

Template for preparation of Detailed Project Report (DPR)
for Setting up of Modern Gas Crematoriums in various
Local Self Government Institutions
with KIIFB assistance

(This Template is only indicative of the minimum requirements in the structure of a DPR and so is not meant to guide in the basic formatting of the document, which is left to the discretion of the agency that prepares the document)

Guidelines for preparing Detailed Project Report

A detailed Project Report is an essential component of the project. It should be prepared carefully. Before finalising the DPR, importance should be given to carry out proper surveys, investigations and designs. Sufficient details should be included to ensure proper appraisal, approval and implementation of the project in time. Considering the importance of DPR preparation, a document intended for reference is detailed along with. The guidelines provided in this document shall be adhered to strictly. In addition, DPR preparing agencies can incorporate specific additional relevant details to supplement the base data.

DETAILED PROJECT REPORT

ON

Setting up of Modern Gas Crematorium

at (*specify the location*)

FOR

..... (*specify Name of Corporation / Municipality/ GP/ BP*)

with KIIFB assistance

Submitted to

IMPACT KERALA

Prepared by

(*Name & address of the agency*)

.....(*year*).....(*month*)

CONTENTS

1. SALIENT FEATURES	6
2. EXECUTIVE SUMMARY	8
3. PROJECT BACKGROUND	11
3.1.Introduction	11
3.2.Project Objective	12
3.3.Methodology	12
3.4.Overview of the Project Area	12
4. PROJECT FEASIBILITY STUDIES	13
4.1.REQUIREMENT/DEMAND ANALYSIS	14
4.2.Existing Situation Assessment	14
4.3.Stakeholder Consultation	15
4.4.ENVIRONMENT & SUSTAINABILITY ASPECTS	15
5. SITE SURVEYS AND INVESTIGATIONS	17
5.1.Ocular/Reconnaissance Survey	17
5.2.Topographical Survey	17
5.3.Soil Investigation	17
5.4.Hydro-Geological Study	17
5.5.Primary Surveys	17
6. FUNCTIONAL DESIGN	18
6.1.CREMATOR (Design & Process)	18
6.1.1.Cremator Design	18
6.1.2.Cremation Procedure and process	22
6.2.CREMATORIUM BUILDING	22
7. ENGINEERING DESIGN	24
7.1.CIVIL WORKS (CREMATORIUM BUILDING AND OTHER ALLIED FACILITIES)	
	Error! Bookmark not defined.
7.2.MECHANICAL WORKS	25
7.2.1.Modern Gas (LPG Based) Cremator, Trolley, Chimney and other accessories	25
7.2.2. 15 KVA Heavy duty Generator	28
8. FINANCIAL ESTIMATES & COST PROJECTIONS	29
8.1.Capital Expenses (CAPEX)	29
8.1.1.CIVIL WORKS	29
8.1.2.MECHANICAL WORKS	29

8.2.Operational Expenses (OPEX)	Error! Bookmark not defined.
8.3.O&M Expenses for Initial ten years	Error! Bookmark not defined.
9. REVENUE STREAMS	35
10. COST BENEFIT ANALYSIS & INVESTMENT CRITERIA	35
11. RISK ASSESSMENT AND MITIGATION MEASURES	35
12. PROJECT MANAGEMENT ORGANISATION	35
13. CONTRACT MANAGEMENT STRATEGY	37
14. IMPLEMENTATION SCHEDULE & WBS	38
15. STATUTORY CLEARANCES	40
16. QUALITY MANAGEMENT PLAN	41
17. OPERATION & MAINTENANCE PLAN	41
17.1.Key Personnel responsible for O&M	41
18. ANNEXURES	43
19. CONCLUSION	44

1.0 SALIENT FEATURES

1	Title of the project	
2	Department	
3	District	
	Taluk	
	Corporation/Municipality/Panchayat	
	Legislative Assembly Constituency	
4	Implementing Agency/SPV	
5	DPR prepared by	
6	Project Outlay	
7	Budget provision	
8	Budget speech reference	
9	Administrative sanction	
10	Nature of the project (New building/Renovation of existing building)	
11	Present status of existing building	
12	Need for the project	
13	Details of investigations/surveys conducted	
	i. Topographical	
	ii. Geotechnical	
	iii. Hydrological	
	iv. Others	
14	Whether Land Acquisition is involved?	

	If yes, furnish details	
15	Total estimated cost and item wise cost break up and details of Schedule of Rates	
16	Whether detailed estimates are attached?	
17	Details of revenue streams, if any	
18	Details of Cost Benefit Analysis (CBR value)	
19	Details of project risks	
20	Details of project management organisation strategy	
21	Details of contract management strategy	
22	Details of Project Implementation Schedule (PIS) & Work Breakdown Schedule(WBS) - Proposed duration to complete the project	
23	Details of statutory clearances	
24	Quality Control infrastructure and Mechanism	
25	Operations & Maintenance(O&M) arrangements of the project after Completion	
26	Details of attached drawings	
27	Other attachments	

2.0 EXECUTIVE SUMMARY

(This section should contain brief of all the relevant details discussed in the following chapters as a brief info about the need, salient features of the Project proposal , Project components, estimated cost, milestones/Timelines and final objectives/benefits of the Project)

(Sample)

As Local Self Government Institutions (LSGIs) are the ones that have the responsibility to provide infrastructural facilities like crematoriums, they have been taking actions to set up such facilities, which would be helpful very much, particularly for the landless. Some of the LSGIs have already set up this facility and it is in operation in such places. But for many others, they had to either keep the idea in abeyance or drop it due to paucity of funds. The Government of Kerala has now earmarked a considerable amount of fund, to be provided through KIIFB for setting up crematoriums in LSGIs.

Project proposal atwith the details as indicated below, is being submitted to IMPACT KERALA to avail financial assistance through KIIFB for setting up the facilities

Sl. No.	Name of LSGI	District	Type of LSGI		Extent of land available for setting up the facility (acre)
			Grama Panchayat	Municipality /Corporation	
1.				✓	

The DPR has been prepared based on observation, data collection and stakeholder consultation through field visit to (*Name of LSGI*) by(*Name of DPR Preparation Agency*). During the field visit all the mandatory requirements with regard to distance from nearest dwelling units, suitability of land, motorable access to the land, water & power availability etc were considered for project feasibility. It was also ascertained that all the legal and environmental requirements are satisfied completely.



Location Map of the proposed project

(Brief description about gas cremator)

LPG based Modern gas cremator is proposed to be set up in a facility for conducting the cremation process in an economical manner following environmental norms. The design and specifications of the cremator shall be the one approved by the Suchitwa Mission, and which shall include;

1. Primary Combustion Chamber
2. Body Loading Trolley
3. Hot Duct
4. Secondary Combustion Chamber
5. Venturi Wet Scrubber
6. Mist Eliminator
7. Dilution System
8. Stack (30 m)
9. Control Panel
10. Ash Chamber

Items 5-8 are to ensure that the system shall have the right pollution control systems to control all sorts of emissions from burning in the cremator.

(Brief description about the building and allied civil works)

The cremator shall be housed in a single storey permanent building with plinth areaSq.m which shall have all the facilities for conducting necessary rituals and shall also have a space for office and store. The construction of the building, compound wall with gate, internal roads and landscaping, shall be completed through open tender as per the design approved by Suchitwa Mission.

(Installation & O&M in brief-as per requirement)

Installation and O & M of the cremator shall be done through Suchitwa Mission approved service providers through competitive bidding to select the lowest quote. The agency which sets up the cremator facility has to undertake the task of O&M for a minimum period of 10 years and shall be ready to continue for another 10 years if the LSGI desires so. For cremating a body, the relatives of the deceased have to approach the LSGI, submit an application, remit the fee fixed by the LSGI and get the receipt to produce at the crematorium. The Operator accepts the receipt and cremate the body. The Operator has to submit all such collected receipts along with the monthly invoice to get his payment for the month during his tenure of operation.

