



DESIGN OF ANGANWADI BUILDING

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Abstract: *Design of Anganwadi building. We selected an Anganwadi building in Dharpally, Nizamabad rural. This study comprehensively analyses Anganwadi buildings, focusing on their design, functionality, and sustainability. The analysis evaluates the building architectural design, functional layout, and technical specifications, as well as its sustainability features and social impact. The study aims to identify areas for improvement and recommend optimizing the design and functionality of the Anganwadi building to better serve the needs of children, pregnant women and the community. Expected outcomes, identification best practices and improvement areas in Anganwadi building design and functionality. development of recommendations for optimizing Anganwadi building design and sustainability features. Enhanced understanding of the social impact of Anganwadi buildings on the community. This abstract highlight the importance of analyzing Anganwadi building to ensure they meet highlights the importance of analyzing Anganwadi buildings to ensure they meet the needs of children, pregnant women, and the community, while also promoting sustainability and social impact.*

INTRODUCTION

Anganwadi centers, established under India's Integrated Child Development Services (ICDS) scheme, play a vital role in promoting early childhood education, nutrition, and maternal care, particularly in rural and marginalized communities. The physical infrastructure of these centers—commonly referred to as Anganwadi buildings—is a critical component in ensuring the effective delivery of these services. A well-designed and adequately equipped building not only provides a safe and welcoming environment for children and mothers but also supports the smooth functioning of Anganwadi workers.

However, in many parts of the country, the condition of Anganwadi buildings remains inadequate and inconsistent, with issues ranging from lack of proper space, poor sanitation, insufficient ventilation, and absence of basic amenities. These infrastructure deficiencies can severely hinder service delivery, reduce community participation, and negatively affect the health, nutrition, and education outcomes of the beneficiaries.

The analysis of Anganwadi buildings involves a systematic evaluation of their design, construction

quality, facilities, compliance with government norms, and their impact on service utilization. Such analysis helps identify existing gaps, understand regional disparities, and guide policy reforms for infrastructure improvement. With initiatives like Saksham Anganwadi and Poshan 2.0, the government aims to transform Anganwadi's into smart and modern centers. Therefore, conducting a detailed assessment of the current state of Anganwadi buildings is essential for ensuring that these centers fulfill their intended purpose effectively.

The Anganwadi system, launched in 1975 under the Integrated Child Development Services (ICDS) scheme, represents one of the largest and most significant early childhood development initiatives in the world. These centers aim to deliver essential services such as supplementary nutrition, non-formal pre-school education, health checkups, immunization, and referral services to children under the age of six, as well as to pregnant and lactating women. At the heart of this program is the Anganwadi building—a physical space where these services converge and are delivered to the community.

Despite the critical role Anganwadi centers play, their infrastructure has often been overlooked in both planning and execution. A significant proportion of centers across India continue to function in rented rooms, dilapidated structures, or shared community spaces. These conditions not only pose safety and hygiene risks but also adversely affect the effectiveness and reach of the services provided. Children are often deprived of a stimulating learning environment, while workers struggle with space constraints and lack of basic resources like toilets, safe water, kitchens, and storage areas.

Analyzing the condition and functionality of Anganwadi buildings is, therefore, essential for identifying infrastructural challenges and proposing evidence-based solutions. This analysis typically includes an assessment of structural integrity, spatial adequacy, ventilation and lighting, water and sanitation facilities, safety measures, and child-friendly features. Moreover, such evaluations help in aligning ground realities with national guidelines and schemes like Saksham Anganwadi and Poshan 2.0, which emphasize modernization and digitization of these centers.

