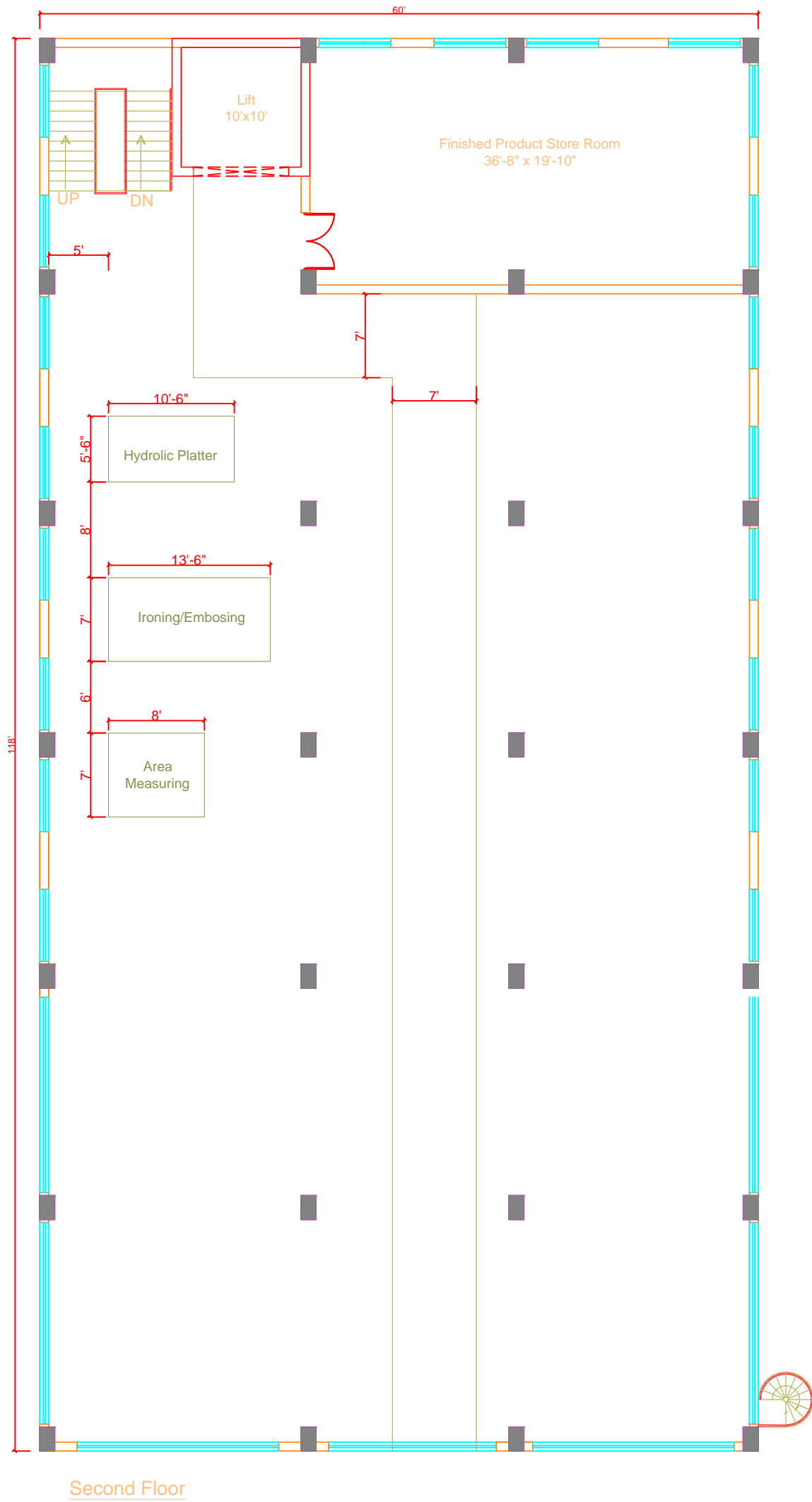
MEZZANINE FLOOR

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BUILDING TITLE:		GREEN TANNERY-2 KANAL DESIGN RAW TO FINISH	
DRAWING TITLE:		MEZZANINE FLOOR PLAN	
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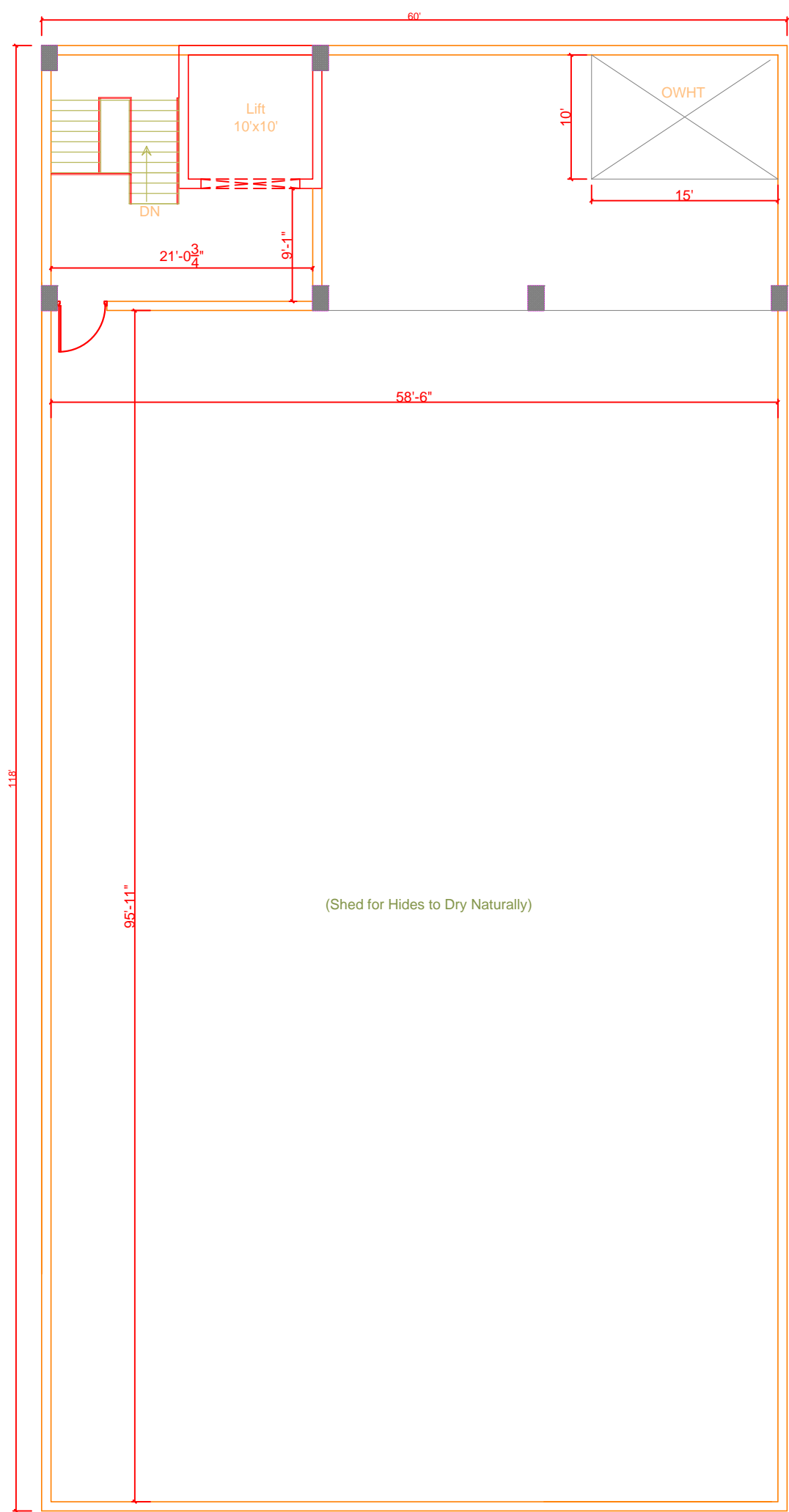


Second Floor


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BUILDING TITLE:		GREEN TANNERY-2 KANAL DESIGN RAW TO FINISH	
DRAWING TITLE:		FIRST FLOOR PLAN	
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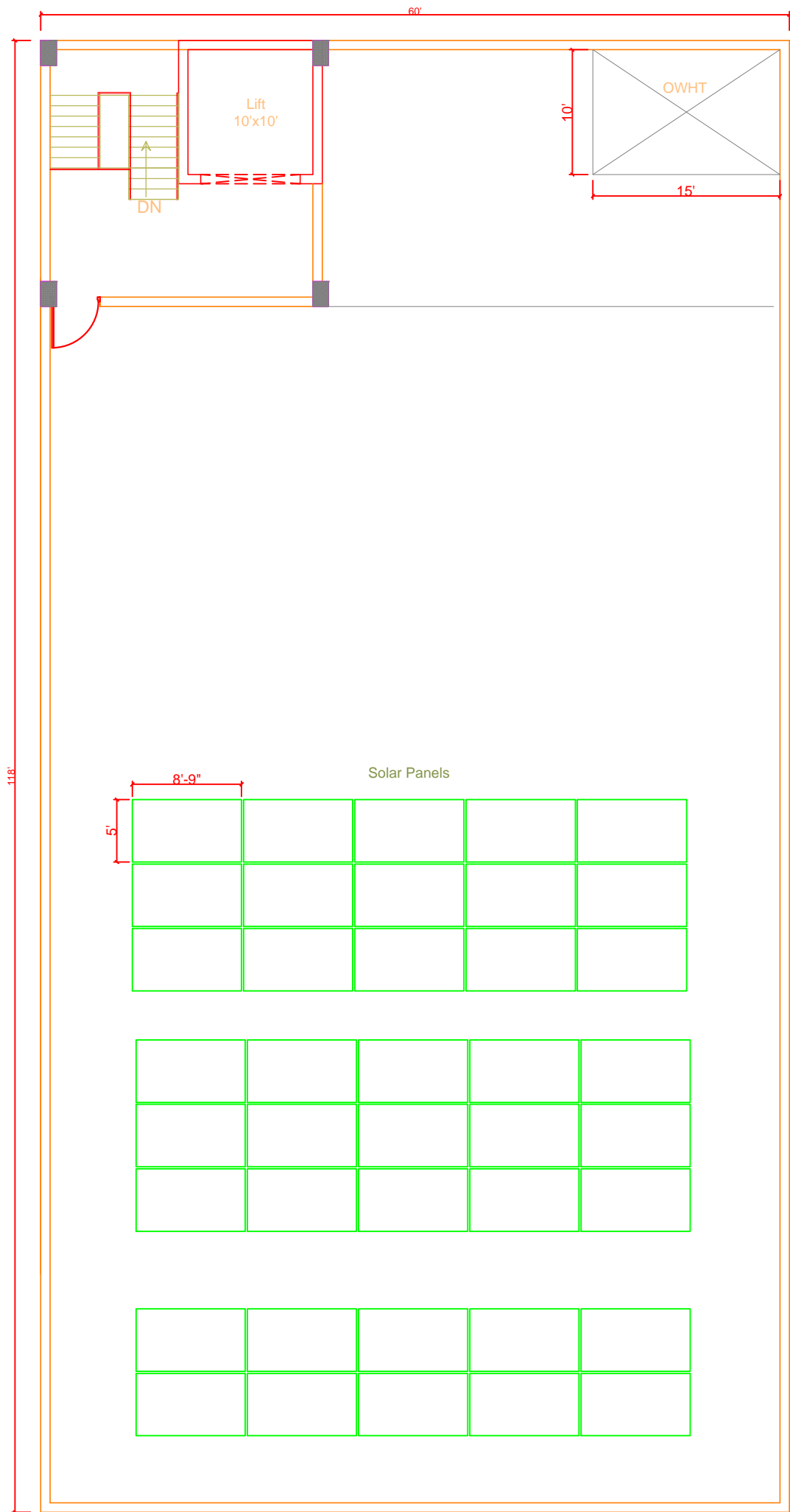


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PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY-2 KANAL DESIGN RAW TO FINISH	
DRAWING TITLE:		SECOND FLOOR PLAN	
SCALE :	NTS.	SHEET # :	4 OF 7
CHECKED BY :	MSA	DRAWN BY :	GULFAM
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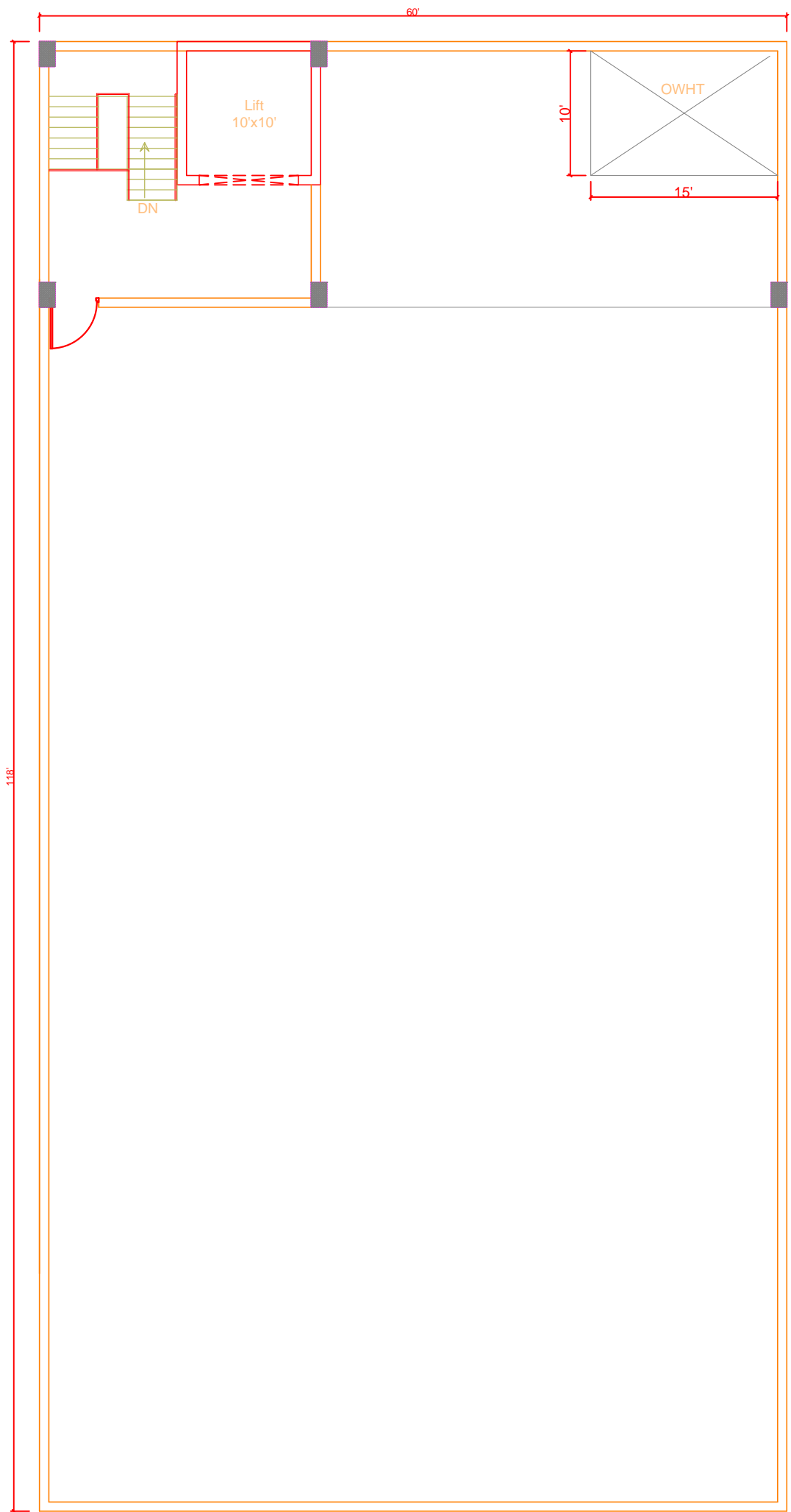
Roof Plan Option 01
(Shed for Hides to Dry Naturally) Possible

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BUILDING TITLE:		GREEN TANNERY-2 KANAL DESIGN RAW TO FINISH	
DRAWING TITLE:		ROOF PLAN	
SCALE :	NTS.	SHEET # :	5 OF 7
CHECKED BY :	MSA	DRAWN BY :	GULFAM
		DATE :	01-09-2019
		DWG. # :	STZ-GTD-ARCH-01




Roof Plan Option 02
(Solar Water Heating System) Possible

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BUILDING TITLE:		GREEN TANNERY-2 KANAL DESIGN RAW TO FINISH	
DRAWING TITLE:		ROOF PLAN	
SCALE :	NTS.	SHEET # :	6 OF 7
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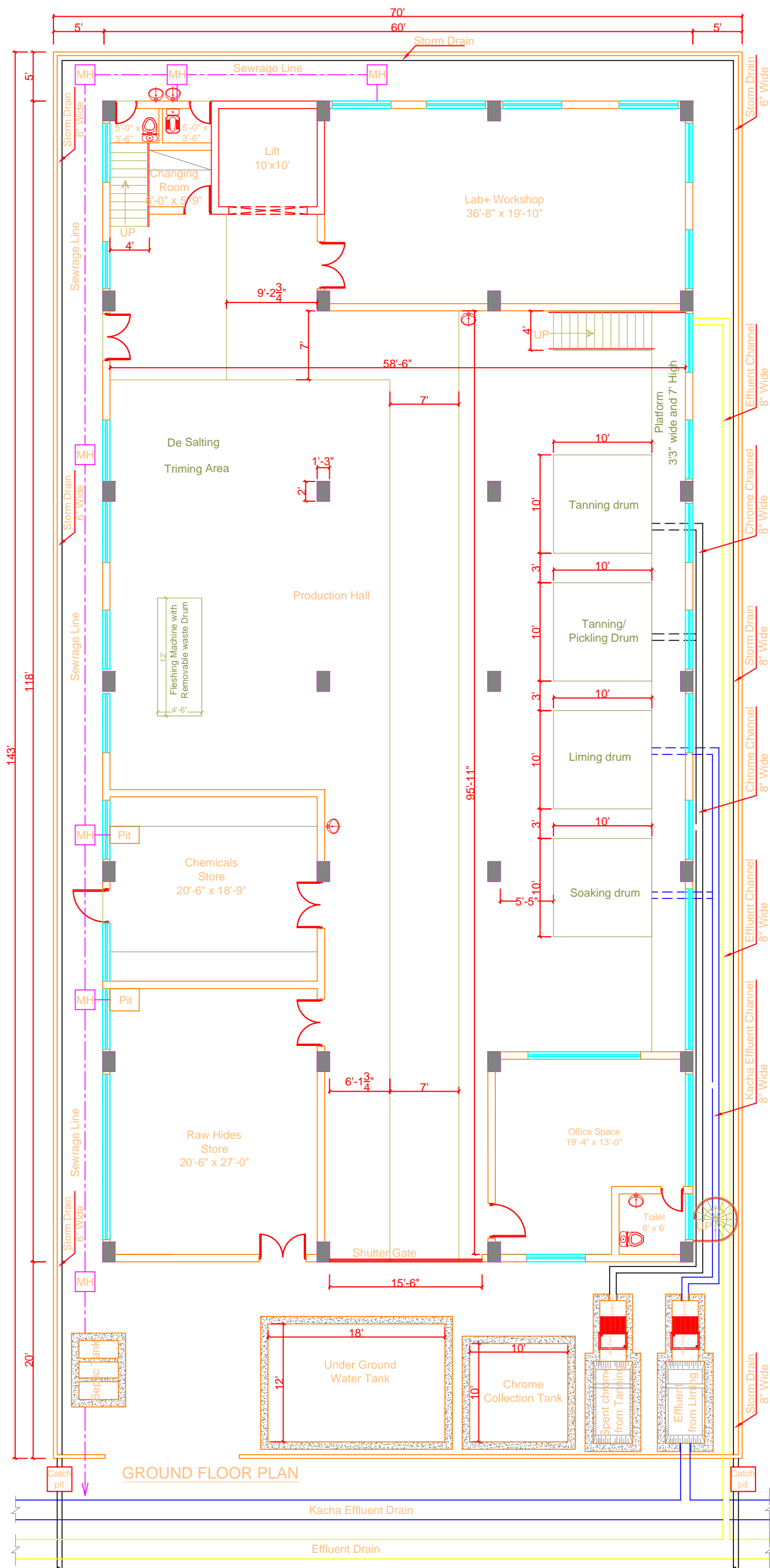


Roof Plan Option 03
(Solar Air Heating System) Possible

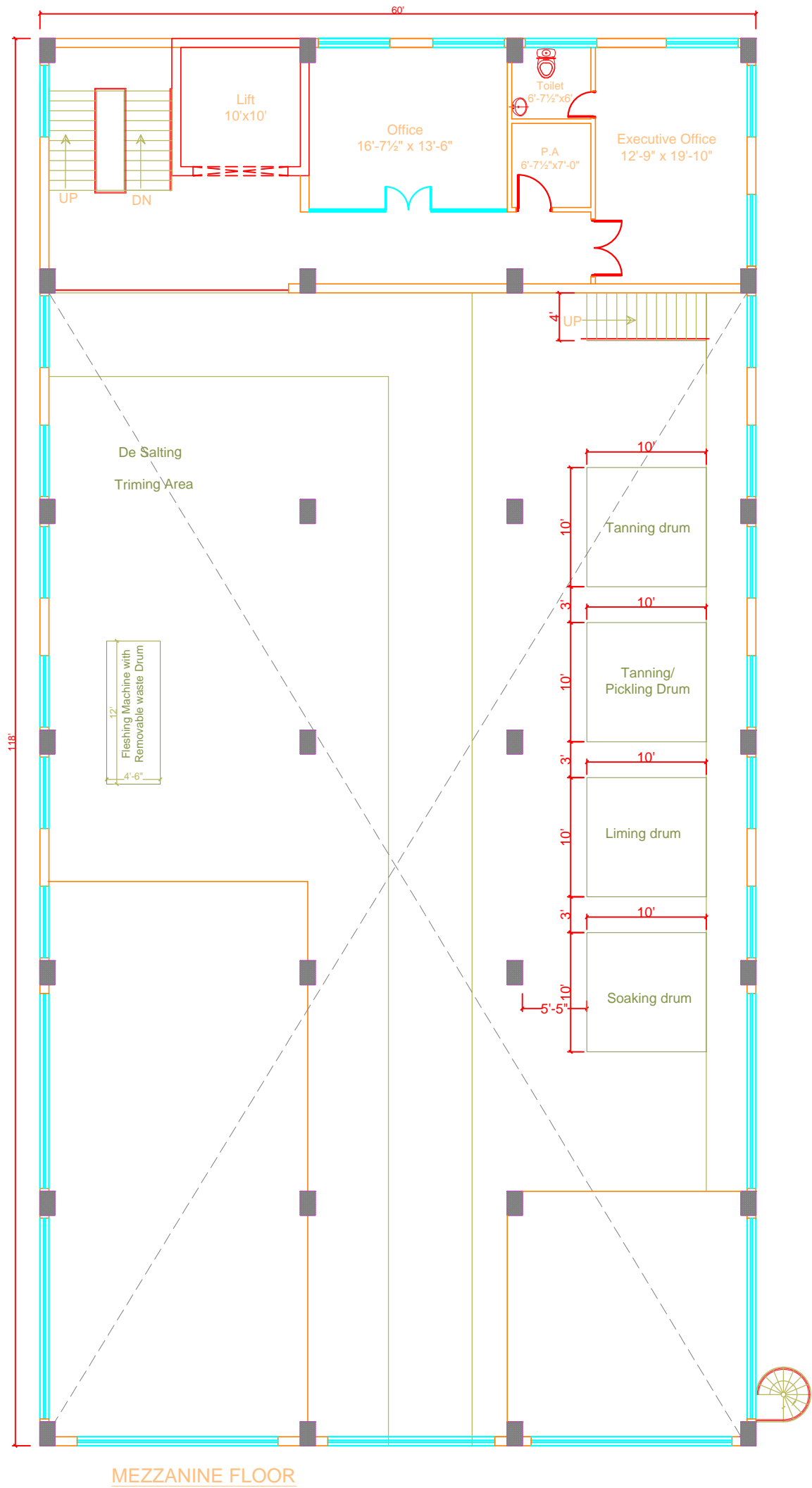
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BUILDING TITLE:	GREEN TANNERY-2 KANAL DESIGN RAW TO FINISH		
DRAWING TITLE:	ROOF PLAN		
SCALE :	NTS.	SHEET # : 7 OF 7	DWG. # : STZ-GTD-ARCH-01
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Annex-07B

Layouts for 2 Kanal Raw to Wet Blue

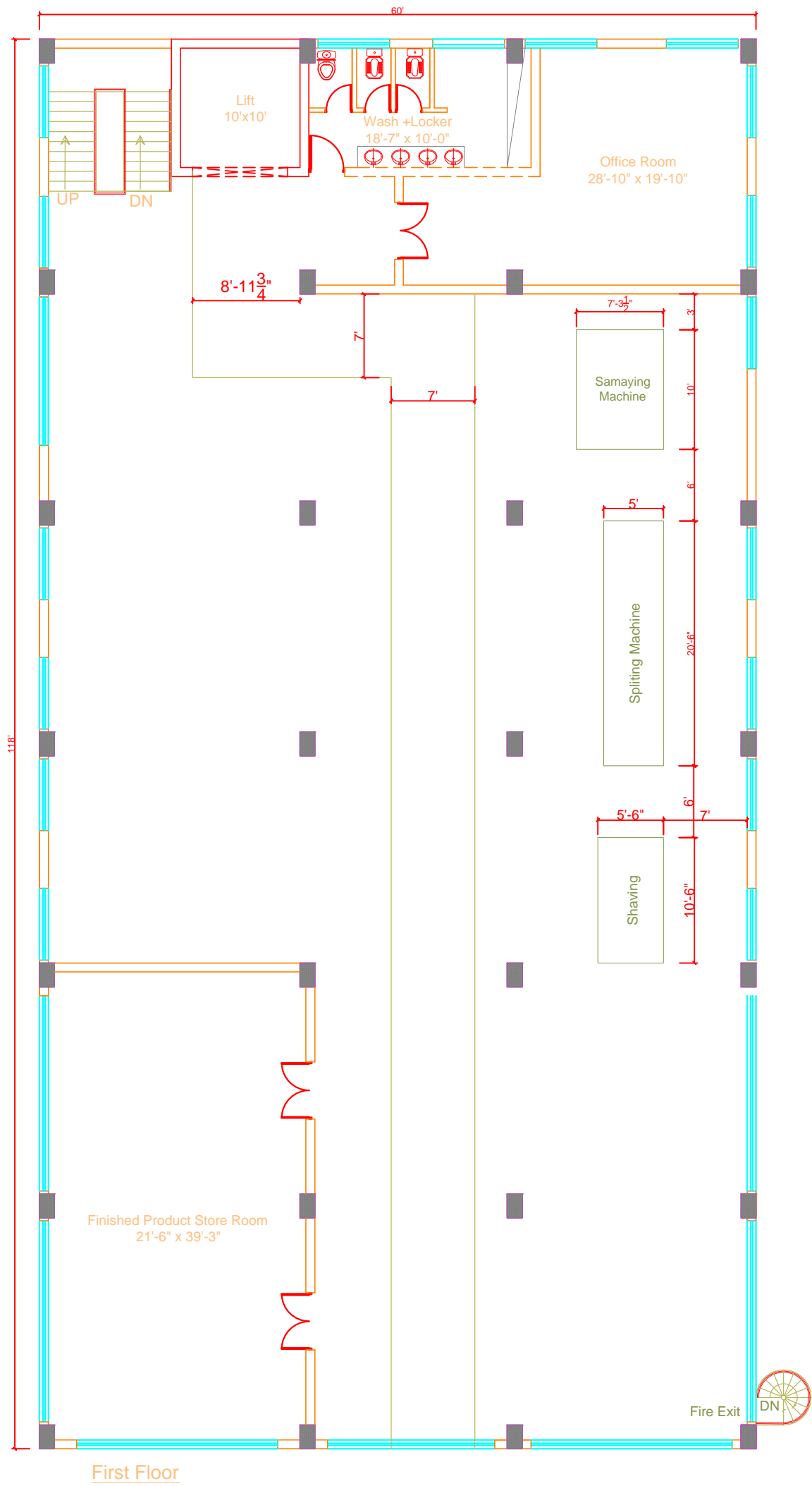


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PROJECT :	SIALKOT TANNERY ZONE		
BUILDING TITLE:	GREEN TANNERY-2 KANAL DESIGN RAW TO WET BLUE		
DRAWING TITLE:	GROUND FLOOR PLAN		
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CHECKED BY :	MSA	DWG. # :	STZ-GTD-ARCH-01
		DATE :	01-09-2019



