Training course on Passive Design Strategies for Infrastructure Facilities

Professional Development Training Course Outline

Category	Civil Engineering and Infrastructure Management	**Duration**	10 Days
Base Fee	$3,000 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

In an era demanding urgent climate action and greater resource efficiency, the design of infrastructure facilities must evolve beyond conventional energy-intensive approaches. Passive design strategies, which harness natural energy flows and environmental conditions to minimize operational energy consumption and enhance occupant comfort, offer a powerful pathway to achieve sustainable and resilient infrastructure. Unlike active systems that rely on mechanical and electrical equipment, passive design leverages building orientation, natural ventilation, daylighting, thermal mass, and shading to create comfortable and efficient indoor environments. This approach not only significantly reduces a facility's carbon footprint and operational costs but also improves indoor air quality, occupant well-being, and resilience to power outages. As the global push for net-zero buildings and climate-adaptive infrastructure intensifies, understanding and applying these fundamental principles becomes critical for civil engineers, architects, and urban planners involved in the built environment. Training Course on Passive Design Strategies for Infrastructure Facilities is meticulously designed to equip professionals with the advanced knowledge and practical skills required to integrate effective passive design strategies into diverse infrastructure facilities, ranging from administrative buildings and maintenance depots to pumping stations and public transport hubs. Participants in this course will gain a comprehensive understanding of the science behind passive heating, cooling, and lighting, and learn how to apply these principles across various climatic zones and building typologies common in infrastructure. The curriculum will delve into advanced topics such as optimizing building envelope performance, designing for natural ventilation and cross-ventilation, maximizing daylight penetration while controlling glare, and utilizing thermal mass for energy moderation. Through a blend of theoretical instruction, hands-on design exercises, and in-depth case studies of successfully implemented passive infrastructure facilities, attendees will develop the expertise to conduct site analyses, perform energy simulations, and select appropriate passive technologies. This course is indispensable for engineers, architects, project managers, and sustainability consultants committed to driving energy efficiency and environmental performance in infrastructure. By mastering the principles and practices of passive design, professionals can lead their organizations towards creating more sustainable,

cost-effective, and comfortable infrastructure assets, contributing directly to global climate goals and fostering a truly resilient built environment.

Programme Curriculum

Training Course on Passive Design Strategies for Infrastructure Facilities

Introduction

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Course Objectives

Upon completion of this course, participants will be able to:

1. Define the core principles of passive design and its relevance to infrastructure facilities.
2. Analyze climatic data and site conditions to inform passive design strategies.
3. Apply principles of building orientation and massing for optimal solar gain and shading.
4. Design effective natural ventilation systems for cooling and indoor air quality.
5. Integrate daylighting strategies to maximize natural light and reduce artificial lighting demand.
6. Understand the role of thermal mass and insulation in moderating indoor temperatures.

7. Explore various shading devices and their application for different building typologies.
8. Evaluate the performance of passive design strategies using simulation tools.
9. Identify appropriate passive design solutions for diverse infrastructure facility types (e.g., offices, depots, stations).
10. Formulate integrated passive design plans that consider energy, comfort, and aesthetics.
11. Understand the interplay between passive design and active systems for hybrid solutions.
12. Analyze case studies of successful passive infrastructure facilities globally.
13. Communicate the benefits and implementation challenges of passive design to stakeholders.

Target Audience

This course is essential for professionals seeking to implement passive design strategies in infrastructure facilities:

1. Architects: Designing energy-efficient and comfortable infrastructure buildings.
2. Civil Engineers: Involved in the planning and design of infrastructure facilities.
3. Mechanical Engineers: Integrating passive strategies with HVAC system design.
4. Sustainability Consultants: Advising on green building and energy efficiency.
5. Project Managers: Overseeing the design and construction of infrastructure assets.
6. Urban Planners: Considering passive design in master planning for infrastructure zones.
7. Facility Managers: Seeking to optimize energy performance and occupant comfort.
8. Government Officials: Developing policies and guidelines for sustainable public infrastructure.

Course Duration

10 Days

Course Modules

Module 1: Introduction to Passive Design and Climate Analysis

- Define passive design and its importance in reducing energy consumption.
- Understand the fundamental principles of heat transfer and building physics.
- Explore global climatic zones and their implications for passive design.
- Learn to analyze site-specific climatic data (sun path, wind patterns, temperature).
- Discuss the benefits of passive design for energy, environment, and occupant well-being.

Module 2: Building Orientation and Massing

- Understand the impact of building orientation on solar gain and daylighting.
- Learn strategies for optimizing building form and massing for passive performance.
- Discuss the use of compact vs. elongated forms in different climates.
- Explore the relationship between building footprint and energy efficiency.
- Apply orientation principles to different infrastructure facility typologies.

Module 3: Natural Ventilation Strategies

- Define natural ventilation and its mechanisms (stack effect, wind-driven effect).
- Design for cross-ventilation and single-sided ventilation in various spaces.
- Understand the role of operable windows, louvers, and wind catchers.
- Explore night purging and thermal comfort strategies using natural ventilation.
- Analyze air flow patterns and sizing of ventilation openings.