After this, the LSGI appointed employee needs to carry out this. The time period for completing the construction of crematorium, installation of cremator and start of operation is expected to be..... **months** after the approval from KIIFB subject to obtaining statutory approvals.

The total CAPEX for setting up the facility is Rs.....

The OPEX to be incurred by the LSGI for 10 Years is Rs.....

3.0 PROJECT BACKGROUND

3.1. Introduction

(This section should provide a general introduction of the project being submitted. General introduction shall include write up on: type of the building project, location of the project area, general description of topography, physiography and geology of the project area, historical background of the project, need for the project, etc. Aims and objectives of the project shall also be briefed in the section-sample is provided and shall be elaborated as per requirements)

(Sample)

Cremation is a process of disposal of the human body of the dead; and crematoriums are facilities where this is done in a scientific way. Cremation of dead bodies is done mainly due to religious reasons. In relatively olden times and in some places even now, cremation is done using pyre. But, with the extent of privately owned land having decreased, people are forced to move to a common place for cremation and that is where the crematoriums gain importance. Also, in a crematorium, the burning takes place in a controlled manner with proper treatment for the emanating gases, before venting it.

A *crematorium* is a facility that houses a cremator, having a *cremation* chamber or retort which is able to generate about 850-1000⁰C. In this chamber, the body of a deceased is incinerated and hence, reduced to skeletal remains and bone fragments. Though previously Electric furnaces were being used, now gas fired crematoriums have taken their place. Many of the modern Cremators have adjustable-control systems that monitor the cremation to see its completion and subsequently to shut it down after the process. The time required for cremation varies from body to body, but mostly it is possible to complete the burning in 1-1.5 hrs of operation.

The *retort* is lined with heat-resistant refractory bricks, mostly in layers. The layer of fire bricks in contact with the combustion process protects the outer layer and may have to be replaced from time to time. The body is mounted on a trolley (manually operated or motorised trolley) that can quickly insert it into the cremator. After burning, the ash remaining represents very roughly 3.5% of the body's original mass (2.5% in children). Ashes of adults can be said to weigh from 1.8 kg (women) to 2.7 kg (men). Cremated remains are kept in an urn and returned to the next of kin.

Suchitwa Mission has finalised the technology after evaluating different technologies and their environmental impacts. The Mission has prepared two draft designs of the crematorium and has also finalised the specification of the cremator and the accessories required. The fuel used for burning is LPG, which has a very high calorific value and this makes the system much more

efficient than the electric cremator and hence, preferable compared to electric crematoriums. It has been particularly ensured that the system is such that the emission from the cremator in no way affects the environment and for this, suitable pollution control components have been insisted upon in the process line. Mission has also enlisted agencies working in this area and with good experience, as service providers and through whom the LSGIs could implement the projects. Now, any LSGI which has got suitable and sufficient land and which has either own or supported funds, can readily put up a crematorium. But in many cases, the fund availability has come as a hindrance. Regarding financial support, the Government has now earmarked a considerable amount through KIIFB for supporting such projects.

Hence,LSGI has prepared this proposal through to set up Modern Gas Crematoriums using financial assistance from KIIFB. Also, officials have visited the sites to ensure its suitability and also to get convinced that the layout proposed in the design is as per the existing religious beliefs.

With the setting up of Modern Gas Crematorium at..... LSGI, it is expected that the present problem of the LSGI for proper cremation of the deceased shall be solved, in addition to making the process of cremation more scientific and environment friendly.

3.2. Project Objective

(Desired outcome of the Project to be described in this section)

3.3. Methodology

(Brief description of the methodology adopted by the consultant to prepare the DPR. This section can include a flow diagram to describe the methodology with the input, output and the process)

3.4. Overview of the Project Area

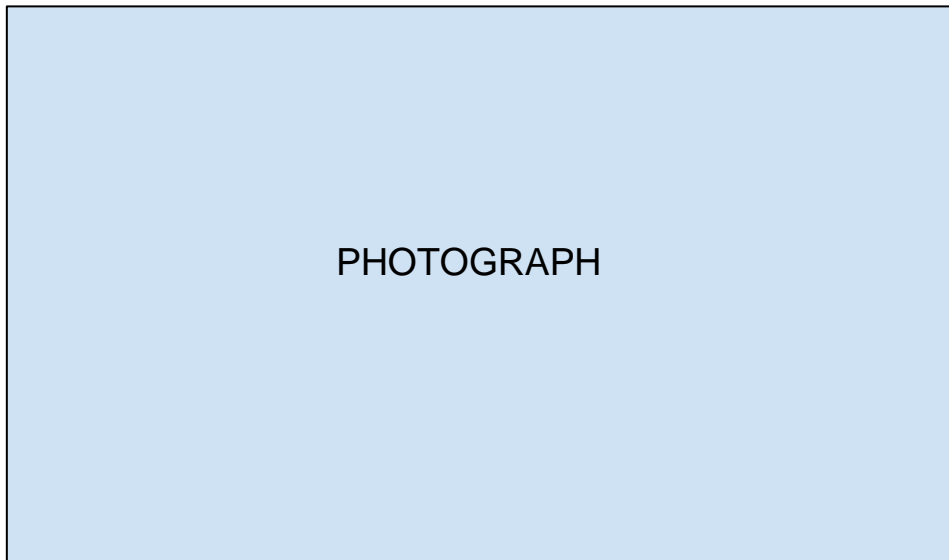
(Overview should cover aspects as location of the site and connectivity with other regions, accessibility to the site by various modes of transport, identification of the population under the direct and indirect impact of the DPR, existing ecological and environmental conditions, soil and terrain condition etc)

4. PROJECT FEASIBILITY STUDIES

(All the mandatory requirements with regard to distance from nearest dwelling units, suitability of land, motorable access to the land, water & power availability etc to be considered for project feasibility.)

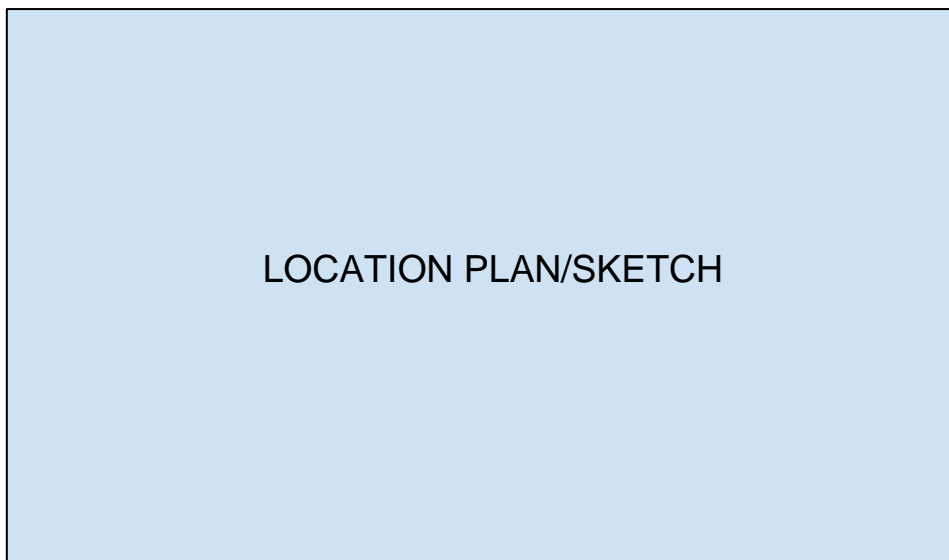
A sample information format is as follows:

1.	<p>..... Municipality/Corp/GP</p> <p>District:</p> <p>Co-ordinates:</p> <p style="padding-left: 40px;">Latitude: 9⁰18'0''N</p> <p style="padding-left: 40px;">Longitudes: 76⁰28'0''E</p> <p>Year of establishment: 2015</p> <p>Total area: 19.24 Sq. Km</p> <p>No. of wards : 29</p> <p>Population: (as per)</p> <p>Details of Crematorium</p> <p>Available land area: 0.4324acre</p> <p>Survey number: 459/2</p> <p>Current status: Open burning of dead bodies using wood</p> <p>Proposal: For setting up a modern gas fired Crematorium with single cremator</p>
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PHOTOGRAPH

Project Location



LOCATION PLAN/SKETCH

Location Plan

4.1. REQUIREMENT/DEMAND ANALYSIS

(In this section, the project proposed should be described in terms of the rationale behind the project, clearly focusing on the existing condition (how it will help in improving the situation and bring benefits to the stakeholders as citizens, businesses or Government))

4.2. Existing Situation Assessment

(Assessment report of the existing condition of infrastructure/facilities of the study area with respect to the prevailing norms, standards or regulations)

4.3. Stakeholder Consultation

(Identification and focused discussion with the Target Beneficiaries / Stake-holders. The outcomes of the stakeholder consultation should be formally documented in the DPR. An assessment in respect of the Infrastructure gaps within the Project area shall also be made)

4.4. ENVIRONMENT & SUSTAINABILITY ASPECTS

(An Environmental Management Plan (EMP) is to be developed explaining the possible environmental issues which may arise during the construction and operation of the infrastructure and associated facilities depending upon the size of the project.

Environmental impact assessment study if mandatory and measures identified to mitigate the adverse impact, if any shall be conducted and documented in detail. Issues relating to land acquisition, diversion of forest land, wildlife clearances, rehabilitation and resettlement, if any, should be addressed in this section. Inclusion of international best practices in sustainable infrastructure management including potential low carbon emission, low energy, zero pollution etc. is desirable)

(Sample)

The project implementation does not have any adverse environmental effect normally and no serious environmental protection measures need to be considered while implementing the project. As a general aspect of project management, the following measures could be considered for environmental management.

Sl.No.	Impact	Mitigation Measure	Responsibility		Time	Monitoring Parameter
			Executing	Monitoring		
1	Construction & Soil erosion	1. Unnecessary clearing outside vegetation area shall be avoided			Construction phase	Land clearing activities
		2. Unnecessary clearing of vegetation shall be prohibited			Before land clearing	Land clearing activities
		3. Drivers to be educated on off road travel & speed limits			Construction phase	Check records
		4. Fuel tanks to be checked daily and leaks plugged timely			Construction phase	Check for leakages
		5. Waste management plan to be prepared to dispose of all waste generated			Construction phase	Development of plan & its implementation

2	Water Resources	1. Follow good housekeeping practices with all machinery that may potentially discharge into or come in contact with surface water			Construction phase	Check housekeeping practices
		2. Fuel and lubricants to be stored in areas with impervious floors that can contain spills			Construction phase	Check compliance
		3. Potentially hazardous materials to be isolated and contained			Construction phase	Check compliance
3	Air Pollution	1. All generators, equipment and vehicles used during the project to be properly maintained in good working condition in order to minimize exhaust emission			Construction phase	Check compliance
		2. All project vehicles to be checked regularly to ensure that engines are in sound working condition and do not emit smoke			During all project activities	Check compliance
		3. Emission from stack during operation of Crematorium to be as per standard limit			Operation phase	Check compliance
4	Noise Pollution	1. All on-site personnel to use required PPEs in high noise areas			Prior to and during construction	Check compliance
		2. Movement of project vehicles to be restricted within work areas			During all project activities	Check compliance
5	Waste Management	1. Separate bins to be used for different types of waste- plastic paper wood and metals			During Construction phase	Check compliance

		2. Recyclable materials to be segregated and sent for recycling			During all project activities	Check compliance
		3. All container of hazardous materials to be properly labelled			During all project activities	Check compliance
		4. Treatment of waste water from wet scrubber using septic tank soak pit system			Operation phase	Check compliance
		5. Management of Ash generated			Operation phase	Check compliance

5. SITE SURVEYS AND INVESTIGATIONS

(Sites which require detailed soil exploration/geotechnical investigations have to be carried out and detailed investigation/survey reports to be attached. Provisions for foundations have to be provided based on the field conditions and the details have to be enclosed in cost estimates provided in Annexures)

5.1. Ocular/Reconnaissance Survey

(The consultant shall carry out an ocular/reconnaissance survey of the project site and the surrounding to understand the presence of various physical features, external and internal infrastructure facilities available at site and off site, and all shall be documented in this section)

5.2. Topographical Survey

(Analysis of the topographical survey of the entire site area. Level of detailing for the survey work will depend on the type of the project and site condition)

5.3. Soil Investigation

(Analysis of soil investigation/soil test report for all architectural and detailed engineering works)

5.4. Hydro-Geological Study

(Analysis of hydro geological survey report of the project area, as required for engineering design calculations)

5.5. Primary Surveys

(Analysis of the data from primary survey(s) depending upon the need of the project)

6. FUNCTIONAL DESIGN

(This section should present an analysis of different options (Building and cremator) available to achieve the objective and the reasons for selecting the proposed option should be substantiated.

The functional design of various components of the project is mainly achieved through field study and documentation using existing information and specifications from various standards.

The building shall be designed with a view to achieve maximum utility. The field study shall also include demand surveys and it should be prepared based on the relevant guidelines of The National Building Code of India (NBC) 2016 for construction of building.)

6.1. CREMATOR (Design & Process)

6.1.1. Cremator Design

(This section shall describe why gas cremator is opted, basic components shall be described and process flow shall be included-Sample literature is provided for reference)

(Sample)

The process of burning or cremation of the deceased used to be done using pyre with wood as the main source of fuel. With the change in time, slowly there was a thought to go for technological options resulting in the development or adoption of electric crematoriums. In many places, the option was acceptable as an advanced method of addressing the issue while in some, people were reluctant to accept the change.

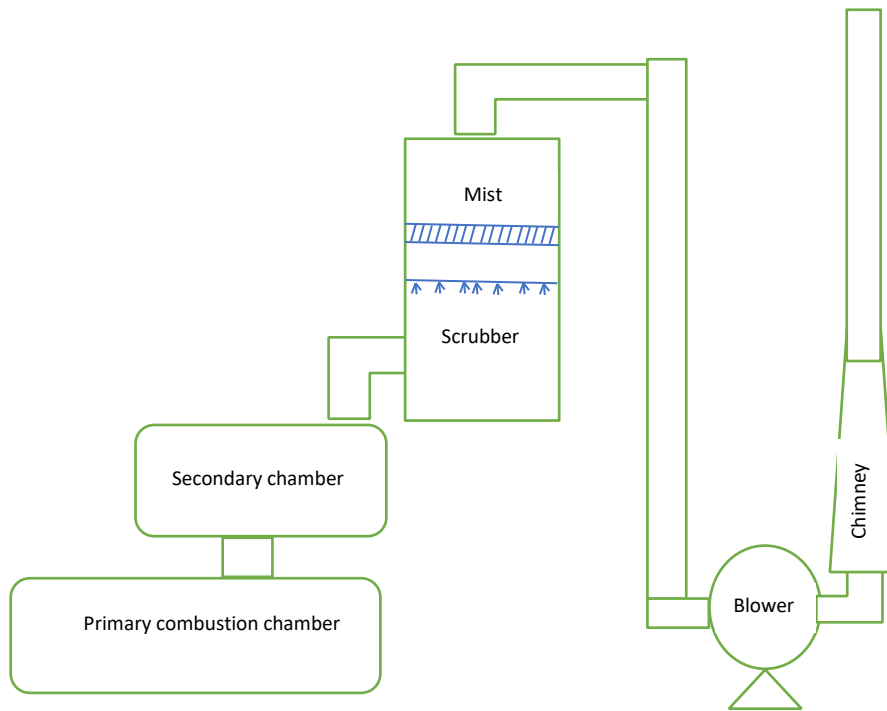
Again, with the passage of time, more advancements were thought of in the mechanical way of cremation, primarily in making the system more efficient. Fuel efficiency was a focus area which took the thought to alternate fuels. This led to the development of gas crematoriums. Though different combustible gases could be used in crematoriums, the main design is that using Liquefied Petroleum Gas (LPG)

The cremators in LPG gas crematoriums consist of a cremator which is mainly a double chamber with accessories such as LPG gas burners, air blowers, gas regulators, gas pipe lines etc and has a proper gas emissions control system.