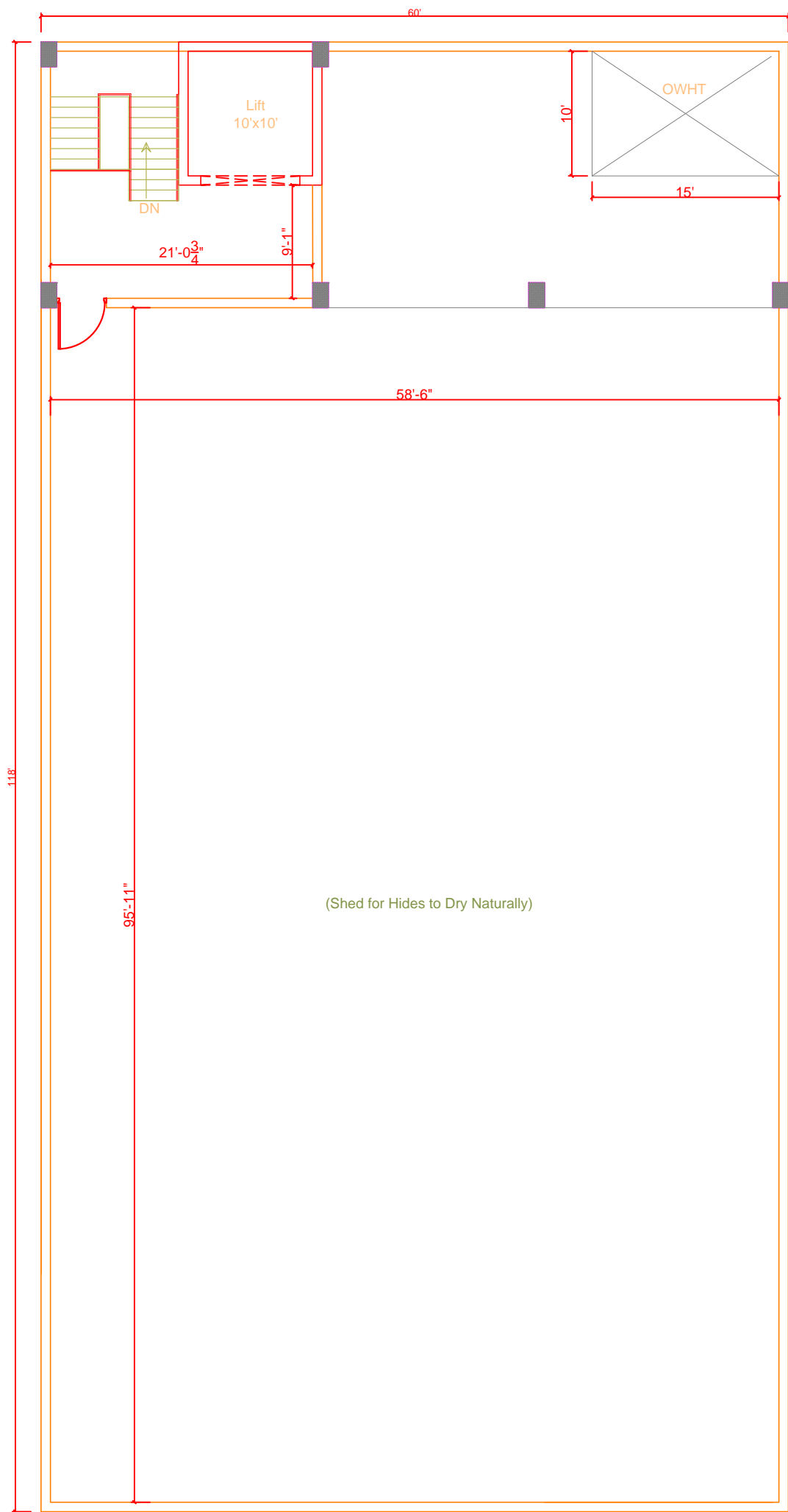
MEZZANINE FLOOR

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DRAWING TITLE:		MEZZANINE FLOOR PLAN	
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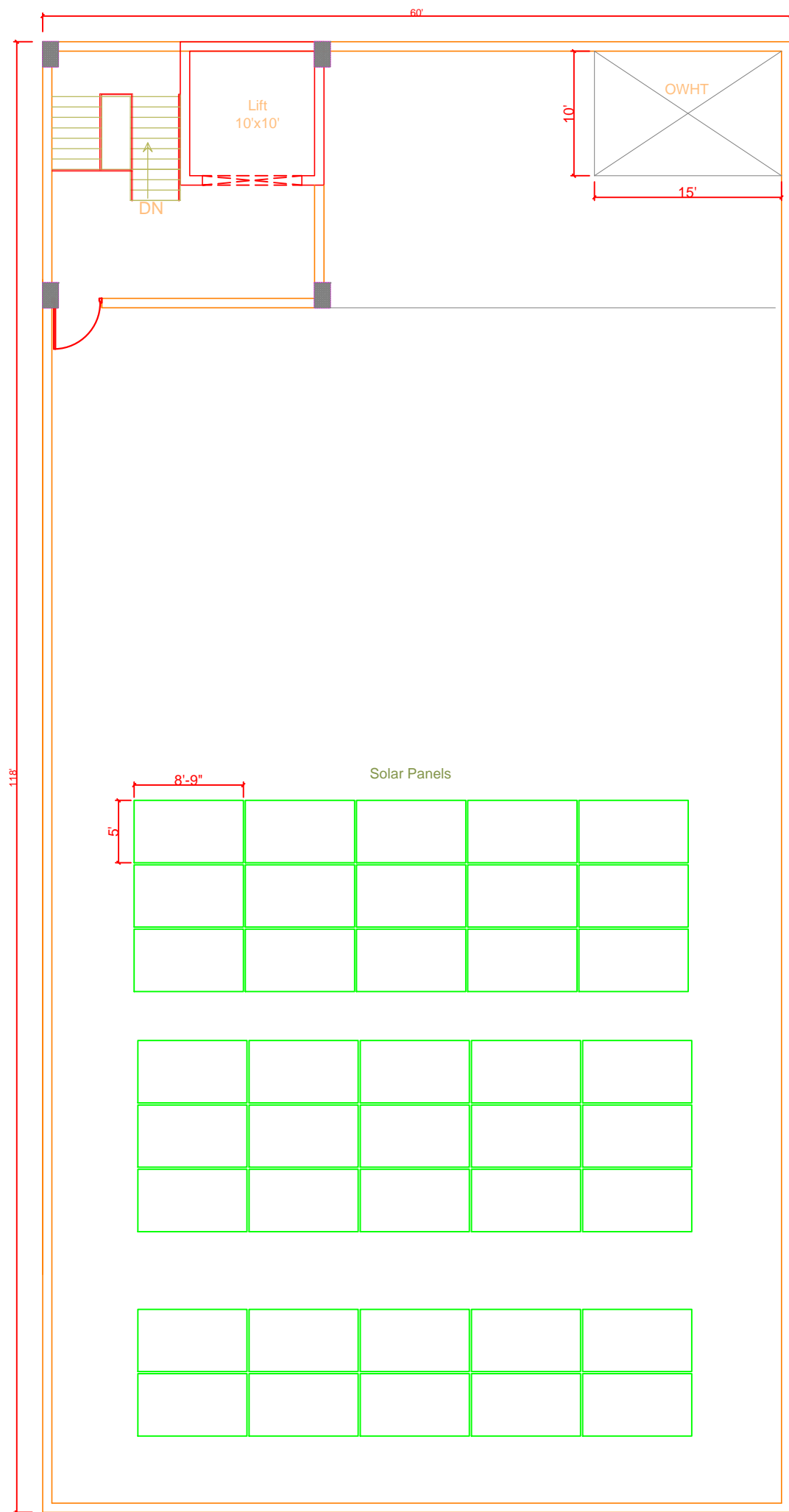
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DRAWING TITLE:		FIRST FLOOR PLAN	
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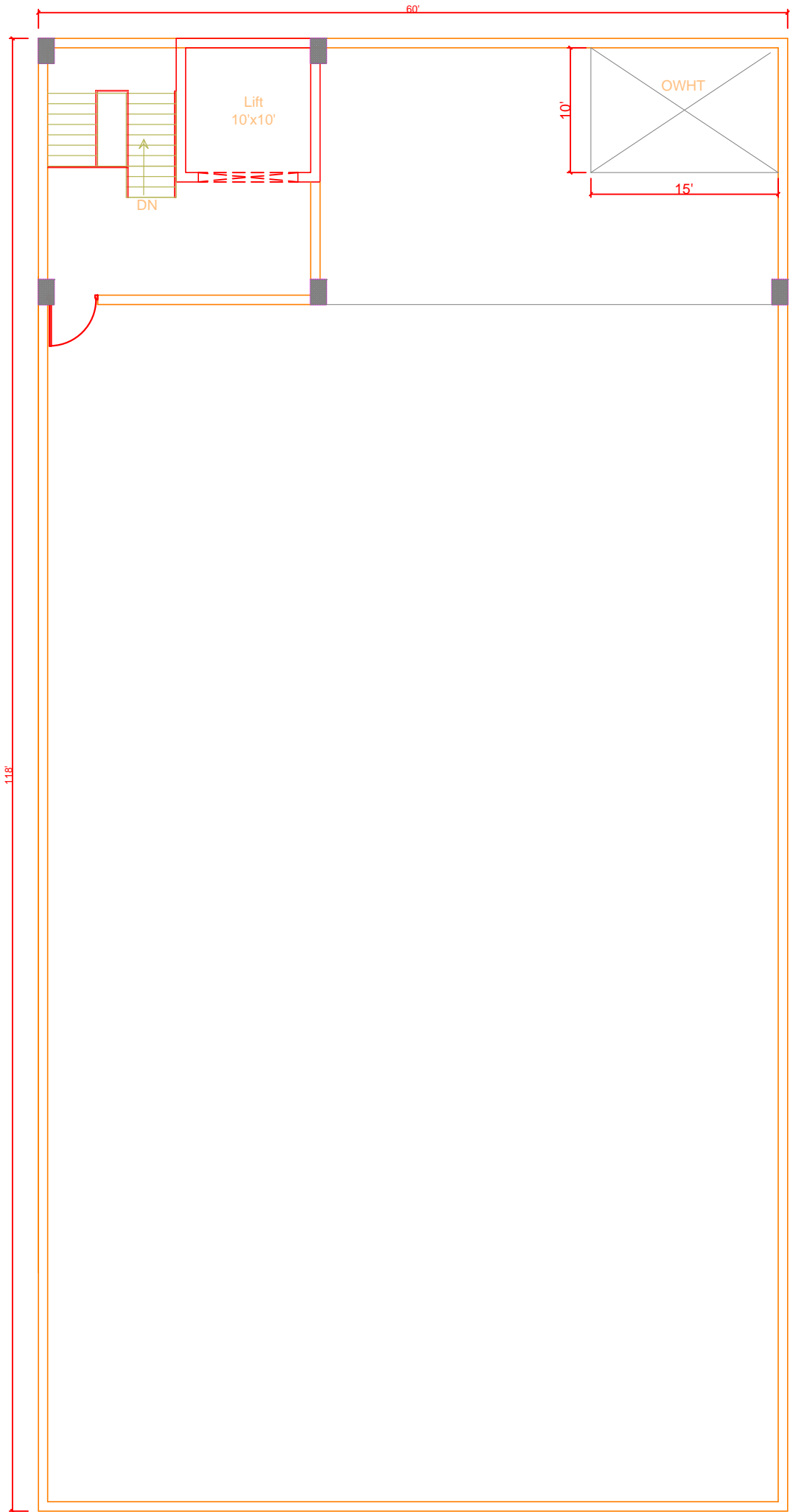
Roof Plan Option 01
(Shed for Hides to Dry Naturally) Possible

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BUILDING TITLE:		GREEN TANNERY-2 KANAL DESIGN RAW TO WET BLUE	
DRAWING TITLE:		ROOF PLAN	
SCALE :	NTS.	SHEET # :	5 OF 7
CHECKED BY :	MSA	DWG. # :	STZ-GTD-ARCH-01
		DATE :	01-09-2019



Roof Plan Option 02
(Solar Water Heating System) Possible

REV.	DESCRIPTION	BY	DATE
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BUILDING TITLE:		GREEN TANNERY-2 KANAL DESIGN RAW TO WET BLUE	
DRAWING TITLE:		ROOF PLAN	
SCALE :	NTS.	SHEET # :	6 OF 7
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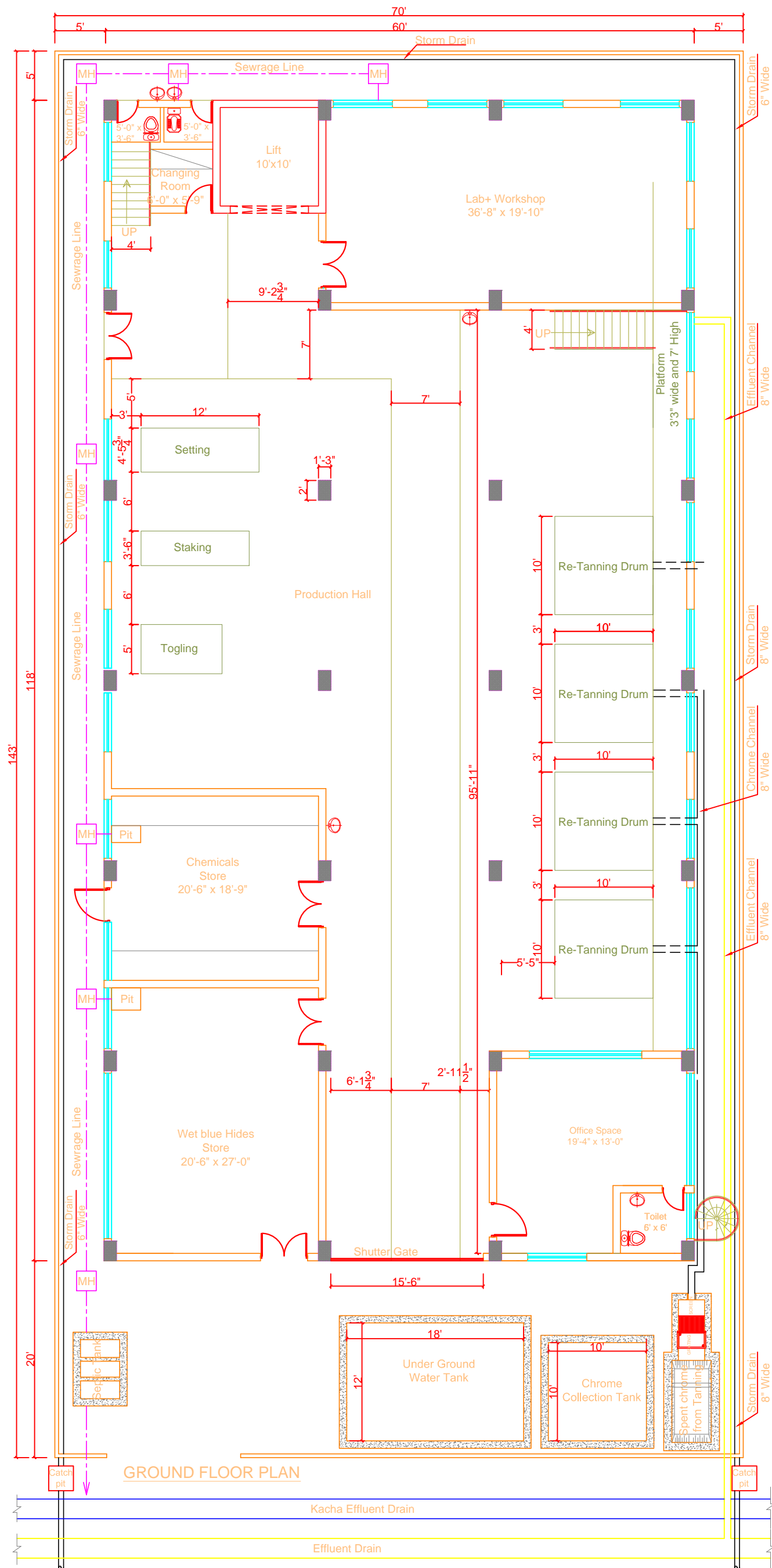


Roof Plan Option 03
(Solar Air Heating System) Possible

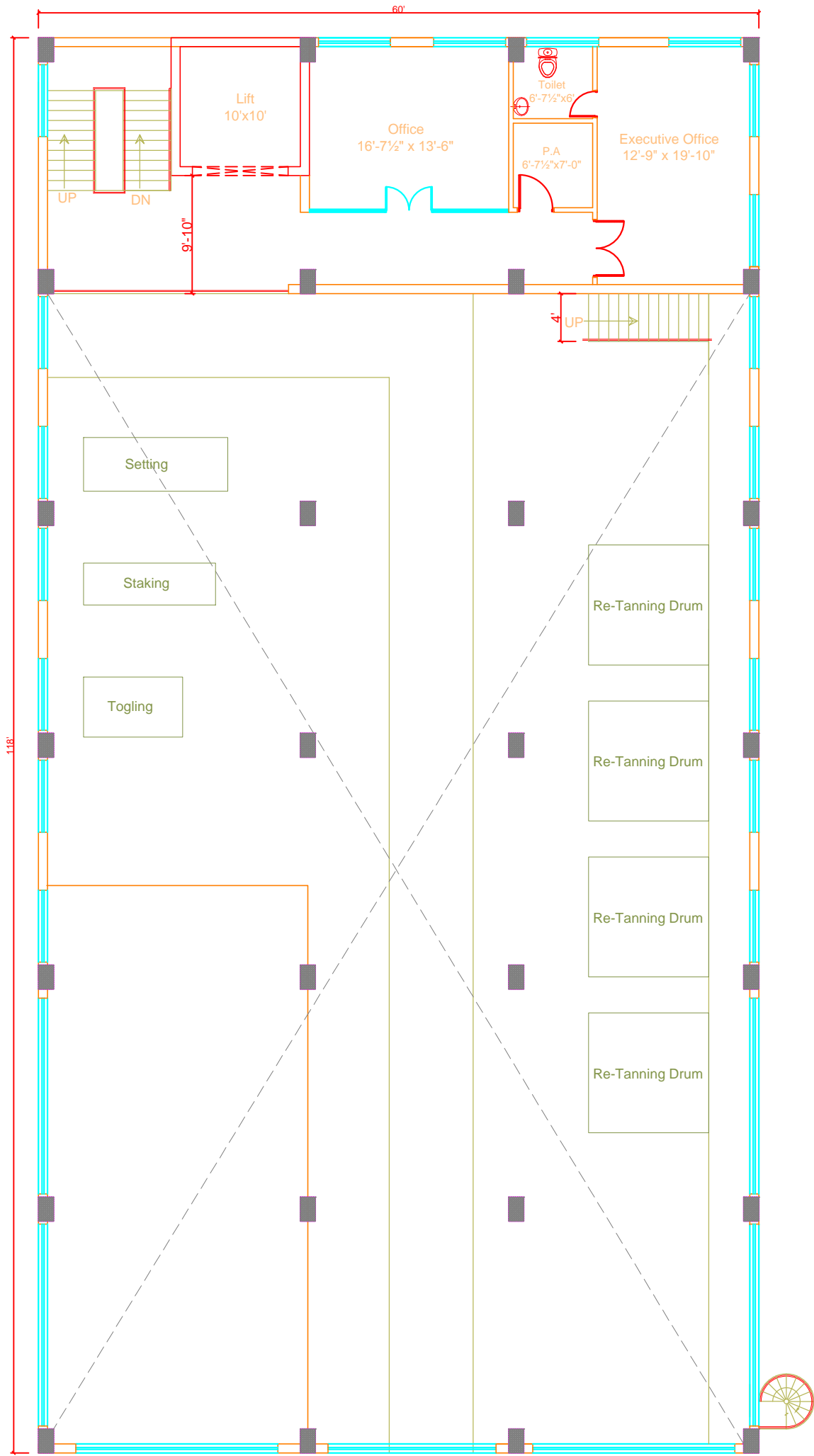
REV.	DESCRIPTION	BY	DATE
<div><div></div><div>IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54000 TEL:35869560-35869561 FAX:35869561</div></div>			
PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY-2 KANAL DESIGN RAW TO WET BLUE	
DRAWING TITLE:		ROOF PLAN	
SCALE :	SHEET # :	DWG. # :	
NTS.	7 OF 7	STZ-GTD-ARCH-01	
CHECKED BY :	DRAWN BY :	DATE :	
MSA	GULFAM	01-09-2019	

Annex-07C

Layouts for 2 Kanal Wet Blue to Finish

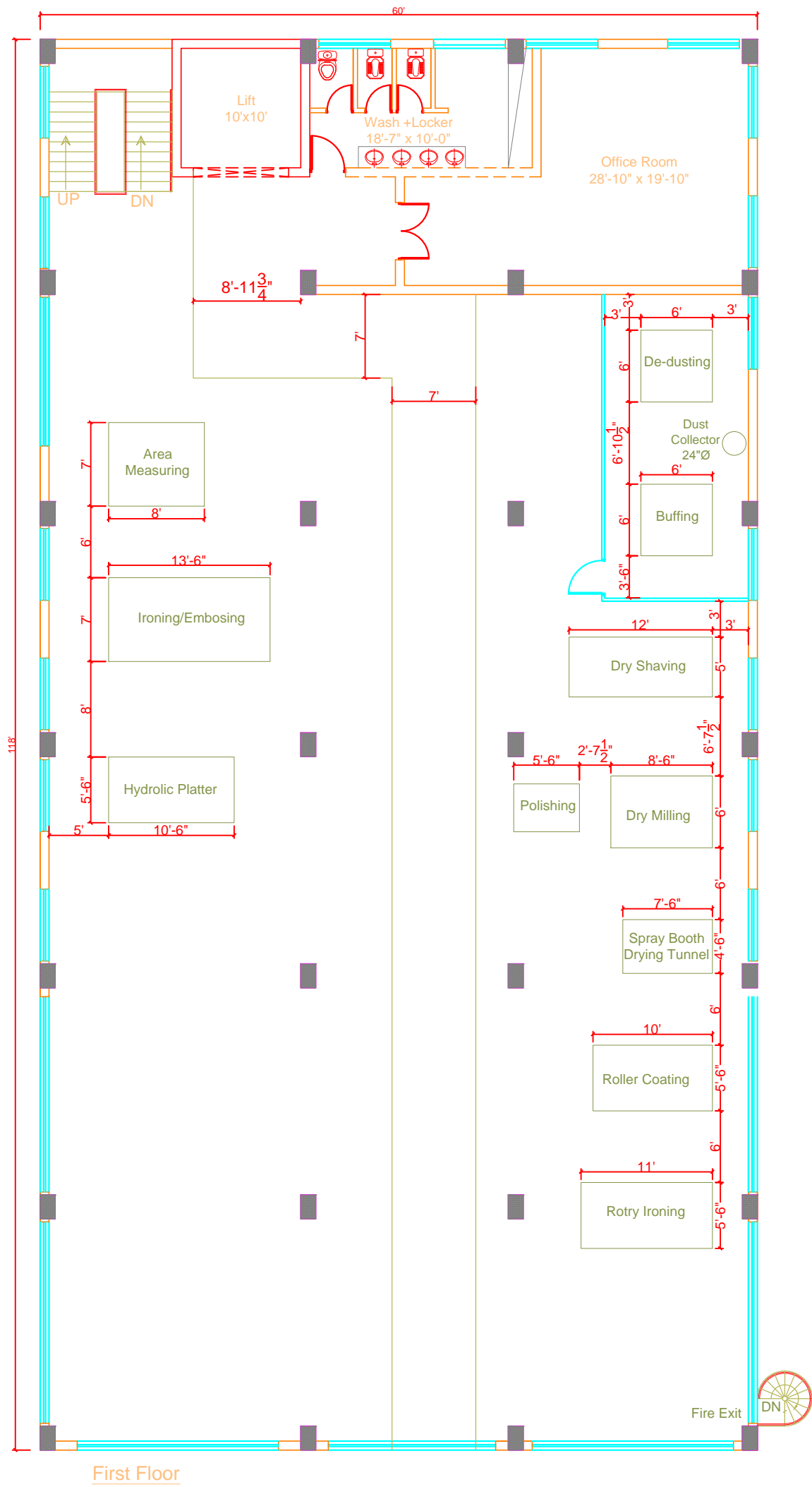


REV.	DESCRIPTION	BY	DATE
IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54800 TEL:35869560-35862234 FAX:35869561			
PROJECT : SIALKOT TANNERY ZONE			
BUILDING TITLE: GREEN TANNERY-2 KANAL DESIGN WET BLUE TO FINISH			
DRAWING TITLE: GROUND FLOOR PLAN			
SCALE : 3/32"=1'-0"	SHEET # : 1 OF 7	DWG. # :	STZ-GTD-ARCH-01
CHECKED BY : MSA	DRAWN BY : GULFAM	DATE :	01-09-2019



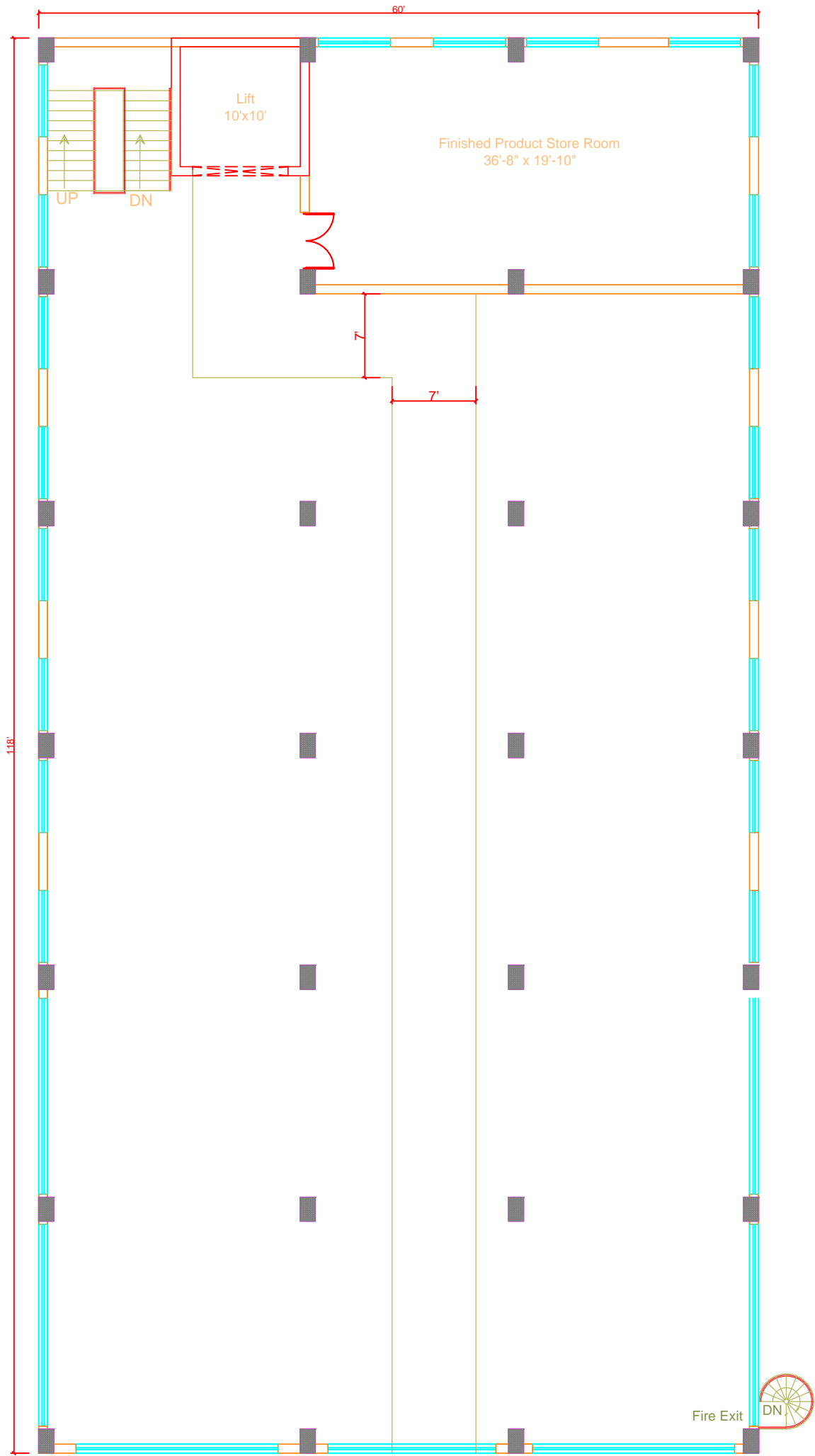
MEZZANINE FLOOR

REV.	DESCRIPTION	BY	DATE
<div><div></div><div>IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54800 TEL:35869560-358632234 FAX:35869561</div></div>			
PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY-2 KANAL DESIGN WET BLUE TO FINISH	
DRAWING TITLE:		MEZZANINE FLOOR PLAN	
SCALE :	NTS.	SHEET # : 2 OF 7	DWG. # : STZ-GTD-ARCH-01
CHECKED BY :	MSA	DRAWN BY : GULFAM	DATE : 01-09-2019



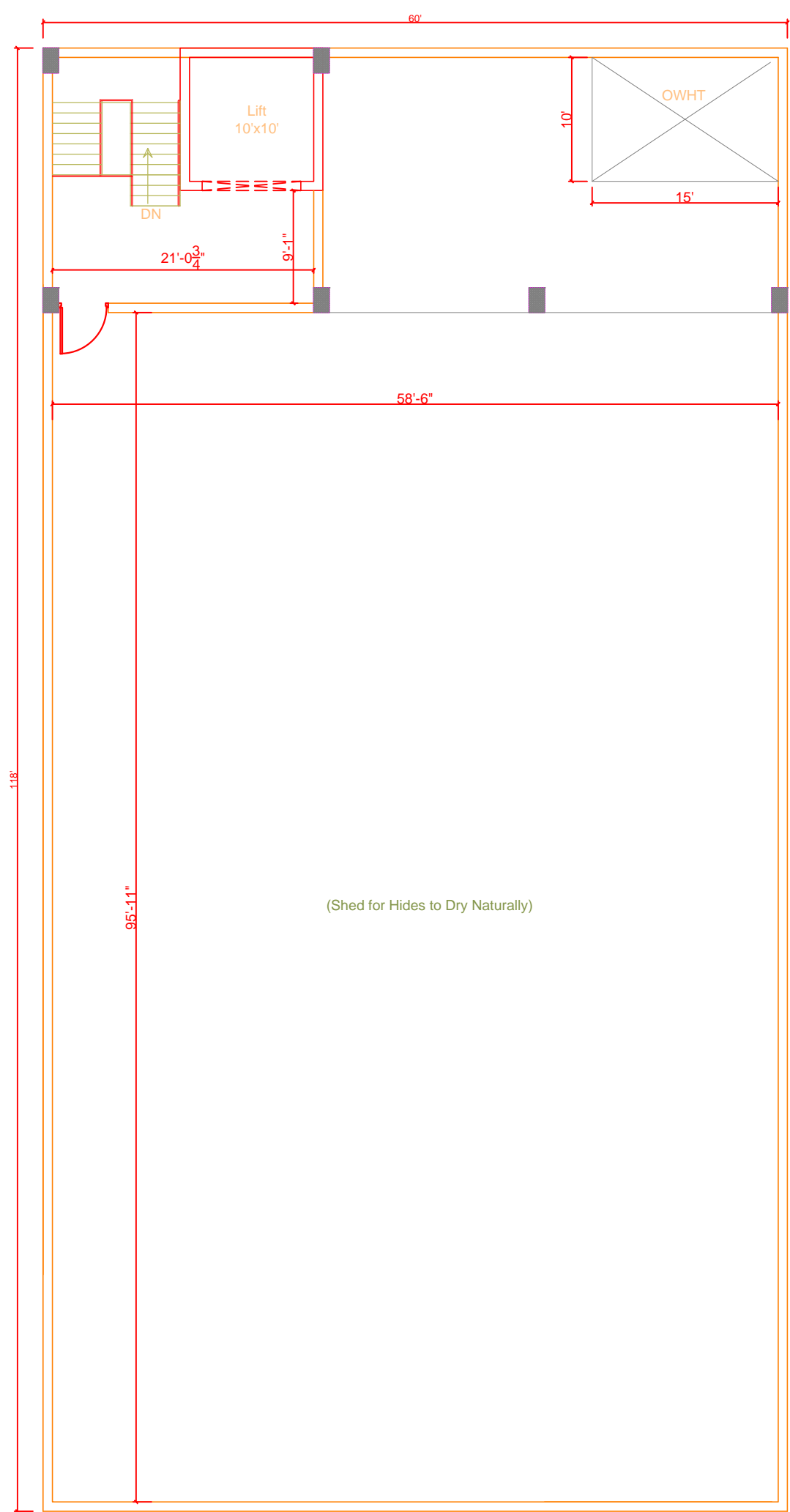
First Floor

REV.	DESCRIPTION	BY	DATE
<div><div></div><div>IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54000 TEL:35869560-35869561 FAX:35869561</div></div>			
PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY-2 KANAL DESIGN WET BLUE TO FINISH	
DRAWING TITLE:		FIRST FLOOR PLAN	
SCALE :	NTS.	SHEET # : 3 OF 7	DWG. # : STZ-GTD-ARCH-01
CHECKED BY :	MSA	DRAWN BY : GULFAM	DATE : 01-09-2019



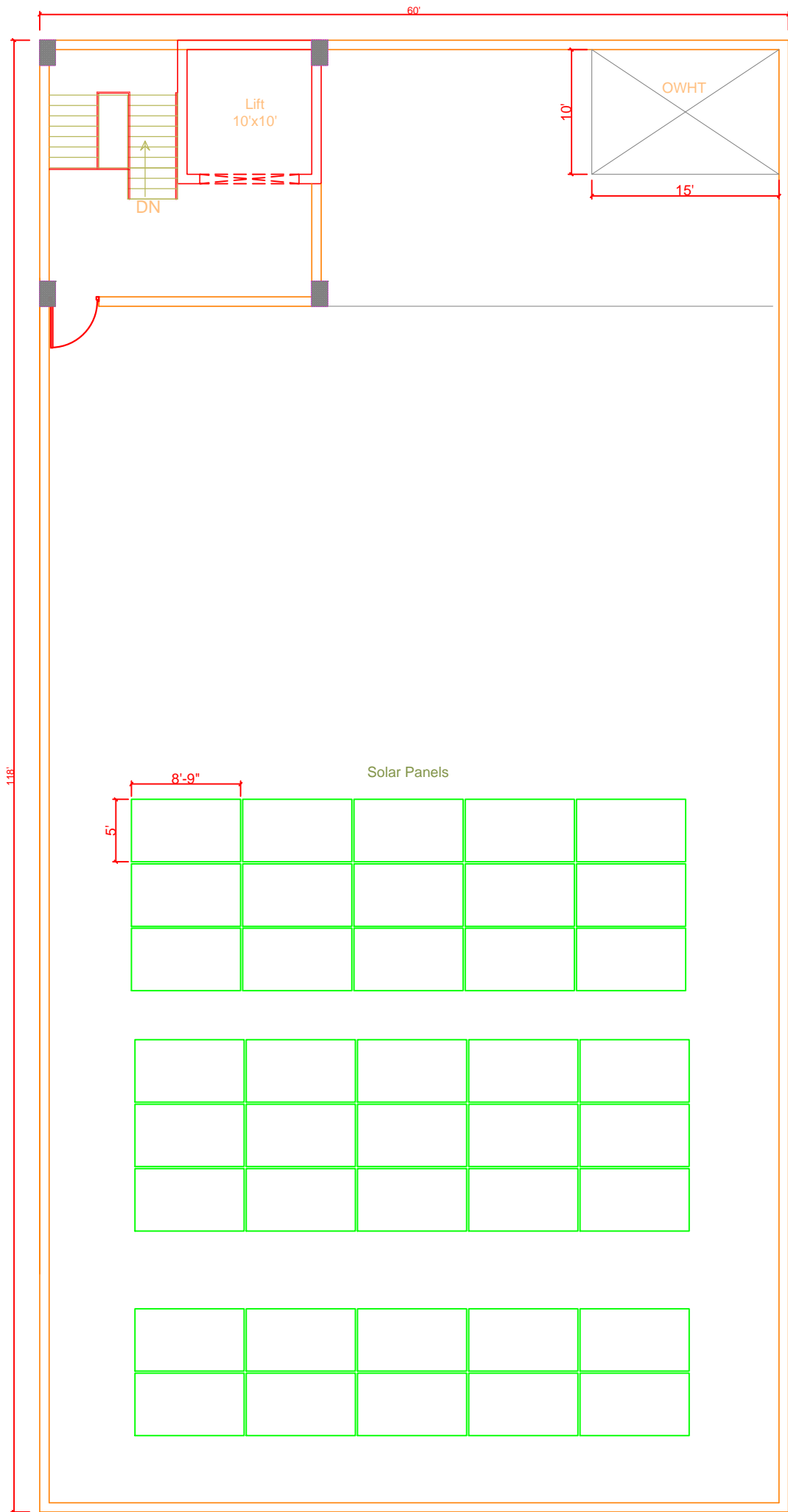
Second Floor

REV.	DESCRIPTION	BY	DATE
<div><div></div><div>IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54000 TEL:35869560-35862234 FAX:35869561</div></div>			
PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY-2 KANAL DESIGN WET BLUE TO FINISH	
DRAWING TITLE:		SECOND FLOOR PLAN	
SCALE :	NTS.	SHEET # : 4 OF 7	DWG. # : STZ-GTD-ARCH-01
CHECKED BY :	MSA	DRAWN BY : GULFAM	DATE : 01-09-2019