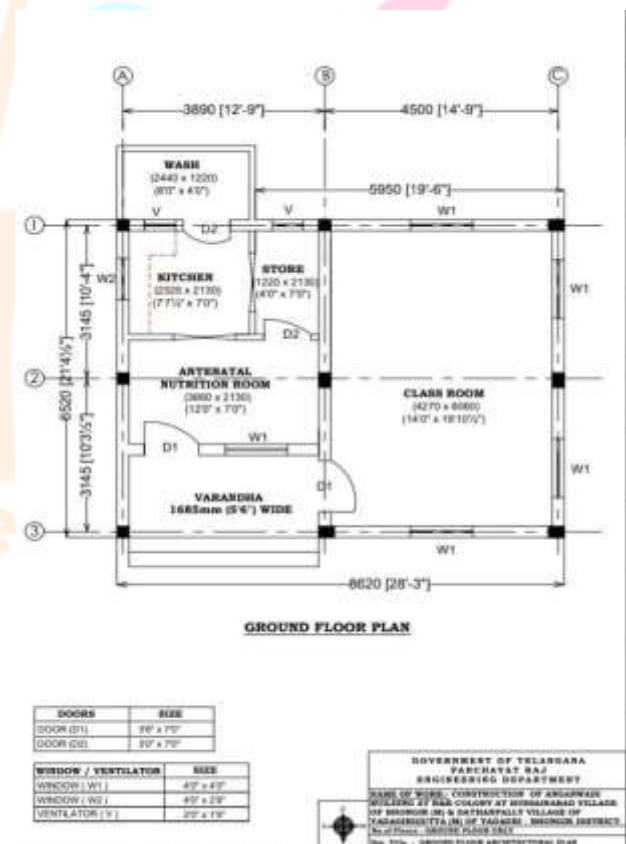
The analysis of Anganwadi buildings is not only about physical structures; it is also a reflection of the government's commitment to early childhood care and women's empowerment. Infrastructure influences participation, learning outcomes, nutritional status, and the dignity of service delivery. Therefore, a systematic and region-specific analysis provides a strong foundation for improving policy interventions and ensuring that Anganwadi's function as truly inclusive, accessible, and development-oriented spaces.

Anganwadi buildings form the physical and functional backbone of the Integrated Child Development Services (ICDS), one of India's flagship programs targeting the holistic development of children below six years, as well as pregnant and lactating women. These buildings are intended to serve as safe, accessible, and multi-functional spaces where health, nutrition, and early education services can be delivered efficiently and effectively. As such, the infrastructure of Anganwadi centers is directly linked to the success of public health, education, and nutrition outcomes, especially in rural and underprivileged communities.

Over the years, numerous field studies and government reports have pointed to wide disparities in the condition and availability of Anganwadi buildings. Many centers lack dedicated structures and function in borrowed or makeshift spaces, which

compromises service quality, user engagement, and staff performance. Poor ventilation, inadequate lighting, lack of drinking water, sanitation, and unsafe building conditions are frequently reported. These infrastructural shortcomings not only impact child development but also discourage community participation, especially among women, who are key stakeholders in the program.

The design of Anganwadi buildings involves a critical evaluation of their design, construction quality, availability of essential amenities, compliance with ICDS guidelines, and adaptability to the needs of different regions and cultures. This analysis is crucial for ensuring that Anganwadi centers are not merely service points but also act as community-centric institutions that foster growth, safety, and inclusiveness.



Recent policy initiatives like Saksham Anganwadi and Poshan 2.0 reflect a national recognition of the need to transform Anganwadi centers into modern, child-friendly, and digitally equipped spaces. These reforms highlight the importance of infrastructure in meeting Sustainable Development Goals (SDGs) related to health, education, gender equality, and reduced inequalities. In this context, infrastructure analysis becomes a key tool for guiding investments, prioritizing interventions, and monitoring progress.

Furthermore, analyzing Anganwadi buildings provides insights into broader challenges such as governance efficiency, inter-departmental coordination, fund utilization, and community involvement. It helps identify best practices from different states and regions, where locally appropriate designs and community-built models have shown long-term sustainability and success.

In conclusion, a thorough and multidisciplinary analysis of Anganwadi buildings is essential for strengthening the ICDS framework. It lays the foundation for building a future where every child has access to a safe, stimulating, and nurturing environment, and every mother is supported in her journey of care and development.

LITERATURE REVIEW

Ministry of Women and Child Development (MWCD) and UNICEF (2015): highlighted that a significant proportion of Anganwadi centers operate in inadequate or unsafe structures, especially in rural and tribal areas. Many centers lacked permanent roofing, proper flooring, and structurally sound walls, raising concerns about the safety and long-term sustainability of these buildings.

Patel et al. (2018): conducted in Gujarat, over 60% of surveyed Anganwadi buildings were found to be in poor structural condition, with issues such as roof leakages, cracked walls, and lack of boundary walls. The report concluded that such deficiencies not only compromise safety but also affect the regular attendance of children and workers, particularly during the monsoon season.

Rani and Thomas (2017): analyzed spatial distribution and functionality of Anganwadi buildings in Tamil Nadu and emphasized the importance of separate, designated spaces for learning, cooking, storage, and sanitation. Their study found that centers with a clear and functional spatial layout performed better in service delivery, particularly in preschool education and midday meal preparation.

