"सुसंस्कृत, संस्थागत र समृद्ध साकेला"

साकेला गाउँपालिका

गाउँ कार्यपालिकाको कार्यालय

मानेभञ्ज्याङ, खोटाङ

पत्र सख्या : ०८२।०८३

च नं.:

कोशी प्रदेश, नेपाल

मिति: २०८३/०२/०८

उत्पादक वा अधिकृत विक्रेताद्वारा निर्धारित दरमा (क्याटलग सपिङ) खरिद विधिबाट शिशाजन्य फोहोर प्रशोधनका लागि मेकानिकल यान्त्रिक उपकरणहरु खरिद गर्ने सम्बन्धी सूचना

सार्वजनिक खरिद ऐन २०६३, को दफा ८ को उपदफा १ (क) (८), सार्वजनिक खरिद नियमावली २०६४ को नियम ३१(ख) तथा उत्पादक वा अधिकृत विक्रेताद्वारा, निर्धारित दरमा (क्यालग सपिङ) खरिद गर्ने कार्यविधि, २०७४ बमोजिम उत्पादक कम्पनी वा सोको आधिकारिक विक्रेताहरुबीच मात्र प्रतिस्पर्धा गराई क्याटलग सपिङ विधिबाट यस कार्यालयको लागि **शिशाजन्य फोहोर प्रशोधनका लागि मेकानिकल यान्त्रिक उपकरणहरु** खरिद गर्नुपर्ने भएकोले इजाजत प्राप्त इच्छुक उत्पादक, कम्पनी वा त्यसको आधिकारिक विक्रेताहरुबाट फर्म दर्ता प्रमाणपत्र, मूल्य अभिवृद्धि कर दर्ता प्रमाणपत्र, एजेन्सी दर्ता प्रमाणपत्र र आ.व. २०८२/०८३ को कर चुक्ताको प्रमाणपत्रको प्रतिलिपि समावेश गरी सार्वजनिक खरिद नियमावली २०६४ को नियम ३१ (ख) को उपनियम २ अनुसार तोकिएको स्पेसिफिकेशन, गुणस्तर, कम्पनीको मूल्य खुल्ने कागजात र सुविधा सहितको विवरण (क्याटलग/ब्रोसर) समेत संलग्न गरी सूचना प्रकाशित भएको मितिले ७ (सात) दिनको कार्यालय समयभित्र यस कार्यालयमा निवेदन दर्ता गर्नहुन सम्बन्धित सबैको जानकारीको लागि यो सूचना प्रकाशित गरिएको छ । निवेदन दर्ता गर्ने अन्तिम दिन सार्वजनिक विदा परेमा त्यसपछि कार्यालय खुल्ने दिन निवेदन दर्ता गर्न सकिनेछ । खरिद गरिने मेकानिकल यान्त्रिक उपकरणहरुको स्पेसिफिकेशन सम्बन्धी जानकारी यस कार्यालयको वेवसाइट www.sakelamun.gov.np बाट लिन सकिनेछ । थप जानकारीको लागि ९८४२९४१६६४ मा सम्पर्क गर्न सकिनेछ ।

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TECHNICAL PROPOSAL

for the establishment of

GLASS WASTE PROCESSING CENTER

Submitted to:

Sakela Rural Municipality
Office of the Rural Executive, Manebhanjyang, Khotang
Koshi Pradesh, Nepal

Submitted by:

AaraTech Consultants
Itahari-1, Sunsari, Nepal

Fiscal Year 2082/083 BS
Date of Submission: 2082/12/20 BS

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मितिः २०८२/१२/२०

श्री प्रमुख प्रशासकीय अधिकृत ज्यू
गाउँ कार्यपालिकाको कार्यालय
साकेला गाउँपालिका
मानेभञ्ज्याङ, खोटाङ

विषयः सिसाजन्य फोहोर प्रशोधन केन्द्र स्थापना सम्बन्धी प्राविधिक प्रस्ताव पेश गरिएको बारे।

महोदय,

त्यस कार्यालयको पत्र संख्या ०८२/०८३ (च. नं. ५८६), मिति २०८२/१२/१६ बमोजिम AaraTech Consultants लाई साकेला गाउँपालिका क्षेत्रभित्र सिसाजन्य फोहोर प्रशोधन केन्द्र "(Glass Waste Processing Center)" स्थापना गर्ने सम्बन्धी अवधारणापत्र तथा सो प्रणाली सञ्चालनका लागि आवश्यक मेकानिकल यान्त्रिक उपकरणहरूको Technical Specifications पेश गर्न अनुरोध गरिएको पत्र प्राप्त भएको व्यहोरा अवगत गराउन चाहन्छौं।