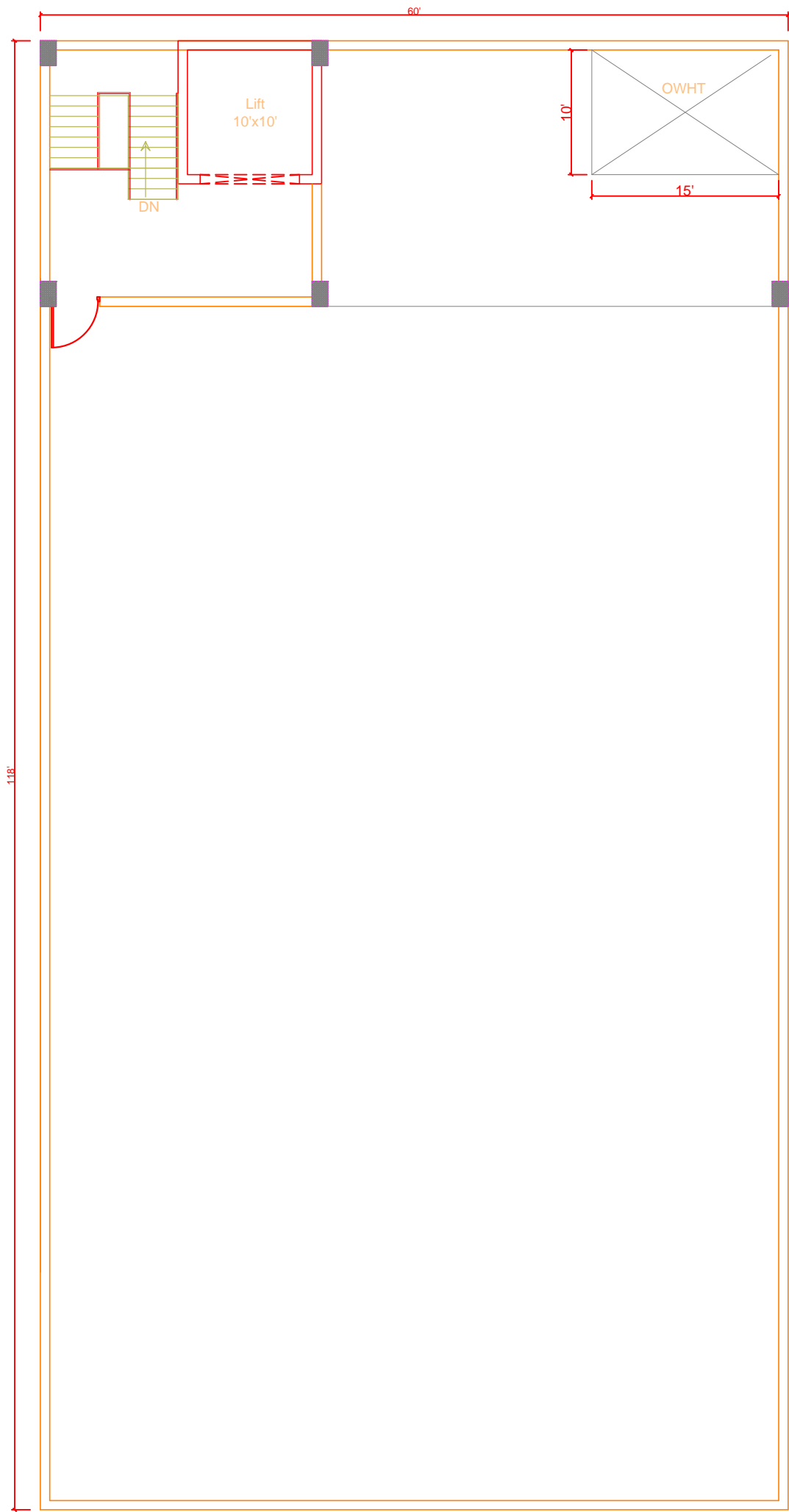
Roof Plan Option 01
(Shed for Hides to Dry Naturally) Possible

REV.	DESCRIPTION	BY	DATE
<div><div></div><div>IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54000 TEL:35869560-35869561 FAX:35869561</div></div>			
PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY-2 KANAL DESIGN WET BLUE TO FINISH	
DRAWING TITLE:		ROOF PLAN	
SCALE :	NTS.	SHEET # :	5 OF 7
CHECKED BY :	MSA	DRAWN BY :	GULFAM
		DWG. # :	STZ-GTD-ARCH-01
		DATE :	01-09-2019



Roof Plan Option 02
(Solar Water Heating System) Possible

REV.	DESCRIPTION	BY	DATE
<div><div></div><div>IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54000 TEL:35869560-35869561 FAX:35869561</div></div>			
PROJECT :	SIALKOT TANNERY ZONE		
BUILDING TITLE:	GREEN TANNERY-2 KANAL DESIGN WET BLUE TO FINISH		
DRAWING TITLE:	ROOF PLAN		
SCALE :	NTS.	SHEET # : 6 OF 7	DWG. # : STZ-GTD-ARCH-01
CHECKED BY :	MSA	DRAWN BY : GULFAM	DATE : 01-09-2019

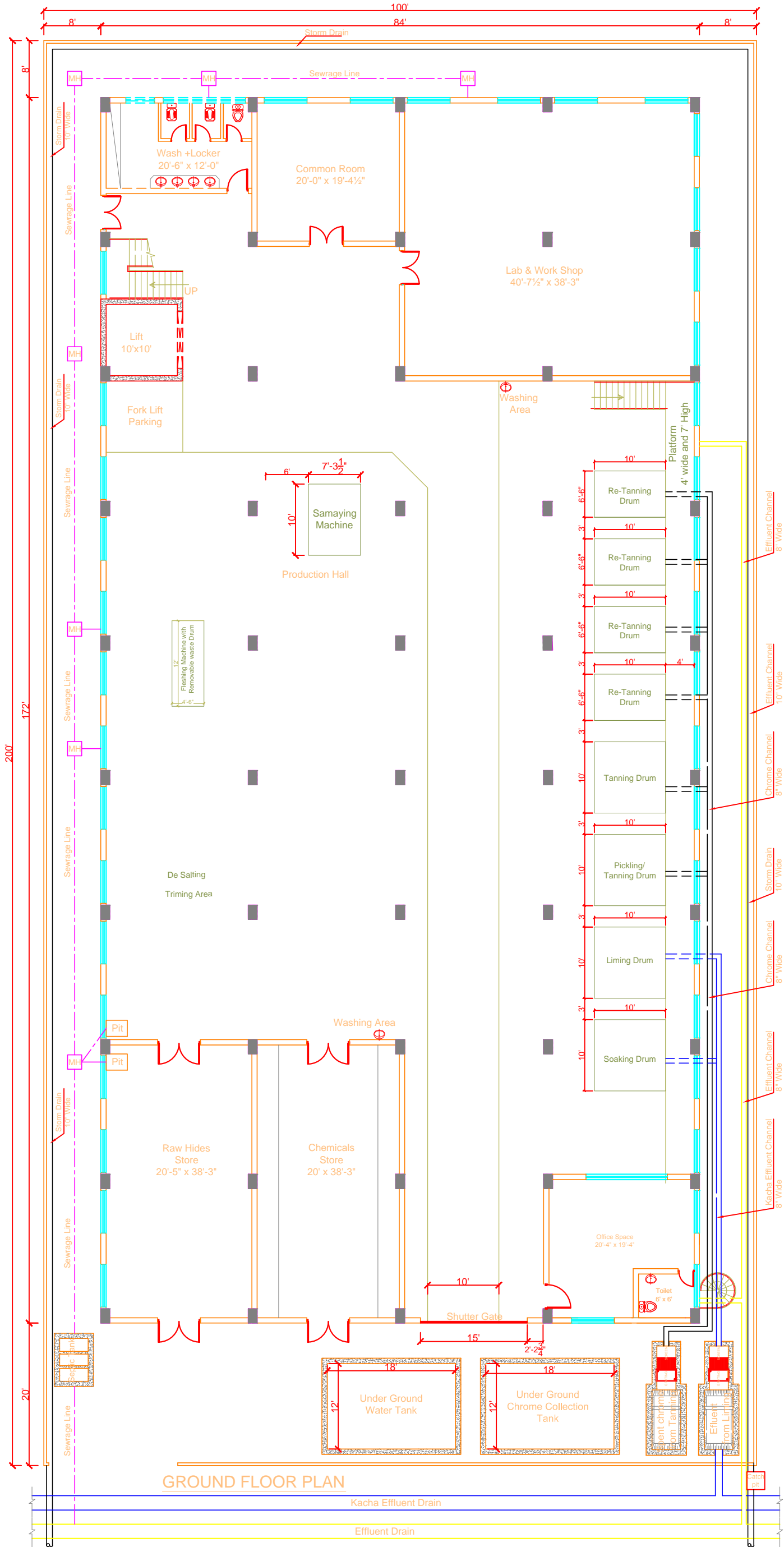


Roof Plan Option 03
(Solar Air Heating System) Possible

REV.	DESCRIPTION	BY	DATE
<div><div></div><div>IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54000 TEL:35869560-35869561 FAX:35869561</div></div>			
PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY-2 KANAL DESIGN WET BLUE TO FINISH	
DRAWING TITLE:		ROOF PLAN	
SCALE :	NTS.	SHEET # :	7 OF 7
CHECKED BY :	MSA	DWG. # :	STZ-GTD-ARCH-01
		DATE :	01-09-2019

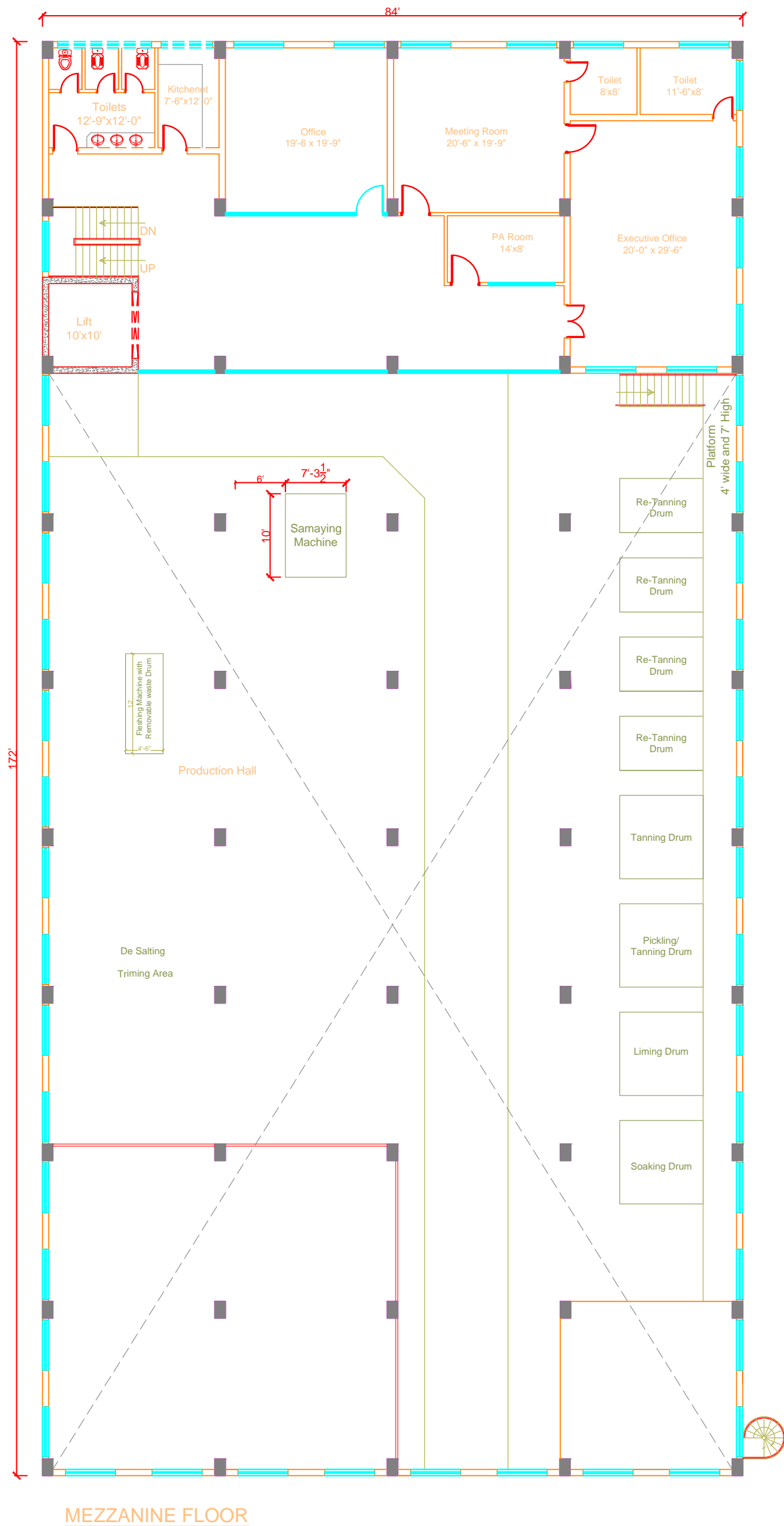
Annex-08A

Layouts for 4 Kanal Raw to Finish




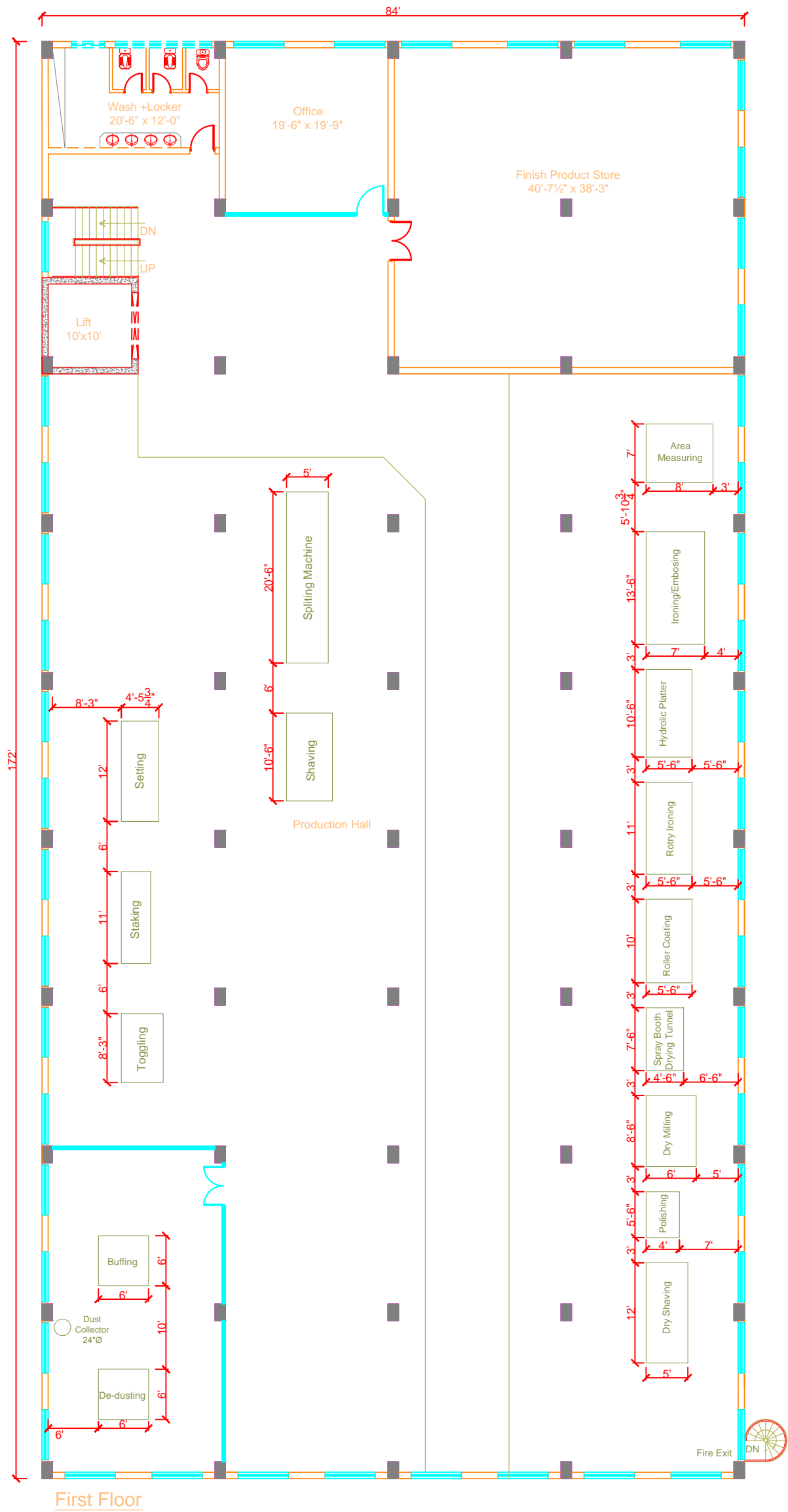
GROUND FLOOR PLAN

REV.	DESCRIPTION	BY	DATE
	IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54630 TEL:35869560-35832234 FAX:35869561		
PROJECT :	SIALKOT TANNERY ZONE		
BUILDING TITLE:	GREEN TANNERY-4 KANAL DESIGN RAW TO FINISH		
DRAWING TITLE:	GROUND FLOOR PLAN		
SCALE :	NTS.	SHEET # : 1 OF 7	DWG. # : STZ-GTD-ARCH-01
CHECKED BY :	MSA	DRAWN BY : GULFAM	DATE : 01-09-2019




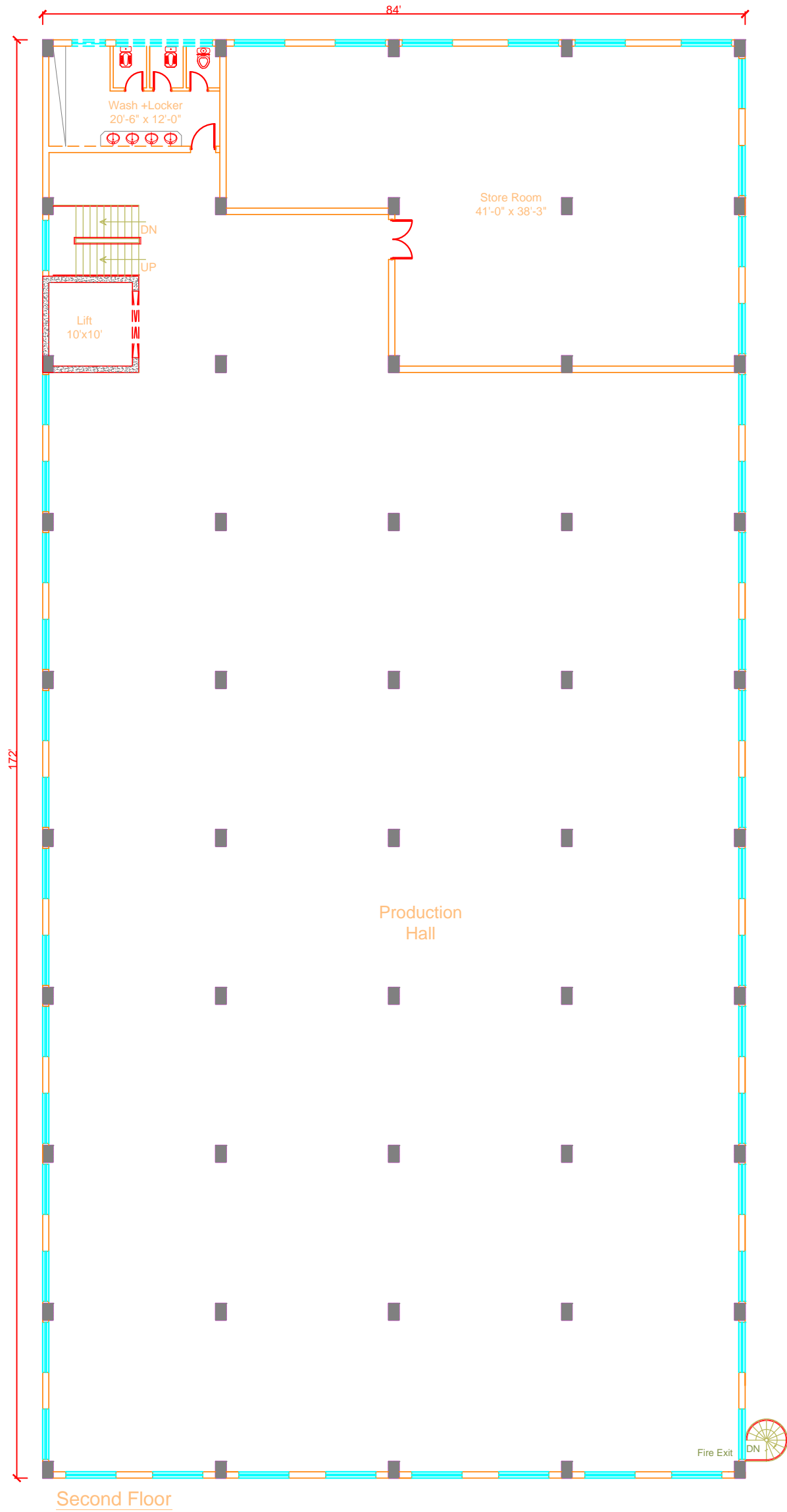
MEZZANINE FLOOR

REV.	DESCRIPTION	BY	DATE
<div>IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54000 TEL:35869560-35869561 FAX:35869561</div>			
PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY-4 KANAL DESIGN RAW TO FINISH	
DRAWING TITLE:		MEZZANINE FLOOR PLAN	
SCALE :	NTS.	SHEET # : 2 OF 7	DWG. # : STZ-GTD-ARCH-01
CHECKED BY :	MSA	DRAWN BY : GULFAM	DATE : 01-09-2019



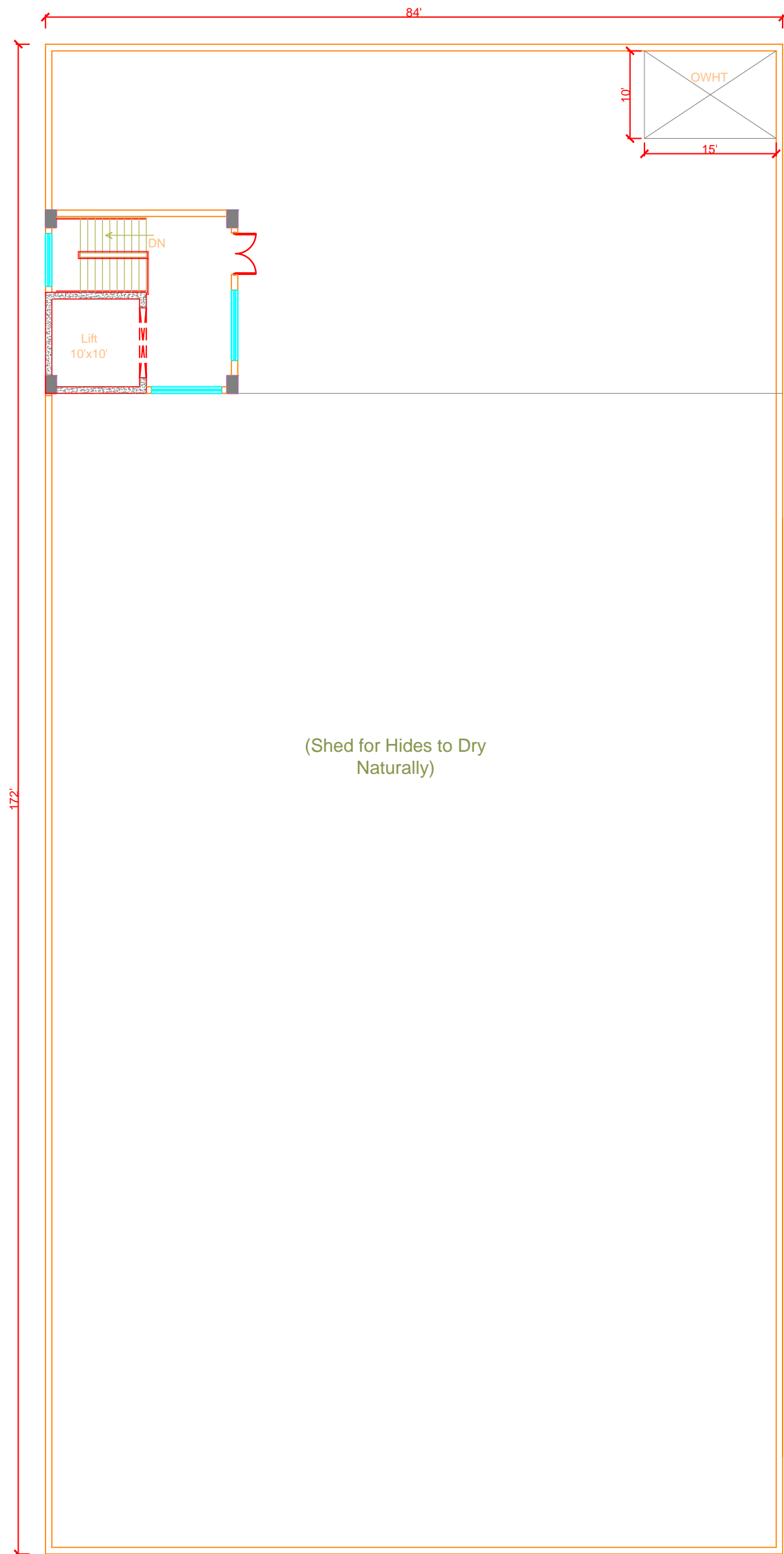
First Floor

REV.	DESCRIPTION	BY	DATE
<div>IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54600 TEL: 35869560-35832234 FAX: 35869561</div>			
PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY-4 KANAL DESIGN RAW TO FINISH	
DRAWING TITLE:		FIRST FLOOR PLAN	
SCALE :	NTS.	SHEET # : 3 OF 7	DWG. # : STZ-GTD-ARCH-01
CHECKED BY :	MSA	DRAWN BY : GULFAM	DATE : 01-09-2019




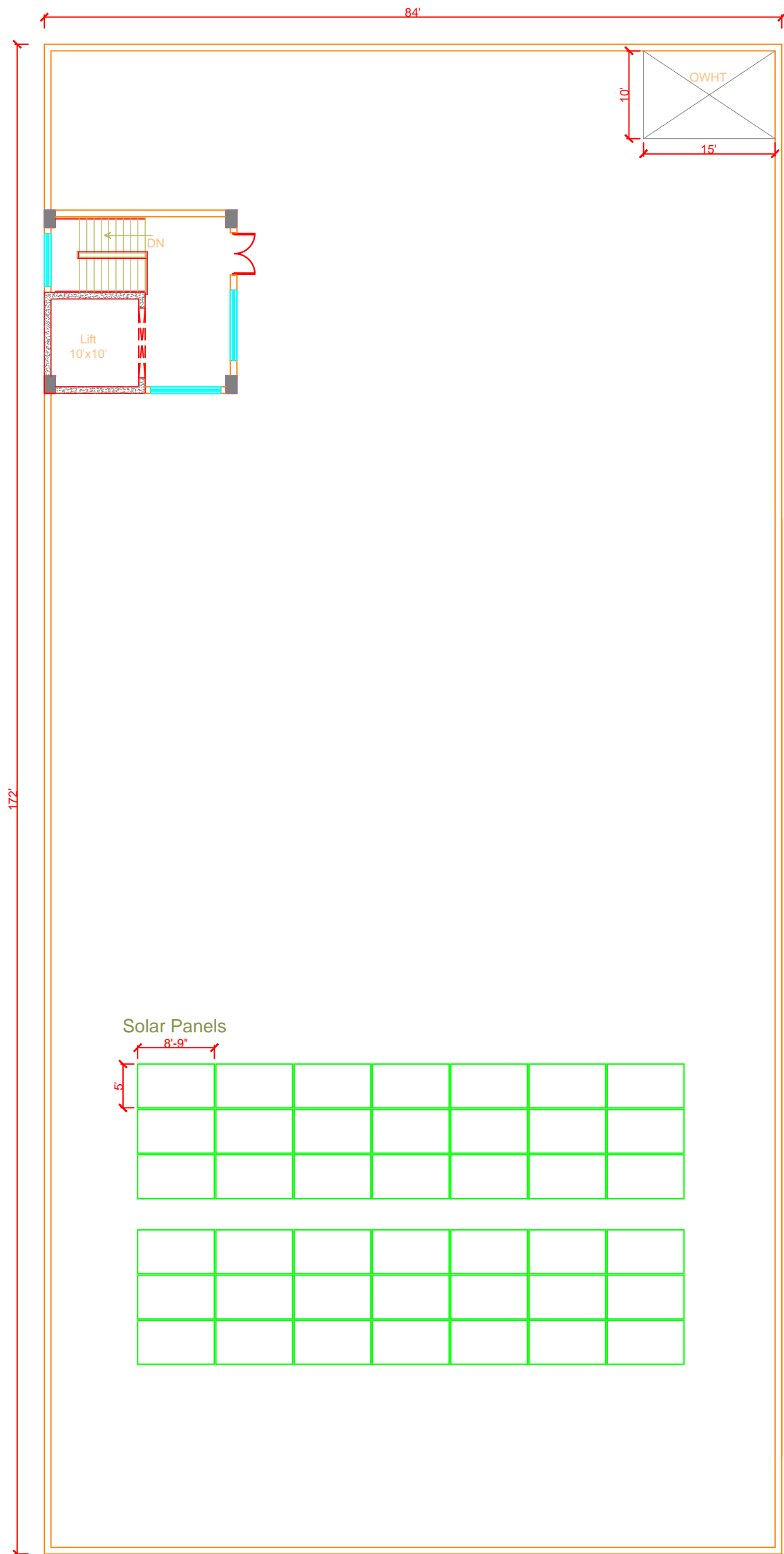
Second Floor

REV.	DESCRIPTION	BY	DATE
<div><div></div><div>IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54000 TEL:35869560-35869561 FAX:35869561</div></div>			
PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY-4 KANAL DESIGN RAW TO FINISH	
DRAWING TITLE:		SECOND FLOOR PLAN	
SCALE :	NTS.	SHEET # :	4 OF 7
CHECKED BY :	MSA	DRAWN BY :	GULFAM
		DATE :	01-09-2019




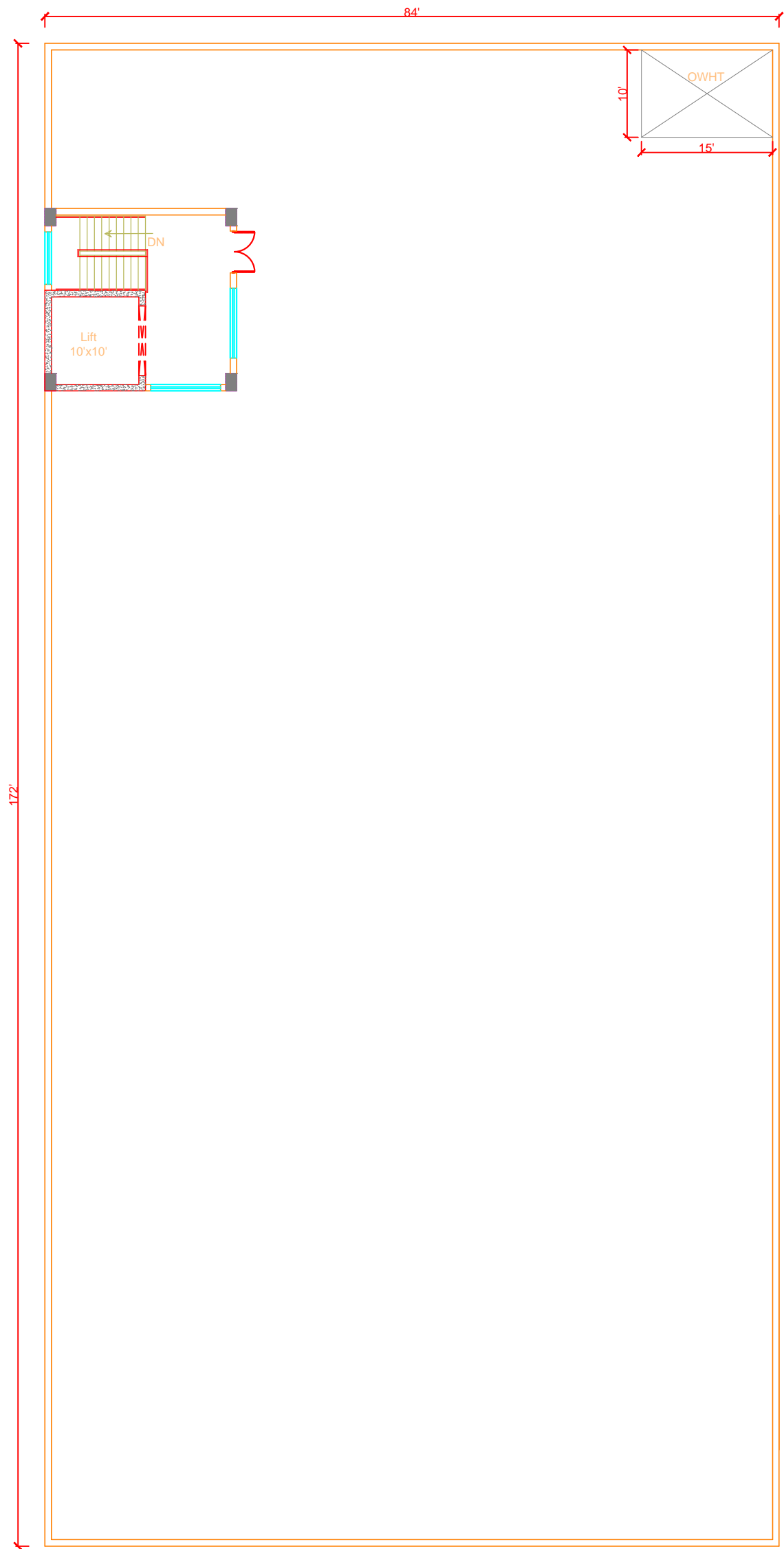
Roof Plan Option 01
(Shed for Hides to Dry Naturally)Possible

REV.		DESCRIPTION	BY	DATE
<div><div></div><div>IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54000 TEL:35869560-35832234 Fax:35869561</div></div>				
PROJECT :		SIALKOT TANNERY ZONE		
BUILDING TITLE:		GREEN TANNERY-4 KANAL DESIGN RAW TO FINISH		
DRAWING TITLE:		ROOF PLAN		
SCALE :	NTS.	SHEET # :	5 OF 7	DWG. # : STZ-GTD-ARCH-01
CHECKED BY :	MSA	DRAWN BY :	GULFAM	DATE : 01-09-2019




Roof Plan Option 02
(Solar Water Heating System) Possible

REV.	DESCRIPTION	BY	DATE
<div><div></div><div>IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54000 TEL:35869560-35869561 FAX:35869561</div></div>			
PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY-4 KANAL DESIGN RAW TO FINISH	
DRAWING TITLE:		ROOF PLAN	
SCALE :	NTS.	SHEET # : 6 OF 7	DWG. # : STZ-GTD-ARCH-01
CHECKED BY :	MSA	DRAWN BY : GULFAM	DATE : 01-09-2019

