



Technical Guide:
IMPLEMENTING THE LOW-ENERGY
CONSUMPTION HOUSES (LECH)
DELIVERY MODEL

Step-by-Step Framework for Replication

geres
ACTING FOR
CLIMATE
SOLIDARITY

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ACRONYMS

GHG	Green House Gas
LECH	Low Energy Consumption House
MFI	Micro Finance Institutions
NGO	Non Governmental Organisation
SRICA	Scientific Research Institute for Construction and Architecture
TDCA	Tajikistan Design and Construction Authority (Loihakash)

TAJIKISTAN



LEC HOUSING PROGRAM

- | | |
|-------------------|-------------|
| • Bobojon Gafurov | • Rasht |
| • Spitamen | • Lakhsh |
| • Jabbor Rasulov | • Rudaki |
| • Konibodom | • Faizobod |
| • Hisor | • Tojikobod |
| • Vahdat | |

INTRODUCTION

PURPOSE OF THE MANUAL



This technical guide systematically documents the **Low-Energy Consumption Houses (LECH) delivery model**, capturing every step – from households counselling to construction supervision – to **preserve critical knowledge** and **facilitate replication** in Tajikistan and beyond.

It provides **clear, actionable guidance** for engineers, architects, NGOs and government agencies seeking to implement **energy-efficient housing solutions**.

TARGET AUDIENCE



This manual is designed for:

- **Engineers and architects.**
- **Micro-Finance Institutions** supporting green loans.
- **Local builders and contractors** trained in energy-efficient construction techniques.
- **NGOs and government agencies** implementing energy-efficiency housing programmes.

LEC HOUSE MODEL OVERVIEW

OVERVIEW OF THE LEC HOUSE PROJECT AND ITS ACHIEVEMENTS

The LEC House project, implemented in Tajikistan since 2015, addresses two interconnected challenges: **climate change** and **energy inefficiency** in the housing sector.

Poorly insulated, coal-dependent houses contribute to **20% of Tajikistan Green House Gas (GHG) emissions**.

Low energy-efficiency in residential buildings results in:

- High energy costs for households.
- Increased reliance on firewood and coal for heating.
- Accelerated deforestation and worsening air pollution.

This creates a cycle of environmental degradation, rising emissions and economic strain.

The LEC House model, developed by Geres, the Scientific Research Institute for Construction and Architecture (SRICA), the Tajikistan Construction and Design Authority (TDCA)¹, Loihakash and Micro-Finance Institutions (MFIs)², has led to the construction of 1,540+ energy-efficient homes in the last eight years, offering **affordable, sustainable and comfortable housing**.

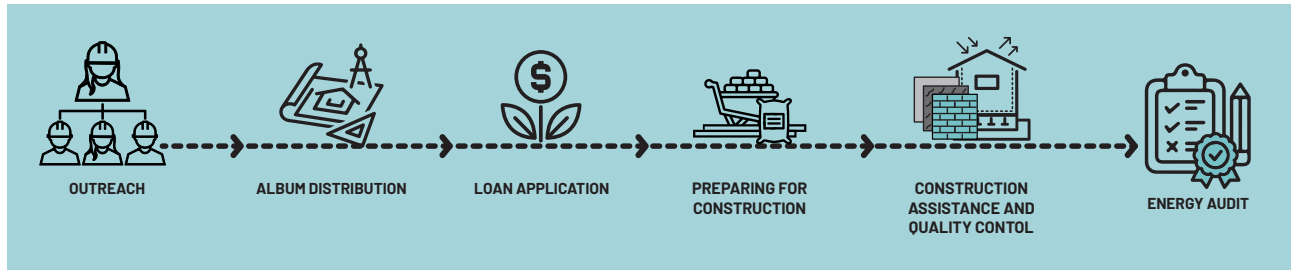
1: Within the framework of the LECH program, several Construction and Design Authorities participated, the main one being the State Unitary Enterprise "Loihakash."