उक्त प्रस्ताव तयार गर्ने क्रममा गाउँपालिकाबाट प्राप्त पत्राचार, छलफलमार्फत दिइएका सुझावहरू तथा उपलब्ध गराइएका तथ्याङ्क एवं सूचनाहरूलाई आधार मानी प्राविधिक रूपमा सक्षम, व्यवहारिक, सञ्चालनयोग्य तथा लागत-प्रभावकारी समाधान समेटिएको प्राविधिक प्रस्ताव यसैसाथ पेश गरिएको व्यहोरा अनुरोध गर्दछौं।

यस प्रस्ताव स्वीकृतिपश्चात गाउँपालिकाले आवश्यक खरिद प्रक्रिया अगाडि बढाई प्रशोधन केन्द्रको भौतिक स्थापना कार्यतर्फ अघि बढ्न सक्ने विश्वास लिएका छौं।

धन्यवाद।

भवदीय,

Abhishek

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1. Proposed System Concept

The proposed Glass Waste Processing Center is a mechanized facility designed to collect, crush, and size-grade glass waste generated within Sakela Rural Municipality. The system converts raw glass waste (sheets and bottles) into uniform crushed glass chips (cullets) suitable for recycling, reuse in construction materials, or safe, controlled disposal. The facility has been designed to be semi-automatic, operationally straightforward, and maintainable by locally trained personnel.

1.1 Objectives

- Reduce the volume of glass waste disposed in open landfills and uncontrolled dumping sites within Sakela Rural Municipality.
- Produce reusable, graded crushed glass (cullets and powder) in at least four defined size categories, suitable for sale or downstream use.
- Establish a safe, semi-automatic, and operationally simple processing facility that can be managed with minimal skilled labor.
- Enable revenue generation through the sale of graded glass cullets to construction material suppliers, glass recyclers, and industrial buyers — contributing to the financial self-sufficiency of the facility.
- Serve as a model for sustainable waste management infrastructure replicable across other rural municipalities of Koshi Pradesh.

1.2 System Overview

The processing system consists of four integrated machines arranged in a linear line of minimum 32 ft processing line. The system is designed for a minimum processing capacity of 200 kg/hour of glass waste. The four constituent units are as follows:

- Feeding Conveyor Belt – Receives manually loaded raw glass waste from a hopper and delivers it at a controlled feed rate to the crusher inlet.
- Glass Hammer Crusher (Heavy Model) – Reduces glass into fine particles ranging from powder to 8 mm chips at a rated capacity of no less than 200 kg/hour.
- Output Conveyor Belt– Transfers crushed glass from the crusher discharge to the screening machine.
- Vibrator Screening Machine– Separates crushed glass into four distinct size categories for classified collection and dispatch.