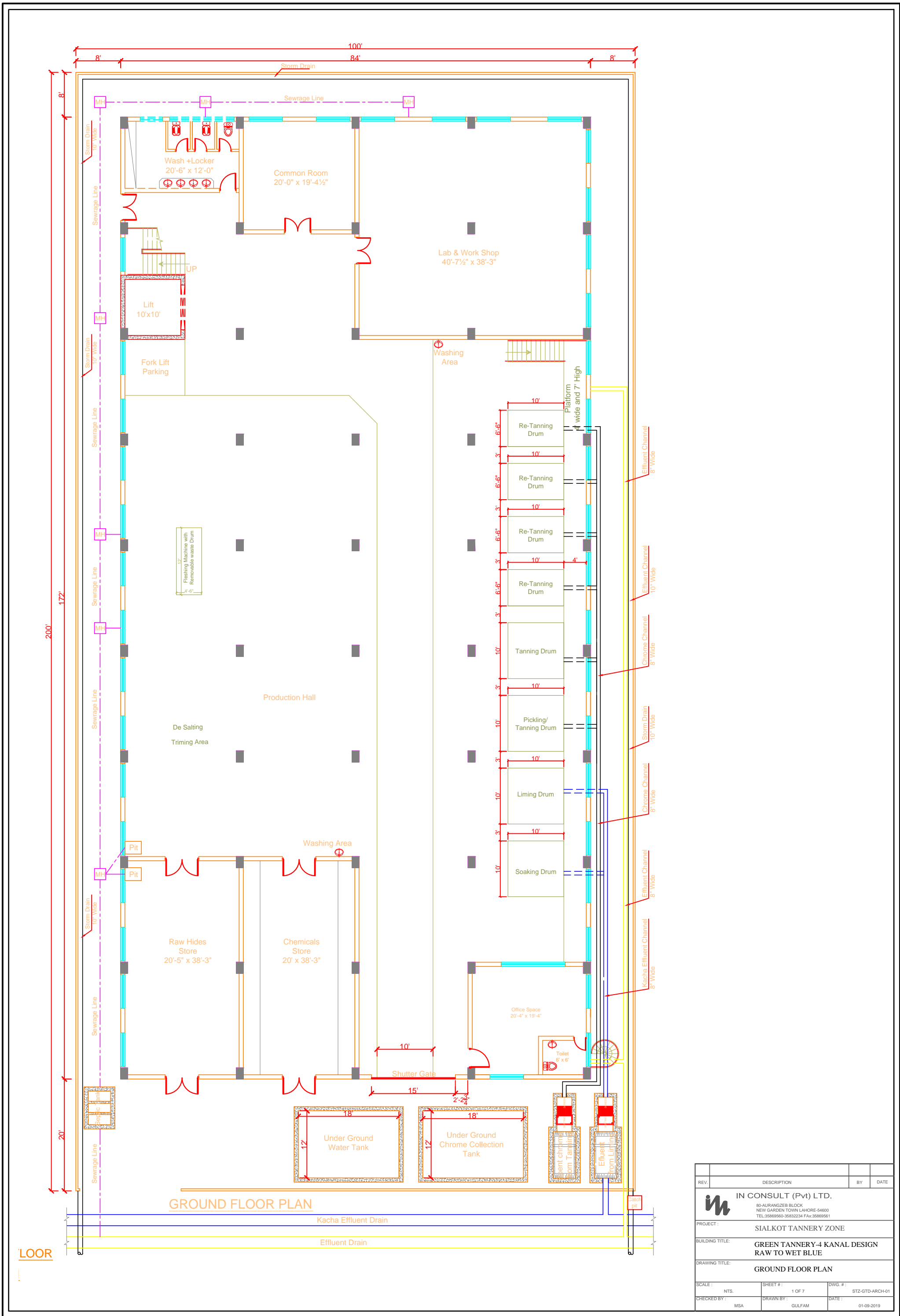


Roof Plan Option 03
(Solar Air Heating System) Possible

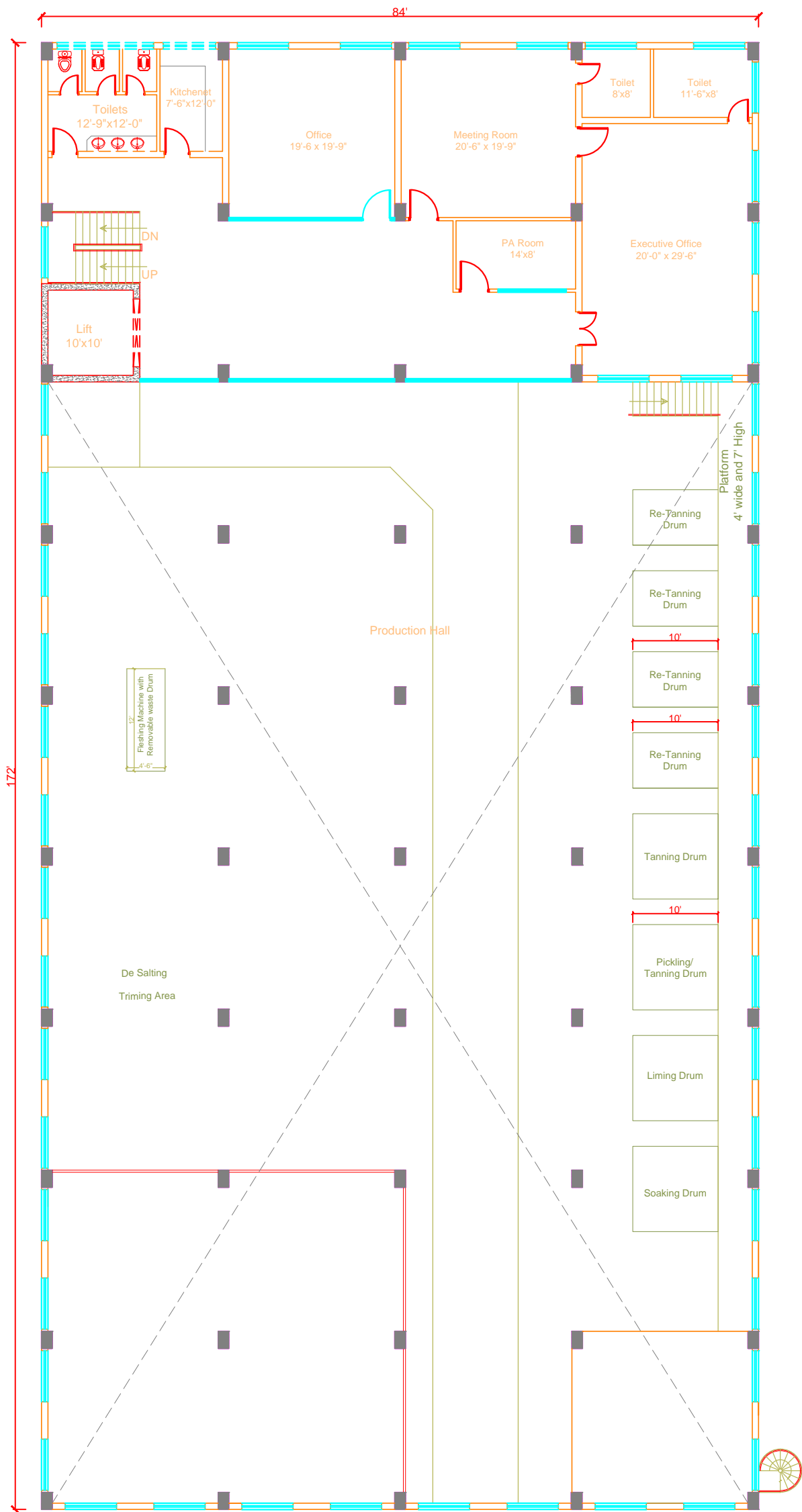
REV.	DESCRIPTION	BY	DATE
<div><div></div><div>IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54000 TEL:35869560-35869561 FAX:35869561</div></div>			
PROJECT :	SIALKOT TANNERY ZONE		
BUILDING TITLE:	GREEN TANNERY-4 KANAL DESIGN RAW TO FINISH		
DRAWING TITLE:	ROOF PLAN		
SCALE :	NTS.	SHEET # : 7 OF 7	DWG. # : STZ-GTD-ARCH-01
CHECKED BY :	MSA	DRAWN BY : GULFAM	DATE : 01-09-2019

Annex-08B

Layouts for 4 Kanal Raw to Wet Blue

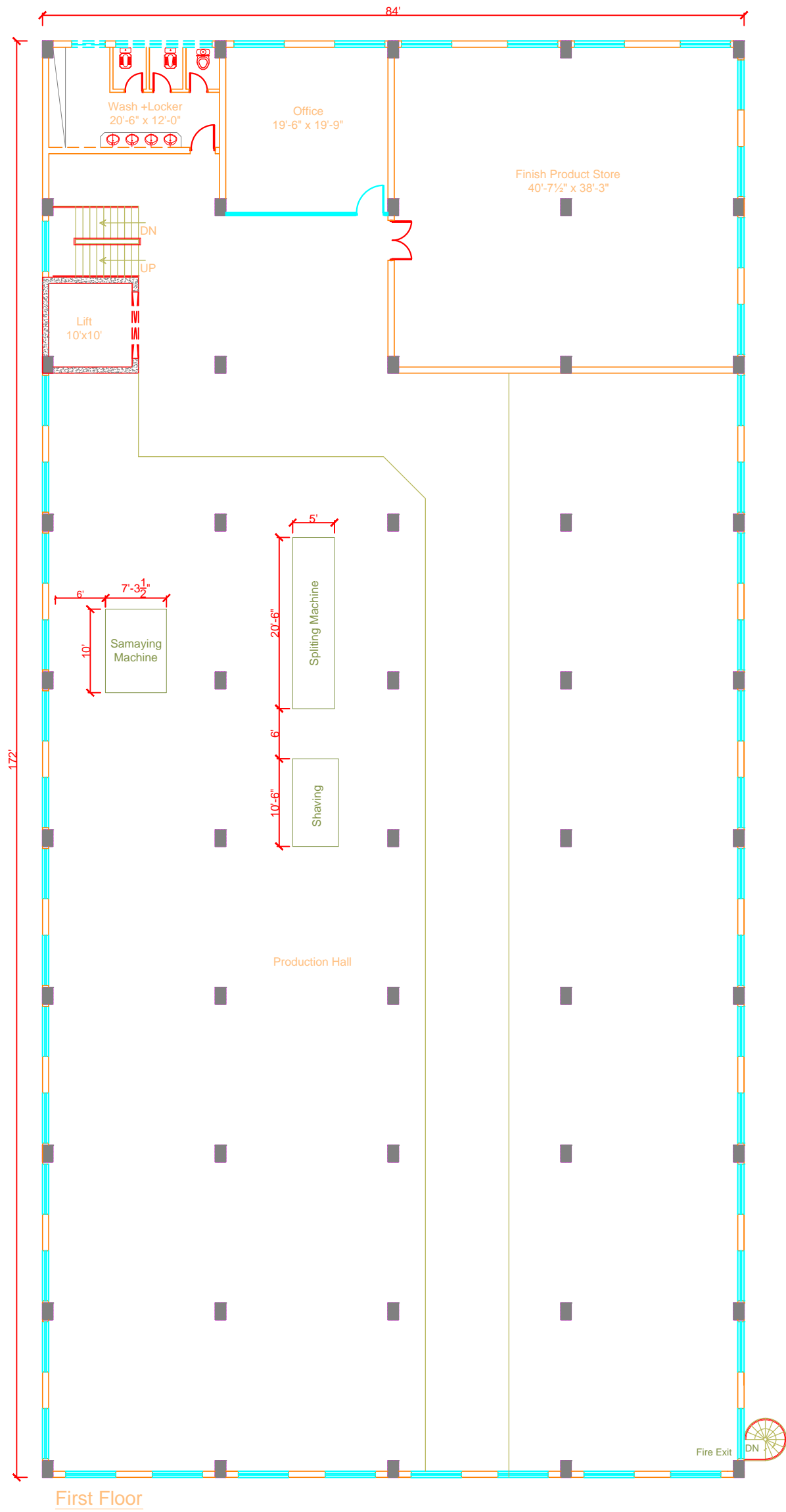


REV.	DESCRIPTION	BY	DATE
	IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54800 TEL:35869560-35832234 FAX:35869561		
PROJECT :	SIALKOT TANNERY ZONE		
BUILDING TITLE:	GREEN TANNERY-4 KANAL DESIGN RAW TO WET BLUE		
DRAWING TITLE:	GROUND FLOOR PLAN		
SCALE :	NTS.	SHEET # : 1 OF 7	DWG. # : STZ-GTD-ARCH-01
CHECKED BY :	MSA	DRAWN BY : GULFAM	DATE : 01-09-2019

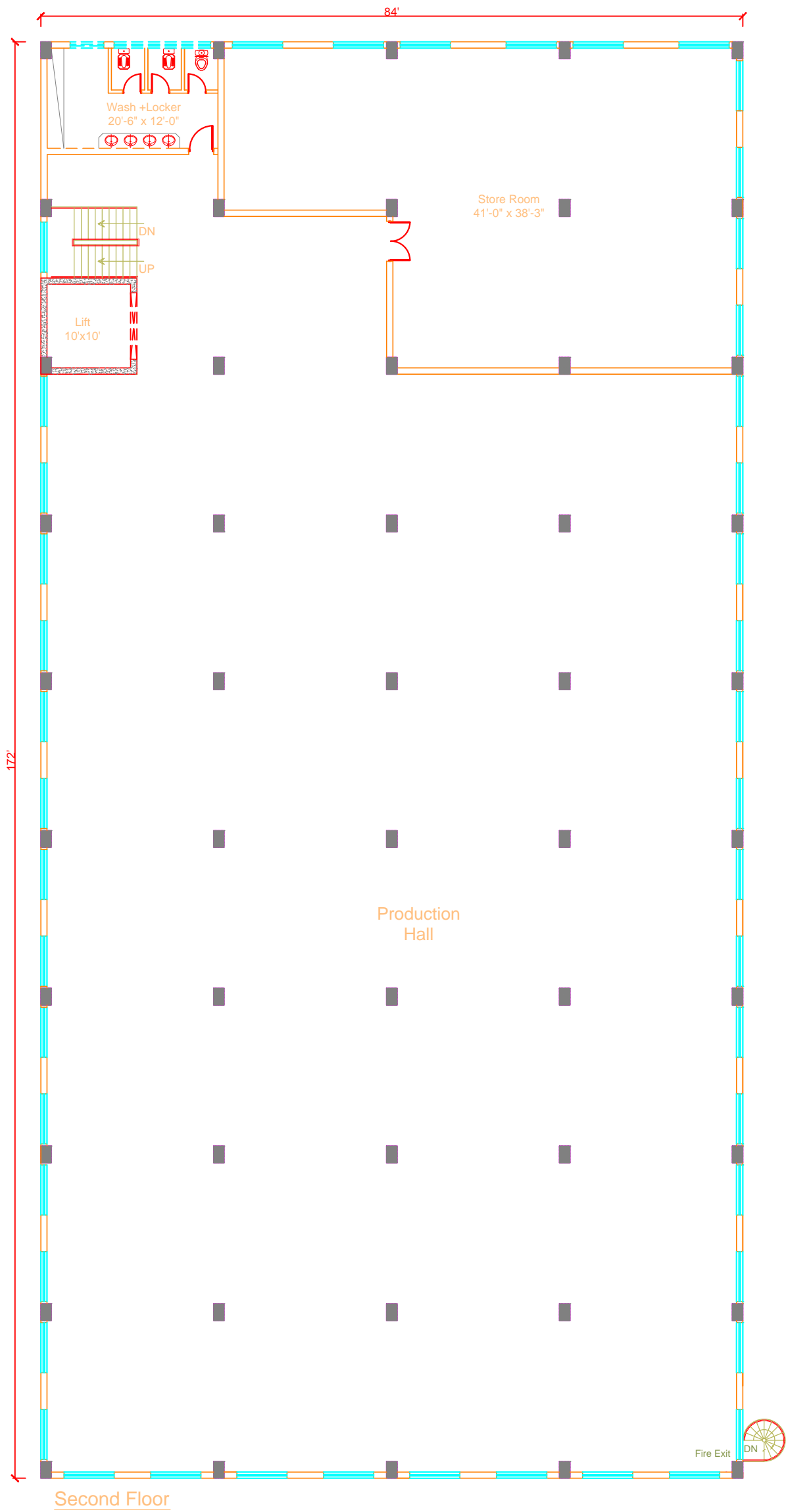


MEZZANINE FLOOR

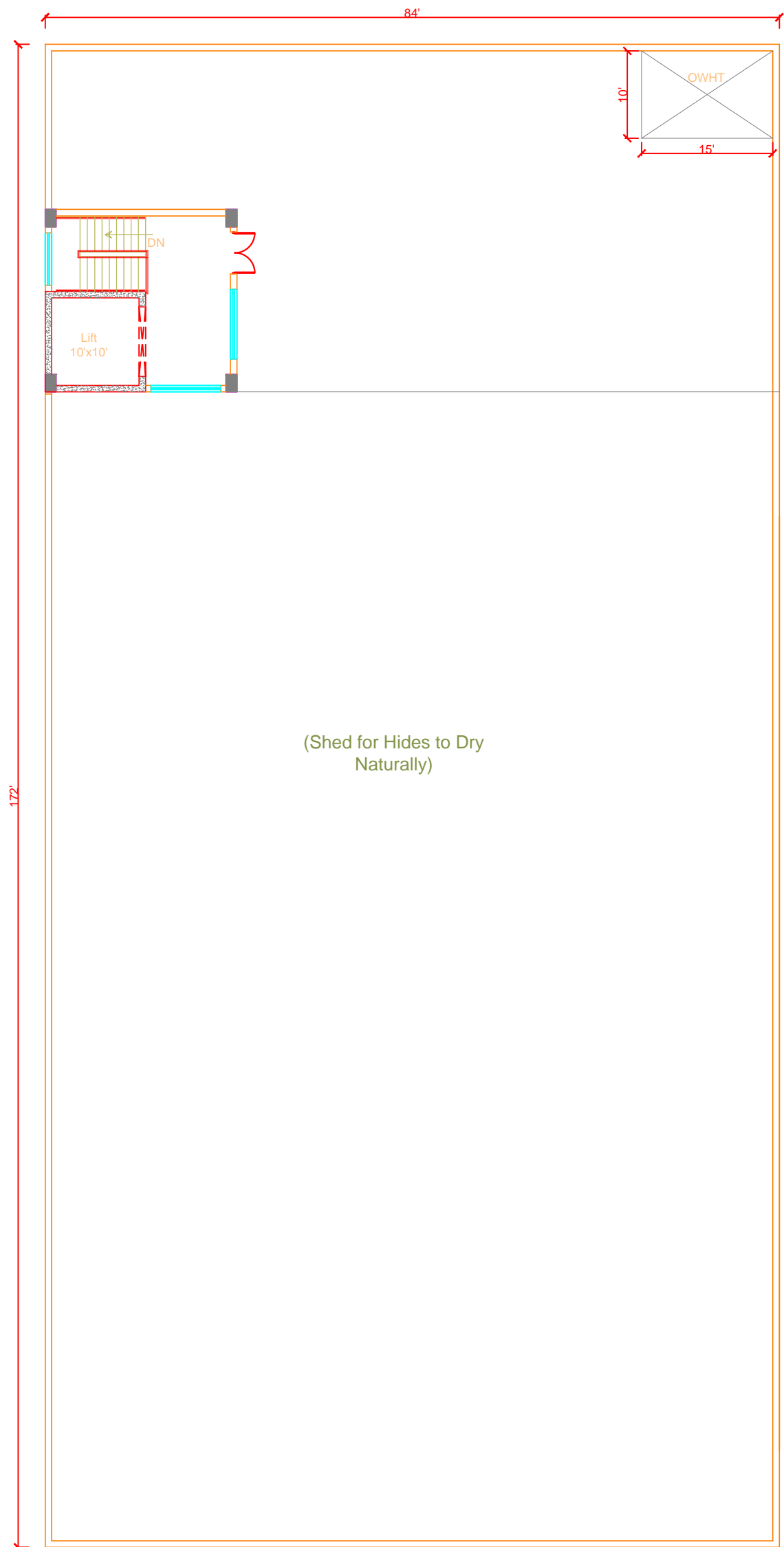
REV.	DESCRIPTION	BY	DATE
<div>IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54000 TEL:35869560-35869561 FAX:35869561</div>			
PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY-4 KANAL DESIGN RAW TO WET BLUE	
DRAWING TITLE:		MEZZANINE FLOOR PLAN	
SCALE :	NTS.	SHEET # : 2 OF 7	DWG. # : STZ-GTD-ARCH-01
CHECKED BY :	MSA	DRAWN BY : GULFAM	DATE : 01-09-2019




REV.	DESCRIPTION	BY	DATE
<div><div></div><div>IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54000 TEL:35869560-35832234 FAX:35869561</div></div>			
PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY-4 KANAL DESIGN RAW TO WET BLUE	
DRAWING TITLE:		FIRST FLOOR PLAN	
SCALE :	NTS.	SHEET # : 3 OF 7	DWG. # : STZ-GTD-ARCH-01
CHECKED BY :	MSA	DRAWN BY : GULFAM	DATE : 01-09-2019

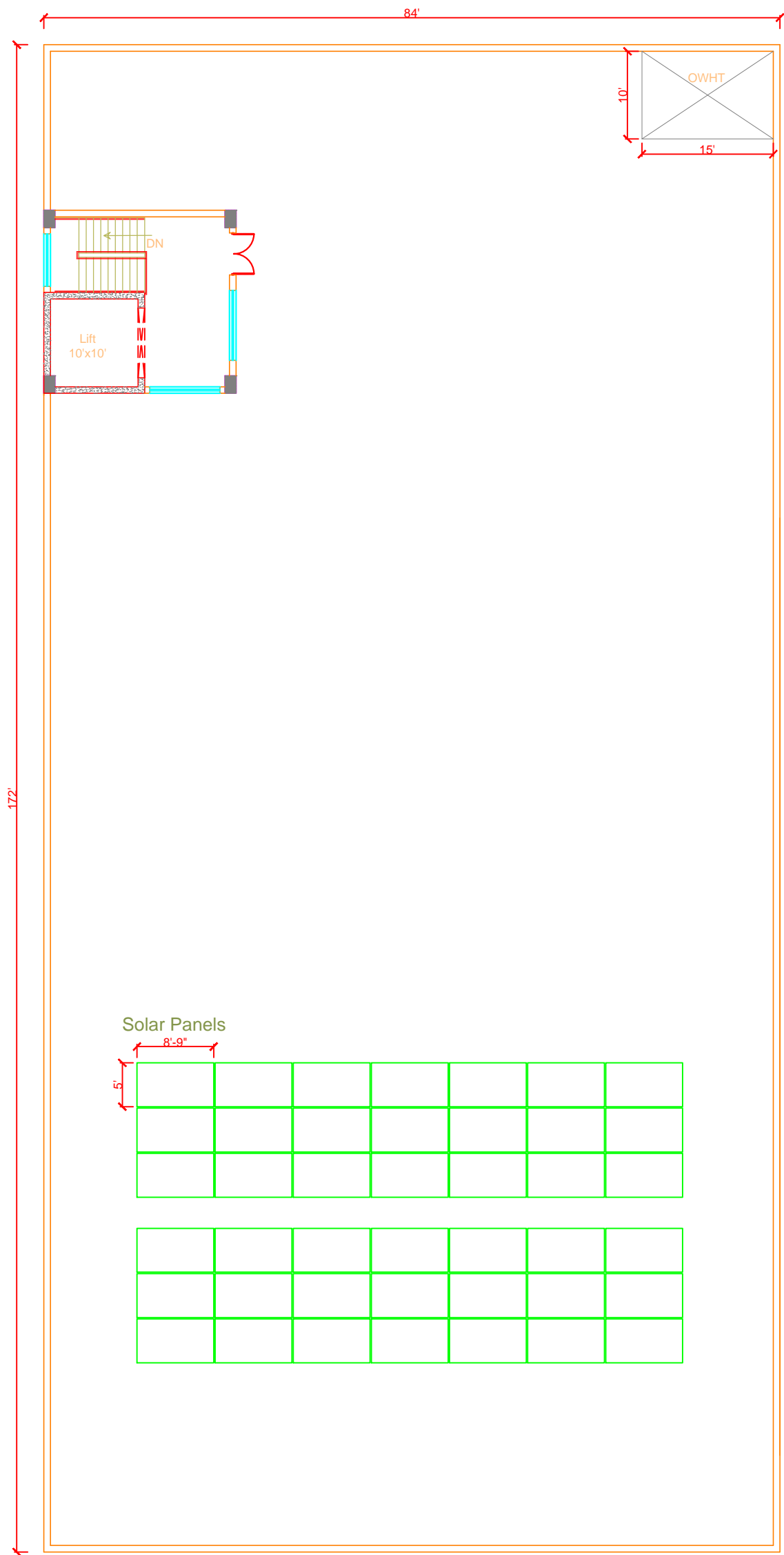


REV.	DESCRIPTION	BY	DATE
<div><div></div><div>IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54000 TEL:35869560-35869561 FAX:35869561</div></div>			
PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY-4 KANAL DESIGN RAW TO WET BLUE	
DRAWING TITLE:		SECOND FLOOR PLAN	
SCALE :	NTS.	SHEET # : 4 OF 7	DWG. # : STZ-GTD-ARCH-01
CHECKED BY :	MSA	DRAWN BY : GULFAM	DATE : 01-09-2019



Roof Plan Option 01
(Shed for Hides to Dry Naturally)Possible

REV.	DESCRIPTION	BY	DATE
<div><div></div><div>IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54000 TEL:35869560-35869561 FAX:35869561</div></div>			
PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY-4 KANAL DESIGN RAW TO WET BLUE	
DRAWING TITLE:		ROOF PLAN	
SCALE :	NTS.	SHEET # : 5 OF 7	DWG. # : STZ-GTD-ARCH-01
CHECKED BY :	MSA	DRAWN BY : GULFAM	DATE : 01-09-2019



Roof Plan Option 02
(Solar Water Heating System) Possible

REV.	DESCRIPTION	BY	DATE
<div><div></div><div>IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54000 TEL:35869560-35869561 FAX:35869561</div></div>			
PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY-4 KANAL DESIGN RAW TO WET BLUE	
DRAWING TITLE:		ROOF PLAN	
SCALE :	NTS.	SHEET # : 6 OF 7	DWG. # : STZ-GTD-ARCH-01
CHECKED BY :	MSA	DRAWN BY : GULFAM	DATE : 01-09-2019

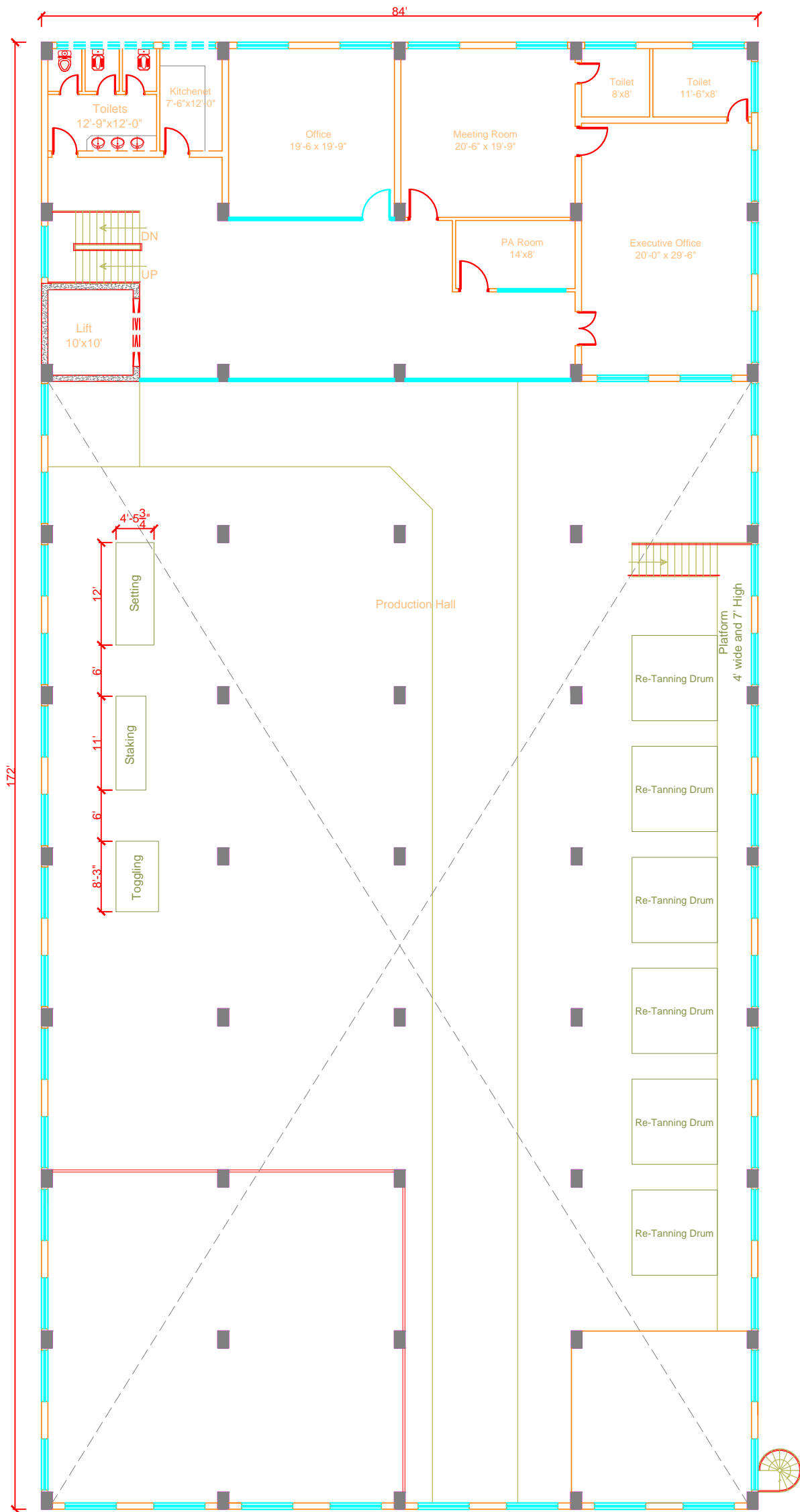


Roof Plan Option 03
(Solar Air Heating System) Possible

REV.	DESCRIPTION	BY	DATE
<div><div></div><div>IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54000 TEL:35869560-35869561 FAX:35869561</div></div>			
PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY-4 KANAL DESIGN RAW TO WET BLUE	
DRAWING TITLE:		ROOF PLAN	
SCALE :	NTS.	SHEET # : 7 OF 7	DWG. # : STZ-GTD-ARCH-01
CHECKED BY :	MSA	DRAWN BY : GULFAM	DATE : 01-09-2019