2: Within the framework of the LECH program, the following financial institutions participated: CJSC Bank "Arvand," CJSC "Investment Credit Bank of Tajikistan," and CJSC MDO "IMON International."

THE LEC HOUSE DELIVERY MODEL

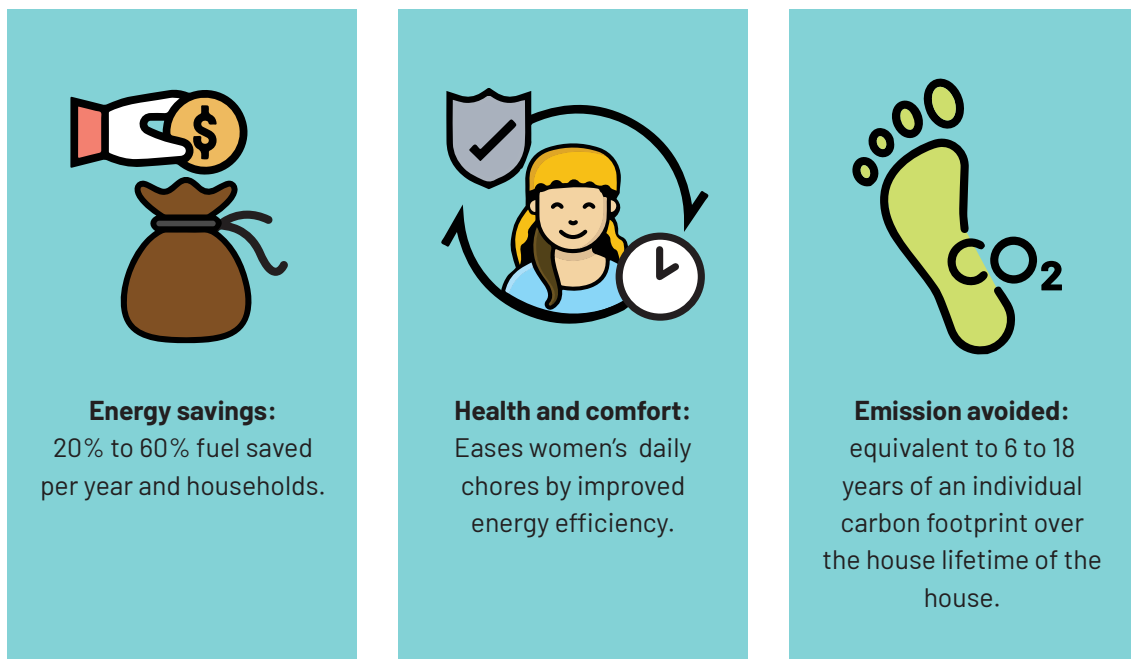
The LEC House delivery model includes households counselling, technical design, financial incentives and construction supervision to support the construction of energy-efficient detached house.

Figure 1. LEC House Delivery Model



THREE LEVELS OF ENERGY EFFICIENCY

A range of energy efficiency options ensures that every household can choose a solution adapted to its financial capacity and preferences.



STAKEHOLDERS ROLES AND RESPONSIBILITIES

The LEC House delivery model relies on coordinated interactions between the main implementing partners: **Geres, TDCA Loihakash, SRICA and MFIs**. Local governments and local builders can also be involved during the process.