2. Process Flow Diagram and System Description

2.1 Process Flow Diagram

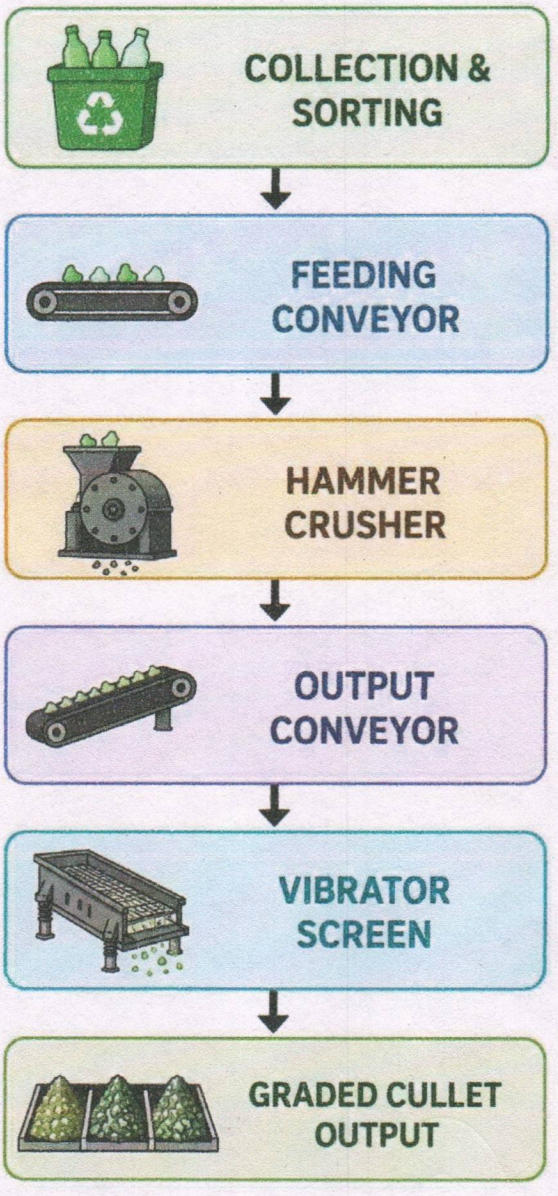

*Figure 1 **Process Flow Diagram***

2.2 System Description (Stage-by-Stage)

Stage 1 – Glass Waste Collection, Sorting, and Pre-Processing

Glass waste is collected from designated municipal collection points and delivered to the processing center. Prior to machine processing, trained operators manually sort incoming waste to segregate glass from non-glass contaminants (plastics, metal caps, paper labels, organic matter). Sorted glass is visually inspected for quality and loaded into a hopper placed at the head of the feeding conveyor. All personnel at this stage must wear appropriate PPE (heavy-duty cut-resistant gloves, safety goggles, and safety footwear).

Stage 2 – Feeding Conveyor

The inclined belt conveyor transports glass waste from the hopper loading station to the crusher inlet at a controlled feed rate. Side wall spillage protection is maintained. A hopper positioned above the conveyor inlet allows safe loading by operators without direct contact with the moving belt surface.

Stage 3 – Hammer Crushing

Glass waste is delivered into the hammer crusher. The heavy-duty hammer reduces glass into particles ranging from fine powder to a maximum chip size of 8 mm. The crusher outlet is enclosed with a fiber sheet or equivalent material to contain dust inside and direct the discharge stream onto the output conveyor, through a fiber sheet or equivalent material covering.

Stage 4 – Output Conveyor

Crushed glass discharges from the crusher onto an inclined output conveyor. The inclined design ensures efficient transfer of crushed material to the screening machine inlet. Side wall spillage protection is maintained. The grooved outlet interface ensures accurate material delivery into the screening machine feed opening.

Stage 5 – Vibration Screening and Grading

The vibrator screening machine separates the crushed glass stream into four distinct size grades. Graded output from each deck is filled into dedicated sealed collection bins. A conduit of leather or dust preventing clothes can be attached to each outlet of each grader to prevent fine dust dispersal and enabling direct filling to the bins. Operators should be equipped with leather-palmed gloves and full-face protection during bin management to guard against glass cullet contact. Each bin should be clearly labeled by grade for downstream dispatch.

Stage 6 – Post processing

Each bin filled with the graded glass powder and cullet should be emptied by filling it into their respective filling sacks at the storage.

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3. Required Machine and Equipment List

The following table represents required machines to be procured for the Glass Waste Processing Center.

Table 1 ***Required Machine and Equipment List***

S.N.	Machine / Item	Qty	Unit
1	Feeding Conveyor Belt	1	Set
2	Glass Crusher	1	Set
3	Output Conveyor (Transfer Conveyor)	1	Set
4	Vibrator Screening Machine	1	Set

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4. Detailed Technical Specifications of Machines and Equipment

The following technical specifications have been prepared suitable for the operation of the plan to ensure compatibility, safety, and the achievement of the specified processing capacity.

These specifications define the minimum performance and material standards required for each item of equipment.

4.1 Feeding Conveyor Belt

*Table 2 **Feeding Conveyor Belt Specifications***

Parameter	Minimum Specification
Belt Length	12 feet– Inclined, Grooved
Belt Width	≥ 500 mm (Standard for manual loading of glass bottles and sheets)
Wall Spillage Height	≥ 3 inches– (to contain glass waste safely during transport)
Drive Motor	≥ 2 HP motor-gearbox set
Bearing Type	Pillow block bearing suitable for continuous dustyduty operation, minimum 35 mm shaft compatibility, self-aligning type or equivalent;
Idler Roller Spacing	≤ 1500 mm centres (or as required for belt sag ≤ 2% of span)
Impact Roller Spacing	400–700 mm
Frame Construction	Minimum equivalent structural strength to 3" square pipe / C-channel construction
Inlet Arrangement	Adjustable-height hopper positioned above belt inlet for safe manual loading
Inclination	As required for glass bottles to avoid slipback

