

5.1 TEA FACTORY- RISK ASSESMENT

The objective behind this assessment which involved of evaluation of the present condition of tea factory in terms of fire safety concerns.

Safety Concerns

Safety of the people & property of the factory is the paramount concern of all mass production units and hence, this was one of most important aspects of any assessment

- a. Fire hazard
- b. Structural hazards
- c. Mechanical hazards

Supporting Evidences

In order to facilitate the Assessment, floor plans of the different sections are obtained.

Overview

Tea Estate and the Factory are situated in Rathnapura. Located an altitude of 1000 feet, it has a plantation area of 110.88 Hectares. The Factory is a three storied structure, with the ground floor resting on sandstone base and brick and stone retention wall acting as the supporting column (base) for the garage and trough section of the first floor.

Ground Floor

The brick and stone retention wall has been given a cemented plaster finish. Ground floor is home to the heaviest machinery of the factory and offers the only presence of steel and concrete in the entire of the factory. The ground floor comprises of

1. Dreyer section
2. Sifting section
3. Rolling section
4. Engine and power room

Dryer Section

The Dryer and Sorting Section together occupy an area about 350 square meters. The Section starts at brick and stone retention wall.

Sorting Section

The sorting section is situated immediately next to the Dryer Section and houses the massive sorting machines.



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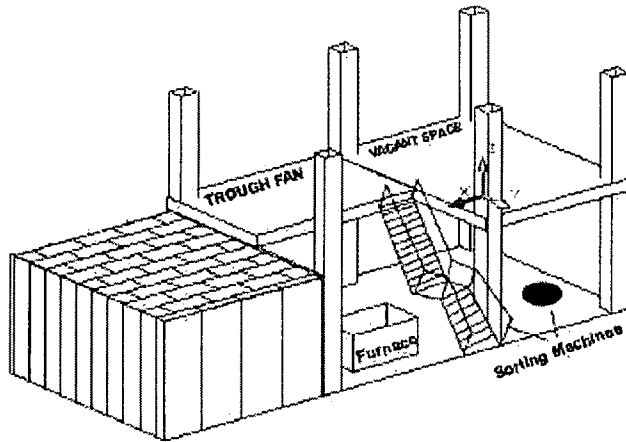
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Rolling Section

The Rolling Section occupies an area of about 100 square meters. The flooring of the section is tiled.

First Floor



Ground and First Floor Elevated Profile

The First Floor covers the largest area in the factory and is entirely made up of wooden planks and beams.

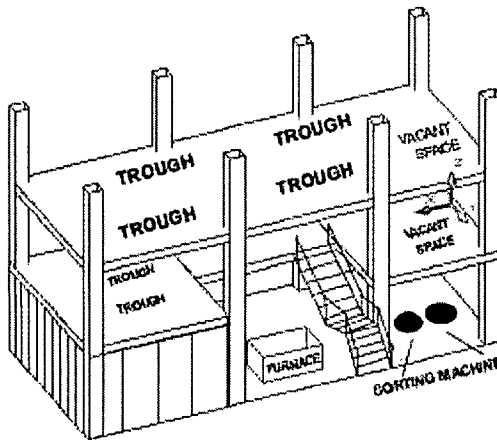


Trough Section

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The Trough Section is the first section that a visitor is introduced to in the factory Section occupies an area of 106.94 square meters and is entirely a wooden enterprise with the two troughs itself being made of wood.

Second Floor



Ground, First and Second Floor Elevated Profile

- a) Date of Erection : Not Known(Before 1990s)
- b) Number of Floors : Ground Floor & two lofts
- c) Verandahs : Along Both sides
- d) Porticos : Two storied porch rising through front Verandah
- e) Annex : Fire wood shed at the rolling room end
- f) Foundations & Ground
- | | | |
|---------------------|---|---|
| Floor | : | Masonry & Concrete |
| i) Main Framework | : | Steel Columns & beams |
| j) Outer Walls | : | Masonry walls surmounted by G.I Claddings |
| k) Loft Floors | : | Wooden |
| l) Top Loft Ceiling | : | None |
| m) Main Roof | : | Amano sheets on steel frame & purlins |
| n) Windows | : | Wooden/aluminum frame with glass |
| o) Stairways | : | Wooden /SS/ rubber mat |

Through allocation for loft Floors

First Loft

Withering Fans Size	No	Capacity	Motor Rating
60' x 6'	2	900 kg	7.5Hp/960rpm
71' x 6'	8	1065kg	7.5Hp/960rpm
100' x 6'	8	1500kg	10Hp/960rpm
54' x 6'	4	810kg	7.5Hp/960rpm
50' x 6'	6	750kg	7.5Hp/960rpm

Second Loft

Withering Fans Size	No	Capacity	Motor Rating
80' x 6'	9	1200 kg	7.5Hp/960rpm
72' x 6'	6	1065kg	7.5Hp/960rpm
100' x 6'	6	1500kg	10Hp/960rpm
48' x 6'	3	720kg	5.0Hp/960rpm

Transport of leaf is being semi automated by conveyors & weighing system is being fully automated by introduction of electromechanical sensors & load cells.