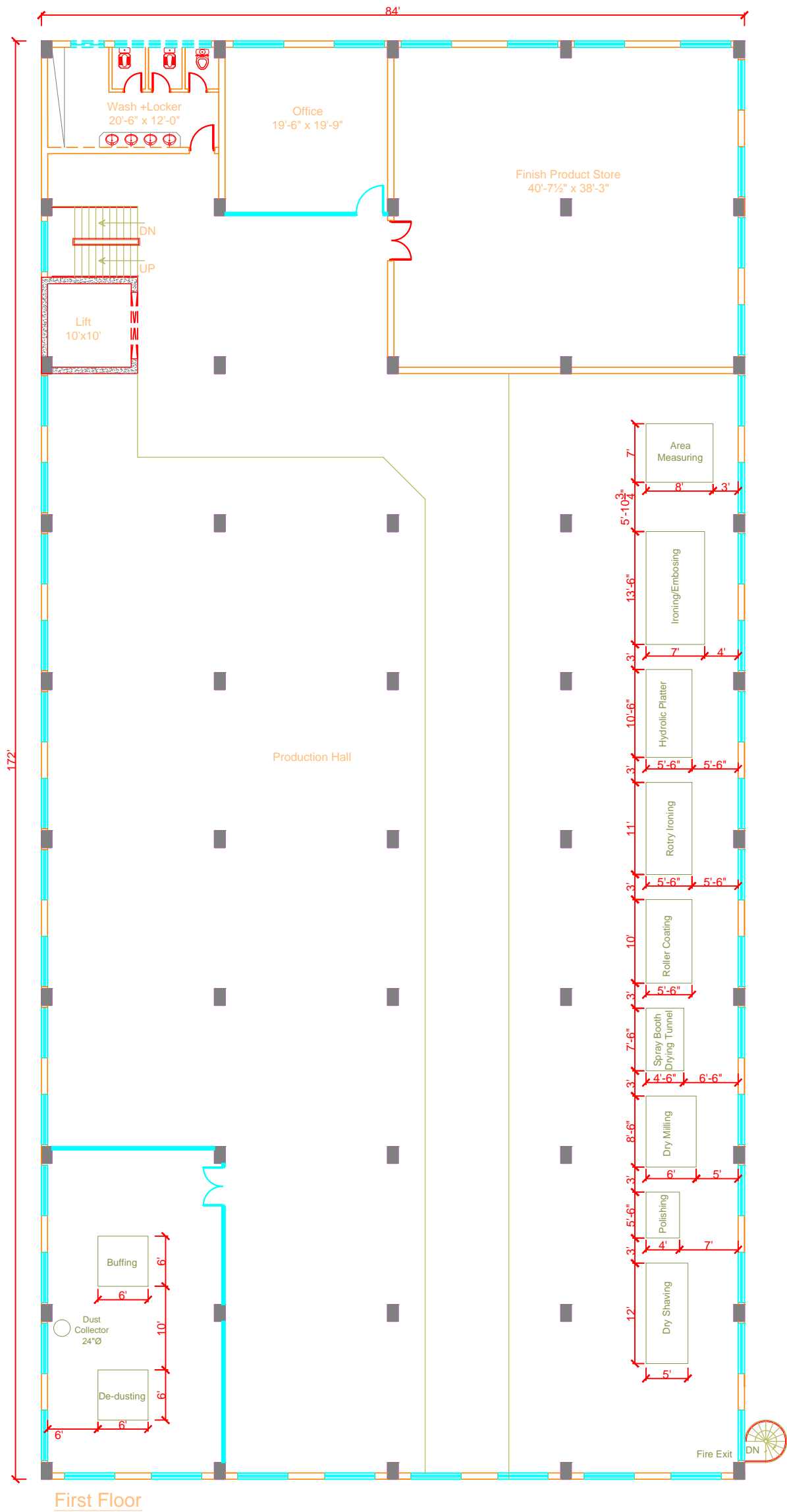
Annex-08C

Layouts for 4 Kanal Wet Blue to Finish



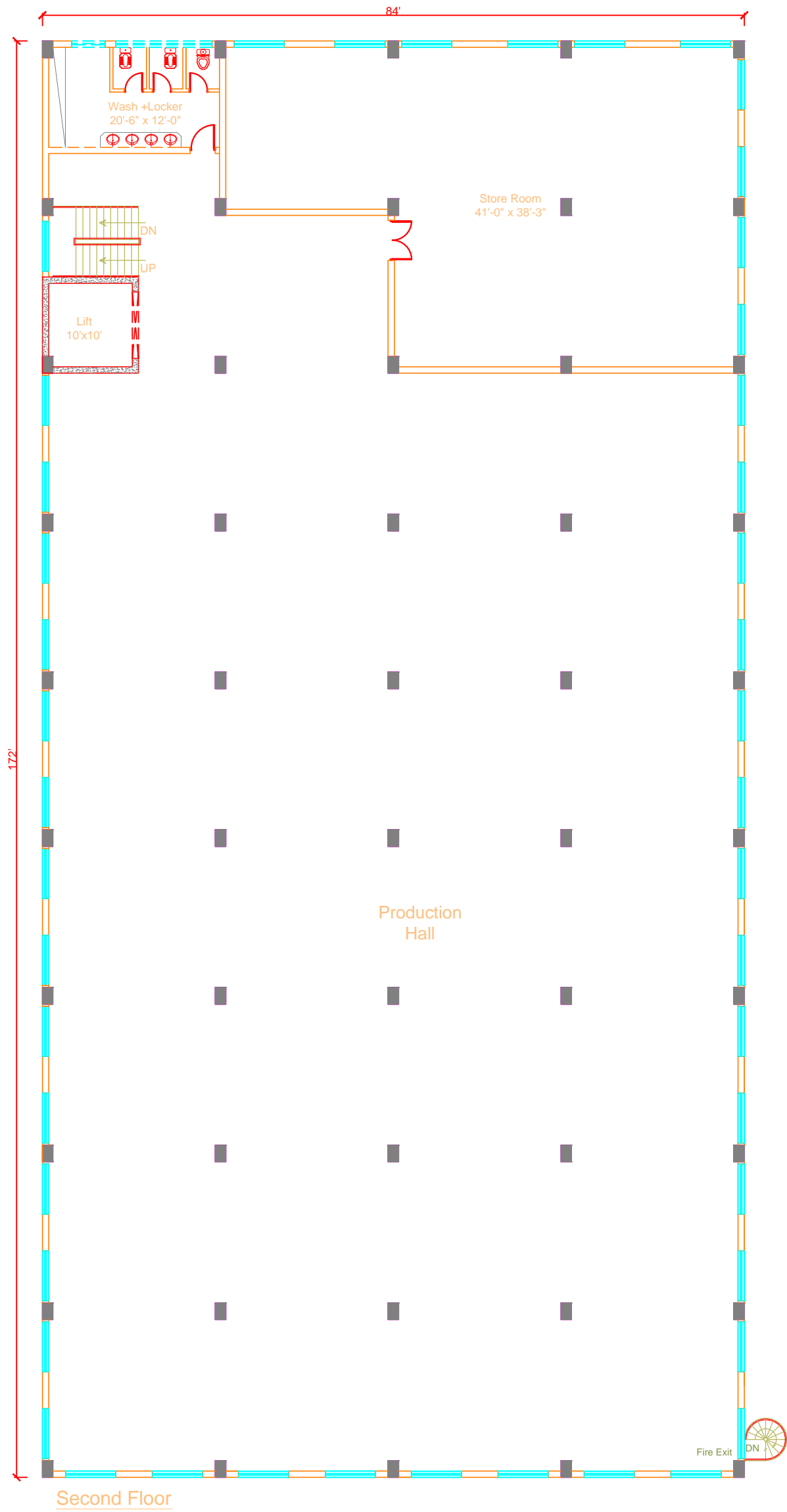
MEZZANINE FLOOR

REV.	DESCRIPTION	BY	DATE
<div>IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54000 TEL:35869560-35869561 FAX:35869561</div>			
PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY-4 KANAL DESIGN WET BLUE TO FINISH	
DRAWING TITLE:		MEZZANINE FLOOR PLAN	
SCALE :	NTS.	SHEET # : 2 OF 7	DWG. # : STZ-GTD-ARCH-01
CHECKED BY :	MSA	DRAWN BY : GULFAM	DATE : 01-09-2019

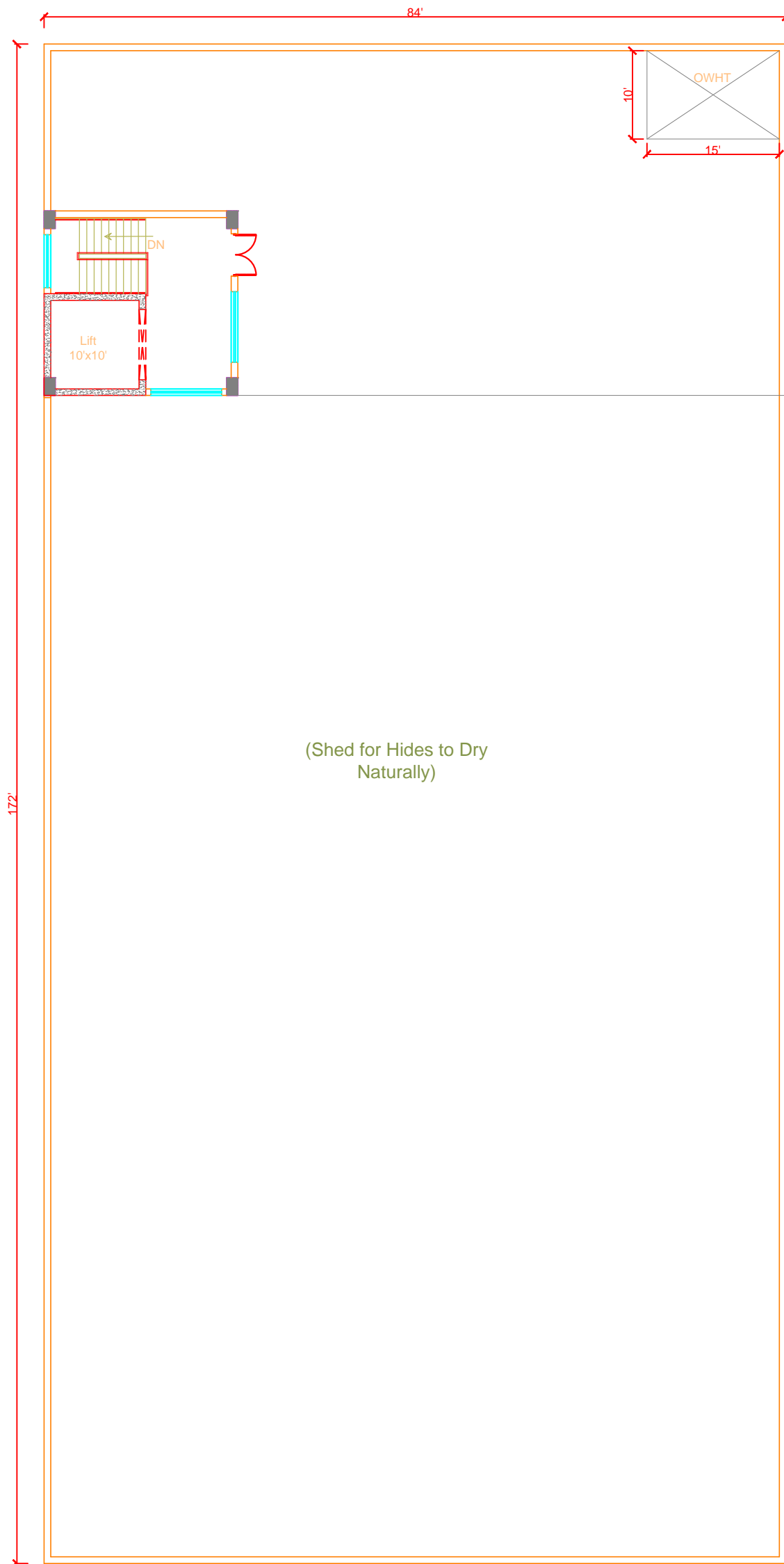


First Floor

REV.	DESCRIPTION	BY	DATE
<div>IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54000 TEL:35869560-35869561 FAX:35869561</div>			
PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY-4 KANAL DESIGN WET BLUE TO FINISH	
DRAWING TITLE:		FIRST FLOOR PLAN	
SCALE :	NTS.	SHEET # : 3 OF 7	DWG. # : STZ-GTD-ARCH-01
CHECKED BY :	MSA	DRAWN BY : GULFAM	DATE : 01-09-2019

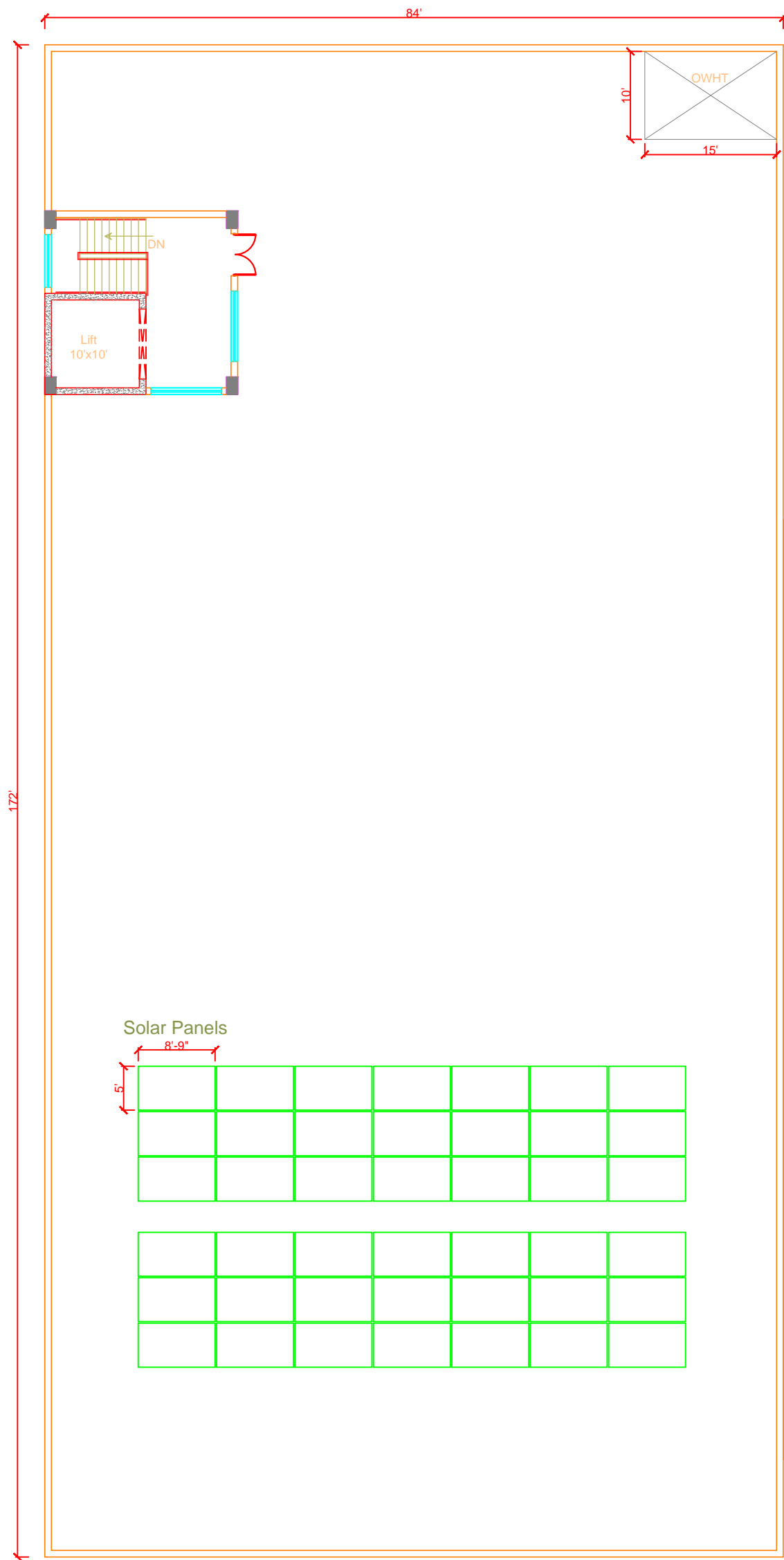


REV.	DESCRIPTION	BY	DATE
<div><div></div><div><div>IN CONSULT (Pvt) LTD.</div><div>80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54000 TEL:35869560-35869561 FAX:35869561</div></div></div>			
PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY-4 KANAL DESIGN WET BLUE TO FINISH	
DRAWING TITLE:		SECOND FLOOR PLAN	
SCALE :	NTS.	SHEET # :	4 OF 7
CHECKED BY :	MSA	DRAWN BY :	GULFAM
		DWG. # :	STZ-GTD-ARCH-01
		DATE :	01-09-2019



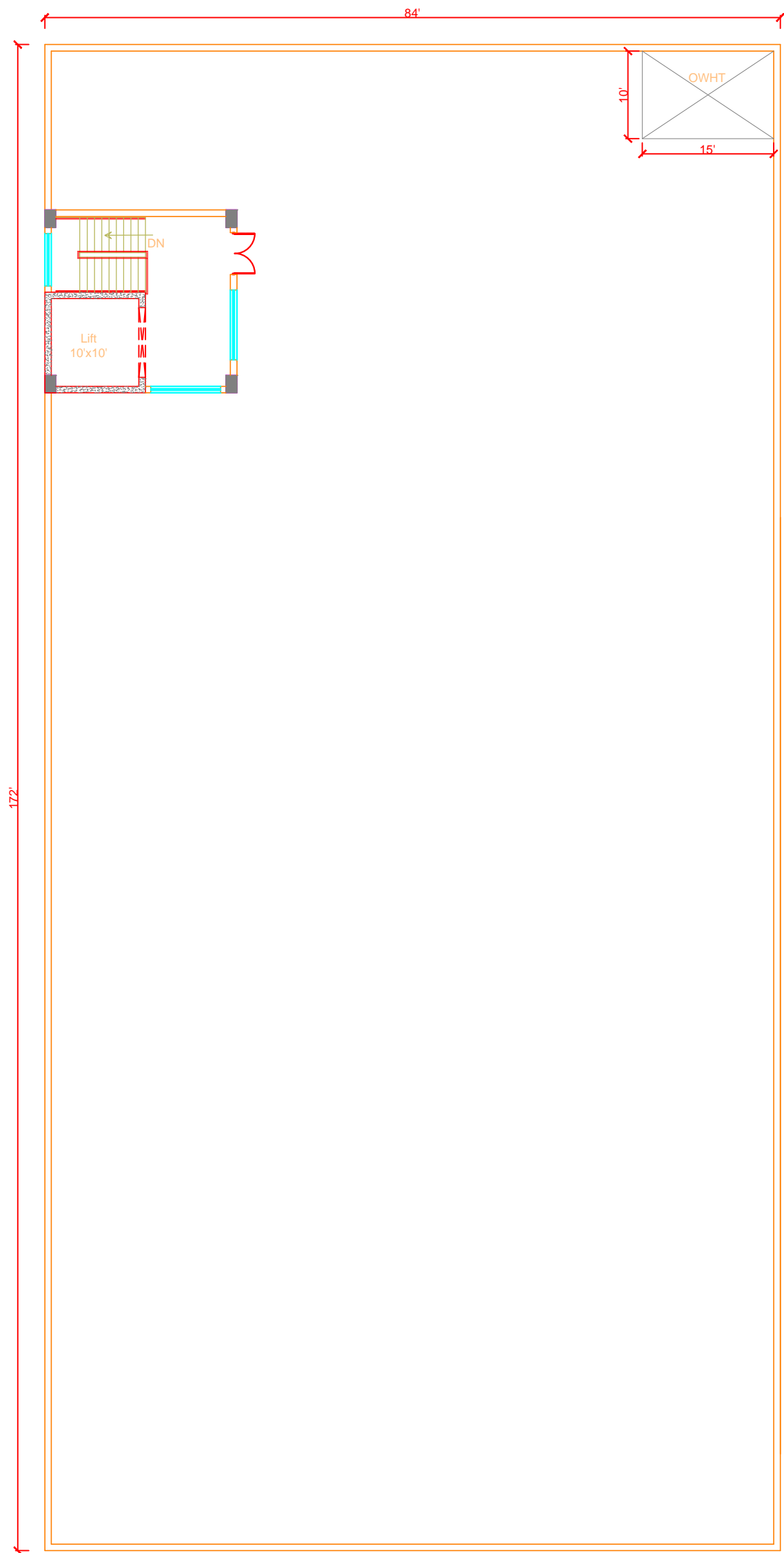
Roof Plan Option 01
(Shed for Hides to Dry Naturally)Possible

REV.	DESCRIPTION	BY	DATE
<div><div></div><div>IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54000 TEL:35869560-35869561 FAX:35869561</div></div>			
PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY-4 KANAL DESIGN WET BLUE TO FINISH	
DRAWING TITLE:		ROOF PLAN	
SCALE :	NTS.	SHEET # : 5 OF 7	DWG. # : STZ-GTD-ARCH-01
CHECKED BY :	MSA	DRAWN BY : GULFAM	DATE : 01-09-2019



Roof Plan Option 02
(Solar Water Heating System) Possible

REV.	DESCRIPTION	BY	DATE
<div>IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54000 TEL:35869560-35869561 FAX:35869561</div>			
PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY-4 KANAL DESIGN WET BLUE TO FINISH	
DRAWING TITLE:		ROOF PLAN	
SCALE :	NTS.	SHEET # : 6 OF 7	DWG. # : STZ-GTD-ARCH-01
CHECKED BY :	MSA	DRAWN BY : GULFAM	DATE : 01-09-2019

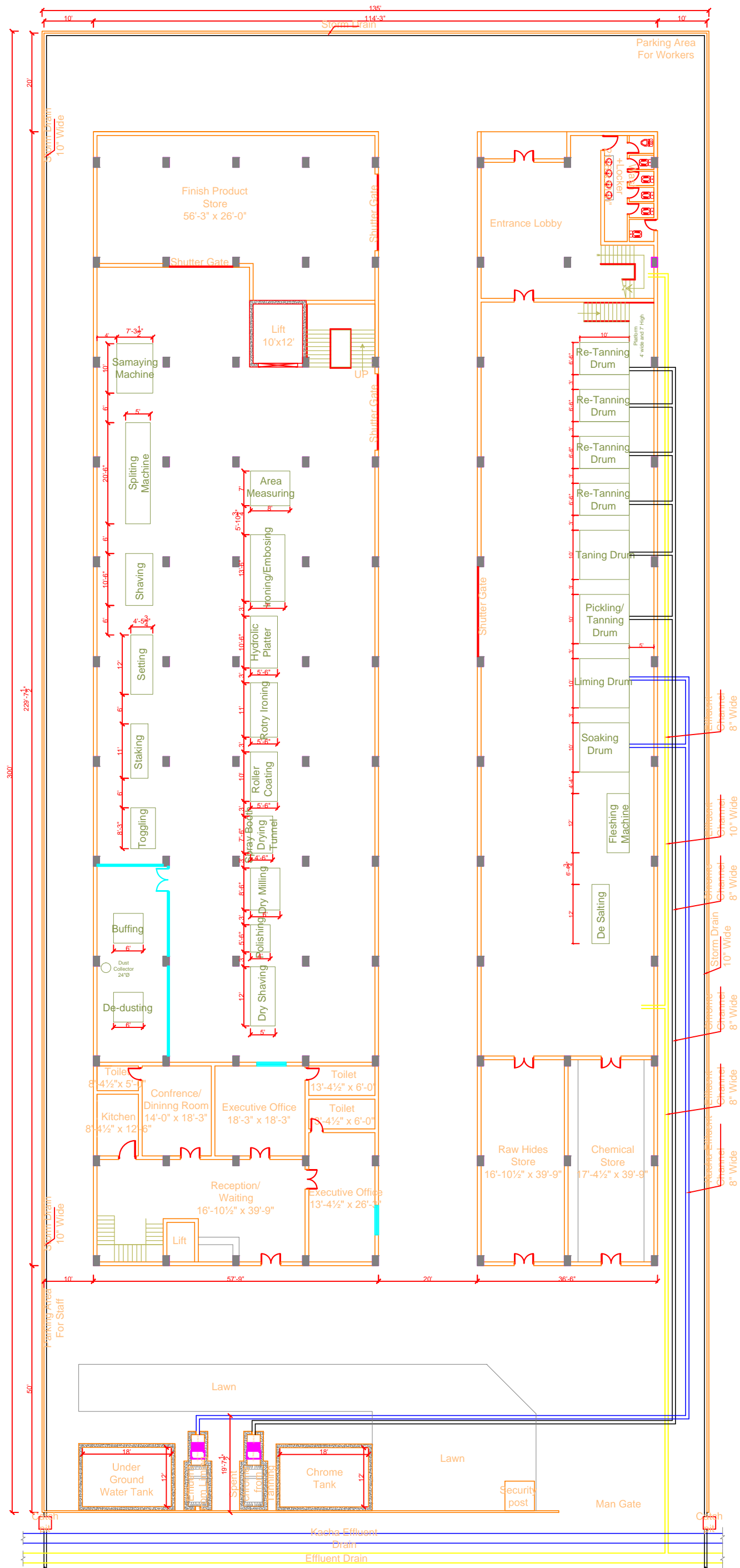


Roof Plan Option 03
(Solar Air Heating System) Possible

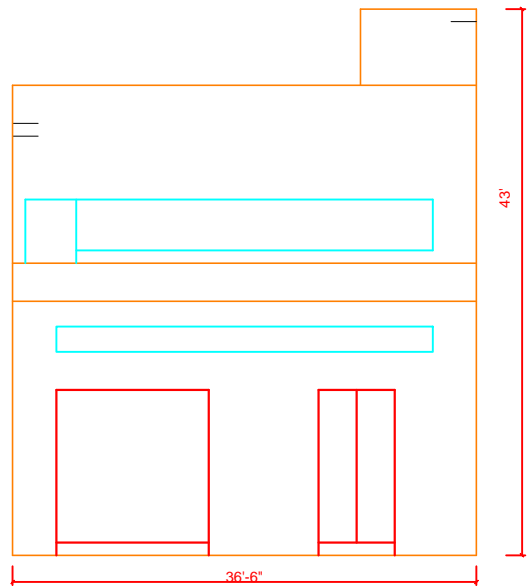
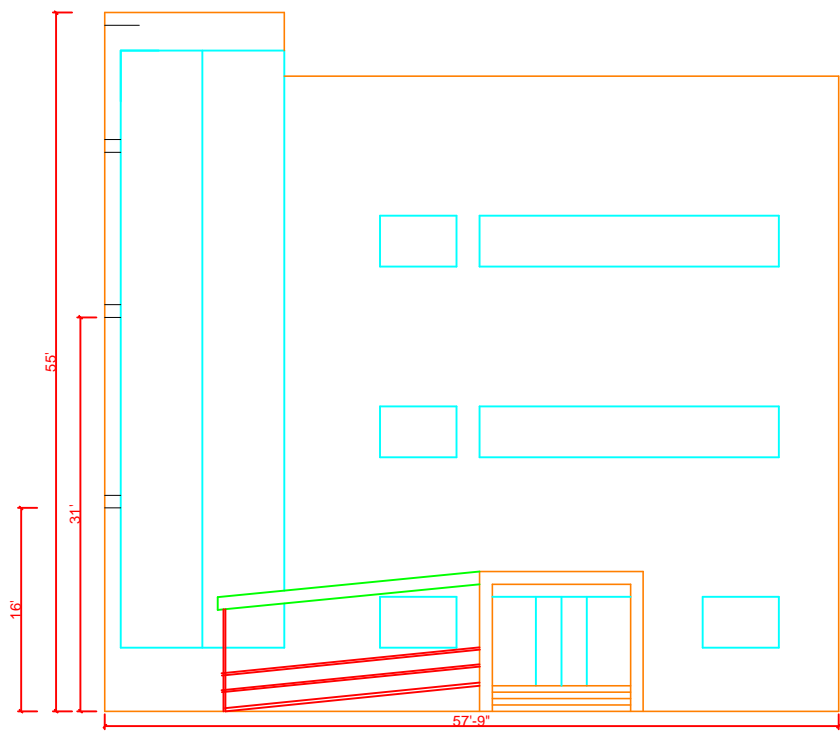
REV.	DESCRIPTION	BY	DATE
<div><div></div><div>IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54000 TEL:35869560-35869561 FAX:35869561</div></div>			
PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY-4 KANAL DESIGN WET BLUE TO FINISH	
DRAWING TITLE:		ROOF PLAN	
SCALE :	NTS.	SHEET # : 7 OF 7	DWG. # : STZ-GTD-ARCH-01
CHECKED BY :	MSA	DRAWN BY : GULFAM	DATE : 01-09-2019


Annex-09

Layouts for 8 Kanal Raw to Finish



REV.	DESCRIPTION	BY	DATE
IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54800 TEL:35869560-35862234 FAX:35869561			
PROJECT : SIALKOT TANNERY ZONE			
BUILDING TITLE: GREEN TANNERY-8 KANAL DESIGN RAW TO FINISH			
DRAWING TITLE: GROUND FLOOR PLAN			
SCALE : NTS.	SHEET # : 1 OF 7	DWG. # :	STZ-GTD-ARCH-01
CHECKED BY : MSA	DRAWN BY : GULFAM	DATE :	01-09-2020




REV.	DESCRIPTION	BY	DATE
<div><div></div><div>IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54000 TEL:35869560-35832234 FAX:35869561</div></div>			
PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY-8 KANAL DESIGN RAW TO FINISH	
DRAWING TITLE:		ELEVATION	
SCALE :	SHEET # :	DWG. # :	
NTS.	1 OF 7	STZ-GTD-ARCH-01	
CHECKED BY :	DRAWN BY :	DATE :	
MSA	GULFAM	01-09-2020	


Annex-10


Electrical Plans for Tanneries


**1 Kanal Raw to Wet
Electrical Plans**


LEGEND


- 


Philips LED Linear Light with 2ft Power:10W,Mirror Light ,Surface mounted.or approved equivalent
- 


Philips Led tube light rod type T8 or approved equivalent, complete with capacitor, electronic ballast, 1X11 W Fl. TLD. Lamp etc.
- 


Philips Led tube light rod type T8 or approved equivalent, complete with capacitor, electronic ballast, 2X11 W Fl. TLD. Lamp etc.
- 


Outdoor water proof wall bracket light complete with 1X18 watts Energy Saver Lamp manufactured by Sky LED (Similar to Bega Light 6508 P-97) or approved by Engineer.
- 


LED Bulb
- 


Led High Bay Ecomax Light 60 Watt manufactured by LEDVANCE or approved equivalent
- 


Single phase switch socket unit indoor type,10 Amp rating, wired from nearest circuit with 1.5 mm² wires. Manufactured by Phillips, Legrand or Clipsal or approved equivalent.
- 


Single phase switch socket unit for air Conditioner, indoor type, 20 Amp rating, wired direct from circuit breaker located in distribution board with 3X6.0 mm² wires. Manufactured by Phillips, Legrand, or Clipsal.
- 


Power Socket 1000 Watt / 10 Amps rating manufactured by Legrand or approved equivalent
- 


Snap Action Mini Switch 1-Gang 1-WAY 10 A for light control manufactured by Phillips, Legrand, or Clipsal.
- 


Snap Action Mini Switch 1-Gang 2-WAY 10 A for light control manufactured by Phillips, Legrand, or Clipsal.
- 


Fan regulator 10 A rating for fan speed control manufactured by Phillips, Legrand, or Clipsal.
- 


Telephone Socket manufactured by Phillips, Legrand, or Clipsal.
- 


Intercom as approved by engineer.
- 


Internet Cable knode manufactured by Clipsals/schneider Australia
- 


TPN & E or SPN & E. Distribution Board with circuit breaker & contractors from Legrand,ABB,MG.
- 


Main L.T Panel and two inch dia PVC Pipe as cable riser with circuit breaker & contractors from Legrand,ABB,MG.
- 


Phase indicator lamp.
- 


Ampere Meter complete with Selector Switch
- 


Volt Meter Range 0-500V.
- 


10A SP Miniature circuit breaker (Mcb) with breaking capacity 6kA.
- 


TP Module Case Circuit Breaker (MCCB) with breaking capacity as shown on drawing.
- 

Bell / Intercom Push Button or hand set.
- 

Control Board Manufactured by Schneider/ Siemens/Legrand or approved by the site Engineer
- 

56" Sweep ceiling fan 'DELUX' model manufactured by Climax, Pak fans, Super Asia, Wahid Fans or approved equivalent.
- 

Wall Bracket Fan complete with cord switch and speed regulator manufactured as above.
- 

8" Sweep exhaust fan for bath rooms metallic body and complete with shutter manufactured by Climax, Pak fans, Super Asia, , Wahid Fans or approved equivalent.
- 

24" Sweep exhaust fan for industry, metallic body and complete with shutter manufactured by Bilal Engg. Climax, Pak fans, Super Asia or approved equivalent.

GENERAL NOTES

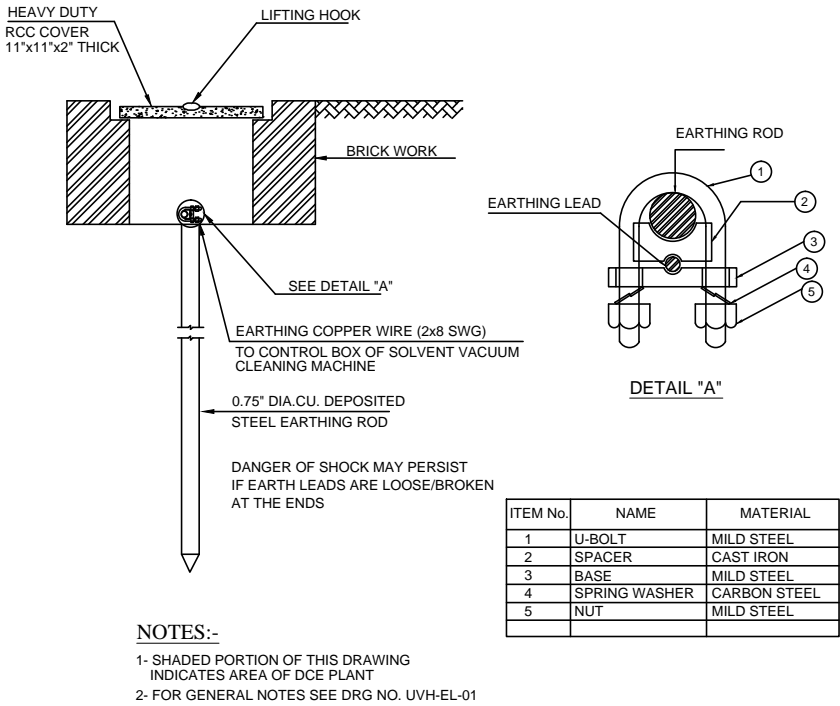
- 1- The wiring through conduit shall be started only after conduiting system is completely installed and all outlet boxes etc are fixed in position.
- 2- Minimum size of conduit for concealed wiring is ¾" dia. for on surface wiring minimum size of conduit is 25mm dia.
- 3- Unless otherwise noted, schedule for pvc conduit shall be,


Conductor size	20mmØ Conduit	25mmØ Conduit	32mmØ Conduit
1.5mm ² (3/.036)	8 nos.	14 nos.	26 nos.
2.5mm ² (7/.029)	6 nos.	10 nos.	18 nos.
4.0mm ² (7/.036)	4 nos.	6nos.	11 nos.
6.0mm ² (7/.044)	3 nos.	5 nos.	9 nos.

- 4- The wiring shall be continuous between terminations. the looping system shall be followed throughout, any joint in wires will not be allowed.
- 5- Unless otherwise noted, all final sub circuits shall be of the following minimum size.