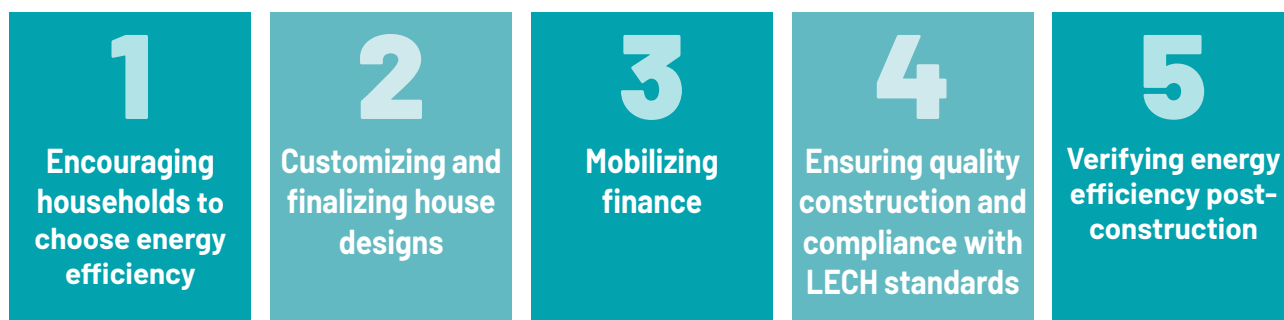
Table 1: Stakeholders Roles and Responsibilities

Stakeholder	Role in LEC House project	Key responsibilities
Geres	International NGO, project coordinator	• Launches initiatives • Secures funding • Provides financial incentives to households.
TDCA (Loihakash)	State architectural firm, main implementing partner	• Promotes LEC Houses to households. • Designs blueprints. • Supervises construction and ensures compliance with LEC House standards.
SRICA	Government research institute, sets building standards	• Validates LEC House models / designs. • Certifies trained craftsmen and craftswomen.
MFIs	Provide financial services to low-income households (e.g. small loans, insurances, money transfer, etc.)	• Promote LEC Houses to households. • Offer green loans with performance-based bonus.
Local governments	Maintain land and construction permit records, support awareness raising efforts	• Organize information sessions with landowners/households.
Local builders	Skilled workers trained in LEC House construction.	• Build and / or renovate houses using energy-efficiency techniques.



STEP BY STEP DELIVERY PROCESS

The LEC House delivery process is structured into five key steps.



In the following chapters, each step is presented with a clear structure: the objective defines the purpose, timing sets when it should happen, responsible stakeholders identify who is in charge, key actions outline what needs to be done, expected outputs describe the desired results, tools and resources list what is required for implementation, and key points of attention highlight critical considerations to ensure smooth execution.

STEP 1: ENCOURAGING HOUSEHOLDS TO CHOOSE ENERGY EFFICIENCY

OBJECTIVE

Raise households' awareness towards LEC houses and their social, economic, health and environmental co-benefits.

TIMING

Initial engagement, before designing or financing phases.

RESPONSIBLE ACTORS

TDCA engineers, MFI loan officers, and local governments are the main actors for LEC House promotion.



TDCA engineers introduce the benefits of LEC House during blueprints consultations, ensuring that households understand the technical and long-term advantages from social, energy savings, comfort and health perspectives. **MFI loan officers integrate LEC House promotion into the loan application process**, helping households to access the financing needed to build energy-efficient homes. **Local governments also contribute by organizing information sessions**, though their engagement can vary depending on regional priorities and resources. Since the involvement of local governments varies, this guide focuses primarily on the roles of TDCA engineers and MFI loan officers.

KEY ACTIONS

Promotion through TDCA engineers:

When households visit TDCA for the design of their future house blueprint, engineers **assess the feasibility of a LEC house** using land plans provided by households and Google Earth imagery. They evaluate the feasibility of a south-facing orientation and potential obstacles blocking sunlight (buildings, trees, fences, hills, etc.) If conditions are favorable, engineers present LEC House solutions, highlighting:

- Improved thermal comfort (winter and summer)
- Reduced energy costs

- Health benefits
- Existing financial incentives to support construction
 - 50% discount on the blueprint design
 - Access to green loans with up to 50% reduced interest rates

Engineers also introduce:

- The 13 validated LEC House models following construction norms
- Customization options (layout, rooms, veranda, etc.)
- Key energy-efficiency elements (double glazed windows, orientation)

If the household expresses interest, an on-site visit is scheduled.