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General Condition

Good/Management is keen with improvements being carried out in regard to manufacturing process, specially process integration & automation of manufacturing system.

Sub Building

1. Office Building
2. Vehicle shed
3. Labors room/generator room
4. Fire wood shed-open yard

Driers

1. Andrew Yule -3 stage drier 6 feet-appears to be in good order
2. Conquest -2 stage drier 6 feet-2002-in order
3. Mehendra_-2 stage drier 6feet -1993- in order

Drier Outlets

In order -Ceiling above the drier outlets being erected contrary to the relevant dryer & engine rules

Chimney

Vertical Steel Chimney system-In order horizontal stub chimney-In order

Driers

Liquid Fuel - Not in use



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Heater Verandah

The heater section of the drier is not effectively separated in accordance with warranty No 17

Fire Extinguishing Appliances

Soda acid ,9L water & Carbon dioxide Fire extinguishers can be observed in the Dryer room & sifting room. Fire hose reels are available for dryer room & 1st loft area but no compliance with warranty number 24.

Engine Room

Prime Movers (1) : Dale 6 Cylinder Diesel engine coupled to
312 KVA alternator

Liquid Fuel Exhaust : 5000 L Diesel tank in bed plate
: In order & Compliance with Warranty No 14

Wiring : P.V.C Cables in steel conduits

Supply : CEB 3 phase supply via 33 KV transformer

Lighting Fittings

Ground Floor : Florescent Fittings

Lofts : same

Power Installation : Electrical motors – individual drives



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- 14 Are any of Compulsory Warranties Nos.1 to 8 inclusive not satisfied? - None
- 15 Are there any Optional Warranties Nos.9 to 12 inclusive not satisfied? - None
- 16 Are there any Optional Warranties Nos.13 to 26 inclusive not satisfied? - 14,15,20,21

Recommendations

- Lightning arresters are not installed within the factory premises. It is highly recommended to install suitable lightning arrester for factory premises immediately as factory surrounding consist with larger number of mobile transmission towers and it will increase the possibility of lighting affection
- It is recommended to check and obtain a working certificate for those lighting arresters in once a year from external parties & earthling resistance should be maintained below 5 Ohms
- It is highly recommended to install surge arresters for main electrical panel as well as sub electrical panel which is installed in ground floor.
- We have observed that some power lines were drawn from generator room to the near building and it is not arranged in proper way. It is advisable to remove those power lines and install above wires through the conduits properly.
- Recently they have removed electrical panel from electrical transmission room at rolling section and the space (hole at floor) which is used to lay cables still not covered therefore it is advisable to cover this opening by using concrete blocks.
- Power cables should not be exposed to the environment in the rolling room motors
- Some electrical wires at color separation section as well as separation lines drawn through walls and floor without any protection. Therefore it is highly recommended to cover all these unprotected electrical wires.
- First loft consist with one fire hose reel, but there is no hose reel in second loft therefore it is recommended to install one hose reel to second loft and also we are recommended to introduce two additional water type 9L fire extinguishers to both first and second loft and they should be situated in both sides of length of building.
- Dry tea leaves were trapped in the out side of the overhanging heat transmitting ducts. This may cause to originate fire at these leaf contacted points. It is highly recommended that these trapped dry tea leaves should be removed from the above hot chamber ducts

- Vanes of the ventilation line at color separation machine area are blocked with tea dust and they are not cleaned therefore tea dusts are not extracted properly and those dust clearly visible in the shifting room. Therefore we are recommended that above ducts and vanes should be properly cleaned.
- Some refuse tea bags are stored in part of shifting room and it creates hazards area within the premises, therefore it is recommended to remove those rejected item immediately or recommended to store 30 feet away from the factory premises in separate area.
- Room temperature of the drying area is far higher than acceptable level therefore it is recommended to introduce heat removing mechanism to reduce the temperature.
- Electrical wiring at drying area is not proper manner. It should maintain proper manner.
- Dryers & heaters should be thoroughly examined weekly for smoke leaks & the results of such tests must be recorded in book.
- Every hot air channel should be constructed as to facilitate cleaning throughout its entire length.
- A fire extinguisher should be always be at hand while hot work operations are in progress.
- A regular schedule of inspection and maintenance & cleaning of al electrical equipments should be drawn up. Particular attention should be given to maintenance of motor contacts in motor starters and switch gears & such maintenance records should be available for risk Engineer's inspection.
- That all tea fluff, dust & similar waste matter be removed daily from driers, heaters & be not kept in the factory overnight.

5.2 RISK CONCLUSION

Risk Value Matrix Method

- We define the probability that a fire event will occur as the fire risk, and the harm that would result from that event as the fire hazard.
- Risk Value = Fire Hazard Value x Fire Risk Value

Risk classification table.