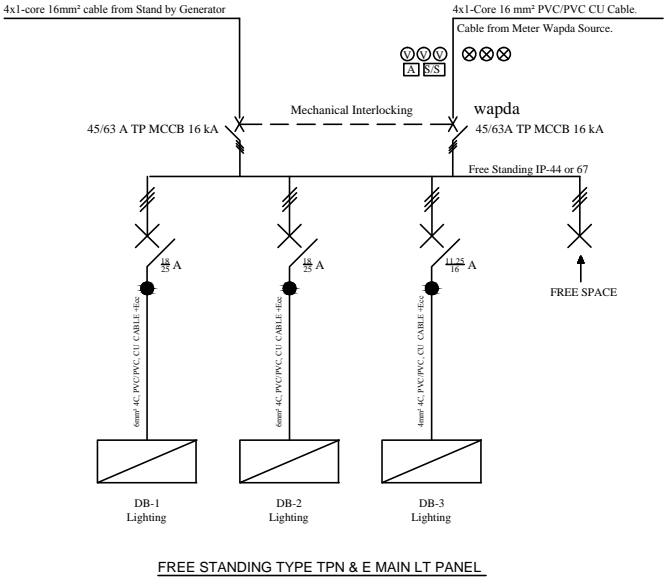
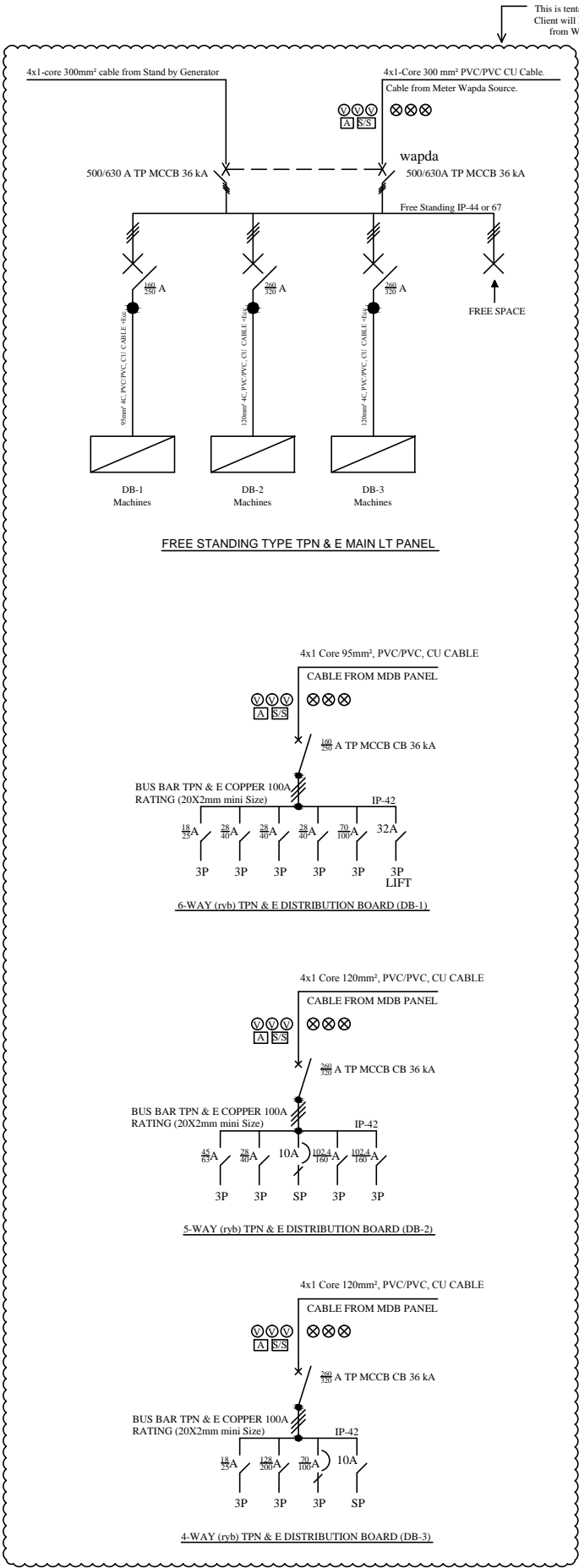
	Description	Phase wire	Neutral wire	Earth
a	Light and point wiring	1.5mm ²	1.5mm ²	2.5mm ²
b	Circuit wiring	2.5mm ²	2.5mm ²	2.5mm ²
c	Power wiring	6.0mm ²	6.0mm ²	4.0mm ²


- 6- The electrical resistance of ecc together with earth lead and earth electrode shall not exceed one ohm.
- 7- Circuit directory shall be provided on lighting db
- 8- Exact location of all equipment and outlets to be confirmed prior to installation.
- 9- The mounting height of different equipment above finished floor level shall be as following as measured from the bottom of equipment.
- A. Distribution board 4'
- B. Light and fan control switch 4'
- C. 10/15A Switch sockets 0'-9"
- D. Wall mounted bracket light 8'-0" or as directed
- 10- Light fan point with u are powered through ups.



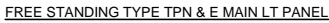
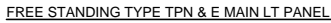
REV.	DESCRIPTION	BY	DATE
 IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54600 TEL:35869560-35832234 FAX:35869561			
PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY-I KANAL DESIGN	
DRAWING TITLE:		GENERAL NOTES	
SCALE :	NTS.	SHEET # : 1 OF 3	DWG. # : STZ-GTD-ELE-01
CHECKED BY :	M. AFZAL	DRAWN BY : GULFAM	DATE : 01-09-2019


WET TO FINISH SINGLE LINE DIAGRAMS

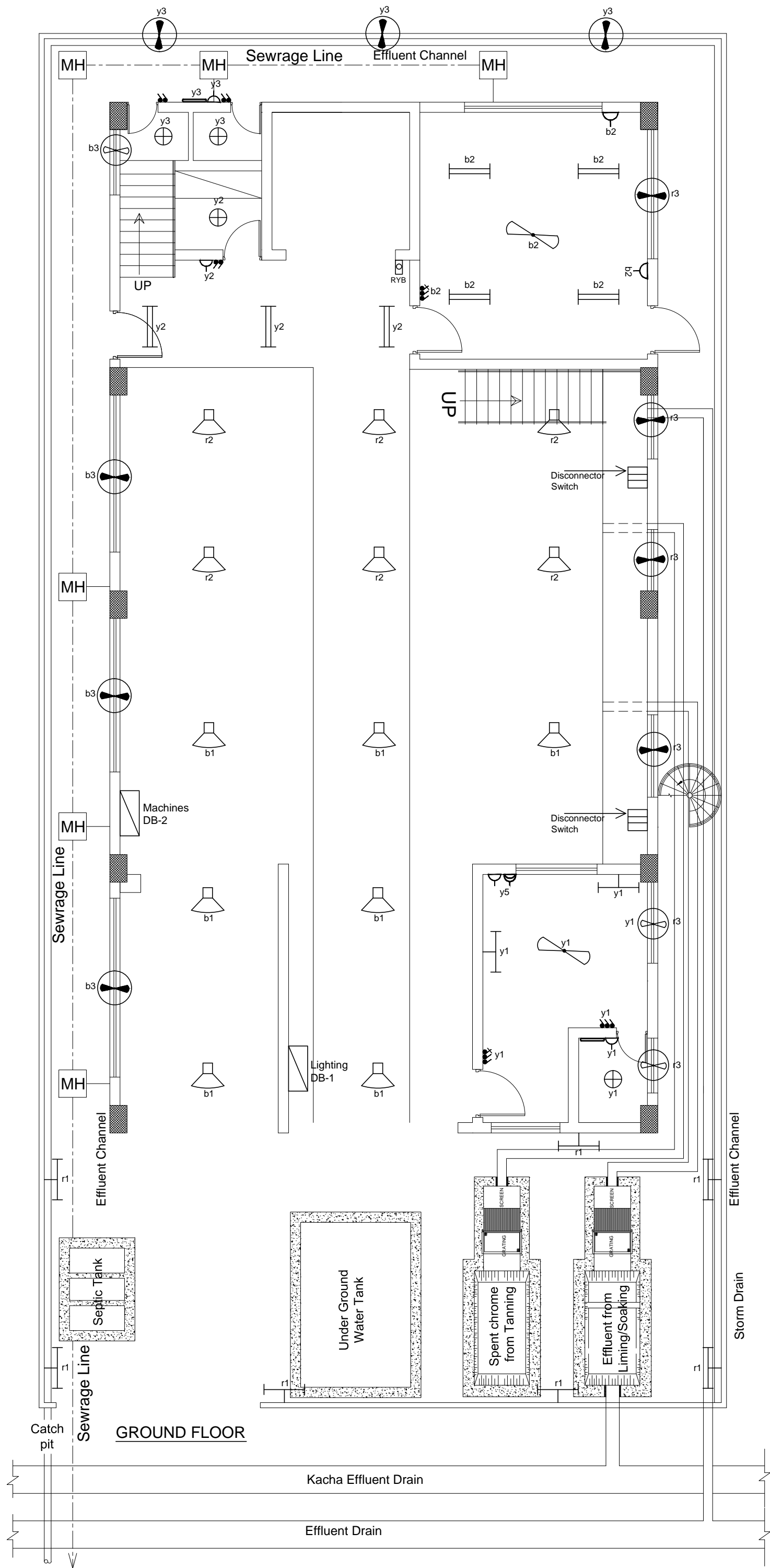



REV.	DESCRIPTION	BY	DATE
 IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54600 TEL:35869560-35832234 Fax:35869561			
PROJECT : SIALKOT TANNERY ZONE			
BUILDING TITLE: GREEN TANNERY-1 KANAL DESIGN			
DRAWING TITLE: SINGLE LINE DIAGRAMS			
SCALE : NTS.	SHEET # : 2 OF 3	DWG. # :	STZ-GTD-ELE-01
CHECKED BY : M. AFZAL	DRAWN BY : GULFAM	DATE :	01-09-2019

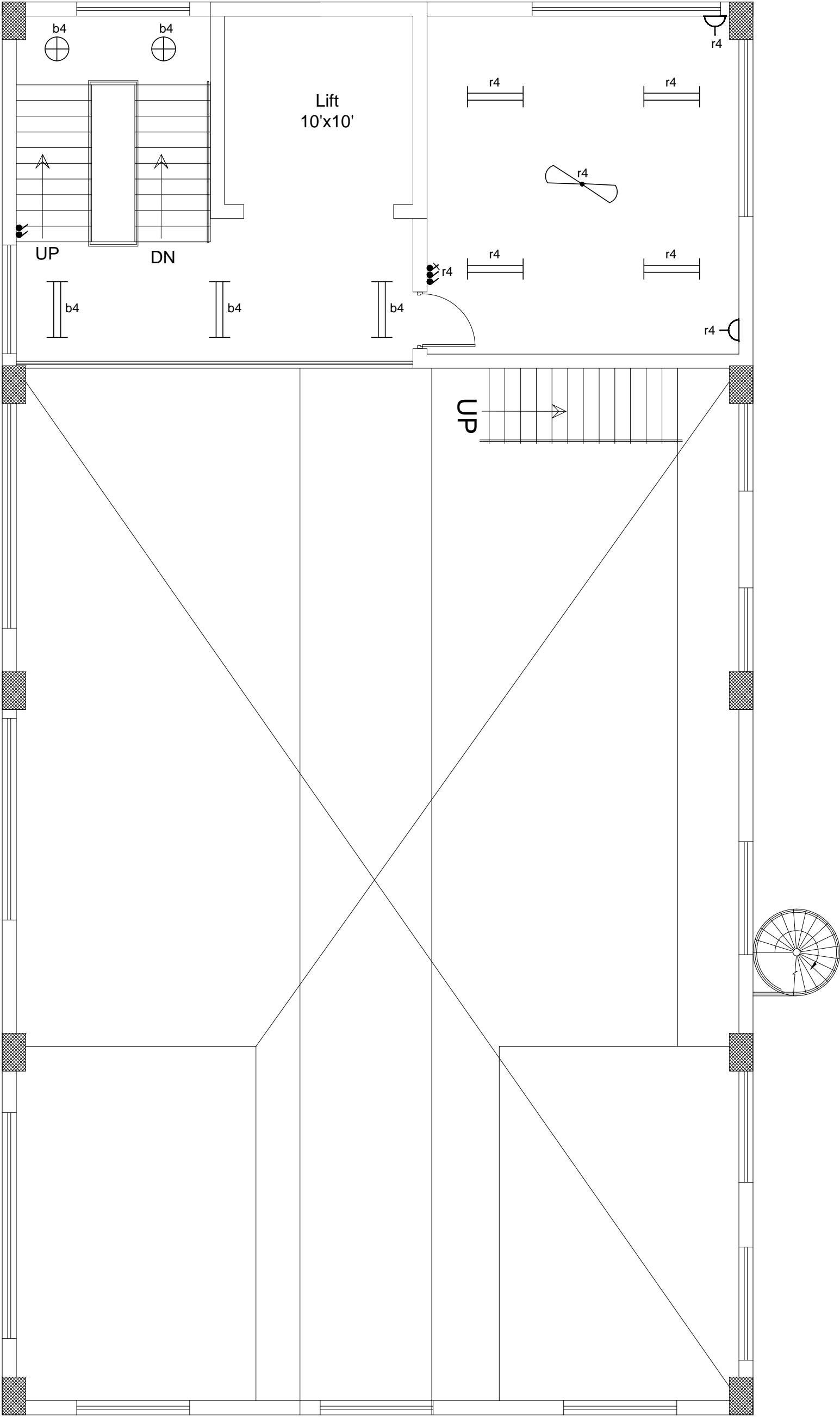
RAW TO WET SINGLE LINE DIAGRAMS



REV.	DESCRIPTION	BY	DATE
 IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54600 TEL:35869560-35832234 FAX:35869561			
PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY -I KANAL DESIGN	
DRAWING TITLE:		SINGLE LINE DIAGRAMS	
SCALE :	NTS.	SHEET # : 3 OF 3	DWG. # : STZ-GTD-ELE-01
CHECKED BY :	M. AFZAL	DRAWN BY : GULFAM	DATE : 01-09-2019

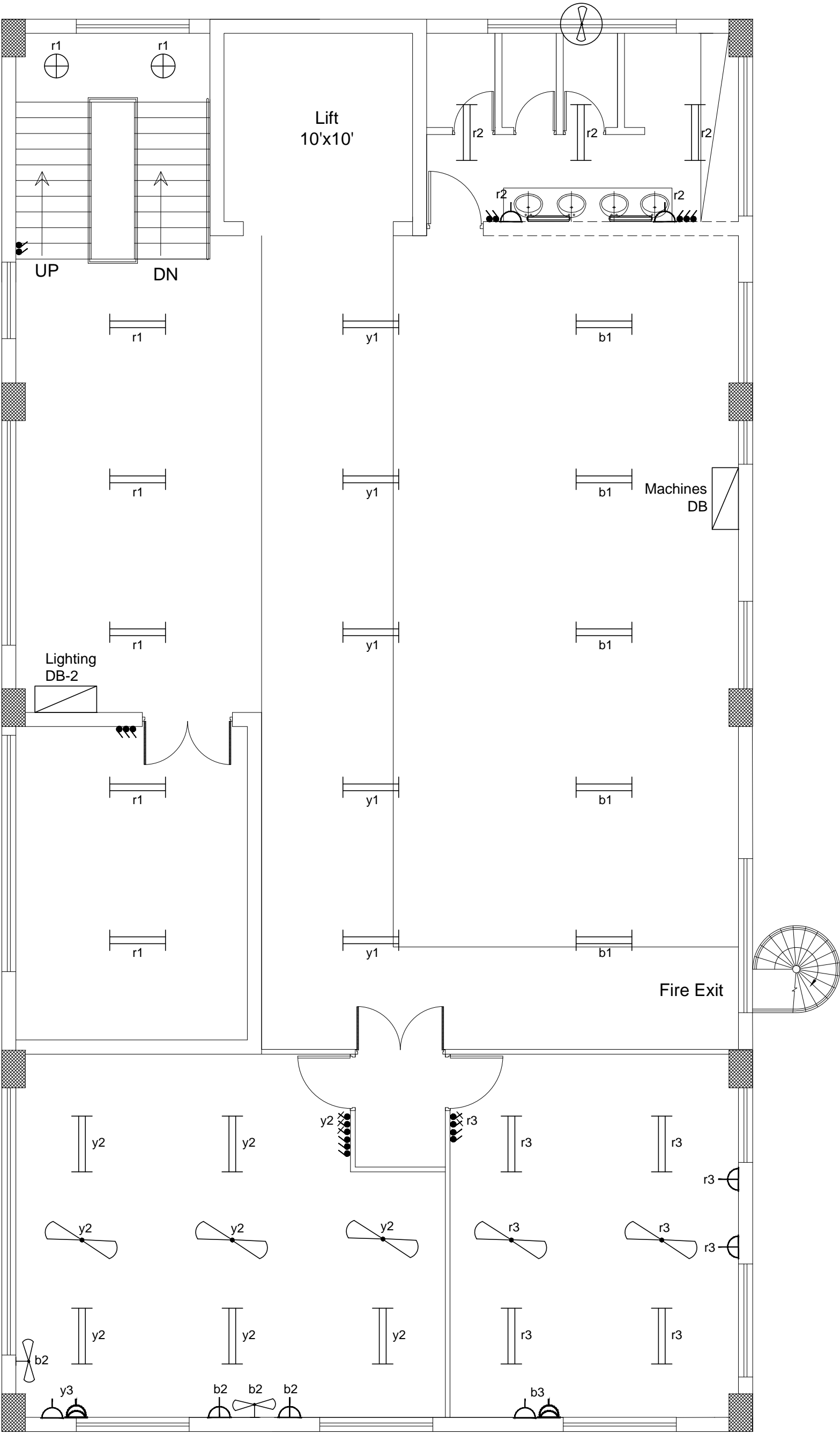


REV.	DESCRIPTION	BY	DATE
	 IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54600 TEL:35869560-35832234 FAX:35869561		
PROJECT :	SIALKOT TANNERY ZONE		
BUILDING TITLE:	GREEN TANNERY-1 KANAL DESIGN RAW TO WET BLUE		
DRAWING TITLE:	GROUND FLOOR PLAN		
SCALE :	NTS.	SHEET # : 1 OF 5	DWG. # : STZ-GTD-ELE-01
CHECKED BY :	M. AFZAL	DRAWN BY : GULFAM	DATE : 01-09-2019




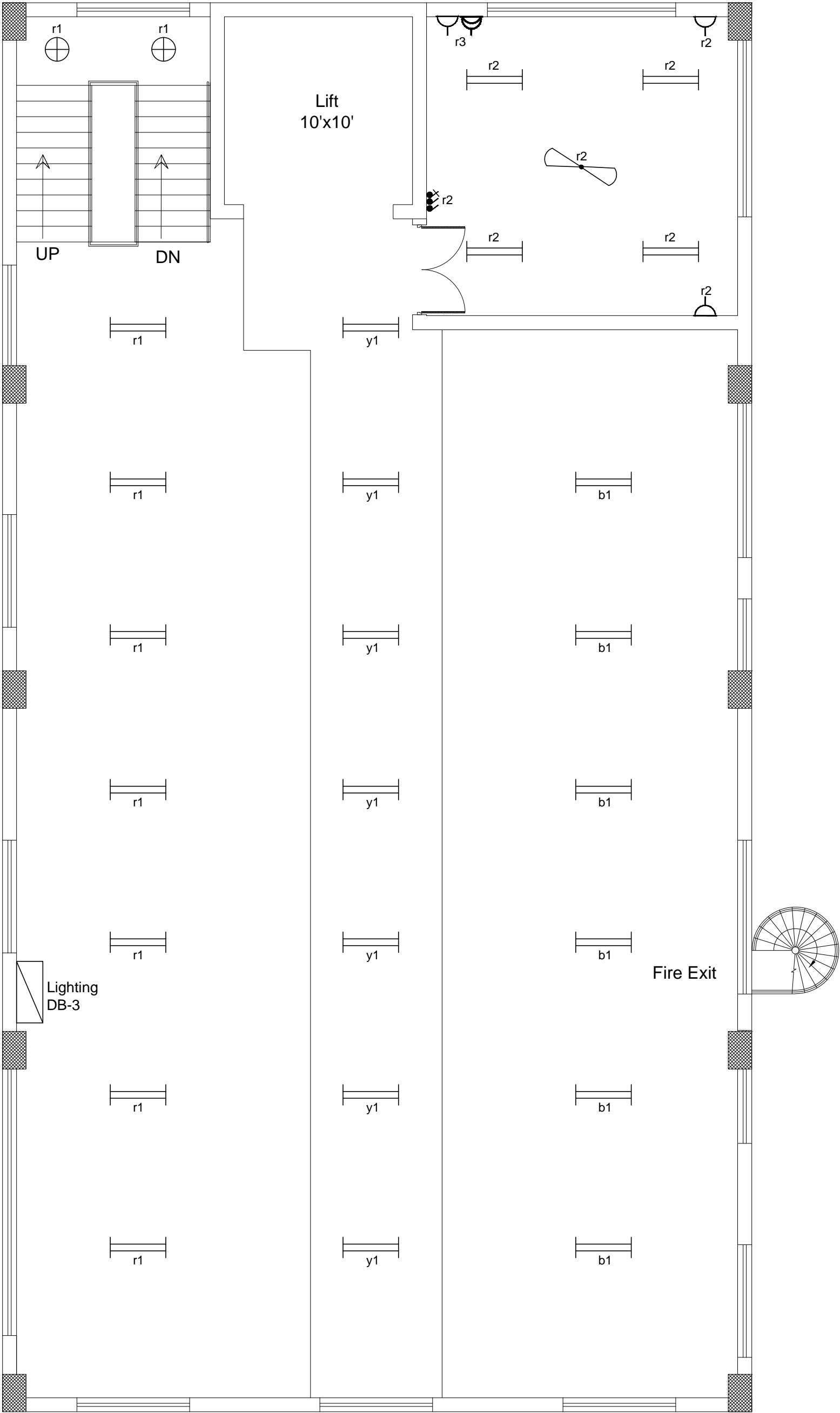
MEZZANINE FLOOR

REV.	DESCRIPTION	BY	DATE
<div><div></div><div>IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54600 TEL:35869560-35832234 FAX:35869561</div></div>			
PROJECT :	SIALKOT TANNERY ZONE		
BUILDING TITLE:	GREEN TANNERY-1 KANAL DESIGN RAW TO WET BLUE		
DRAWING TITLE:	MEZZANINE FLOOR PLAN		
SCALE :	NTS.	SHEET # : 2 OF 5	DWG. # : STZ-GTD-ELE-01
CHECKED BY :	M. AFZAL	DRAWN BY : GULFAM	DATE : 01-09-2019




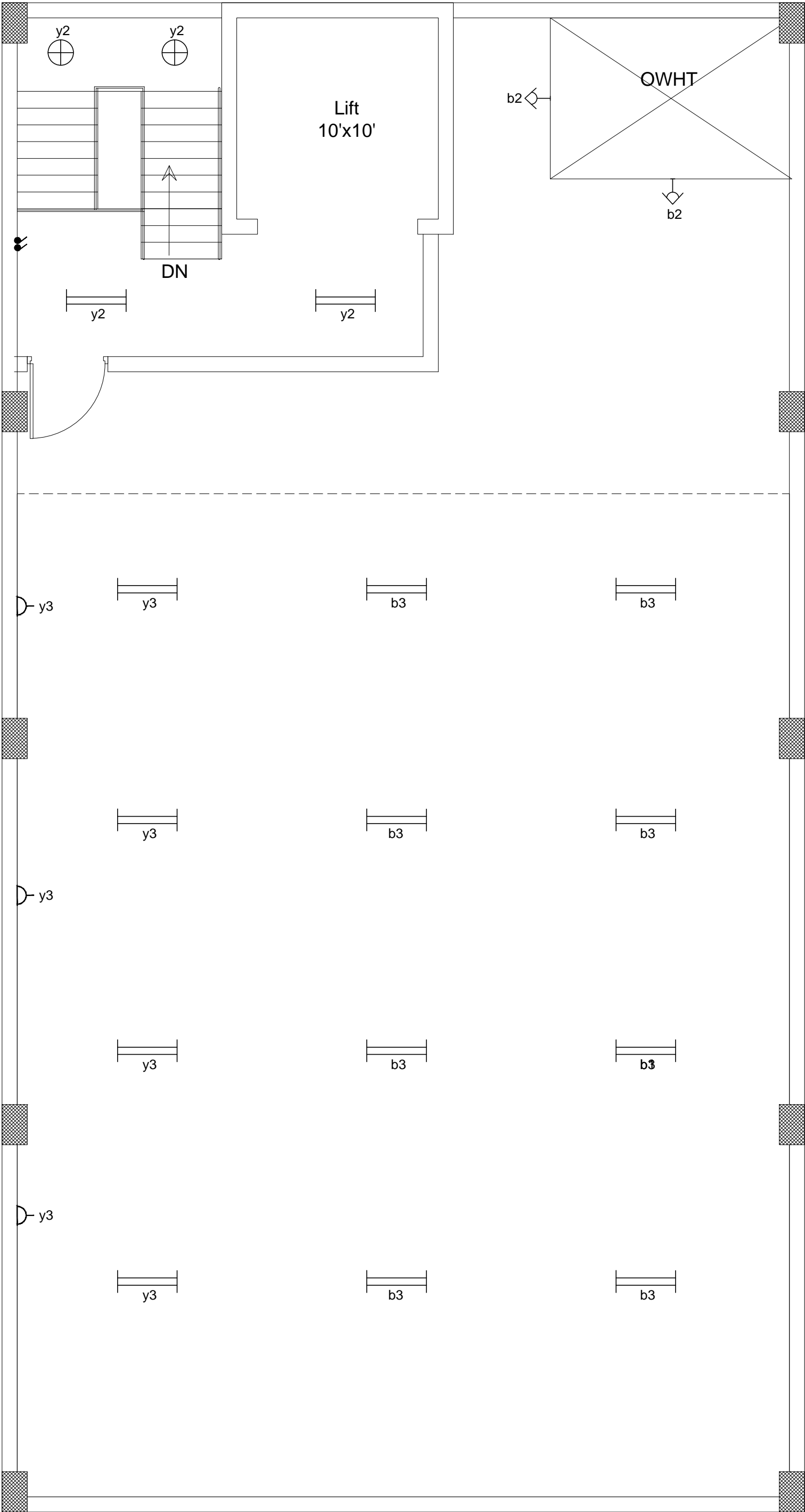
First Floor

REV.	DESCRIPTION	BY	DATE
<div><div></div><div><div>IN CONSULT (Pvt) LTD.</div><div>80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54600 TEL:35869560-35832234 FAX:35869561</div></div></div>			
PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY-1 KANAL DESIGN RAW TO WET BLUE	
DRAWING TITLE:		FIRST FLOOR PLAN	
SCALE :	NTS.	SHEET # : 3 OF 5	DWG. # : STZ-GTD-ELE-01
CHECKED BY :	M. AFZAL	DRAWN BY : GULFAM	DATE : 01-09-2019




Second Floor

REV.		DESCRIPTION	BY	DATE
<div><div></div><div>IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54600 TEL:35869560-35832234 FAX:35869561</div></div>				
PROJECT :		SIALKOT TANNERY ZONE		
BUILDING TITLE:		GREEN TANNERY-1 KANAL DESIGN RAW TO WET BLUE		
DRAWING TITLE:		SECOND FLOOR PLAN		
SCALE :		SHEET # :	DWG. # :	
CHECKED BY :		DRAWN BY :	DATE :	
M. AFZAL		GULFAM	01-09-2019	
NTS.		4 OF 5	STZ-GTD-ELE-01	































Roof Plan
(Shed for Hides to Dry Naturally)

REV.	DESCRIPTION	BY	DATE
 IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54600 TEL:35869560-35832234 FAX:35869561			
PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY-1 KANAL DESIGN RAW TO WET BLUE	
DRAWING TITLE:		ROOF PLAN	
SCALE :	NTS.	SHEET # : 5 OF 5	DWG. # : STZ-GTD-ELE-01
CHECKED BY :	M. AFZAL	DRAWN BY : GULFAM	DATE : 01-09-2019

**1 Kanal Wet to Finish
Electrical Plans**

LEGEND

- 
- Philips LED Linear Light with 2ft Power:10W,Mirror Light ,Surface mounted.or approved equivalent
- 
- Philips Led tube light rod type T8 or approved equivalent, complete with capacitor, electronic ballast, 1X11 W Fl. TLD. Lamp etc.
- 
- Philips Led tube light rod type T8 or approved equivalent, complete with capacitor, electronic ballast, 2X11 W Fl. TLD. Lamp etc.
- 
- Outdoor water proof wall bracket light complete with 1X18 watts Energy Saver Lamp manufactured by Sky LED (Similar to Bega Light 6508 P-97) or approved by Engineer.
- 
- LED Bulb
- 
- Led High Bay Ecomax Light 60 Watt manufactured by LEDVANCE or approved equivalent
- 
- Single phase switch socket unit indoor type,10 Amp rating, wired from nearest circuit with 1.5 mm² wires. Manufactured by Phillips, Legrand or Clipsal or approved equivalent.
- 
- Single phase switch socket unit for air Conditioner, indoor type, 20 Amp rating, wired direct from circuit breaker located in distribution board with 3X6.0 mm² wires. Manufactured by Phillips, Legrand, or Clipsal.
- 
- Power Socket 1000 Watt / 10 Amps rating manufactured by Legrand or approved equivalent
- 
- Snap Action Mini Switch 1-Gang 1-WAY 10 A for light control manufactured by Phillips, Legrand, or Clipsal.
- 
- Snap Action Mini Switch 1-Gang 2-WAY 10 A for light control manufactured by Phillips, Legrand, or Clipsal.
- 
- Fan regulator 10 A rating for fan speed control manufactured by Phillips, Legrand, or Clipsal.
- 
- Telephone Socket manufactured by Phillips, Legrand, or Clipsal.
- 
- Intercom as approved by engineer.
- 
- Internet Cable knode manufactured by Clipsals/schneider Australia
- 
- TPN & E or SPN & E. Distribution Board with circuit breaker & contractors from Legrand,ABB,MG.
- 
- Main L.T Panel and two inch dia PVC Pipe as cable riser with circuit breaker & contractors from Legrand,ABB,MG.
- 
- Phase indicator lamp.
- 
- Ampere Meter complete with Selector Switch
- 
- Volt Meter Range 0-500V.
- 
- 10A SP Miniature circuit breaker (Mcb) with breaking capacity 6kA.
- 
- TP Module Case Circuit Breaker (MCCB) with breaking capacity as shown on drawing.
- 
- Bell / Intercom Push Button or hand set.
- 
- Control Board Manufactured by Schneider/ Siemens/Legrand or approved by the site Engineer
- 
- 56" Sweep ceiling fan 'DELUX' model manufactured by Climax, Pak fans, Super Asia, Wahid Fans or approved equivalent.
- 
- Wall Bracket Fan complete with cord switch and speed regulator manufactured as above.
- 
- 8" Sweep exhaust fan for bath rooms metallic body and complete with shutter manufactured by Climax, Pak fans, Super Asia, , Wahid Fans or approved equivalent.
- 
- 24" Sweep exhaust fan for industry, metallic body and complete with shutter manufactured by Bilal Engg. Climax, Pak fans, Super Asia or approved equivalent.

GENERAL NOTES

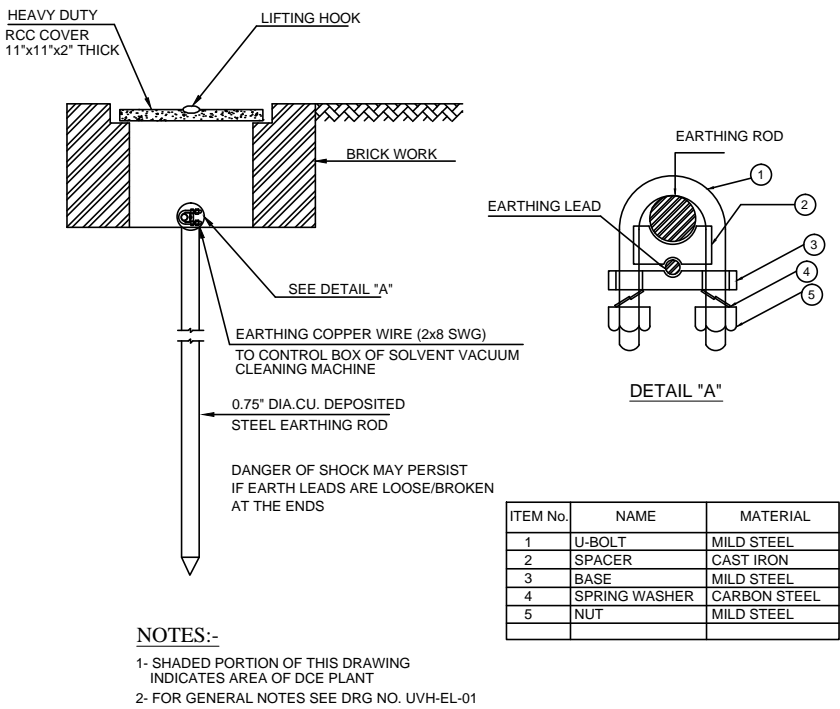
- 1- The wiring through conduit shall be started only after conduiting system is completely installed and all outlet boxes etc are fixed in position.
- 2- Minimum size of conduit for concealed wiring is ¾" dia. for on surface wiring minimum size of conduit is 25mm dia.
- 3- Unless otherwise noted, schedule for pvc conduit shall be,


Conductor size	20mmØ Conduit	25mmØ Conduit	32mmØ Conduit
1.5mm ² (3/.036)	8 nos.	14 nos.	26 nos.
2.5mm ² (7/.029)	6 nos.	10 nos.	18 nos.
4.0mm ² (7/.036)	4 nos.	6nos.	11 nos.
6.0mm ² (7/.044)	3 nos.	5 nos.	9 nos.

- 4- The wiring shall be continuous between terminations. the looping system shall be followed throughout, any joint in wires will not be allowed.
- 5- Unless otherwise noted, all final sub circuits shall be of the following minimum size.