The design and specifications of the cremator shall be the one approved by the Suchitwa Mission, and which shall include;

1. Primary Combustion Chamber
2. Body Loading Trolley
3. Hot Duct
4. Secondary Combustion Chamber

5. Venturi Wet Scrubber
6. Mist Eliminator
7. Dilution System
8. Stack/Chimney
9. Control Panel
10. Ash Chamber



Process Flow diagram

Primary Combustion Chamber: This is for the incineration of the Human dead Body. Incineration is achieved by maintaining the temperature of the Chamber and also supplying air for combustion. The moment the body is introduced, it catches fire and incineration process starts

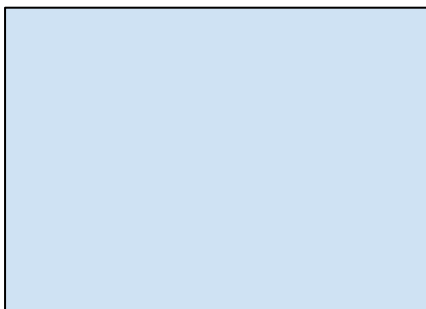


Photo 1 (Front view)

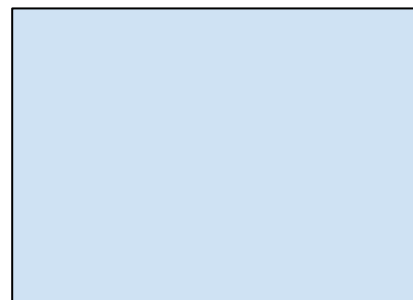
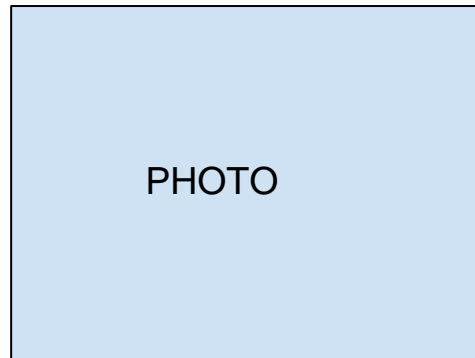


Photo 2 (Side view)

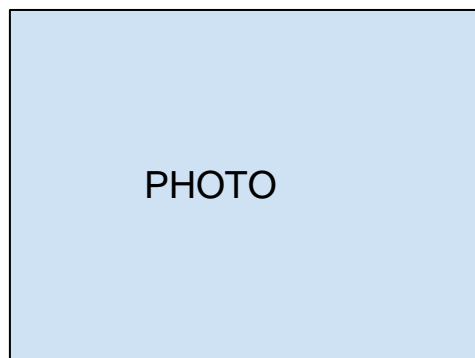
Body Loading Trolley: For loading and transferring the body to the furnace, a trolley that moves on rails is provided.



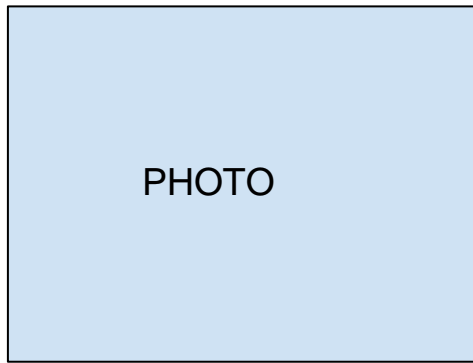
Hot Duct: The Duct connecting the Primary Combustion Chamber to Secondary Combustion chamber is to enable the hot air to enter inside the Secondary Combustion chamber during the cremation process.

Secondary Combustion Chamber: This is to incinerate the emission gas again during the cremation process. Secondary burning helps in converting hydrocarbons to compound forms, removal of foul odour, conversion of certain gaseous elements to soluble emission gases.

Venturi Wet Scrubber: This system is for the removal of soluble emissions, particulate matter and also for the removal of emissions of acid in nature.

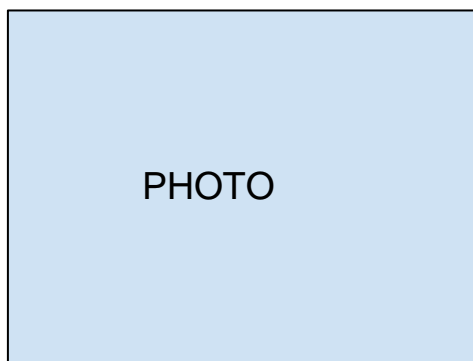


Mist Separator: This helps in the removal of carried over mist from emissions prior to entrance of the emissions to the Chimney

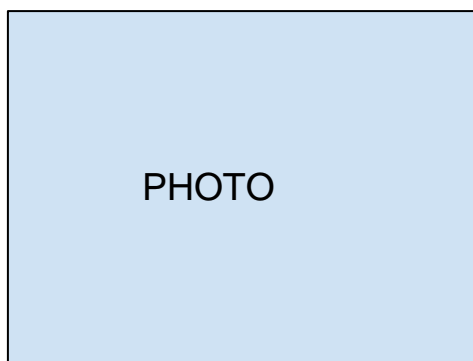


Dilution System: Dilution System helps in diluting the emissions so that the concentration of emissions is brought down prior to letting it out to the atmosphere.

Stack/Chimney: Stack/Chimney having a height of 30 meters from the ground level is for the safe disposal of treated emissions to atmosphere.



Ash Chamber: The burnt-out materials in the form of ash from the primary burning chamber will fall to the chamber provided beneath the primary chamber from where the ash gets collected.



6.1.2. Cremation Procedure and process

*(The cremation of bodies in crematoriums are undertaken based on certain procedures devised by the LSGIs. These procedures are to be listed out based on discussion with LSGI concerned.)
(Sample)*

The dependents/relatives of the deceased have to visit the LSGI and obtain the cremation forms. The forms, after duly filling and signing, has to be submitted to the LSGI with necessary support documents such as death certificate, photo of the deceased, ID card of the applicant etc. The applicant then has to go to the crematorium with the receipt of payment and get the time of cremation. Usually the cremation time shall be between 8 am and 6 pm on all cremation days.

After the religious rituals, the body will be handed over to the crematory operator for the cremation. In the cremator LPG gas is injected and burned to raise the inside temperature of the chamber. When the cremation furnace temperature reaches 800⁰ C, then the human body is placed on the body charging trolley and the trolley moves forward as the furnace door opens. The body charging trolley lays the body on the cremation bed and come backward and when it is out, the cremation furnace door will completely close, for the cremation to begin.

The cremator furnace is built with high quality alumina refractory bricks, various size and types of slabs are bonded with high quality castables, fire clay and mortars to enable the cremator to withstand the cremation temperature more than 900⁰ C.

During cremation, flue gas from primary chamber is let out into the secondary chamber where the hazardous gases and toxics and other volatile substances are completely burned and again trenced out as the hot flue gas into the venturi scrubber with the water and finally the scrubbed and cleaned gas is passed out into the 30 m chimney.

The cremator has an ash pit to collect the cremation remains which is collected in an urn and given to the relatives of the deceased.

To cremate a human body, about 14-18 Kg of LPG is required and about 1-1.5 hours is required.