Promotion through MFI loan officers:

During construction / renovation loan applications, MFI loan officers:

- Present LEC House as a preferred option
- Explain the advantages, and especially the reduced energy costs
- Present the financial incentives to support construction:
 - 50% discount on the blueprint design
 - Access to green loans with up to 50%, reduced interest rates.

If the household expresses interest, they are referred to TDCA office for obtaining a blueprint.

OUTPUTS

- Household interest and preliminary commitment to the construction of a LEC House.

TOOLS AND RESOURCES NEEDED

- Guidelines:
 - How to Build an Energy Efficient House?
 - Manual for House Insulation
 - Memo for loan officers
 - Green loan guide for LEC Houses

KEY POINTS OF ATTENTION

The messaging insures building households' trust and interest in the LECH approach:

- Need for a clear and consistent messaging across responsible actors
- Adapted to household's needs and priorities

STEP 2: CUSTOMIZING AND FINALIZING HOUSE DESIGNS

OBJECTIVE

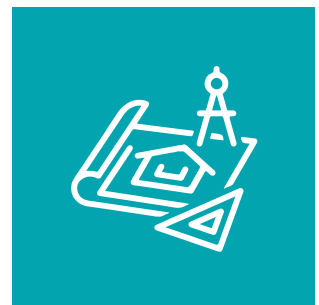
Develop and adapt LEC Houses blueprints to meet household needs while ensuring full compliance with energy-efficiency standards.

TIMING

After household commitment for LEC House construction.

RESPONSIBLE ACTORS

TDCA engineers, households.



KEY ACTIONS

After deciding to build a LEC House, **households sign the contract and request the design blueprints**. They then receive guidance on suitable materials and recommendations for local builders. Following this, an engineer conducts site measurements and initiates the supervision log.

CONTRACT SIGNING	BLUEPRINT REQUEST
A tripartite agreement is signed between the household, TDCA and Geres, that defines: • Roles and responsibilities of each party • Construction supervision requirements • Construction timeline Required documents: • Land plan (map and / or satellite image) • Selected LEC House model • Household identification (ID/passport) • Land ownership certificate	The household submits a formal request for blueprint design to TDCA and proceed to 50% downpayment (<i>Geres will provide the remaining 50%, discounted to the household</i>). • Standard preparation time: 10 days (up to 1 month depending on complexity) • The blueprint is based on: • Selected LEC House model • Household preferences (layout, size, features) • National construction regulation and seismic norms TDCA provides a list of trained local builders and approved material (non-mandatory).

SITE VISIT

To develop the blueprint, a TDCA engineer conducts an on-site to take detailed measurements, including:

- Total area of the house (plot size and planned building footprint)
- Diagonal measurements to verify the accuracy of the layout
- Dimensions of each room for precise construction planning
- Placement of main and auxiliary rooms
- Orientation of main and auxiliary rooms, ensuring:
 - Main living rooms face south, for optimal solar gain
 - Auxiliary rooms face north, to minimize heat loss
 - If the house cannot be oriented directly south, the front may be adjusted up to 20° towards the southwest or southeast to maintain effective solar gain
 - For designs with a veranda, the house can be angled up to 50° in either direction (southwest or southeast), since the porch helps compensating for reduced solar exposure
- Window size, particularly for the main winter room to balance natural light and energy efficiency
- Dimensions of the shading element (overhang), which are critical for regulating energy performance and indoor temperature

The **supervision log** that will be used during the whole construction process is created during the site visit.

OUTPUTS

- Signed contract
- Finalized LEC House blueprint
- Supervision log opened

TOOLS AND RESOURCES NEEDED

- Site measurement tools
- Supervision log template
- LEC House model catalogue

KEY POINTS OF ATTENTION

- Strong knowledge of energy-efficiency technical requirements
- Future digitalization may enhance coordination among all stakeholders, and simplify implementation steps and follow up.

STEP 3: MOBILIZING FINANCE**OBJECTIVE**

Facilitate access to affordable green loans, for households that cannot self-finance their construction project.

TIMING

Post-design approval, pre-construction.