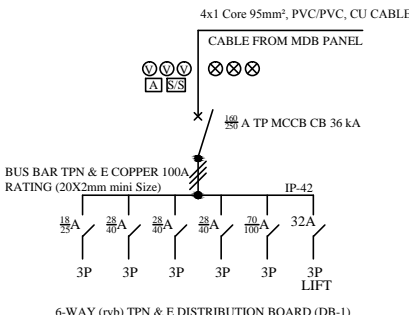
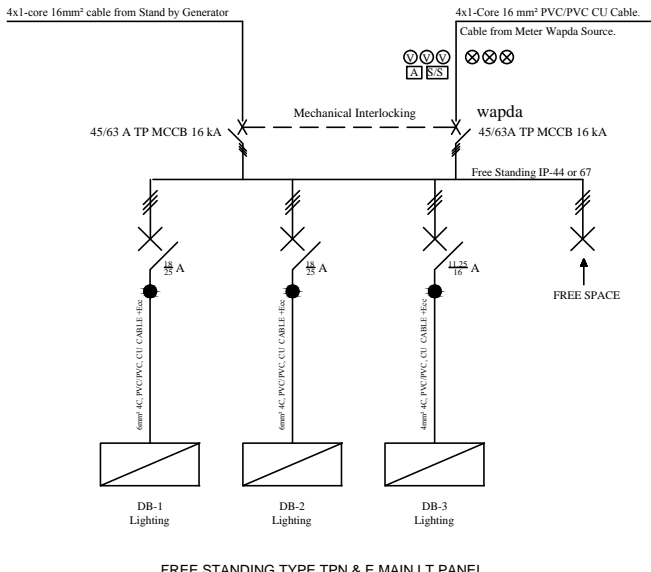
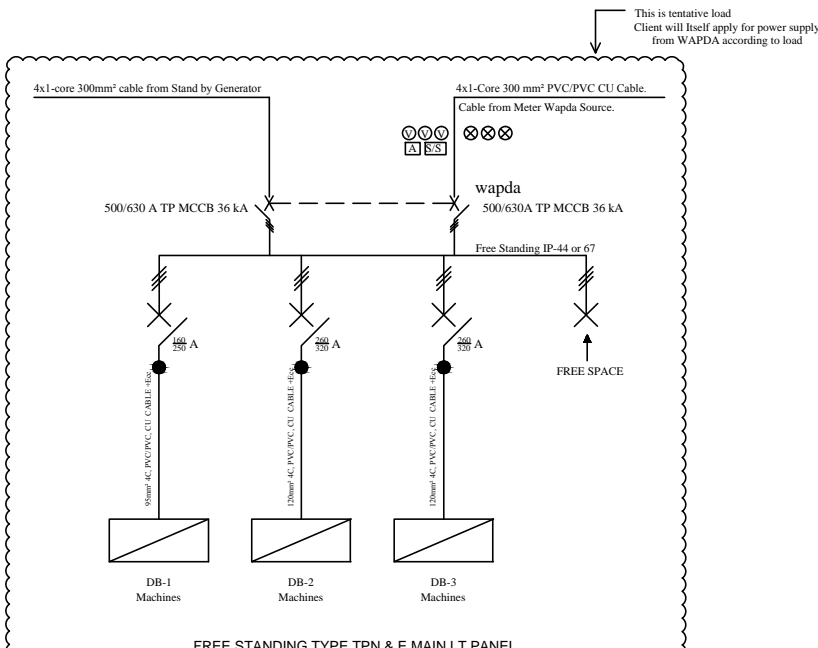
	Description	Phase wire	Neutral wire	Earth
a	Light and point wiring	1.5mm ²	1.5mm ²	2.5mm ²
b	Circuit wiring	2.5mm ²	2.5mm ²	2.5mm ²
c	Power wiring	6.0mm ²	6.0mm ²	4.0mm ²

- 6- The electrical resistance of ecc together with earth lead and earth electrode shall not exceed one ohm.
- 7- Circuit directory shall be provided on lighting db
- 8- Exact location of all equipment and outlets to be confirmed prior to installation.
- 9- The mounting height of different equipment above finished floor level shall be as following as measured from the bottom of equipment.
- A. Distribution board4'
- B. Light and fan control switch4'
- C. 10/15A Switch sockets0'-9"
- D. Wall mounted bracket light8'-0" or as directed
- 10- Light fan point with u are powered through ups.

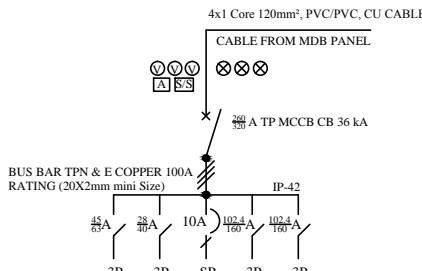


REV.	DESCRIPTION	BY	DATE
 IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54600 TEL:35869560-35832234 FAX:35869561			
PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY-I KANAL DESIGN	
DRAWING TITLE:		GENERAL NOTES	
SCALE :	NTS.	SHEET # : 1 OF 3	DWG. # : STZ-GTD-ELE-01
CHECKED BY :	M. AFZAL	DRAWN BY : GULFAM	DATE : 01-09-2019

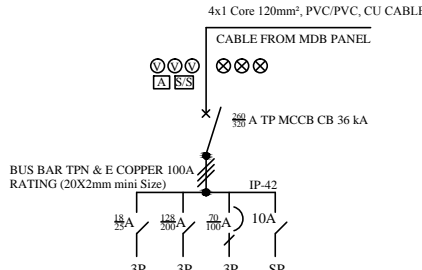
WET TO FINISH SINGLE LINE DIAGRAMS



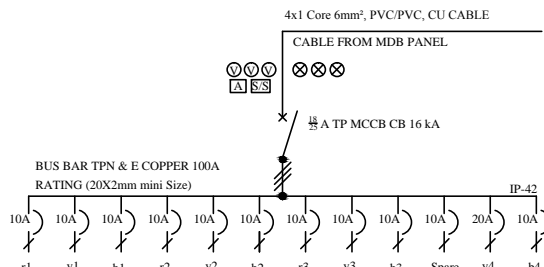
6-WAY (ryb) TPN & E DISTRIBUTION BOARD (DB-1)



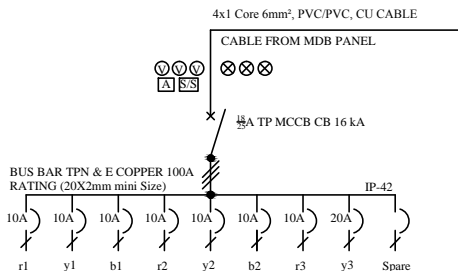
5-WAY (ryb) TPN & E DISTRIBUTION BOARD (DB-2)



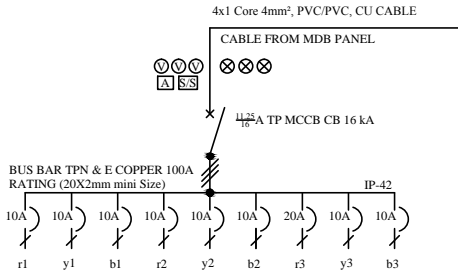
4-WAY (ryb) TPN & E DISTRIBUTION BOARD (DB-3)



G+M floor 4-WAY(ryb) TPN & E DISTRIBUTION BOARD (DB-1)



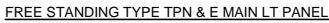
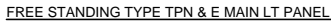
F.F 3-WAY(ryb) TPN & E DISTRIBUTION BOARD (DB-2)




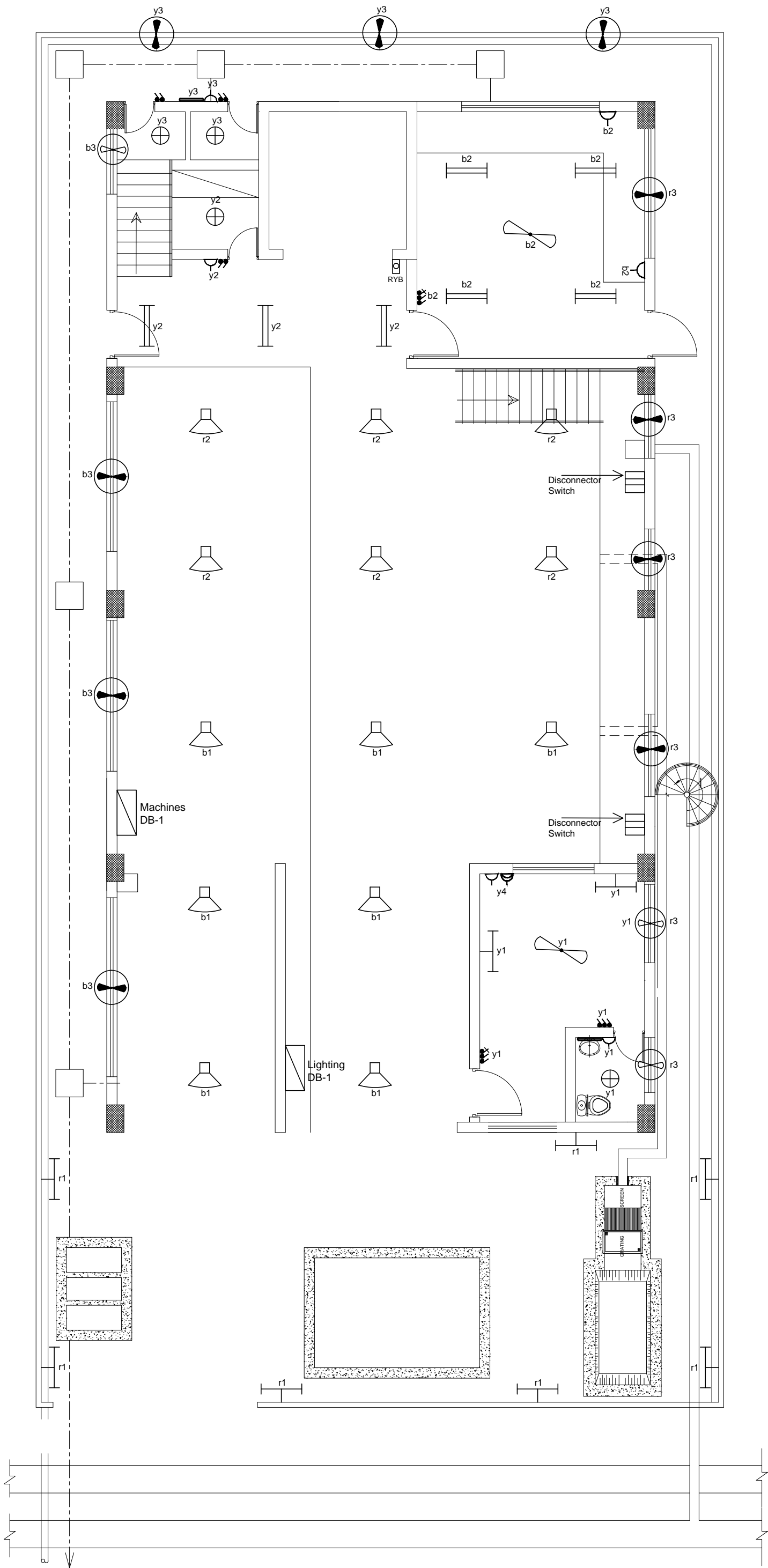
F+S floor 3-WAY(ryb) TPN & E DISTRIBUTION BOARD (DB-3)

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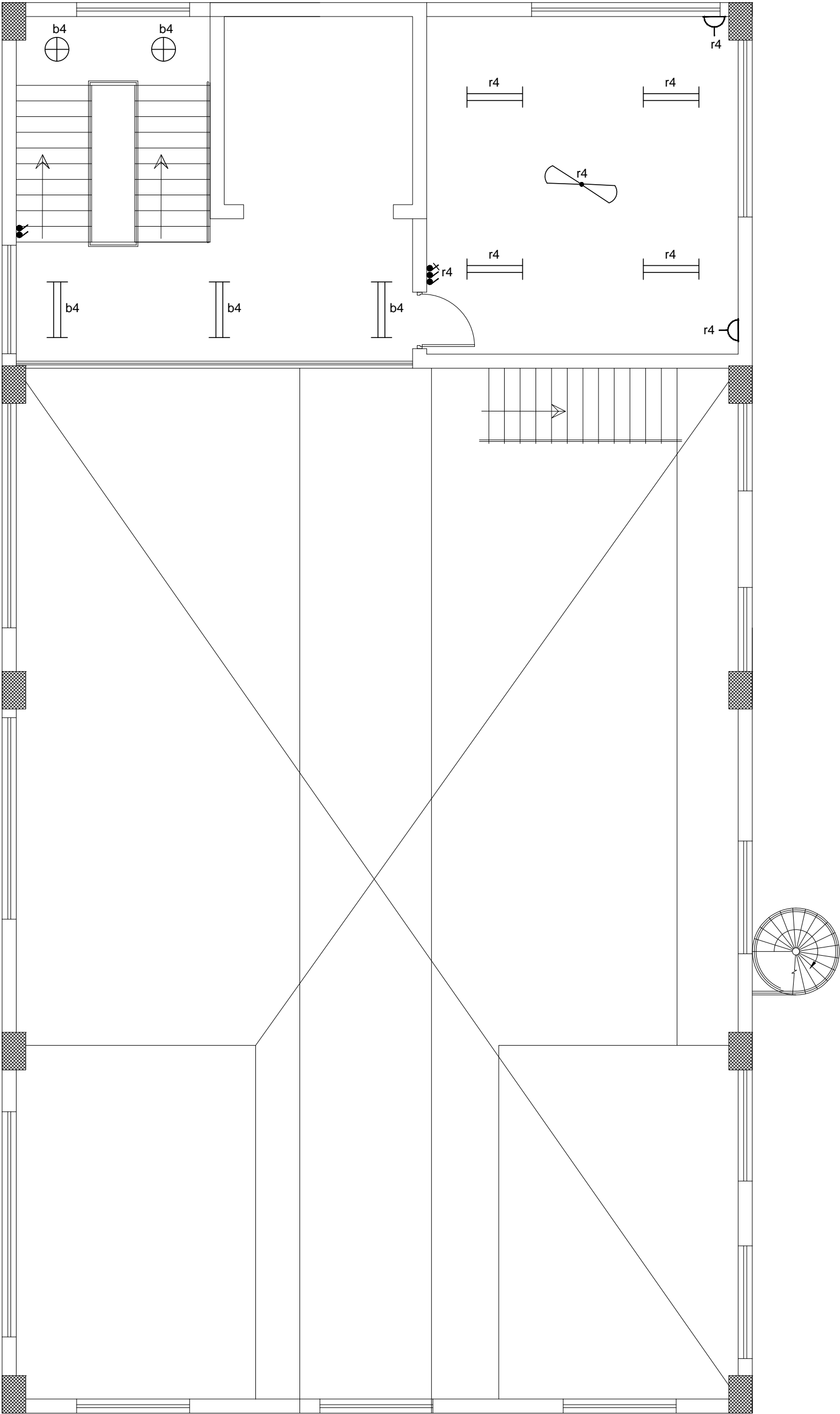
RAW TO WET SINGLE LINE DIAGRAMS



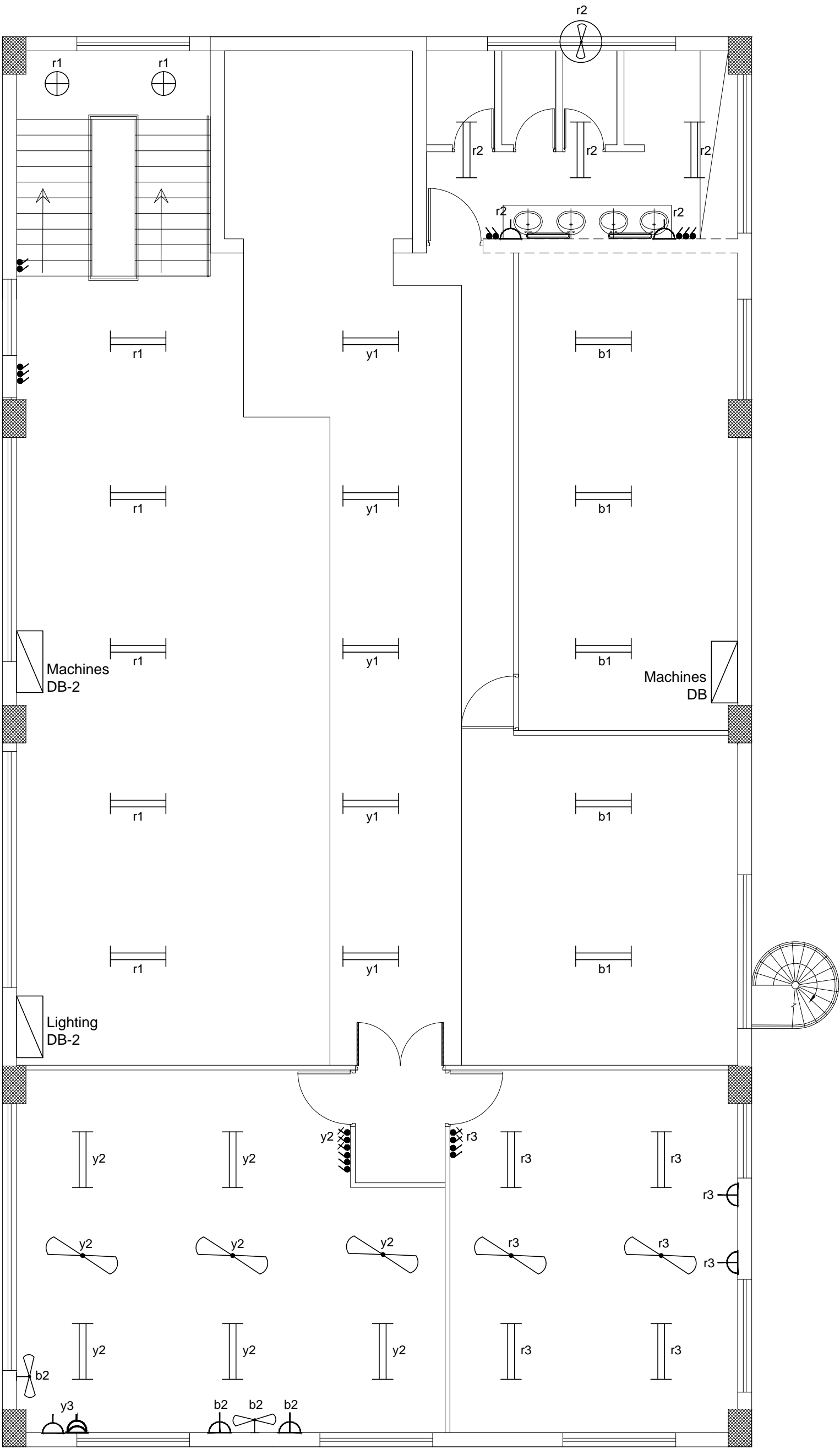
REV.	DESCRIPTION	BY	DATE
 IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54600 TEL:35869560-35832234 FAX:35869561			
PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY -I KANAL DESIGN	
DRAWING TITLE:		SINGLE LINE DIAGRAMS	
SCALE :	NTS.	SHEET # : 3 OF 3	DWG. # : STZ-GTD-ELE-01
CHECKED BY :	M. AFZAL	DRAWN BY : GULFAM	DATE : 01-09-2019



REV.	DESCRIPTION	BY	DATE
	IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54600 TEL:35869560-35832234 Fax:35869561		
PROJECT :	SIALKOT TANNERY ZONE		
BUILDING TITLE:	GREEN TANNERY-1 KANAL DESIGN WET BLUE TO FINISH		
DRAWING TITLE:	GROUND FLOOR PLAN		
SCALE :	NTS.	SHEET # : 1 OF 5	DWG. # : STZ-GTD-ELE-01
CHECKED BY :	M. AFZAL	DRAWN BY : GULFAM	DATE : 01-09-2019

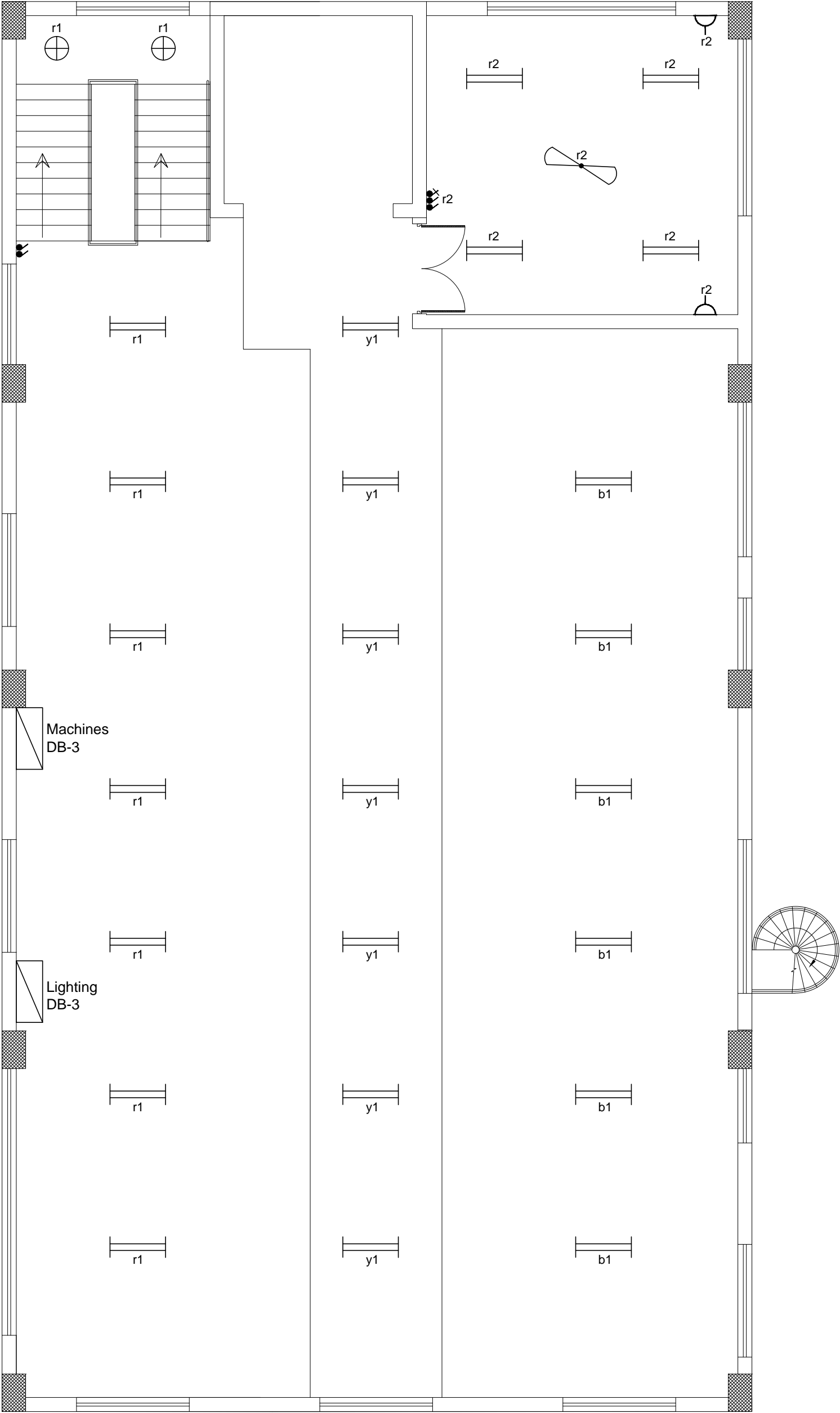


REV.	DESCRIPTION	BY	DATE
<div><div></div><div><div>IN CONSULT (Pvt) LTD.</div><div>80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54600 TEL:35869560-35832234 FAX:35869561</div></div></div>			
PROJECT :	SIALKOT TANNERY ZONE		
BUILDING TITLE:	GREEN TANNERY-1 KANAL DESIGN WET BLUE TO FINISH		
DRAWING TITLE:	MEZZANINE FLOOR PLAN		
SCALE :	NTS. NTS.	SHEET # : 2 OF 5	DWG. # : STZ-GTD-ELE-01
CHECKED BY :	M. AFZAL	DRAWN BY : GULFAM	DATE : 01-09-2019



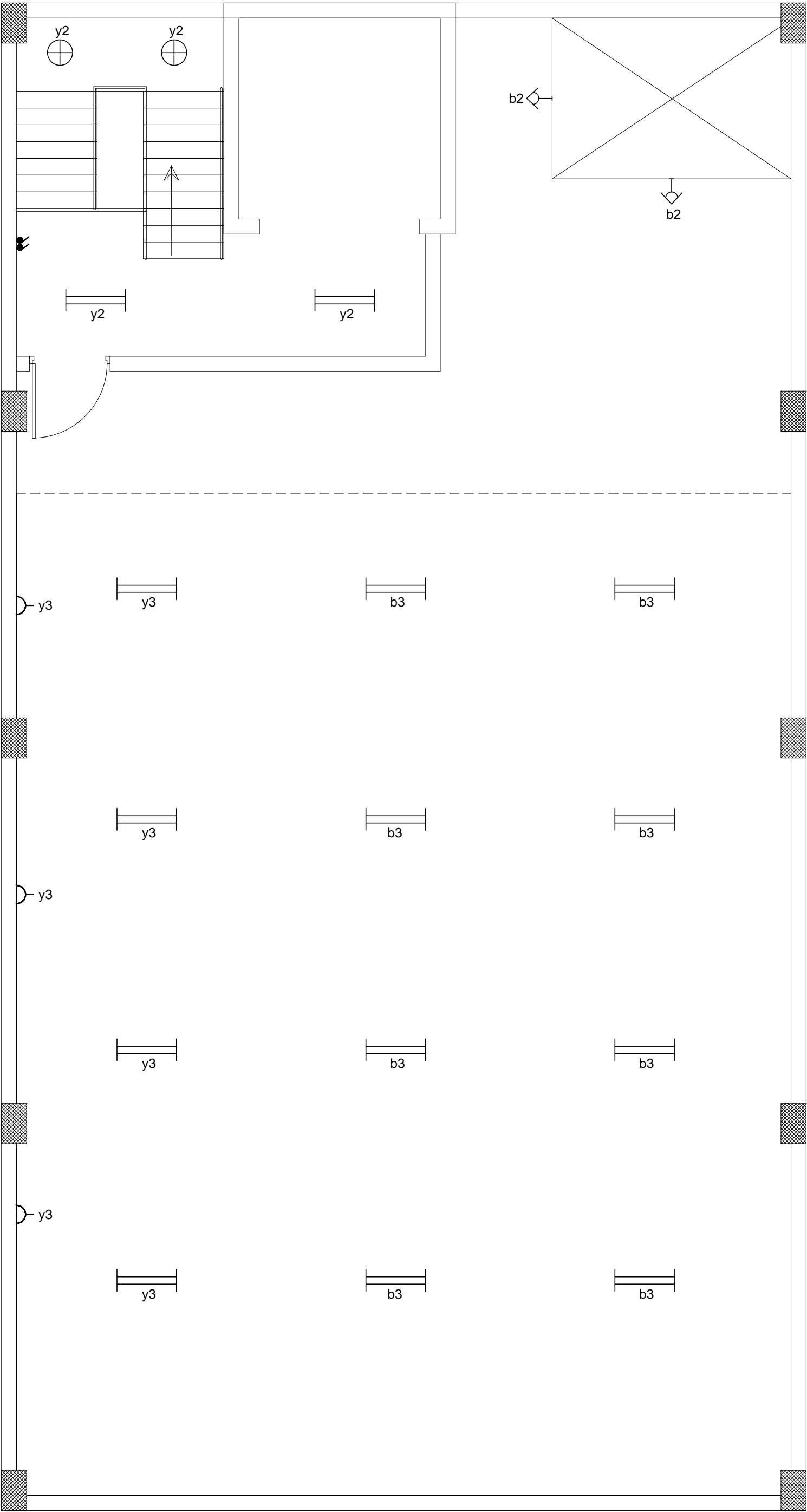
Wet Blue to Finish


REV.	DESCRIPTION	BY	DATE
<div><div></div><div>IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54600 TEL:35869560-35832234 FAX:35869561</div></div>			
PROJECT :	SIALKOT TANNERY ZONE		
BUILDING TITLE:	GREEN TANNERY-1 KANAL DESIGN WET BLUE TO FINISH		
DRAWING TITLE:	FIRST FLOOR PLAN		
SCALE :	NTS. NTS.	SHEET # : 3 OF 5	DWG. # : STZ-GTD-ELE-01
CHECKED BY :	M. AFZAL	DRAWN BY : GULFAM	DATE : 01-09-2019



Wet Blue to Finish

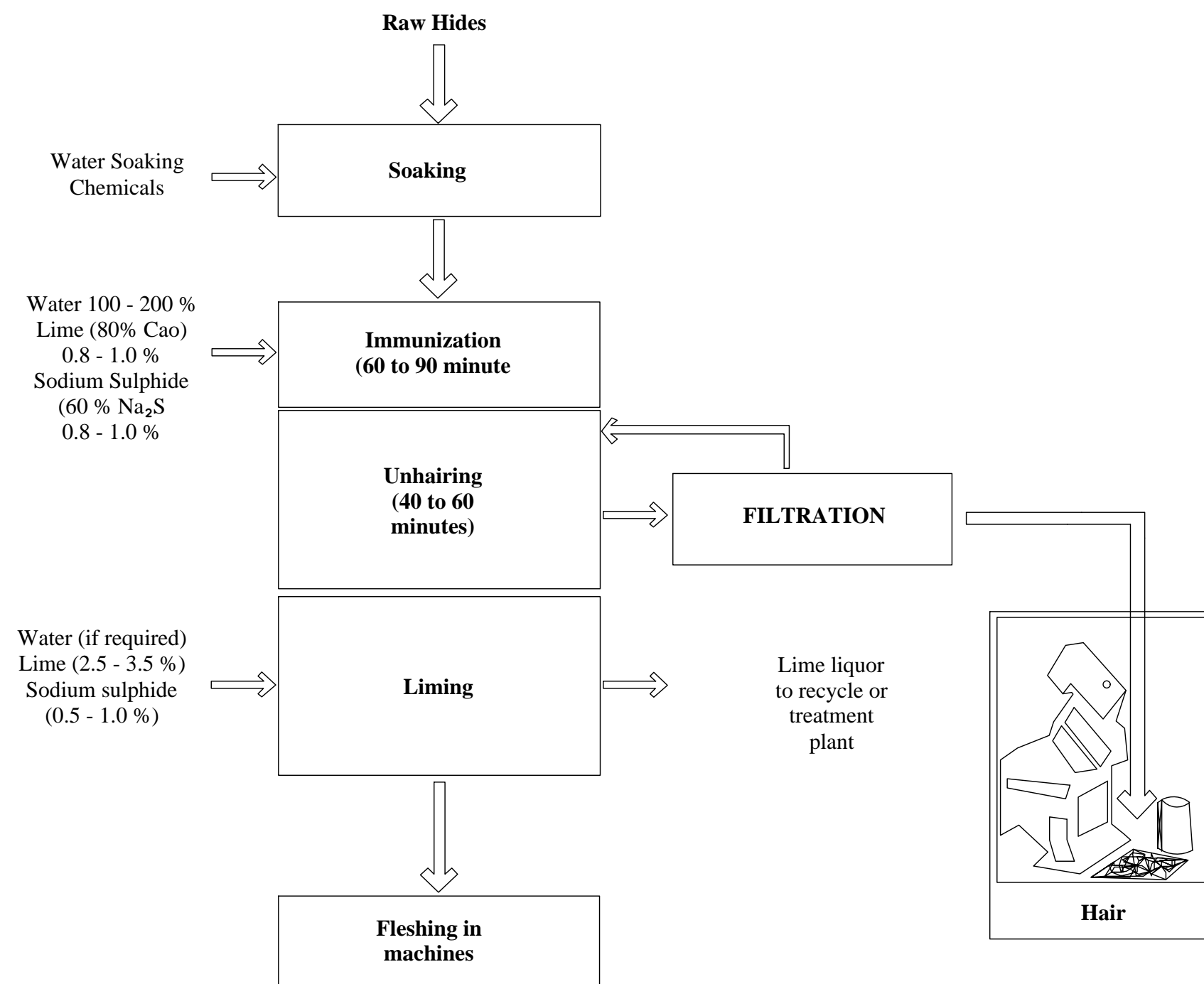
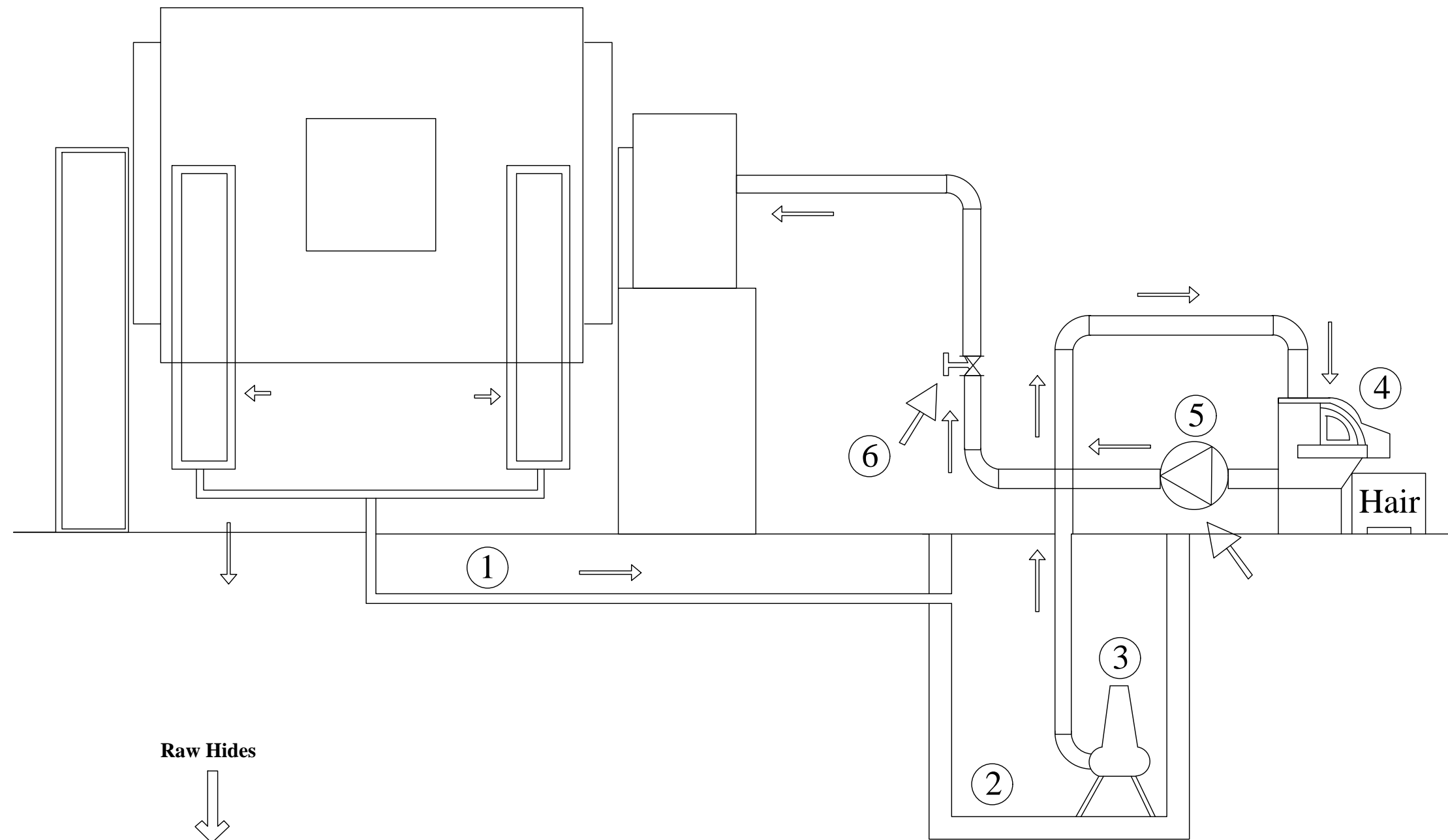
REV.	DESCRIPTION		BY	DATE
<div><div></div><div><div>IN CONSULT (Pvt) LTD.</div><div>80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54600 TEL:35869560-35832234 FAX:35869561</div></div></div>				
PROJECT :		SIALKOT TANNERY ZONE		
BUILDING TITLE:		GREEN TANNERY- I KANAL DESIGN WET BLUE TO FINISH		
DRAWING TITLE:		SECOND FLOOR PLAN		
SCALE :		SHEET # :	DWG. # :	
NTS.		4 OF 5	STZ-GTD-ELE-01	
CHECKED BY :		DRAWN BY :	DATE :	
M. AFZAL		GULFAM	01-09-2019	