4.2 Glass Crusher – Hammer Crusher

*Table 3 **Glass Crusher Specifications***

Parameter	Minimum Specification
Processing Capacity	≥ 200 kg/hour of glass waste under continuous operation
Output Size Range	Fine powder to maximum 8 mm chips (adjustable via screen mesh)
Motor Power	≥ 10 HP, with Star-Delta starter
Machine Weight	Approximately 400 kg (for foundation and frame sizing)
Blade (Hammer) Material	EN 8 or equivalent wear-resistant spring steel;
Body Material	≥ 6 mm mild steel plate
Frame Material	Minimum equivalent structural strength to 3" square pipe / C-channel constructio
Discharge Covering	Fully enclosed discharge housing with fiber sheet or equivalent material directing output to conveyor; prevents open dust release; Shall be open/close system for accessibility and cleaning purposes

4.3 Output Conveyor Belt

*Table 4 **Output Conveyor Belt Specifications***

Parameter	Minimum Specification
Belt Length	8 feet– inclined configuration with grooved outlet
Belt Width	≥ 500 mm
Wall Spillage Height	≥ 3 inches (75 mm)
Drive Motor	≥ 1 HP motor-gearbox set
Bearing Type	Pillow block bearing suitable for continuous dustyduty operation, minimum 35 mm shaft compatibility, self-aligning type or equivalent;
Idler Roller Spacing	≤ 1500 mm centres
Impact Roller Spacing	400–700 mm at crusher discharge zone
Frame Construction	Minimum equivalent structural strength to 3" square pipe / C-channel construction
Outlet Configuration	Grooved outlet for accurate material direction into screening machine inlet
Conveyor Covering	Fiber Sheet or equivalent material, fully enclosed upto the screening machine. Shall be open/close system for accessibility and cleaning purposes
Inclination	As required for glass cullets to avoid slipback

4.4 Screening Machine – Vibrator Model

*Table 5 **Vibrator Screening Machine Specifications***

Parameter	Minimum Specification
Model Designation	4-MSIL or functionally equivalent 4-deck vibrator screen
Motor Power	≥2 HP
Number of Output Grades	4 (four independent separation decks) (0.5 mm to 8 mm)
Body Material	Mild Steel (MS) with wear-resistant screen mesh inserts
Minimum separator Size (each)	1.5 ft × 4 ft
Discharge Arrangement	Enclosed chute outlets directed into sealed collection bins for each grade
Support Frame	Bolted to concrete plinth; vibration isolation mounts required
Top Covering	Fiber Sheet or equivalent material enclosed Covering

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4.5 Summary of technical requirements of machines

(For Procurement Purpose)

*Table 6 **Summary of Required Machines and Equipment List***

S.N.	Machine	Minimum Technical Requirements	Qty	Unit
1	Feeding Conveyor Belt	➢ Minimum 12 ft inclined grooved belt; ➢ Belt width ≥500 mm; ➢ Wall spillage height ≥3"; ➢ Drive motor ≥2 HP motor-gearbox set; ➢ Bearing: Pillow block bearing suitable for continuous dustyduty operation, minimum 35 mm shaft compatibility, self-aligning type or equivalent; ➢ Idler roller spacing ≤1500 mm centres; ➢ Impact roller spacing 400–700 mm; ➢ Frame construction: Minimum equivalent structural strength to 3" square pipe / C-channel construction ➢ Hopper above inlet for safe manual loading; Inclination suitable to prevent glass bottle slipback during conveying	1	Set
2	Glass Crusher	➢ Crushing mechanism: Heavy-duty hammer crusher; ➢ Processing capacity ≥200 kg/hr under continuous operation; ➢ Output size: ≤ 8 mm chips via screen mesh; ➢ Motor power ≥10 HP with Star-Delta starter; ➢ Approximate machine weight: 400 kg; ➢ Hammer material: EN 8 or equivalent wear-resistant spring steel; ➢ Body plate thickness ≥ 6 mm mild steel; ➢ Frame construction: 3" C-Channel structural steel; ➢ Fully enclosed discharge housing with fiber sheet or equivalent for dust-controlled discharge to conveyor	1	Set