RESPONSIBLE ACTORS

MFI loan officers, with TDCA and Geres support

**KEY ACTIONS**

Loan application: Households apply for a construction loan through a partnering MFI. To assess eligibility, the following information and documents are required:

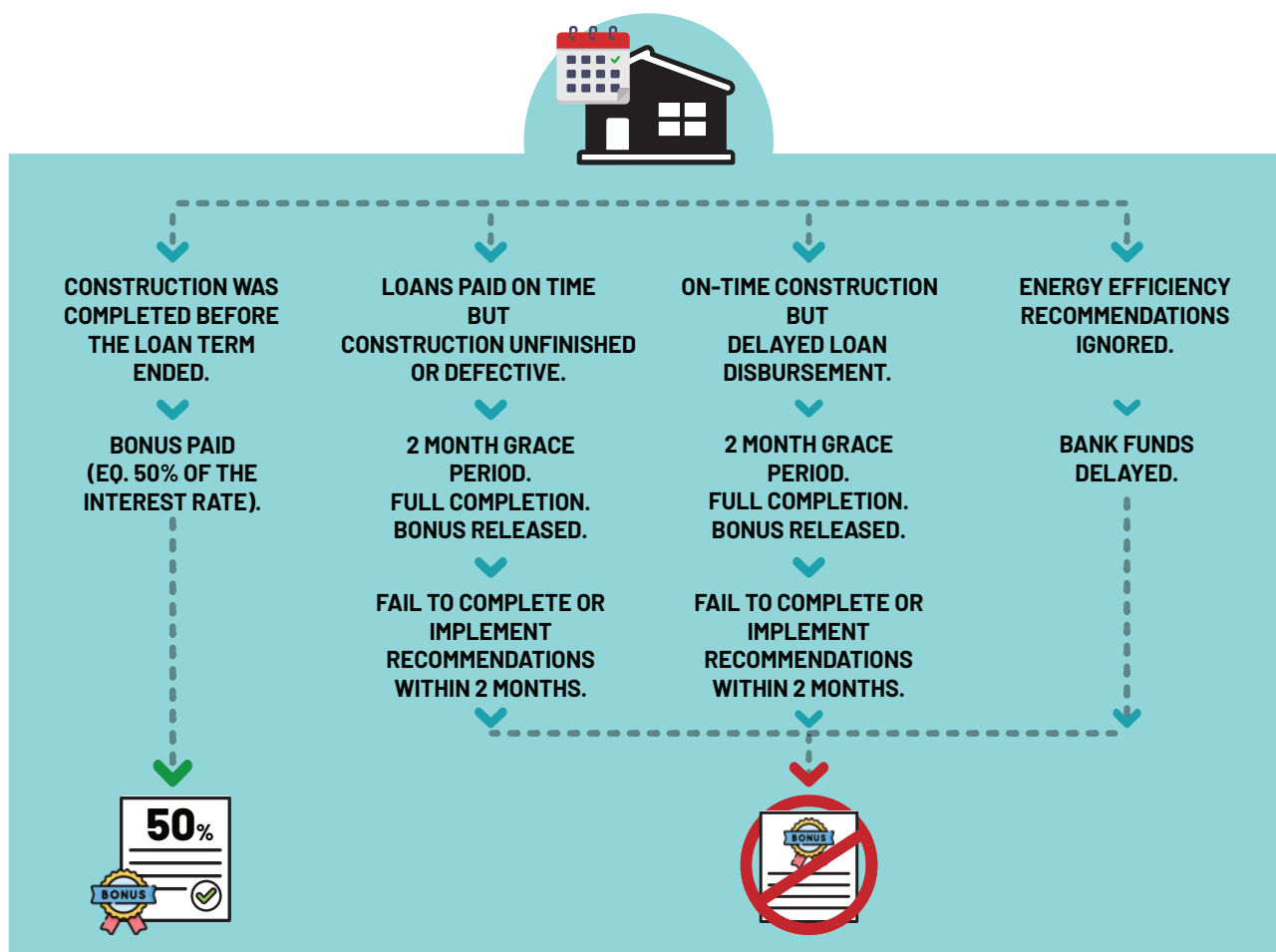
- Proof of land ownership
- Approved LEC House design
- Financial capacity assessment (remittances can be considered as income)