6.2. CREMATORIUM BUILDING

(Following aspects should be considered and elaborated here designing the crematorium building)

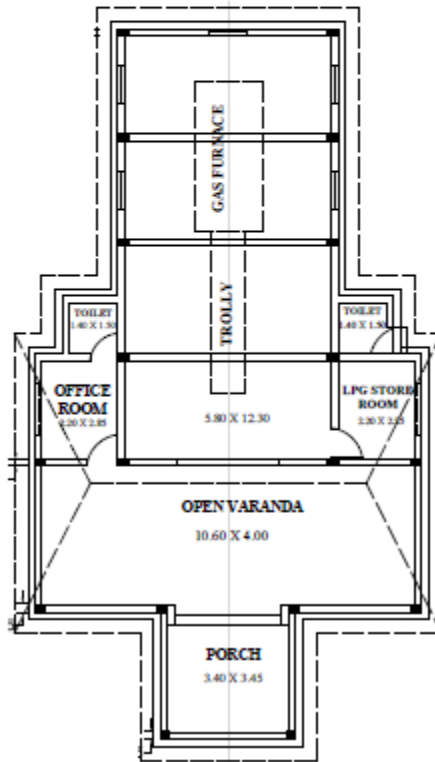
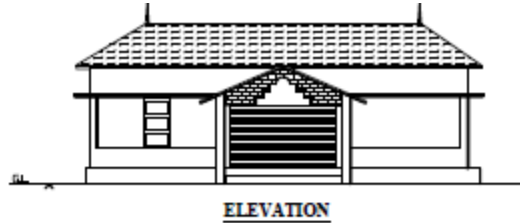
- *Mandatory open space as per building rules.*
- *Access width.*
- *Alignment of the building in the available plot (As per religious norms)*
- *Orientation of cremator, trolley etc.*
- *Available facilities*

- *Public utility*

This section should describe about the area of building, type of building etc and shall be elaborated)

(Sample)

In order to house the cremator, it is proposed to have a building of area m² (..... ft²). Based on the geotechnical investigation report, a framed structure building with sloped/flat concrete roof is proposed. The estimate submitted along with has been arrived at after deciding on this and other factors.



Plan and Elevation of the Crematorium Building (sample drawing)

7. ENGINEERING DESIGN

7.1. CIVIL WORKS (CREMATORIUM BUILDING AND OTHER ALLIED FACILITIES)

(This section should elaborate the technology choices, structural aspects, foundation options and evaluation of the technology option, as well as the basis for the technology for the proposed project. Detailed description of site including topographical and geotechnical investigations adequate to choose the suitable foundation shall be furnished.

The structural layout shall be so planned that the viability of adopting state of the art large span arrangements like flat slab, grid floor slab, ribbed slab, pre-stressed panels etc. shall be explored with a view to bring in maximum utility, aesthetics, economy etc.

The preliminary design for a typical building project shall consist of architectural drawings of the proposed buildings, including floor plans, elevations, sections, site plans etc. conforming to the guidelines laid down in the relevant building bye laws and manuals. New innovations like green building concept may be incorporated in the design of the buildings

Detailing of all the drawings submitted as a part of this report to be done in this section, all the drawings to be annexed. Details of all other facilities such as internal road, retaining wall, compound wall, well, security room etc to be included here.)

- 7.1.1.** Foundation options/design (including drawing)
- 7.1.2.** Structural design
- 7.1.3.** Architectural designs and details
- 7.1.4.** Plumbing details
- 7.1.5.** Electrical details
- 7.1.6.** Fire fighting details (if required as per NBC and Building Rules Provision)
- 7.1.7.** Landscaping details
- 7.1.8.** Details Internal roads, compound wall, well, security room etc

(Proposed buildings floor plans, elevations, sections, site plans etc of all components shall be annexed.)

7.2. MECHANICAL WORKS

(Detailed specifications of all mechanical items such as Cremator with accessories, Generator etc shall be described here)

7.2.1. Modern Gas (LPG Based) Cremator, Trolley, Chimney and other accessories

(Detailed specifications of all units and compliance reporting with the standards prescribed by Suchitwa Mission)

	Item	Specification	Compliance confirmation
1.	Primary Chamber	Minimum 3.2 x 2.1 x 1.5 m (interior dimensions) made up of minimum 5 mm thick MS plate.	✓
2.	Secondary Chamber	Separate chamber with adequate size and provision to achieve a minimum residence time of 1 sec at 1100 ⁰ C, for the oxidation of the exit gases from the primary chamber to get exposed to the flame of the after burner.	✓
3.	Door of Primary Chamber	Front opening, vertical sliding, counter weight balanced with view port.	✓
4.	Temperature in primary chamber	850 ± 50 ⁰ C	✓
5.	Temperature in Secondary Chamber	1100 ± 50 ⁰ C	✓
6.	Furnace bed & Structure	Stainless steel with high quality IS 8 refractory bricks as insulation.	✓
7.	Internal Insulation	IS 8 refractory brick lining with min. thickness = 230 mm to withstand 1500oC with high quality castable fire clay and mortars with specific type of curing to the furnace.	✓
8.	External Insulation	Outer skin temperature of the furnace wall to be maintained below 50oC. Rock wool and as per TS 6701 and ASTM C-680	✓
9.	Fuel	Liquified Petroleum Gas	✓
10.	LPG consumption	12 ± 2 kg (max.)	✓
11.	LP Gas cylinder	Minimum 8 number.	✓

12.	Gas pipe line from gas cylinder storage room	Copper piping with pressure gauge	✓
13.	Cremation time	60-90 minutes.	✓
14.	Burner System	<p>4 Nos. for the primary chamber and 2 Nos. for secondary chamber each having 250-300 kW. High pressure, full length burners on either side of primary and secondary chambers</p> <p>Features:</p> <ul style="list-style-type: none"> ● Fully automatic burners with fan, motor, pump, ignition transformer & electrode, flame sensor, sequence controller, gas solenoid valve, air/gas pressure switches. ● Step less fully modulating operation ● Allows air gas fine tuning ● Ability to obtain optimum combustion values by regulating combustion air and gas ● Integrated with PLC control for burner trip alarm/hooter and other specified safety features. 	✓
15.	Trolley	Stretcher type trolley fully SS with SS bed and provision for easy sliding of the body into the primary chamber with min. size of 11ft x 3 ft x 2ft	✓
16.	Emission Parameters	As per KSPCB standards	✓
17.	Dilution system with ID fan	Atleast 5 HP blower to bring down the concentration of pollutants.	✓
18.	Combustion Air Supply	With at least 1HP blower for the supply of air for incineration of the body in the primary chamber and for supply of excess air to the secondary chamber.	✓
19.	Motors	All motors should conform to IE-2 specifications.	✓
20.	Venturi scrubber, cyclone separator and mist eliminator	Integrated or separate units shall be provided to remove particulate matter and harmful emissions before letting it out to the atmosphere.	✓

21.	Activated carbon adsorption unit.	The unit should be packed with activated carbon adsorbents to limit odorous emissions.	✓
22.	Chimney	30m height chimney as per CPCB norms and State PCB norms. Made of MS bottom dia 1000 mm, top dia 325 mm with specified thickness as per the drawing. From bottom up to 18m ht. MS sheet with thickness varying from 8 mm to 6 mm with inner lining lagged with high alumina refractory in the conical area. From 18m-24m ht, MS cylinder 400 mm dia and 5 mm thick. From 24 m -30 m, MS cylinder 325 mm dia.	✓
23.	Chimney connection	300 mm dia. MS refractory lagged pipe from ID blower to chimney/ manifold.	✓
24.	Support for chimney and ladder	Full length ladder type support in MS, coated with epoxy paint. Up to 11m with platform and remaining 19m ladder to be provided.	✓
25.	Temperature in Chimney/stack	Min 200 ⁰ C	✓
26.	Power	Approximately 9kW, 3 Ø	✓
27.	Temperature Sensor	Adequate nos. of k-type thermocouples/RTD in primary and secondary chambers.	✓
28.	Temperature controller and indicator	Solid State digital type temperature indicator controller 0-1200 ⁰ C in each chamber.	✓
29.	Foundation for chimney	As per detailed drawing attached	
30.	Sampling port	At 11m from the chimney bottom	✓
31.	Lightning arrestor	At the top of the chimney and to be connected to the ground	✓
32.	Earthing pit	Upto 3m as per requirement.	✓