Fire Hazard consequences	Value	Fire Risk
Negligible	1	Unlikely
Slight	2	Possible
Moderate	3	Quite Possible
Severe	4	Likely
Very Severe	5	Very Likely

Risk Value Matrix

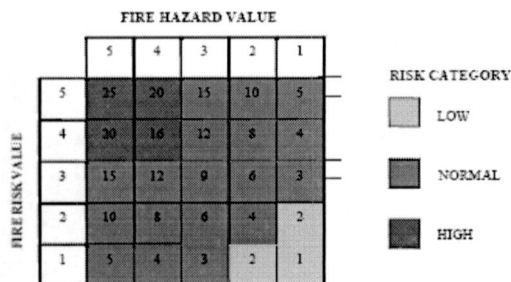


Figure 5.1: Risk value matrix

Fire Risk Number = 6

PML (Probable Maximum Loss) is an estimate of the largest loss that a building or a business in the building is likely to suffer considering the existing mitigation features because of a single fire. The PML is the maximum expected loss, expressed as a percentage of the building's value, when critical protection systems are functioning as expected.

EML =100%

PML = 100%

According to our observations, Risk is regarded as Normal.



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5.3 Risk Assessment - Example-2

- Date of Erection : 1992
- Number of Floors : Ground Floor & one lofts
- Verandahs : Along Both sides
- Porticos : None
- Annex. : Fire wood shed at the rolling room end
- Dimensions : 100' X 55'(Sq feet)
- Foundations & Ground
Floor : Masonry & Concrete
- Main Framework : Steel Columns & beams
- Outer Walls : Masonry walls surmounted by Al sheets
- Loft Floors : Wooden
- Top Loft Ceiling : None
- Main Roof : Aluminum sheets on steel frame & purlins
- Windows : Wooden/aluminum framed

General condition

Good/Management is keen with improvements being carried out in regard to manufacturing process, specially process integration & automation of manufacturing system.

3. **Withering fans** : **First Loft**
7 Nos 80' X 6'

Type of motors- 7.5 Hp

Transport of leaf is being semi automated by conveyors.

- 4 **Driers** **Sirricco** -3 stage drier 6 feet
22Hp motor of 260Kg per hour-appears to be
In good order
Browns -2 stage drier 4 feet-standby dryer
Capacity of 20Hp & 150kg per hour.

5. **Dryer Outlets: In order** - above the drier outlets is being erected contrary to the relevant dryer & engine rules. (Concrete slab above the dryer outlet)

- 6 **Chimney** : Horizontal stub chimney-In order

- 7 **Fuel**
Liquid Fuel - Not in use

- 8 **Heater vatranda** The heater section of the drier is not effectively separated in accordance with warranty No 17
Iron rotation door is available

- 9 **Fire Extinguishers appliances.**

Soda acid ,9L water & Carbon dioxide Fire extinguishers can be observed in the Dryer room & sifting room. But no compliance with warranty number 24. (100L water trolley is available)

- 10 **Engine room.**

Prime Movers (1) : Stamford Diesel engine coupled to 180 KVA alternator(Tempest)

Liquid Fuel : 400 L Diesel tank in bed plate

Exhaust : In order & Compliance with Warranty No 14

11 **Electrical**

Wiring : steel conduits

Supply : CEB 3 phase supply.

Lighting Fittings

Ground Floor : Florescent Fittings

Lofts : same

Power Installation : Electrical motors –individual drives

12 **Hand illumination** : Electric torches

13 Are any of Compulsory Warranties - 7
Nos.1 to 8 inclusive not satisfied?

14 Are there any Optional Warranties - None
Nos.9 to 12 inclusive not satisfied?

15 Are there any Optional Warranties - 14,15,20,21
Nos.13 to 26 inclusive not satisfied?

Reccomendations.

- That no smoking be permitted in the factory or in any building attached thereto and that notices to this effect, written in Sinhalese, Tamil and English in letters at least 3 inches high, be exhibited at each entrance to the factory.
- Dryers & heaters should be thoroughly examined weekly for smoke leaks & the results of such tests must be recorded in book.
- Every hot air channel should be constructed as to facilitate cleaning throughout its entire length.
- Fire wood should be stored 30 feet away from the factory buildings.
- There shall be installed & maintained following fire extinguishing appliance plan for efficient working order in the factory.

- a) **Loft** - 2 Nos of Soda acid or water type(9L)
- b) **Drier Room**- 6 Nos of Soda acid or Water (9L) Extinguishers
- c) **Sifting Room**- 2 Nos of Soda acid or water type
- d) **Engine Room** – One Foam type Extinguisher
- e) **Switch board**-1 carbon dioxide fire extinguisher for near to each switch board

- A regular schedule of inspection and maintenance & cleaning of al electrical equipments should be drawn up. Particular attention should be given to maintenance of motor contacts in motor starters and switch gears & such maintenance records should be available for risk Engineer’s inspection.
- That all tea fluff, dust & similar waste matter be removed daily from driers, heaters & be not kept in the factory overnight.
- There should be kept at least 3 feet separation gap between driers & tea stock.



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PML (Probable Maximum Loss) is an estimate of the largest loss that a building or a business in the building is likely to suffer considering the existing mitigation features because of a single fire. The PML is the maximum expected loss, expressed as a percentage of the building's value, when critical protection systems are functioning as expected.

EML=100%

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According to our observations, Risk is regarded as Normal