Once all required documents have been submitted, a site visit is conducted for all households. For those with an approved LEC House album, eligibility is confirmed following the visit. Households presenting their own house plans or renovation proposals undergo a technical assessment by Geres, after which a Certificate of Eligibility is issued and submitted to the bank.

Loan disbursement, repayment and bonus:

The approved loan amount is disbursed

- Minimum loan amount: 5,000 somoni (~ 460 USD)
 - Minimum loan term: 12 months
 - Annual interest rate: 26% (for women-headed households) to 33%
- Repayments begin one month after disbursement
- A repayment schedule is provided to the client
- If compliant, with LECH energy efficiency standards, performance-based bonus of up to 50% of accrued interest.



OUTPUTS

- Approved green loan
- Detailed financing plan
- Construction phase ready to start

TOOLS AND RESOURCES NEEDED

- Loan application forms
- Financial assessment tools
- Green loan and LEC House eligibility criteria

KEY POINTS OF ATTENTION

- Strong coordination between MFIs and stakeholders.
- Loan officers need to undergo training on energy-efficiency and LEC Houses benefits.
- Consider digitalization of application and tracking systems for enhanced efficiency of the loan application and repayment process.
- Loan interests place an additional burden on households, and should not enhance overindebtedness, particularly of vulnerable or female-led households.

STEP 4: ENSURING QUALITY CONSTRUCTION AND COMPLIANCE WITH LECH STANDARDS

OBJECTIVE

Ensure that construction complies with LEC House standards through **structured supervision and technical support**.

TIMING

During construction.

RESPONSIBLE ACTOR

TDCA engineers.



CONSTRUCTION IS SUPERVISED THROUGH 4 STRUCTURED SITE VISITS:

VISIT 1 FOUNDATION LAYOUT



Purpose: Ensure correct positioning and orientation

- Take precise measurements and mark foundation layout.
- Ensure main living rooms face south, and auxiliary rooms face north for optimal solar gain.

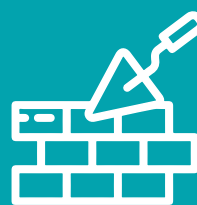
VISIT 2 POST FOUNDATION INSPECTION



Purpose: validate foundation and prepare wall construction

- Check foundation dimensions and mark locations for doors and windows.
- Provide material-specific recommendations for wall construction.
- Confirm window sizes to balance natural light and energy efficiency.

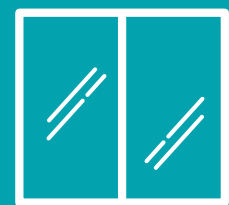
VISIT 3 WALLS AND ROOF CONSTRUCTION



Purpose: Ensure thermal performance and solar protection.

- Verify that wall construction follows earlier recommendations.
- Advise on roof design and eaves.
- Measure the winter room to ensure windows are correctly sized, neither too large (heat loss) nor too small (insufficient light).
- Recommend roof/ceiling insulation materials and thickness.

VISIT 4 WINDOWS, DOORS AND FLOORS



Purpose: Finalize energy-efficient installations and insulation.

- Inspect windows and door installation for airtightness.
- Provide guidance on floor insulation, especially if a basement is present.
- Verify the size and placement of the eaves.

OUTPUTS

- Compliance with LEC House standards, recorded in supervision log

TOOLS AND RESOURCES NEEDED

- Supervision log template
- Measurement tools
- Technical guidelines

KEY POINTS OF ATTENTION

- Each visit lasts 30-40 minutes (excl. travel time).
- Ensure continuity (same engineer along the whole process).
- Strong coordination among all actors.
- Documentation through digital tools may enhance the efficiency of the process.

