

## **Material Collection Facility (MCF)**

The Material Collection Facility receives the non-biodegradable waste that is gathered through door-to-door collection. A Material Collection Facility is a place where non-biodegradable garbage can be temporarily kept and where various categories, like paper, plastic, bottles, and packaging paper, are separated out by secondary segregation. After being separated, the MCF output is either sold to recyclers or moved to RRFs.

### **I. Applicable Rules and Legislations**

- Solid Waste Management Rules, 2016.
- Plastic Waste Management Rules, 2016.
- The fire protection and safety requirements for storage buildings are covered under Chapter-7 of the National Building Code of India published by the Ministry of Housing and Urban Affairs.
- Kerala Municipal/ Panchayath Building Rules, 2019 and its amendments.
- G.O.(Rt)No.113/2021/LSGD dated, 16/01/2021.
- Circular No. PCB/T4/115/97 dated 2/5/2018.

### **II. Site Selection**

- Locate close to existing roads which are wide enough for movement of heavy vehicles, including Fire engines.
- Wetlands, low lying areas and flood-prone areas should be avoided for construction of MCFs.
- Siting Criteria for MCF stipulated by PCB as per Circular No. PCB/T4/115/97 dated 2/5/2018 shall be complied with.

### **III. Design Factors**

- 1) Area of MCF shall be fixed, based on the quantity of waste to be handled and frequency of waste Clearance.
- 2) The LSGIs, those who do not have adequate space in existing MCF, shall set up another facility to meet the requirements.
- 3) The structure of the building shall be permanent or semi permanent in nature.
- 4) Adequate height shall be provided at the loading and unloading area.

- 5) The use of the Baling machine shall be ensured in all upcoming MCFs, as it helps to increase the waste handling capacity, by improving the effective utilization of area inside the MCF and also makes transportation easier.
- 6) Industrial flooring: The flooring should be resistant to abrasion and load, as it would be subject to high load of traffic movement by heavy vehicles, compatible with vacuum cleaning and high-pressure water spray cleaning.
- 7) Roof top Air ventilation / turbine roof vent.
- 8) Mezzanine Floor is desirable for better space utilization
- 9) Size of the front door shall be decided considering the size of machinery to be fixed in the MCF and easy movement of waste and vehicles(if necessary).
- 10) Adequate foundation shall be provided for fixing the machineries.
- 11) Provision for fixing the electrical circuit board/ panel on the wall shall be provided in the building.
- 12) Labels or sign boards for cabins/ storage racks/ utility areas etc. shall be provided.
- 13) Adequate capacity storage cabins/ racks shall be provided to store the segregated waste.
- 14) Drop in facility for the public to give non-biodegradable waste directly to the MCF facility shall be provided.
- 15) Forklift for stacking and unstacking the baled waste may be provided, if necessary.
- 16) Proper lighting shall be provided inside the facility.
- 17) Adequate height shall be given to the building for sufficient ventilation.
- 18) The building shall be aesthetically pleasing.

#### **IV. Components of MCF**

- 1) Waste receiving or tipping area: Should be large enough to accommodate the waste arriving.
- 2) Segregation/ sorting area: Sufficient space should be earmarked in the MCF for sorting and segregation of waste based on the type of waste.
- 3) Segregated material storage area: Storage area for storing the segregated material.
- 4) Space for machineries: Space should be considered for the machineries to be installed like weighing machine, conveyor belt/ sorting table, baling machine, shredding machine etc.
- 5) Separate toilet facilities for ladies and gents.

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- 6) Dress changing Room
- 7) Rest/ Dining room (Openings shall be given towards outside)
- 8) Store room for tools and equipments
- 9) Office room
- 10) CCTV having night vision
- 11) Water connection
- 12) Three phase electric connection for machineries
- 13) Compound wall and gate
- 14) Vehicle parking area (optional)
- 15) Green belt should be provided on the periphery which should be protected by fences.

<b>Functional Area</b>	<b>Divisions</b>
Tipping area	Incoming waste dumping area
Segregated storage	Storage of segregated, unbaled waste
Baled waste storage	Storage space for baled material
Machinery area	Weighing machine + Sorting table/ Conveyor belt + Baling machine + Shredding machine
Utility area	Office space
	Toilets (separate for men and women)
	Store room
	Changing/ Dining/ Restroom
Passage	Area for passage (taken as 20%)
Unloading/ Loading	Vehicle Parking for Unloading/ Loading area (not included in built-up area)