Module 4: Daylighting and Glare Control

- Learn principles of effective daylighting for reducing artificial lighting needs.
- Discuss different daylighting strategies: side-lighting, top-lighting, light shelves.
- Understand the concept of daylight autonomy and useful daylight illuminance.
- Explore methods for controlling glare and excessive heat gain from windows.
- Apply daylighting design to various functional areas within infrastructure facilities.

Module 5: Thermal Mass and Insulation

- Define thermal mass and its role in moderating indoor temperature swings.
- Understand the properties of different insulation materials and their application.
- Discuss the optimal placement of thermal mass and insulation in building envelopes.
- Explore phase change materials (PCMs) for enhanced thermal performance.
- Analyze the balance between thermal mass, insulation, and climate conditions.

Module 6: Shading Devices and Building Envelope Performance

- Design external and internal shading devices (overhangs, fins, louvers) for solar control.
- Understand the impact of window-to-wall ratio on energy performance.
- Explore high-performance glazing options and their U-values and SHGC.
- Discuss the importance of airtightness and thermal bridging in the building envelope.
- Apply shading strategies for different facade orientations and climatic conditions.

Module 7: Passive Heating Strategies

- Learn principles of passive solar heating (direct gain, indirect gain, isolated gain).
- Design for solar collection and distribution in cold climates.
- Understand the use of Trombe walls, sunspaces, and greenhouses for heating.
- Explore earth-sheltering and geothermal heat exchange for ground tempering.
- Analyze the integration of passive heating with other building systems.

Module 8: Passive Cooling Strategies

- Discuss various passive cooling techniques: evaporative cooling, radiant cooling, desiccant cooling.
- Explore the use of cool roofs and green roofs for reducing heat absorption.
- Understand the role of natural ventilation and night purging in hot climates.
- Design for effective shading and solar control to prevent overheating.
- Apply passive cooling strategies to maintain thermal comfort in warm environments.

Module 9: Water Management in Passive Design

- Understand the role of rainwater harvesting for non-potable uses in facilities.
- Explore greywater recycling systems for landscape irrigation and toilet flushing.
- Discuss the use of green infrastructure (e.g., bioswales, rain gardens) for stormwater management.
- Learn about water-efficient fixtures and appliances to reduce consumption.
- Analyze the synergy between water conservation and energy savings in passive design.

Module 10: Integrated Passive Design and Hybrid Systems

- Develop an integrated approach to passive design, combining multiple strategies.
- Understand the interaction between passive design and active HVAC systems.

- Explore hybrid systems that optimize energy use through smart controls.
- Discuss the commissioning and performance monitoring of passive infrastructure facilities.
- Analyze the challenges and opportunities of integrating passive and active systems.

Module 11: Simulation Tools and Performance Evaluation

- Introduce energy modeling and simulation software for passive design analysis.
- Learn to input building geometry, material properties, and climate data.
- Conduct simulations to predict energy consumption, daylight levels, and thermal comfort.
- Interpret simulation results to optimize passive design strategies.
- Understand the limitations and assumptions of energy simulation tools.

Module 12: Case Studies and Future Trends in Passive Infrastructure

- Analyze successful global case studies of passively designed infrastructure facilities.
- Discuss the economic benefits and cost-effectiveness of passive design over the life cycle.
- Explore emerging trends: adaptive facades, smart materials, and AI-driven passive optimization.
- Examine the role of passive design in achieving net-zero energy and carbon-neutral infrastructure.
- Identify future research needs and innovations in passive design for the built environment.

Training Methodology

- **Interactive Workshops:** Facilitated discussions, group exercises, and problem-solving activities.
- **Case Studies:** Real-world examples to illustrate successful community-based surveillance practices.
- **Role-Playing and Simulations:** Practice engaging communities in surveillance activities.
- **Expert Presentations:** Insights from experienced public health professionals and community leaders.
- **Group Projects:** Collaborative development of community surveillance plans.
- **Action Planning:** Development of personalized action plans for implementing community-based surveillance.
- **Digital Tools and Resources:** Utilization of online platforms for collaboration and learning.
- **Peer-to-Peer Learning:** Sharing experiences and insights on community engagement.
- **Post-Training Support:** Access to online forums, mentorship, and continued learning resources.

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call +254769199797

Certification

Upon successful completion of this training, participants will be issued with a globally recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

- Participants must be conversant in English.
- Upon completion of training, participants will receive an Authorized Training Certificate.
- The course duration is flexible and can be modified to fit any number of days.

- Course fee includes facilitation, training materials, 2 coffee breaks, buffet lunch, and a Certificate upon successful completion.
- One-year post-training support, consultation, and coaching provided after the course.
- Payment should be made at least a week before the training commencement to Fineskill Training Center account, as indicated in the invoice, to enable better preparation.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Online	$2,000
23 Nov 2026	04 Dec 2026	Physical	$3,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$9,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$12,000

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