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3	Output Conveyor Belt	➢ Minimum 8 ft inclined conveyor with grooved outlet; ➢ Belt width ≥500 mm; ➢ Wall spillage height ≥3" (75 mm); ➢ Drive motor ≥1 HP motor-gearbox set; ➢ Bearing: Pillow block bearing suitable for continuous dusty duty operation, minimum 35 mm shaft compatibility, self-aligning type or equivalent; ➢ Idler roller spacing ≤1500 mm centers; ➢ Impact roller spacing 400–700 mm; ➢ Frame construction: Minimum equivalent structural strength to 3" square pipe / C-channel construction; ➢ Grooved outlet arrangement for proper feeding into screening machine; ➢ Conveyor fully enclosed with fiber sheet or equivalent open/close covering for dust control and maintenance access; ➢ Inclination suitable to prevent glass cullet slipback	1	Set
4	Vibrator Screening Machine	➢ Model designation: Four-deck vibratory screening machine or equivalent functional configuration; ➢ Motor power ≥2 HP; ➢ Number of output grades: 4 independent separation decks (0.5 mm to 8 mm); ➢ Body material: Mild Steel (MS) with wear-resistant screen mesh inserts; ➢ Minimum separator deck size: 1.5 ft × 4 ft each; ➢ Enclosed discharge chute outlets directed to sealed collection bins; ➢ Support frame bolted to concrete plinth with vibration isolation mounts; ➢ Fully enclosed top covering with fiber sheet or equivalent; ➢ Suitable vibration frequency for efficient glass cullet separation	1	Set
5	Transportation to Site	➢ Delivery of all equipment to the Glass Processing Site at, Khotang. ➢ Vendor responsible for safe loading, transportation, transit insurance (if applicable), unloading, and placement of equipment at site. ➢ All equipment shall be supplied complete and free from physical damage.	1	All
6	Installation, Alignment & Commissioning	➢ Complete installation including mechanical assembly, structural alignment, electrical wiring and connection, ➢ Trial operation under load, commissioning, and formal handover. ➢ Vendor shall provide one day operator training and certify equipment performance against specified processing capacity prior to final acceptance.	1	All

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5. Plant Layout and Space Requirements

5.1 Process Layout Overview

The entire processing system is arranged in a single linear layout spanning approximately 32 ft (from feeding conveyor to the screening machine output) as illustrated below. The linear arrangement minimizes material transfer distances, simplifies operator supervision, and reduces civil construction requirements.