33.	Safety controller	PLC based control. Safety features: <ul style="list-style-type: none"> • Able to prevent the charging door from being opened unless the temperature in the primary chamber is below the set point or when the burners are in ignited mode. • Automatically shut down the fuel flow to the burner at the end of the cremation cycle. 	✓
34.	Ash removal	At rear side of primary chamber, scraping by manual operation, with hinged type door manually operated.	✓
35.	Painting	Steel items other than SS to be painted with high temperature resistant paints.	✓

Detailed engineering drawing (plan,section, elevation) dimensions of the following to be provided (to be attached as annexure)

- *Cremator furnace (details of foundation to be included)*
- *Trolley*
- *Scrubbing system*
- *Chimney (with foundation)*

7.2.2. 15 KVA Heavy duty Generator

(Detailed specifications to be provided)

7.2.3. FIRE FIGHTING EQUIPMENTS (IF REQUIRED AS PER NORMS)

(Detailed specifications to be provided)

8. FINANCIAL ESTIMATES & COST PROJECTIONS

(This section should focus on the cost estimates, budget for the project, means of financing and phasing of expenditure. Cost estimates have to be worked out on the basis of a detailed bill of quantities (with detailed measurements of length, breadth, and depth / height for each item), using the current Schedule of Rates of the State Government (PRICE) or relevant SOR as applicable. Applicable taxes, contingencies, investigation charges including any O&M cost for a specific period shall be clearly specified. Lump sum provisions for land acquisition , if any, shall be explained in detail)

8.1. Capital Expenses (CAPEX)

8.1.1. CIVIL WORKS:-

(Cost for construction of the building for housing the crematorium, construction of compound wall with gate, internal road, landscaping, electrification, plumbing etc)

8.1.2. MECHANICAL WORKS:-

(Cost of Cremator with accessories and chimney: This cost has many components which shall be presented as below)

SI. No.	Item
1.	Design, supply and erection of high temperature double chamber cremation furnace with 20 mm stainless steel bed for body, insulation brick of IS specification, duct made of 2.5-3.0 mm sheet and insulated with bricks and complete fittings and painting.
2.	Design, supply, erection and commissioning of body charging trolley with loading mechanism
3.	Design, supply, erection and commissioning of exhaust gas cleaning system including scrubbing system with water tank of 3000-5000 litre capacity and level indicator, 5 HP blower, SS connection lines with complete fittings and painting.
4.	Design, supply, erection and commissioning of 30m height in 5 parts, made by 6 mm sheet, 16 mm plate and 8" B class pipes, bottom flanges 2 nos. Cone length 18 m and balance 12 m with ϕ 8" pipes, 'D' type flanges and canopy. Bottom size of cone 900-920 mm and top 210-220 mm. At 10 m high platform, 11 m high sampling point, ladder up to top. The stack to be provided with a lightning arrestor with aluminium strips, 11/2"GI pipe, bus bar support etc, with complete fittings and painting.

5.	Design, supply, erection of LPG fuel supply system with 4 burners at the primary chamber and 2 for the secondary, ID fan, gas flow meter, copper tube, valves, adapter, jet etc and with complete necessary fittings as per requirement.
----	--

8.1.3. **ELECTRIFICATION WORKS**

8.1.4. **ELECTRICAL GENERATOR**

8.1.5. **FIRE FIGHTING EQUIPMENTS**

The total CAPEX including the Civil component and mechanical component (with accessories)

(Sample) (ABSTRACT FROM PRICE)

Sl. No	Item	Amount (Rs)
1.	Crematorium Building	
2.	Construction of well	
3.	Maintenance works-existing shed	
4.	Retaining wall and road	
5.	15 KVA Generator	
6.	Gas furnace as per ISI mark and specification approved by SPCB	
7.	Fire and safety requirements	
8.	Electrification	
9.	Unforeseen if any	
Taxes		
Total Amount		
Rounded Total Amount		
Rounded Total Amount in words		

8.2. Operational Expenses (OPEX)

(Sample)

In addition to the CAPEX mentioned above, the LSGI would have to spend on the OPEX when the facility becomes functional.

- Power requirement of the crematorium
- LPG requirement
- Cost Estimate for O&M Charges for First year (Client scope and Contractors scope detailed separately)

Approx. Operational Expenses				
1.	Gas consumption			
2.	Electricity consumption			
3.	Water consumption			
4.	Salary for operator			
				Total
In addition to the O&M expenses for the cremator, there could be a maintenance expense for the building				
6.	Civil maintenances including building maintenance, landscaping etc			
				Total

8.3. O&M Expenses for Initial ten years

(This section shall describe the O&M expenses considering the following aspects

- *Operation and Maintenance cost (with split up of client scope and contractor's scope*
- *O&M cost for 10 years*

including brief description)

(Sample)

The service provider who installs the cremator has to operate & maintain the crematorium for the initial period of 10 years. So, the service provider could claim this amount from the second year onwards as, for the first year, O&M shall be done free of cost by the service provider.

The contractor's scope regarding Operation & maintenance of the facility includes:

- 1.
- 2.
- 3.
-

Th scope of LSGI (client) in the Operation & maintenance of the facility includes:

- 1.
- 2.
- 3.
-

Yearly OPEX to be incurred could be estimated and summarised as below.

Yearly Operation and Maintenance Cost				
SI No	Particulars	Client Scope (Rs)	Contractor's Scope (Rs)	Total (Rs)
Sum				

The major breakdowns/repairs/maintenance that could happen, could be presented as below.

Sr. No.	Item that may require replacement/repair/maintenance	Approx. Cost/unit (Rs.)

1.	Blowers	
2.	Burners	
3.	Timely replacement of Gas Valves, Tubes & Gas Lines	
4.	Trolley	
5.	Bed (Changing SS Rod on Bed)	
6.	Water Impingement Tank	
7.	Panel Board	
8.	Painting (Including chimney)	
9.	Lightning Arrester	
10.	Refractories and Insulating Castables	
11.	Door Maintenance	
12.	Duct Maintenance	
13.	Connection Pipes replacement	
Total		

But the probability of all the parts getting damaged/falling under repair/maintenance together is almost zero. The approximate projection of expenditure for O & M is calculated as below;

Sl. No.	Time period (years)	Approx. Amount to be spent (Rs in lakh)
1.	1 st	Nil
2.	2 nd	
3.	3 rd	
4.	4 th	
5.	5 th	
6.	6 th	
Extrapolation is done for further data		
7.	7 th	
8.	8 th	
9.	9 th	
10.	10 th	
11.	11 th	

So, including the major breakdown/repair/maintenance charges to get the total that the LSGI may have to have provision for is as below.

9. REVENUE STREAMS

(Options for cost recovery, if any, should be explored)

10. COST BENEFIT ANALYSIS & INVESTMENT CRITERIA

(A comparative analysis of the revenue and expenditure to be shown, Cost Benefit Analysis (CBA) is a technique whereby the costs of and benefits from a scheme are quantified over a selected time horizon and evaluated by a common yardstick. Cost Benefit Ratio (CBR - benefit to cost ratio), EIRR (Economic Internal Rate of Return) etc. shall be worked out in detail with all supporting data. The project cash flow projections for the life cycle along with underlying assumptions have to be presented.)