## **V. Safety Aspects**

- 1) 'Fire Protection and Fire Safety Requirements'(Chapter 7) published by MoHUA shall be complied with while designing the MCF building.
- 2) Fire Risk Assessment/ Fire audit of the facilities shall be conducted at regular intervals. However, the following minimum requirements shall be ensured at MCFs
  - a. 3 Nos of 6 Kg ABC type fire extinguisher (Dry Chemical Powder).
  - b. 3 Nos 4.5 Kg CO<sub>2</sub> type fire extinguisher.
  - c. 6 Nos of 9 litre fire buckets filled with sand.
  - d. A minimum 1000 litre capacity overhead water tank with pressure pump to be installed for fire emergencies.
- 3) As per Kerala Municipal/ Panchayath Building Rules, MCFs can be considered as a storage building (H category) based on the functions.
- 4) LPG/ Kerosine shall not be used inside the MCF
- 5) Open burning/ smoking shall be strictly prohibited inside the premises
- 6) Waste clearance shall be ensured at appropriate time intervals considered for designing the storage area. A clause specifying penalty for delay of MCF lifting (within 5 days of intimation) plan may be included in the agreement executed with waste lifting agencies.
- 7) Chances of waste accumulation and dumping at the yard shall strictly be avoided.
- 8) Functioning of the machinery and fire fighting equipment needs to be monitored on a regular basis and maintenance shall be done as and when required.
- 9) Provision for fire safety sign boards (red background with white lettering with battery lighting) shall be provided.
- 10) Fire proof door/ window panels and shutters shall be provided to prevent fire accidents
- 11) The use of wooden furniture inside the MCF shall be minimized in view of fire safety concerns.

## **VI. Machineries Required**

- 1) Weighing Machine
- 2) Sorting Table/ Conveyor Belt
- 3) Dust Remover
- 4) Baling Machine
- 5) Trolley/ Push Cart

- 6) Fire safety equipments
- 7) Shredding Machine (optional)
- 8) Forklift (optional)

**VII. Area required for installing machineries**

Sl.No.	Machinery	Area required (mm x mm)
1.	Weighing Machine	1100 x 1100
2.	Conveyor Belt	6000 x 1000
3.	Baling Press	1200 x 1200 x 2100
4.	Shredding Machine	1310 x 1010 x 1770
5.	Dust remover	1200 x 2550 x 1350

**VIII. Other Facilities to be provided**

- 1) To ensure good working conditions, sufficient furniture such as armless chairs shall be provided in the working space of MCF.
- 2) The office room shall be adequately furnished with necessary furniture.
- 3) Sufficient number of Wheelbarrows/ trolleys shall be provided to facilitate movement of waste within the facility.
- 4) Large size plastic sacks in sufficient quantity shall be made available for transferring segregated waste to RRF or Recycler.

**IX. Process Flow Chart**

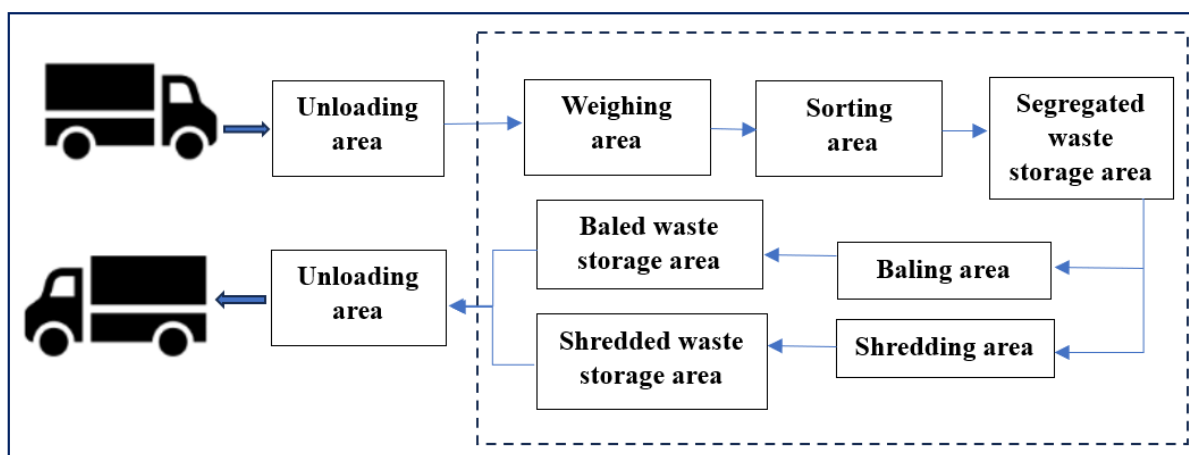


Fig (i) Process Flow Chart\*

\* Hazardous waste like tube lights, CFL etc received at the facility should not be baled and should be sent to hazardous waste processing facilities for disposal.