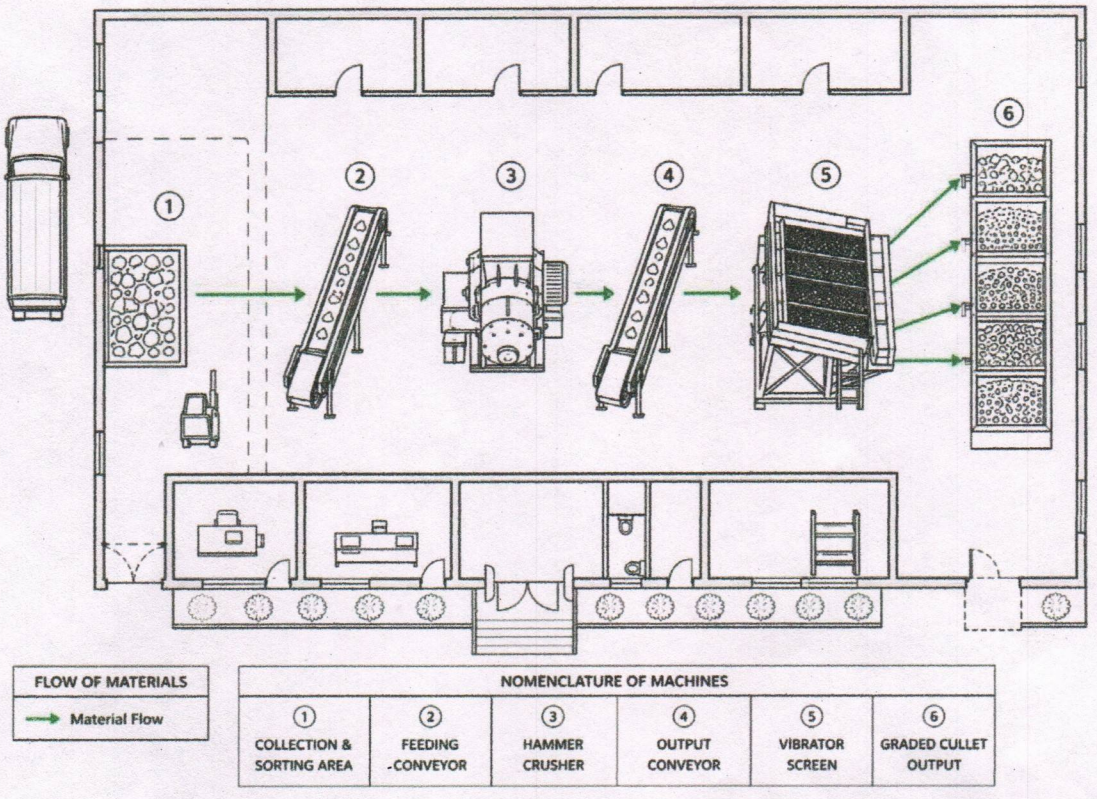

Figure 2 ***Conceptual Plant Layout***

5.2 Elevation Layout

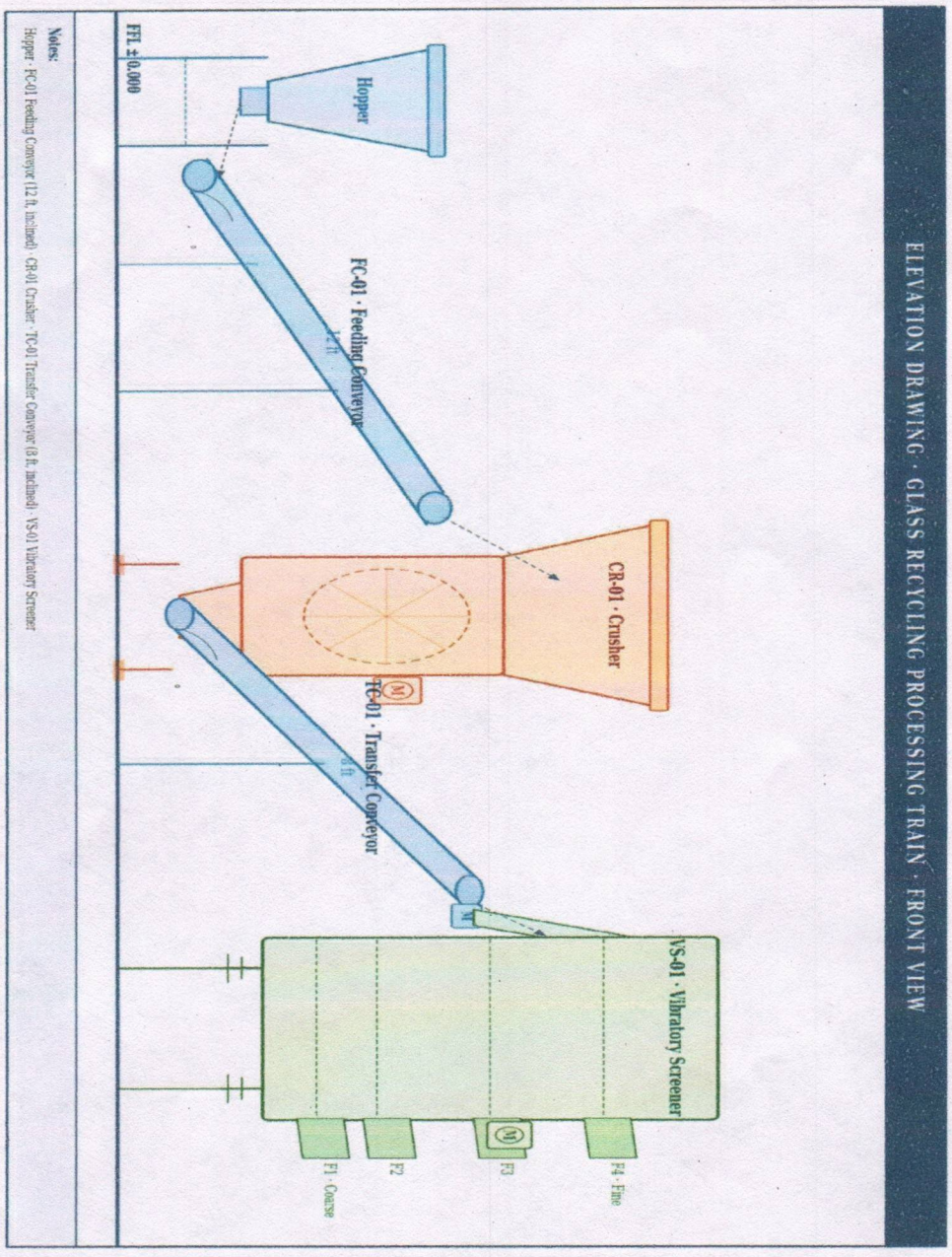

Figure 3 ***Elevation Layout***

5.3 Minimum Space Requirements

*Table 7 **Minimum Space and Civil Requirements***

Requirement	Minimum Value	Remarks
Total linear working length (machine Setup)	32 ft	End-to-end: Feeding hopper to screen outlet
Working width (clear aisle)	6 ft	For operator movement and maintenance access
Clearance height	10 ft minimum	To accommodate inclined conveyor and maintenance lifts
Roofed shed/cover	Required	To protect equipment from rainfall and UV
Electrical supply	3-Phase, 415V, 50 Hz	With earthing, main panel, individual MCBs per machine
Drainage channel	Recommended	Under crusher and screening area; for cleaning and water discharge
Concrete plinth	Required	Under crusher and vibrator screen for vibration absorption
Lighting	≥ 200 lux at working height	Adequate for safe manual operations; PPE visibility compliance (IS 3646)