REV.		DESCRIPTION	BY	DATE
<div><div></div><div><div>IN CONSULT (Pvt) LTD.</div><div>80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54600 TEL:35869560-35832234 FAX:35869561</div></div></div>				
PROJECT :		SIALKOT TANNERY ZONE		
BUILDING TITLE:		GREEN TANNERY-1 KANAL DESIGN WET BLUE TO FINISH		
DRAWING TITLE:		ROOF PLAN		
SCALE :		SHEET # :	DWG. # :	
NTS.		5 OF 5	STZ-GTD-ELE-01	
CHECKED BY :		DRAWN BY :	DATE :	
M. AFZAL		GULFAM	01-09-2019	

Annex-11

Typical Drawings for Pretreatment Facilities

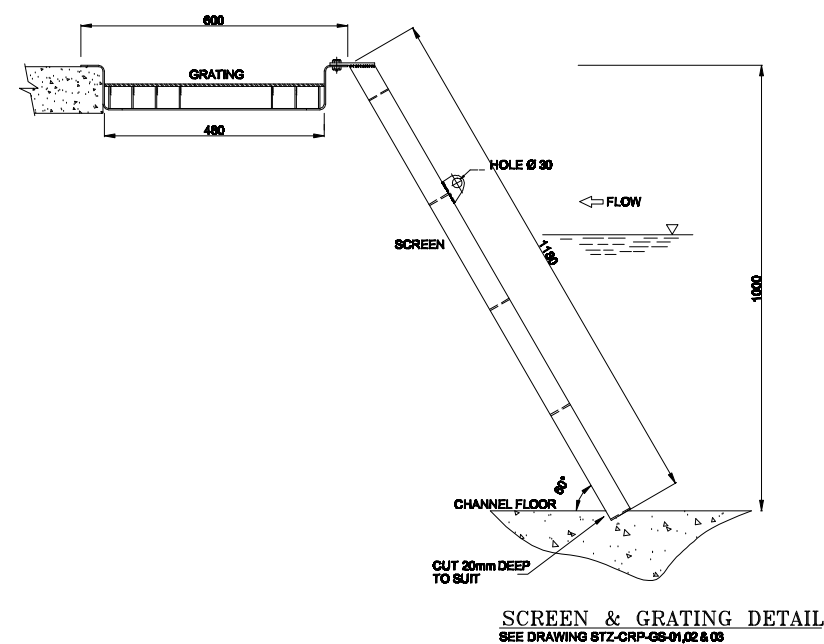
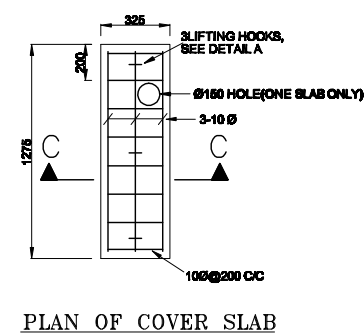
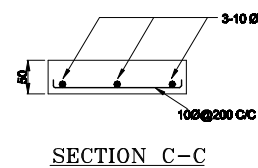
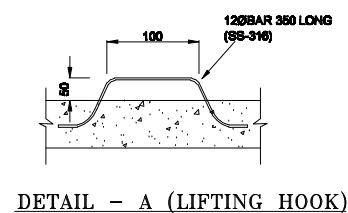
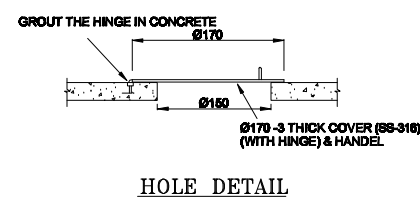
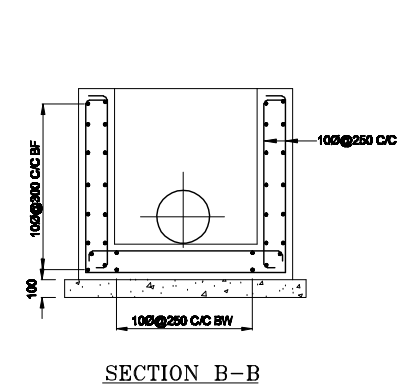
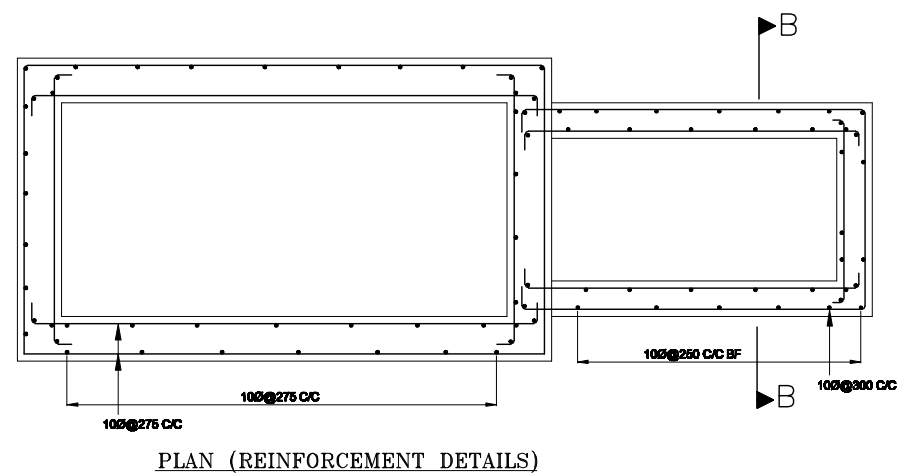
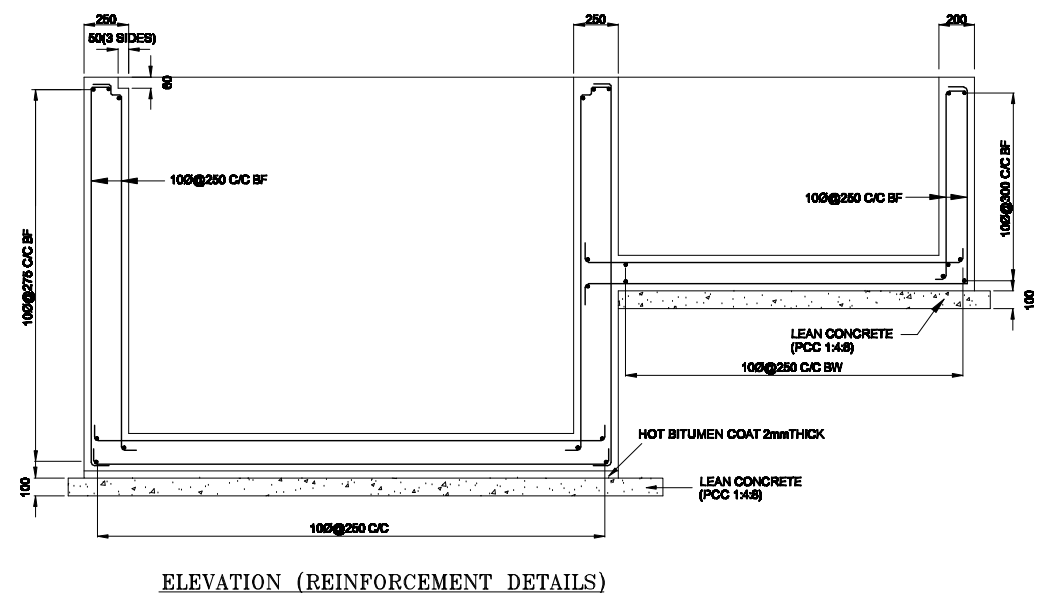
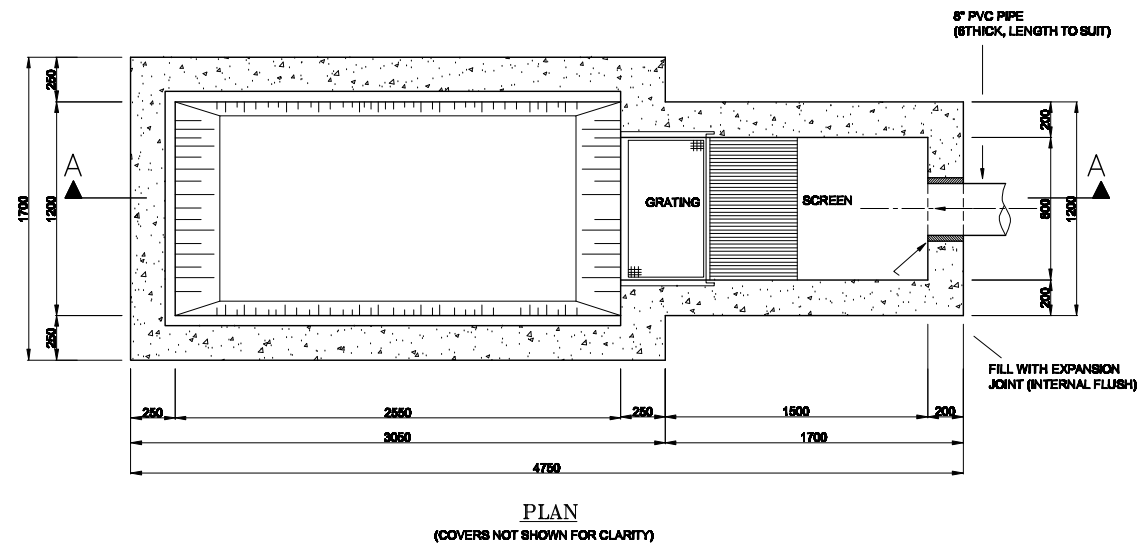
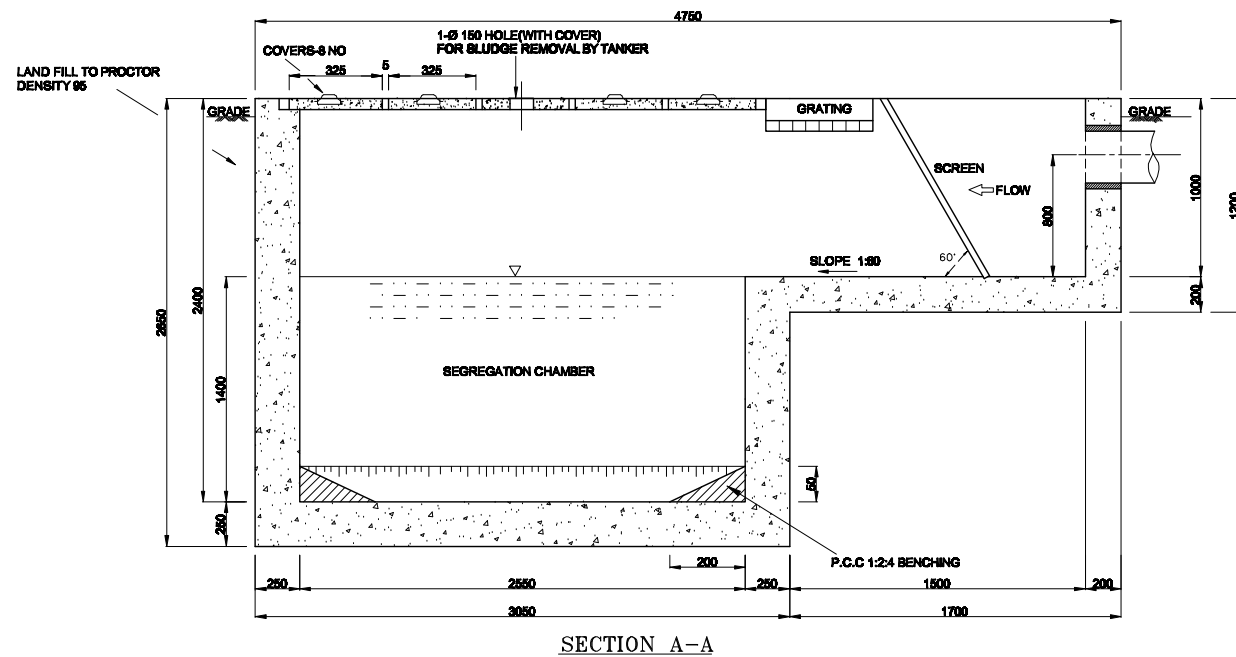


**PROCESS FLOW DIAGRAM FOR
HAIR SAVE UNHAIRING**

LEGEND :-

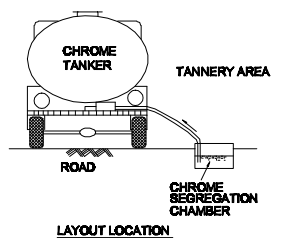
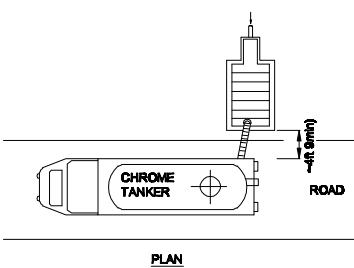
- 1- Float collecting gutters
- 2- Float collecting pit
- 3- Submersible pump
- 4- Fine rotary screen with hair dewatering
- 5-Centrifugal pump for float recycling
- 6- Piping, Valve & Accessories


REV.	DESCRIPTION	BY	DATE
IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54600 TEL:5869560-5832234 FAX:5869561			
PROJECT :		SIALKOT TANNERY ZONE	
BUILDING TITLE:		GREEN TANNERY DESIGN	
DRAWING TITLE:		FINE ROTARY SCREEN WITH HAIR DEWATERING	
SCALE :	SHEET # :	DWG. # :	
NTS.	1 OF 1	STZ-GTD-MECH-01	
DESIGN BY :	DRAWN BY :	DATE :	
MSA	GULFAM	30-04-2020	



NOTES:-


- 1- CHROME COLLECTION PIT TO BE CONSTRUCTED BY FACTORY OWNER WITH HIS INDUSTRY.
- 2- THE SIZE OF THE PIT IS GENERALLY APPLICABLE TO MOST OF THE INDUSTRIES NEEDED. HOWEVER THE DIMENSIONS MAY BE CHANGED ACCORDING TO THE SPECIFIC OF THE INDUSTRY
- 3- THE DIMENSIONS GIVEN ARE IN MILLIMETERS.
- 4- MATERIALS :
 - a - CONCRETE (fco) Cylinder : 2500psi
 - b - REINFORCEMENT STEEL : ASTM#616
 - c - PCC FOR BENCHING : 1:2:4
- 5- COVERS TO REINFORCEMENT
 - a - ALL PARTS EXCEPT BAFFLE WALL : 62mm
- 6- LAPS SPICES AND ANCHORAGE: 30 TIMES DIA OF BARS.
- 7- USE SULPHATE RESISTANT CEMENT ONLY.
- 8- FOR DESILTING/CLEANING:
 - A: SLUDGE REMOVAL-TANKER PUMP
DIP 4" FLEXIBLE PIPE IN GRIT PIT & REMOVE BY PUMPING OUT IN THE TANKER.
 - B: REMOVAL OF COVERS
REMOVE TOP COVER & REMOVE SLUDGE BY HAND LIFTING IN PAILS.
- 9- CAPACITY OF SEGREGATION CHAMBER: 4.147 HRL.
- 10- CEMENT SHALL BE USED SULPHATE RESISTANT
- 11- CONCRETE FINISH INSIDE= MECHANICAL STEEL, (TROWEL FINISH.)
- 12- CONCRETE INTERIOR SURFACES TO BE COATED WITH FRP.
- 13- CONCRETE EXTERIOR SURFACES TO BE HOT BITUMEN COATED-2 THICK.

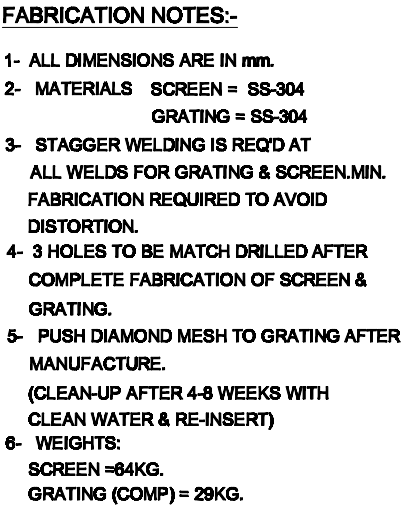



NO.	DESCRIPTION	BY	DATE
			
<p align="center">IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54600 TEL:5869562-5832234 Fax:5869561</p>			
<p align="center">SIALKOT TANNERY ZONE</p>			
<p>BUILDING TITLE:</p>			
<p align="center">GREEN TANNERY DESIGN</p>			
<p>DRAWING TITLE:</p>			
<p align="center">CHROME COLLECTION PIT AT TANNERY</p>			
CALC. BY:	SHEET # :	DWG. # :	
N.T.S.	1 OF 1	STZ-GTD-P1-01	
CHECKED BY:	DRAWN BY:	DATE:	
MSA	GULPAM	30-04-20	

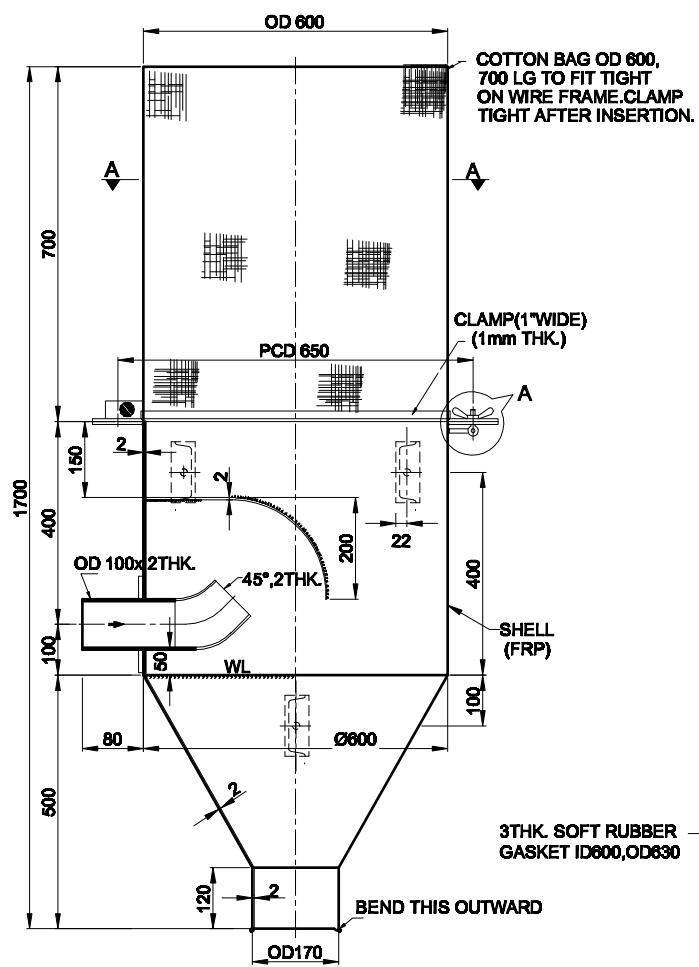


- 1- ALL DIMENSIONS ARE in mm.
- 2- MATERIALS SCREEN = FRP
GRATING = FRP
RESIN TYPE: EPOXY
SCREEN & GRATING TO BE STRONG ENOUGH
TO BEAR A MAN LOAD.
- 3- 3 HOLES TO BE MATCH DRILLED AFTER
COMPLETE FABRICATION OF SCREEN &
GRATING.
- 4- PUSH DIAMOND MESH TO GRATING AFTER
MANUFACTURE. DIAMOND MESH = SS-316
(CLEAN-UP AFTER 4-8 WEEKS WITH
CLEAN WATER & RE-INSERT)
- 5- WEIGHTS:(FRP)
SCREEN = 15
GRATING (COMP) = 7KG.

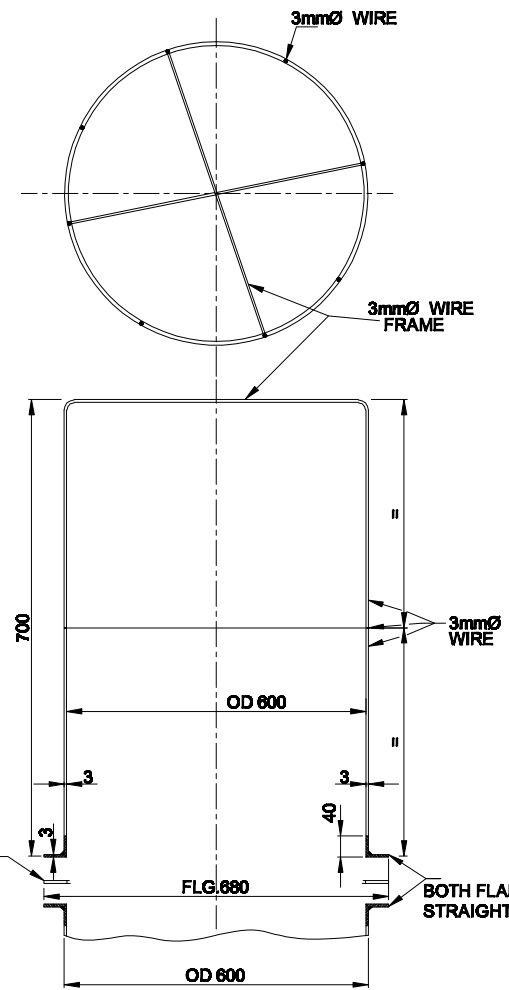
REV.	DESCRIPTION	BY	DATE
	IN CONSULT (Pvt) LTD.		
	80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54600 TEL:5869560-5832234 FAX:5869561		
	PROJECT :		
	SIALKOT TANNERY ZONE		
BUILDING TITLE:			
	GREEN TANNERY DESIGN		
DRAWING TITLE:			
	CHROME SEGREGATION CHAMBER IN INDUSTRIES GRIT SCREEN-2		
SCALE :	SHEET # :	DWG. # :	FRP
N.T.S.	1 OF 1	STZ-GTD-PT-04	
CHECKED BY :	DRAWN BY :	DATE :	
MSA	GULFAM	30-04-2020	



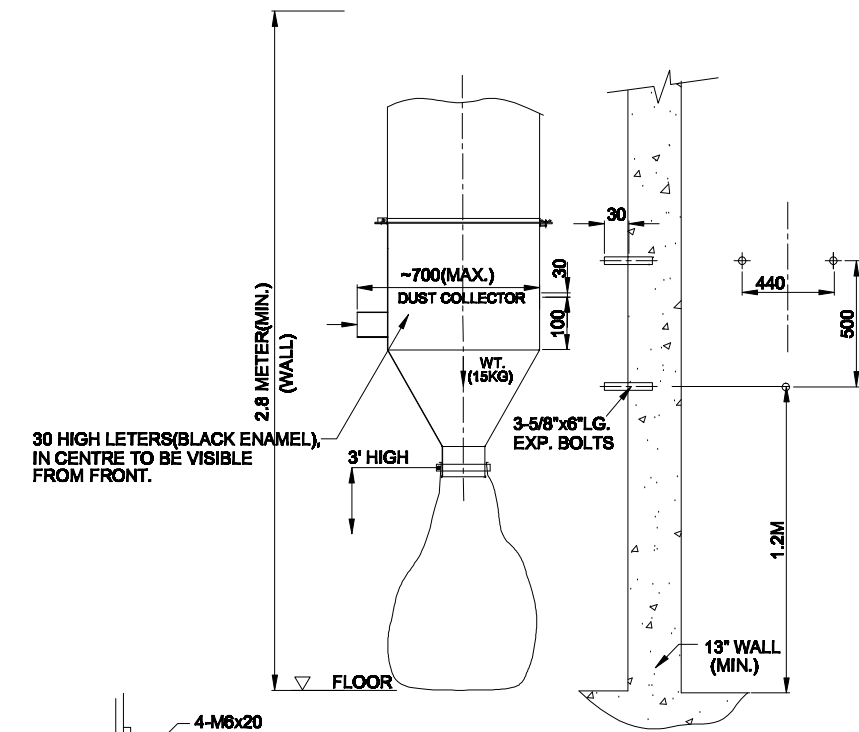
REV.	DESCRIPTION	BY	DATE
	IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54600 TEL:8689560-5832234 Fax:586561		
PROJECT :			
SIALKOT TANNERY ZONE			
BUILDING TITLE:			
GREEN TANNERY DESIGN			
DRAWING TITLE:			
CHROME SEGREGATION CHAMBER IN INDUSTRIES GRIT SCREEN-3			
		SS-304	
SCALE :	SHEET # :	DWG. # :	
N.T.S.	1 OF 1	STZ-GTD-PT-05	
CHECKED BY :	DRAWN BY :	DATE :	
MSA	GULFAM	30-04-2020	



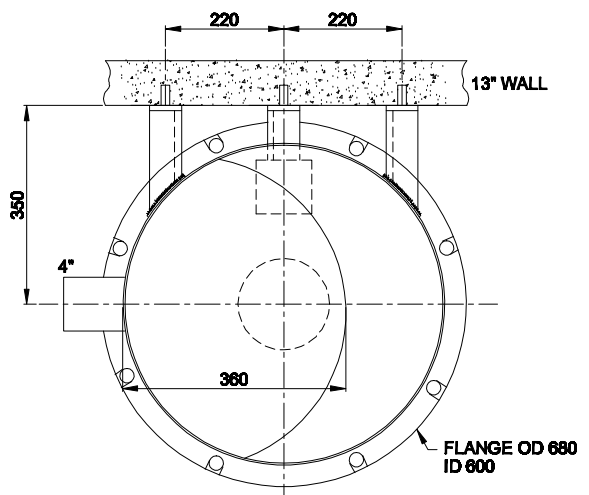
FRONT ELEVATION
SCALE:1=10



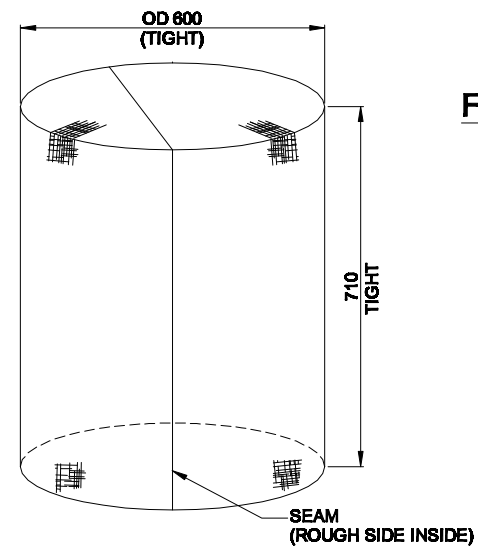
TOP BAG FRAME ASSY DETAIL
(TO BE FABRICATED BY BRAZING)
SCALE:1=10



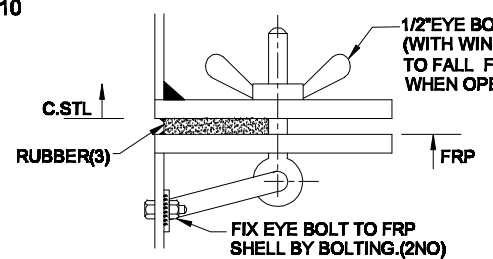
WALL HOLE DRILLING DETAILS
SCALE:1=10



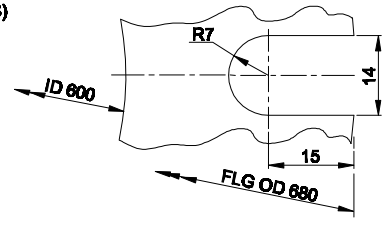
VIEW-A A (PLAN)
SCALE:1=10



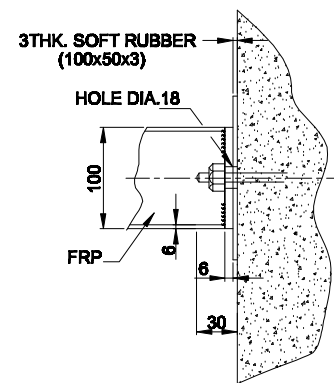
TOP COTTON BAG DETAIL
SCALE:1=10



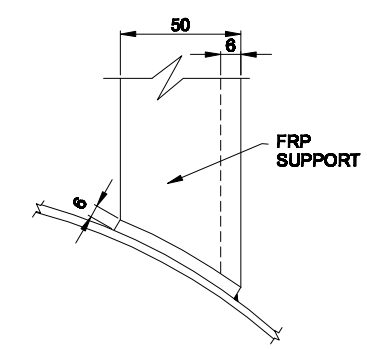
FLANGE FITUP DETAIL-A



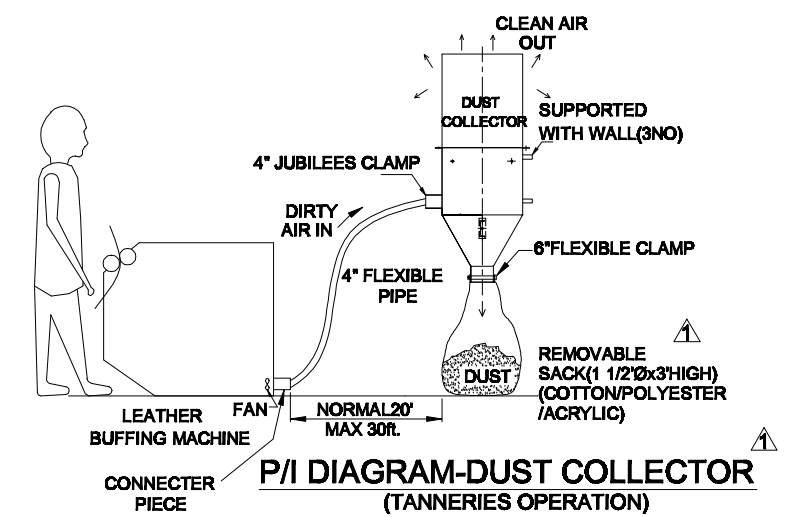
FLANGE-CUT DETAILS
SCALE:1=2.5



SUPPORT-FIX DETAIL
SCALE:1=2.5



FRP SUPPORT DETAIL(TYP)
SCALE:1=2.5



- FABRICATION NOTES**
- ALL DIMENSIONS ARE IN mm.
 - MANUFACTURER TO PRODUCE A SHARP CORNER FREE FINISH-ALL SIDES.
 - BRAZING IS PERMITTED FOR TOP BAG FRAME ASSY WHICH IS MADE OF 3mmØ WIRE.
 - MATERIALS =
 - TOP BAG FRAME: C.STL.
 - SHELL (COMPLETE): FRP
 - INLET PIPE: C.STL.
 - GASKET: SOFT RUBBER
 - OUTSIDE SURFACE OF SHELL TO BE SHINY CLEAN.
 - WEIGHT (STEEL) = 6KG., FRP=9KG TOTAL=15KG
 - SURFACE CLEAN-UP WIRE BRUSH ON TOP BAG FRAME
 - THE UNIT TO BE PAINTED WITH 2 COATS OF EPOXY ON RED OXIDE PRIMER.FINAL COAT WHITE ENAMEL, TOTAL DFT 240 MICRON.

SPECIFICATIONS

600 DIA, WALL MOUNTED,99.5% EFFECTIVE FOR LEATHER DUST, FIBER GLASS DUST COLLECTOR

REV.	DESCRIPTION	BY	DATE
	IN CONSULT (Pvt) LTD. 80-AURANGZEB BLOCK NEW GARDEN TOWN LAHORE-54600 TEL:5869560-5832234 Fax:5869561		
PROJECT : SIALKOT TANNERY ZONE			
BUILDING TITLE: GREEN TANNERY DESIGN			
DRAWING TITLE: 600Ø DUST COLLECTOR (D1) LEATHER BUFFING MACHINE FRP			
SCALE : N.T.S.	SHEET # : 1 OF 1	DWG. # : STZ-GTD-PT-07	
CHECKED BY : MSA	DRAWN BY : GULPAM	DATE : 30-04-2020	