**X. Specifications of Machineries for reference** (Additional or higher grade machineries can be used based on the requirements of the local body)

**a) Weighing machine**

1.	Weighing Capacity	5 Kg to 1 Ton
2.	Usage/Application	Industrial
3.	Display Type	Digital
4.	Calibration	Fully Automatic
5.	Platform Size	1000 x 1000 mm
6.	Dimensions	1050 x 1030 mm

**b) Conveyor Belt**

1.	Conveyor Length	20 feet
2.	Belt	900 mm x 5 mm thickness PVC Belt
3.	Motor	2 HP
4.	Capacity	500 Kg per hour
5.	Belt Speed	5 ft/min to 30 ft/min
6.	Head Roller	Dia 165 mm MS Pipe
7.	Control panel with remote box and VFD	

**c) Baling Machine**

1.	Automation Grade	Fully Automatic
2.	Capacity	25 tonnes
3.	Cylinder	Single Cylinder 140 mm x 80 mm @ 3000 psi
4.	Oil tank capacity	250 litres
5.	Bale Size	600 mm X 600 mm X 600-900 mm
6.	Chamber size	600 mm X 600 mm X 1500 mm
7.	Bale Weight	50 - 75 kg

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8.	Cycle time	15 - 20 min per bale
9.	Power	5 - 10 HP
10.	Controls	Push Button operated, Electrically Controlled
11.	Production Capacity	1000 - 1500 kg / 8 hr. shift
12.	Feed type	PET, HDPE, LDPE, MLP, Paper, Clothes, Bag, Chappal
13.	Bale Ejection (preferable)	By opening the front door and operating bottom plate
14.	Hydraulics Safety	Hydraulic Relief Valves are provided against overload.
15.	Electrical Safety	Overload switches are provided against overloads.
16.	Surface finish (preferable)	Powder coated
17.	Operation (preferable)	Control panel
18.	Manuals	Soft and hard copies

**d) Shredding Machine**

1.	Capacity	1000 kg in 8 hours
2.	Size of the shredded plastic	0.6 - 2.36 mm (As per IRC SP:98-2013 standard)
3.	Feeding hopper	Fully insulated
4.	Motor capacity	15 HP - 20 HP
5.	Blade grinding machine	2 HP
6.	Weighing Machine	Electronic Operated
7.	Blade material	High Carbon High Chromium alloy steel
8.	Mesh material	Mild Steel
9.	Manuals	Soft and hard copies
10.	Panel components	Electronic Motor protection relay (EMPR) with Single phasing protection.

**e) Dust Remover**

1.	Drum diameter	915 mm (perforated casting)
2.	Drum length	2100 mm
3.	Drum cover diameter	1200 mm
4.	Machine output	120 – 200 kg/hr

5.	Rotor	Dynamically balanced
6.	Rotor type	Blender cum impactor
7.	Main motor	15 HP, 1440 rpm
8.	Overall machine size (indicative)	1200 X 2550 X 1350 mm
9.	Machine frame	Heavy framed structure

## XI. Sample Area calculation of MCF (For reference only)

### (a) Calculation of waste generation

Let P be the forecasted population of the LSGI, based on average growth rate of district;

$$P = P_o[1 + (r/100)]^n$$

where, P - population (predicted) after 'n' number of decades

P<sub>o</sub> - last known population

r - growth rate = (increase in population/initial population) \* 100 (%).

n - number of decades between P<sub>o</sub> and P

As per SWM policy 2018, per capita waste generation per day = Avg. 300 gms

Dry waste generation per person per day = 300 x 18% = 54 gm /day

Total Dry waste generated per day = P x 54 gm/day

**Total Dry waste generated per day in Kg (W) = 1.15\* x (P x 54)/1000**

\*An additional 15% area will be included for floating population and commercial establishments.

Let, waste clearance frequency be **30 days\***.

(\*frequency of waste clearance from MCF and density of waste may vary based on the nature of waste and facilities available at concerned LSGIs)

therefore the Waste that can be handled in MCF (W<sub>30</sub>) = 30 x W

### (b) Calculation of Area of MCF

Let, the density(D) of baled waste be **250\* Kg/m<sup>3</sup>** (\*based on baling machine specifications).

Therefore, Volume of baled waste produced per month in m<sup>3</sup> (V) = W<sub>30</sub>/ 250.