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6. Safety, Environmental, and Operational Considerations

6.1 Safety Measures

- All operators must wear full Personal Protective Equipment (PPE): cut-resistant safety gloves (EN 388, Level D or above), anti-fog safety goggles, P3-rated dust masks, steel-toed safety footwear, and ear defenders rated for 85 dB+ environments.
- Emergency stop (E-stop) push buttons with interlocked circuit breakers to be installed at the feeding hopper station, at the crusher panel, and at the screening machine panel. The E-stop chain must de-energize all four machines simultaneously.
- All rotating and moving components — conveyor belts, crusher hammers, vibrator eccentric drives — to be fully guarded with bolted steel mesh safety guards. Guards to be interlocked where practicable.
- Minimum illumination of 200 lux (compliant with IS 3646 and general OSHA guidelines) to be maintained across the entire working area to support safe manual operations.
- A first-aid kit and a minimum 5 kg ABC dry-powder fire extinguisher to be kept accessible at the facility entrance at all times.
- Access to the processing area during operation to be restricted to trained and designated personnel only. Physical barriers (rope barrier or fence) to demarcate the operational zone.
- All operators to receive formal training on machine start-up sequence, safe shutdown sequence, emergency E-stop procedure, and basic first-aid before being permitted to operate independently.

6.2 Environmental Considerations

- Glass dust generated during crushing is the primary environmental hazard. The crusher discharge must be fully enclosed while directing output onto the conveyor belt, to the vibratory screening machine.
- Enclosed section with a thick leather/ dust absorbing clothes from the outlet of screening machine directly into sealed, covered collection bins, preventing fine glass dust from becoming airborne during discharge. Bins should be fitted with lids and are only opened for removal.
- Noise levels from the hammer crusher are expected to reach 85–90 dB at one metre. Operators within 3 metres must wear hearing protection. Noise barriers (brick walls, dense timber panels, or mass-loaded vinyl curtains) are recommended around the crusher to reduce the noise effect.
- All processed glass cullet outputs are to be stored in covered, labelled bins to prevent wind dispersal and ensure traceability for sale or transfer.
- Any non-glass contaminants separated during manual sorting (metals, plastics, organic material) to be segregated and disposed of in compliance with local solid waste management regulations of Sakela Rural Municipality.
- No burning, chemical treatment, or open-air discharge of glass waste is permitted. All processing is exclusively mechanical.

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6.3 Operational Methodology and Maintenance Schedule

The following operational sequence must be followed to ensure safe and efficient plant operation:

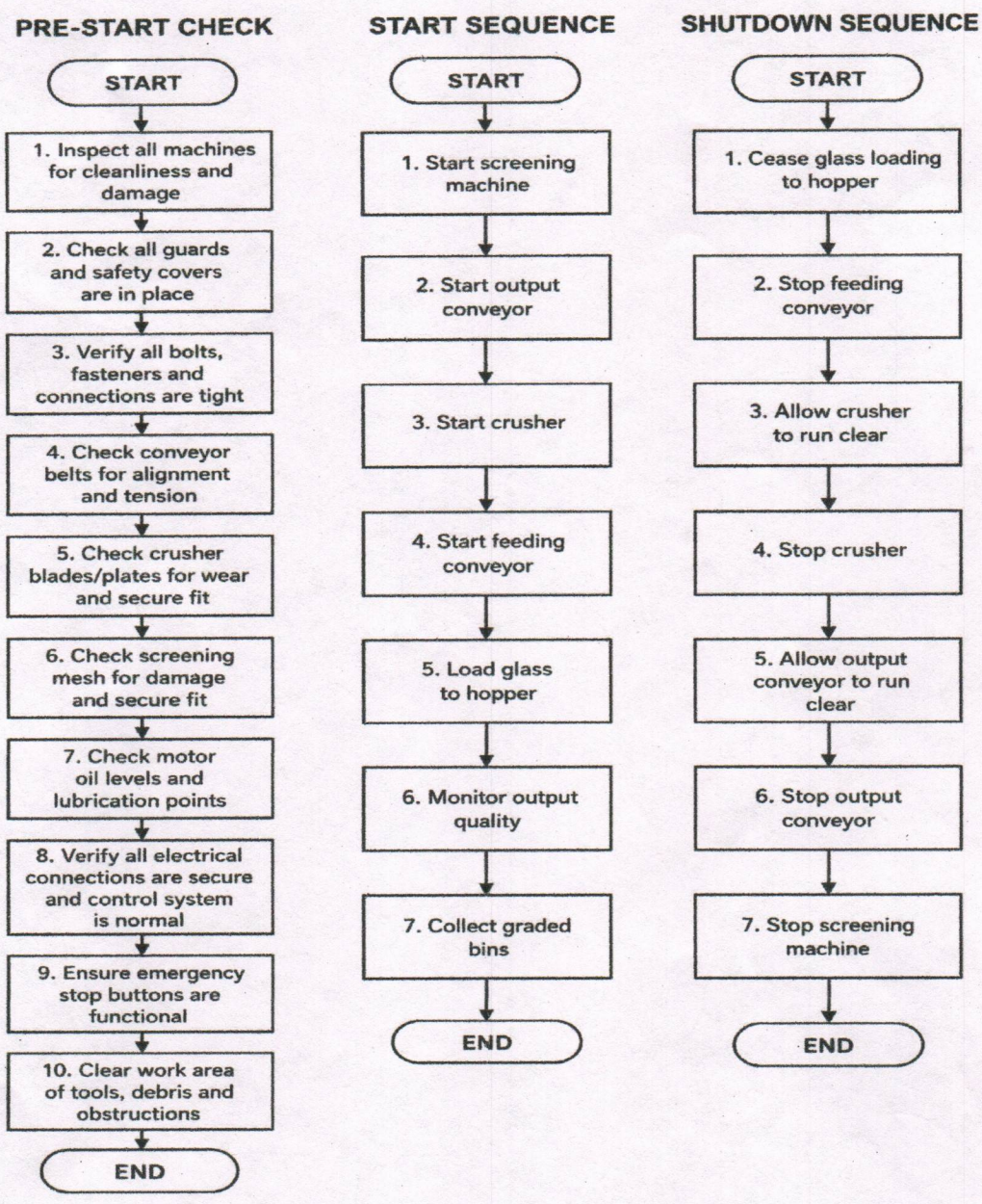

Figure 4 ***Operational Workflow Sequence***

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7. Recommended Maintenance Schedule

Daily

- Remove glass dust from all machine surfaces and guards.
- Inspect all conveyor belt surfaces for cuts, abrasion, or other damage.
- Check bearing temperatures for abnormal heat rise.
- Visually assess crusher blades for excessive wear.
- Verify that all safety guards are correctly positioned and secured.

Weekly

- Measure and adjust belt tension on both conveyors.
- Confirm proper belt tracking alignment.
- Lubricate bearings according to the manufacturer's lubrication specification.
- Inspect electrical connections, terminals, and motor junction boxes for discoloration or evidence of overheating.

Monthly

- Evaluate crusher hammer/blade wear and schedule replacement if wear depth exceeds 3 mm.
- Perform motor insulation resistance testing (megger test).
- Inspect vibrator screen mesh panels for tears, deformation, or material blockage.
- Verify full functionality of the E-stop circuit.

Note:
This maintenance plan is intentionally simplified and should be treated as a baseline. Operators must follow the official maintenance schedule, procedures, and service intervals provided by the equipment vendors. Strict compliance with vendor documentation is essential to ensure long service life, reliability, and continuous availability of the machinery.

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9. Future Revenue Generation Potential

The Glass Waste Processing Center is not merely a cost center for waste management — it represents a commercially viable revenue-generating infrastructure asset. Processed glass cullets command established market value across multiple industries:

- Construction and road materials: Crushed glass (cullets) are actively used as aggregate substitute in road sub-base construction, concrete mixes, and drainage layers.
- Glass manufacturing re-feed: Fine glass powder and clean cullets are sold directly to glass bottle manufacturers and sheet glass producers as recycled raw material, replacing virgin silica sand. This represents the highest-value market segment.
- Sand-blasting and abrasive industry: Graded glass powder (fine grade) is used as a substitute for silica sand in surface preparation and abrasive applications.
- Decorative aggregate: Coarser cullets with rounded edges are increasingly used in decorative concrete, landscaping, and terrazzo flooring

International Reference: The city of San Francisco, USA generates over USD 1 million annually from recycled glass cullet sales. Closer to the region, glass cullet recycling programs in Tamil Nadu and Maharashtra, India have demonstrated payback periods of under 24 months for municipal glass processing facilities of comparable scale.

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