STEP 5: VERIFYING ENERGY EFFICIENCY POST-CONSTRUCTION**OBJECTIVE**

Audit compliance with energy-efficiency standards and determine eligibility for financial incentives.

TIMING

After construction.

RESPONSIBLE ACTORS

Geres, TDCA engineers, MFI loan officers where applicable.

KEY ACTIONS

Following construction, an **on-site inspection is conducted to verify compliance** with the following criteria:

- South-facing orientation of main living / winter rooms.
- Correct window sizes (optimized for light and heat efficiency).
- Roof eaves (designed to block summer heat while allowing winter sun).
- Wall and/or ceiling insulation (meeting thickness and material standards).
- Double-glazed windows (for thermal performance). (*Refer to page 9*)

Houses are classified as fully compliant when all requirements are met, in which case the full bonus is disbursed to households that have taken a loan. When only some requirements are met, the house is classified as **partially compliant** and a two-month correction period is granted for improvements. When critical energy-efficiency requirements are unmet, the house is considered **non-compliant** and households that have taken a loan do not receive the bonus.

OUTPUTS

- Compliance classification recorded in the supervision log, available to households upon request.
- Bonus eligibility decision
- Final validated LEC House

TOOLS AND RESOURCES NEEDED

- Inspection checklist
- Supervision log



KEY POINTS OF ATTENTION

- Ensure transparency of evaluation criteria.
- Foster strong collaboration between technical and that households are aware of these before engaging in the loan and construction process.
- Use audit results for continuous improvements, suggest adaptations or enhancements to achieve full compliance.

TRAINING

OBJECTIVE

The objective of the training ***“Energy-Efficient Solutions for Rural Residential Houses”*** is to strengthen **the technical capacity of engineers and local builders to design, build and supervise the construction of LEC Houses**, in compliance with LECH energy efficiency standards.

TRAINING PROGRAM OVERVIEW

The training is conducted over 5 days, with a total duration of 40 hours, including 8 hours of theoretical sessions and 32 hours of practical training. Engineers from design organizations participating in the training attend only the theoretical sessions, but at a more advanced level.

TRAINING STRUCTURE

The curriculum is divided into two main sections:

SECTION 1

Aims to provide participants with a strong understanding of passive solar design and its application in residential buildings. It lasts 4 hours – lectures only.

Key topics :

- Principles of solar energy collection
- Building orientation and solar positioning
- Use of solar diagrams in design
- Methods for determining south orientation (compass and alternative techniques)
- Building compactness and efficient room layout for solar gain
- Direct and indirect solar heating strategies
- Window sizing for optimal solar gain
- Design of horizontal overhangs to prevent summer overheating
- Identification of obstacles affecting solar access
- Ventilation strategies for energy-efficient houses

SECTION 2

Aims to equip participants with practical skills to minimize energy losses and maximize thermal comfort in detached houses. It lasts 36 hours (incl. 4 hours of lectures and 32 hours of practice).

Key topics:

- Thermal balance of a residential house
- Comfortable indoor conditions and factors affecting them
- Heat loss mechanisms and their impact on energy efficiency

- Optimal insulation thickness for different building components
- Insulation techniques for walls, floor, roof and ceilings, windows and doors

SPECIFIC CURRICULUM

- In addition to the above training, **TDCA engineers** will attend a further half-day session on 'LEC House Construction Follow-up' to learn the main steps of construction supervision.
- Loan officers of the partnering **MFIs** will attend a half-day training on '**Energy-Efficient Solutions for Rural Residential Houses**' to understand the benefits of these solutions and the requirements of the LEC housing program.

TRAINING CERTIFICATION PROCESS

Upon successful completion of the training, participants receive an official certificate issued by SRICA.

KEY POINTS OF ATTENTION

- Ensure regular training sessions to maintain a pool of skilled local builders
- Update refreshment training sessions content based on supervision feedback and technical evolution or research and development results.





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