Let, the stack height be taken as 2 m,

- Therefore, Area required for storage of baled waste (A<sub>b</sub>) = V/2 m<sup>2</sup>.
- Assume equal area is provided for dumping of incoming waste (A<sub>i</sub> = A<sub>b</sub>).
- Double of the baled waste storage area is provided for the storage of segregated



- unbaled waste ( $A_s = 2 A_b$ ).
- d. Area required for Machinery (Weighing, Conveyor belt/ Sorting table, Baling machine and Shredding machine) & Processing ( $A_m$ ) is minimum 25 m<sup>2</sup>.
  - e. Area required for Utilities ( $A_u$ ) is minimum 25 m<sup>2</sup>(Office room, Dining/ Restroom, Toilets, store etc).
  - f. Area for passage ( $A_p$ ) is taken as 20% of total area of MCF.
  - g. Area required for Unloading & Loading ( $A_l$ ) is minimum 24 m<sup>2</sup> (Outside the building).

**Total area Required for MCF,  $A = A_b + A_i + A_s + A_m + A_u + A_p$**

- where;
- $A_b$  = area needed for storage of baled waste
  - $A_i$  = area needed for dumping of incoming waste
  - $A_s$  = area needed for storage of segregated unbaled waste
  - $A_m$  = area needed for machinery and processing
  - $A_u$  = area needed for utilities
  - $A_p$  = area needed for passage/ movement of waste

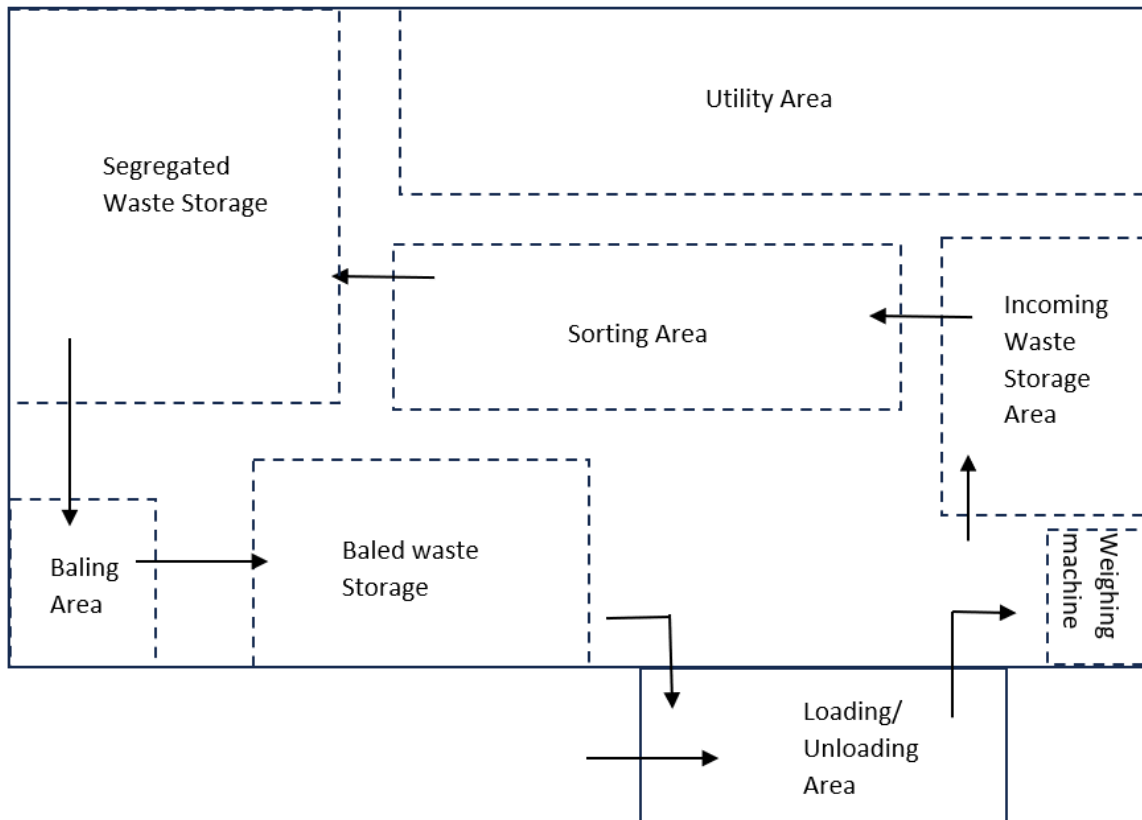


Fig (ii) Conceptual Layout

Sample Photos



Fig (iii) Segregated Storage



Fig (iv) Segregated Storage



Fig (v) Conveyor Belt

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Fig (vi) Sorting Table



Fig (vii) Dust Remover Machine



Fig (viii) Vertical Baling Machine



Fig (ix) Shredding Machine