11. RISK ASSESSMENT AND MITIGATION MEASURES

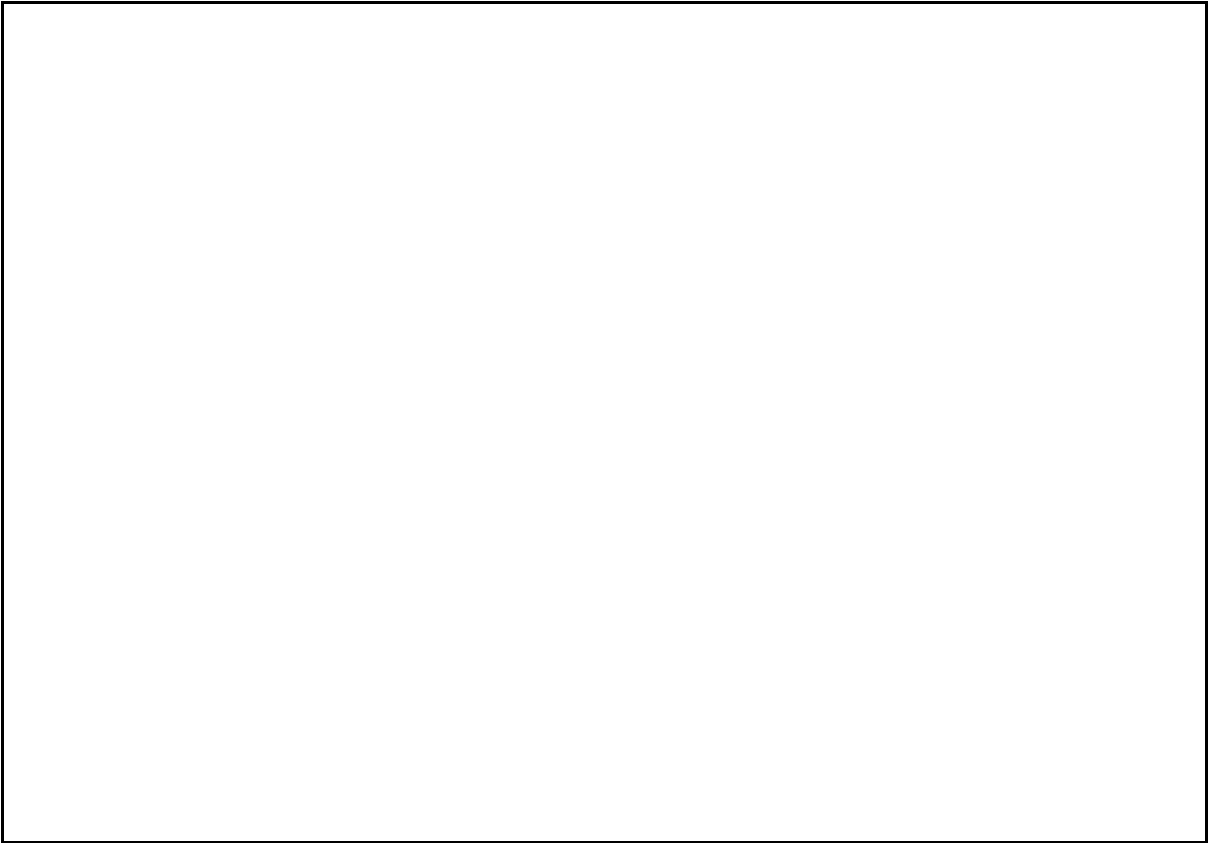
(For those projects which involve large capital outlay and various issues relating to land acquisition, environmental aspects, a detailed and systematic risk analysis may be resorted. Identification and assessment of implementation risks which can lead to time overrun, cost escalation, scope reduction etc. is the primary stage in risk assessment. Risk analysis could include legal/contractual risks, environmental risks, revenue risks, project management risks, regulatory risks etc. The mitigation plans including risk avoidance, risk transfer, and risk elimination are to be well analysed and documented)

12. PROJECT MANAGEMENT ORGANISATION

(Responsibilities of different agencies for project management of the said project should be elaborated. The organization structure at various levels, human resource requirements, as well as monitoring arrangements should be clearly spelt out. Management arrangements refer to the institutional structures and mechanisms that would be set up for ensuring effective project management. The involvement of external consultant if any shall be documented)

(To be finalized by IMPACT Kerala)***

The Special Purpose Vehicle (SPV) named Investment in Municipal and Panchayat Asset Creation for Transformation (IMPACT) Ltd., constituted under the Local Self Government Department shall have the responsibility for overall management of the project. IMPACT Ltd has the following management structure.



Management Structure

The SPV shall be the primary agency responsible for the implementation of the project. After the facility is set up, it shall be handed over to the concerned LSGI for its Operation and Maintenance.

13. CONTRACT MANAGEMENT STRATEGY

(Contracting methodology for the execution of the project should be specified in detail. (item rate, lump sum, design and execution, EPC etc.) The system followed in the bidding document and manuals of reference etc. shall be explained (PWD/CPWD/ FIDIC) etc. Any variation proposed from the current practices acceptable under govt of Kerala (Arbitration, escalation etc.) in the system due to any specific technical aspects associated with the project need to be explained with justification. Any contract clause which may likely to lead to additional financial liability shall be identified and reported with suggestions to overcome such issues)
(Sample)

Regarding execution of the project, construction of the building is planned to be completed through open tender. All the civil constructions shall be done by the IMPACTKerala (SPV) through open tender process. For installation of the cremator, service of a service provider (agencies enlisted as empanelled service providers for Supply and installation of LPG based Crematorium by Suchitwa Mission) who have the right experience and expertise in setting up and running such facilities would be made use of. Also, this saves the task of having a prequalification of agencies as is required in the case of open tender process.

The construction of the building to house the cremator (including electrification, plumbing & sanitary works, water supply), compound wall with gate, internal roads, and landscaping shall be tendered as a single work following the norms of public works.

For installation of cremator SPV shall get support from service providers. For the selection of a service provider, SPV shall first send the request for quote notification to all the enlisted service providers with the required specification and other requirements.

The agencies shall be asked to submit their technical as well as financial proposals within a period of 7 days. After getting the proposals, SPV shall tabulate the proposals, including the technical details submitted in the Technical proposal. As required by the Store Purchase Rules, the agency which has quoted the lowest shall be selected if the technical details provided by the agency are in line with the required specifications and other required technical details.

The SPV shall complete the execution of the project. After installation or after setting up the facility, it shall be handed over to the LSGI concerned and they shall ensure Operation and Maintenance.

14. IMPLEMENTATION SCHEDULE & WBS

(The time bound work schedule is an important part of every project because it helps in better handling of projects in planning, implementation etc. This section should indicate the proposed zero date of commencement and also provide a Bar chart / Project Schedule, wherever relevant. Phasing of project activities, proposed contract packages and schedule of implementation for each phase. Identify critical dependencies in the project and expected timelines for completion of key milestones and associated process indicators for the same. The DPR should provide a time-bound action plan including tendering, appointment of contractors, construction schedule, quality assurance & quality control and post-construction activities, including project delivery.)

(sample)

Implementation of the project is planned to start immediately after the approval of the project by KIIFB and obtaining technical sanction from competent authority. The major components of activities to be taken up include the following.

1. Floating of tender for the construction of building to house the cremator, compound wall with gate, internal roads and landscaping
2. Tabulation and evaluation of bids
3. Selection of successful bidder
4. Agreement with successful bidder
5. Construction by the selected bidder
6. Issuing invitation to Service providers for cremator as per specification
7. Tabulation and evaluation of bids
8. Selection of service provider
9. Agreement with selected service provider
10. Installation of cremator by the service provider and it's trial run
11. Start of operation of the cremator.

Details of each of the components and the expected time of completion of each has to be shown in the attached GANTT chart.

- Time schedule
- Gantt chart showing construction and commissioning of crematorium

Time schedule for implementation shall be as follows: (Sample)

- a) Construction period: xxxxx months
- b) Electro-mechanical equipment supply: xxxxx months
- c) Startup, trial run and commissioning: xxxxx months

Hence the total duration will be xxxxx months

A sample Gantt chart showing construction and commissioning of crematorium unit is shown below

ACTIVITY	TIME IN MONTHS					
	1	2	3	4	5	6
Construction work						
Electro-mechanical equipment Supply						
Startup, trial run and commissioning						

15. STATUTORY CLEARANCES

(This section should elaborate the statutory clearances to be obtained from the various authorities. Statutory approvals as per bye laws, master plan, fire safety norms, environmental clearance etc. as applicable for the project are to be taken.)

Land clearance

The most important clearance that an LSGI which proposes to set up a crematorium has to procure is the clearance for the use of land for the purpose from the District Collector. But this, as per the prevailing Acts and Rules, is required only for a new facility and the existing facilities or the land where already a facility exists are exempted from this.

Sl. No.	Name of LSGI	Land suitability requirements and approval compliance							
		Ownership of land		Distance from nearest house as per MA/PA*		Motorable road access as per MA/PA*		Consent to establish from KSPCB	
		LSGI	Private	Complied	Not complied	Complied	Not complied	Complied	To be complied
1.		✓		✓		✓			✓

*Municipality Act/Panchayat raj Act

Building Rule Compliance

(Describe the provisions and compliances)

Fire NOC

(If required as per Building Rule Provisions)

Consent to Establish and Operate the facility from KSPCB

The other mandatory approvals that the LSGIs have to get to set up and operate the facility, respectively are the **Consent to Establish** and **Consent to Operate** from Kerala State Pollution Control Board as it comes under 'Orange Category' as per norms. These approvals could be obtained after the project approval for funding by KIIFB and after setting up the facility respectively.

16. QUALITY MANAGEMENT PLAN

(The DPR shall include information relating to the institution to be engaged in the quality assurance & quality control of the project execution. Methodology to be adopted to ensure the quality of construction should be clearly mentioned in the report. Quality management plan including the internal inspection and testing procedure shall be documented. Third party quality control mechanism, if adopted, its structure and plan shall be specified in detail.)

(Sample)

The Quality Management Plan for the project will establish the activities, processes, and procedures for ensuring a quality product upon the conclusion of the project. It is proposed to have quantity materials, workforce and management for the execution of the project right from the start of the project.

Product quality

The product quality standards and requirements will be determined by the SPV. During the construction phase, the PWD quality manual would be followed for fixing the quality of the materials used for construction. It shall be insisted that IS standards/specification needs to be followed wherever or for which all materials it is available.

Process quality

The process quality standards and requirements will be determined by the SPV. Many of these standards will be based on existing Government guidelines and procedures. However, it is anticipated that there will be several new and better-quality standards to be adopted, which the SPV would to establish acceptable standards and document these standards for incorporation into the organizational process

17. OPERATION & MAINTENANCE PLAN

(The DPR shall incorporate/include information relating to the institution to be engaged in the O&M of the created infrastructure assets/enhanced infrastructure assets. Brief description/analysis of the key issues and obstacles in regard to O&M (including billing/collection issues) and proposed counter measures to overcome them for the project should be contained. Periodical requirement of funds for operation and maintenance of assets should also be included in the report)

(Sample)

17.1. Key Personnel responsible for O&M

(sample)

The Key personnel who will be responsible for the project would be the following.

Designation	Job Function
Secretary, LSGI	Secretary, LSGI shall be responsible for implementation of O & M as per departmental procedures. He/she shall be responsible for coordinating the different wings like Engineering, Health and Purchase. He/she shall be the signing authority from the part of the LSGI for the agreement on Operation and Maintenance of the facility and he shall oversee the functioning of the facility.
Corporation/Municipal/ Grama Panchayat Engineer	He/she shall assist in the selection of the service provider by evaluating the capability of various service providers who quote. He/she shall be responsible for assisting the Secretary in overseeing the operation and maintenance of the facility.
Health Officer/Health Supervisor/Health Inspector/Officer in charge of Health-related activities	He/she will be responsible for receiving the application and approval of the same for cremation of a dead body. He/she shall verify the application and once approved shall advise the applicant to remit the fees. He/she shall also be the custodian for collecting back the fee receipts from the operator along with the monthly invoice, verify and approve the same and shall be the first signatory to sign for the approval of the monthly invoice.

18. ANNEXURES

I. KEY MAP OF THE PROJECT LOCATION

- Certified A3 Plan of proposed crematorium showing setbacks from boundary, prepared as per prevailing building rules duly signed by Engineer -in-charge

II. APPROVED ARCHITECTURAL,CIVIL & ELECTRICAL DRAWING

- Detailed plan, section and elevation drawings of building and drawings of individual mechanical units with clear dimensions duly signed by Engineer-in-charge
- Structural Drawing (reinforcement detailing) duly signed by structural consultant, counter signed by engineer in charge
- All the drawings specified in the report like Foundation design drawing, Plumbing layout drawings,Electrical drawing,Fire drawing(If required),Landscaping drawing etc

III. ESTIMATE

- Estimate report
- Abstract Estimate (in PRICE)
- Detailed Estimate (in PRICE)
- Rate analysis for observed data
- Quotations for items with market rate

IV. GEO-TECHNICAL INVESTIGATION REPORT

V. HYDROLOGICAL INVESTIGATION REPORT

VI. TOPOGRAPHICAL INVESTIGATION REPORT

VII. COPIES OF STATUTORY APPROVALS

VIII. CHECKLIST

CHECKLIST			
Sl no	General	Yes	No
1.	Estimate is prepared based on prevailing DSR rate with CPWD Specification and is prepared in PRICE Software?		
2.	Detailed estimate report attached?		

3.	Minimum three quotations of items in the estimate with market rate is included?		
4.	Detailed data/rate analysis for items included as Observed data attached?		
5.	Detailed A3 plan showing setbacks from boundary, Cross sectional drawing and elevation of each civil component with clear dimensions is included?		
6.	Soil stability report, Structural stability report is included?		
7.	O&M for 10 years included?		
8.	Engineer in charge of the consultant certified design, estimate (detailed and abstract), observed data, drawings, reports etc?		
9.	LSGI engineer in charge certified detailed estimates, drawings and reports?		
10.	3 sets of DPR submitted?		
11.	Plan and layout is prepared as per provisions of prevailing building rules?		
	Design Aspects		
1	Suchitwa Mission specification fulfilled for Gas Cremator?		
2	Total power consumption is calculated based on the Working hours of electrical and Mechanical equipment?		
3	Electricity charge is separately calculated in the Operational and maintenance plan?		

19. CONCLUSION

(A brief conclusion report-Sample)

Cremation has been accepted widely as an effective way of disposal of the human dead body, though it is practiced mainly by a section of the society. With the growing concern for the environment, the necessity of controlled burning instead of open burning, is being recognised.

Also, the insufficiency of open land where a pyre could be put up has also tempted the society into accepting the method of mechanised cremations. This has helped in the setting up of crematoriums in various places and the demand for such facilities is on the increase and it is likely to go up with time. The authorities, on the other hand, needs to be proactive in adopting such technologies, anticipating the demands of the community and come up with programmes to set up facilities like crematoriums. Initially, though electric crematoriums were the ones available, now, importance is being given for crematoriums using other fuels and among them, LPG which is having a high calorific value is preferred the most.

Controlled burning helps not only in having a controlled emission and hence lesser contamination of the environment, but also helps in eliminating the use of fuels like wood, which is obtained by cutting down trees.

With the allocation of funds by the Government for setting up crematoriums through KIIFB, the main hindrance that the LSGIs, which have suitable and sufficient land for the purpose, has now been cleared. With the support that the KIIFB would provide, theGP/Municipality/Corporation would be able to set up a modern gas crematorium. Though the O&M would be entrusted with the service provider, the LSGI shall monitor the O&M of the facility and shall ensure that it is in operation without any trouble.