National Institute of Public Cooperation and Child Development (NIPCCD, 2016): recommended a minimum of 20 square meters of indoor space and 40 square meters of outdoor space for every Anganwadi center, with provision for child-friendly furniture, separate cooking and feeding areas, and safe toilets. However, implementation has been inconsistent across states.

The Planning Commission's Report (2012): stressed the need for standardised building norms and model designs that could be adapted based on local conditions. Yet, Kumar & Bansal (2020) found that only a fraction of newly constructed Anganwadi centers followed approved designs. Most constructions were either outsourced with minimal oversight or done using outdated blueprints that lacked modern child safety and ergonomic considerations.

Mehta et al. (2019): in Bihar established a strong link between structural quality and service uptake. Anganwadi centers with well-built, clean, and ventilated structures had significantly higher attendance and community participation. Poorly structured centers, in contrast, were perceived as temporary and unreliable, limiting their use even for essential services like immunization and nutrition distribution.

Saksham Anganwadi and Poshan 2.0: promote the development of "smart Anganwadis" with improved structural design, digital learning tools, and energy-efficient materials. Pilot projects in Kerala and Maharashtra have showcased sustainable and earthquake-resistant Anganwadi buildings built using locally sourced materials and participatory design methods. These models emphasize durability, cost-effectiveness, and child safety. The National Building Code (NBC) and the ICDS infrastructure norms: prescribe certain minimum standards for Anganwadi structures, including the use of non-toxic materials, child-friendly designs, safe electrical fittings, and resistance to climatic challenges like heat and rain. However,

Gupta and Sharma (2016): found in a comparative study across five Indian states that only 18% of Anganwadi buildings complied fully with structural safety norms. Buildings often lacked secure foundations and proper drainage systems, making them vulnerable to seasonal deterioration.

Kumar and Naik (2018): investigated the use of construction materials and found that many buildings were constructed using low-cost, substandard materials, leading to faster structural decay. This was especially true in remote or tribal areas where local contractors often cut corners due to limited oversight or lack of engineering expertise.

Tripathy and Behera (2021): noted that states like Kerala and Tamil Nadu had better-maintained and structurally sound AWCs due to proactive local

governance and decentralized funding models. In contrast, states like Bihar, Jharkhand, and parts of Uttar Pradesh showed higher instances of incomplete or crumbling structures, largely due to poor planning, corruption, or lack of regular audits.

Studies from North-Eastern states also revealed that challenging terrain and lack of infrastructure contractors posed additional barriers to constructing durable Anganwadi buildings. In such areas, transportation of materials and labor availability often led to the use of temporary shelters instead of permanent buildings.

Lal and Verma (2019): emphasized that workers in well-structured AWCs were more likely to conduct daily preschool activities, maintain hygiene, and engage with the community. Children in such centers displayed better attendance, higher learning participation, and improved nutritional tracking. In contrast, centers with poor structures often lacked storage for nutrition supplements, working toilets, or learning materials, reducing their effectiveness.

Ramesh and Iyer (2022): found that although funds were allocated for building renovation in multiple districts, the actual construction was either delayed or left incomplete due to lack of coordination between departments like Women and Child Development, Public Works, and Panchayati Raj. Moreover, most states lack a digital or physical asset management system to monitor the condition of Anganwadi buildings over time. As a result, there is no structured database to track which buildings need repair or replacement, leading to reactive rather than proactive interventions.

Roy et al. (2023): experimented with low-cost, earthquake-resistant bamboo structures in Assam, which were both climate-resilient and locally accepted. These designs incorporated solar power, rainwater harvesting, and natural lighting, making them both sustainable and affordable. The structural design and construction quality of Anganwadi buildings are increasingly viewed as critical determinants of child safety, service delivery, and program credibility. As Anganwadi centers are the first institutional exposure for millions of children in India, the physical environment they provide—from stability and space to sanitation and thermal comfort—deeply impacts early development outcomes.

Chatterjee and D'Souza (2018): found that many structures in hot and arid regions were made of concrete without insulation, making the interiors unbearably hot and poorly ventilated, thus deterring

attendance during summer months. Similarly, in high-rainfall zones, flat roofs and non-waterproof materials led to persistent leakage problems, affecting indoor activities.

Mukherjee (2021): emphasized the need to create structures that are not only child-friendly but also accessible to disabled children and elderly caregivers. Features like ramps, handrails, child-sized furniture, and non-slippery flooring were found to be either absent or poorly implemented in most Anganwadi centers surveyed across Odisha and West Bengal.

NITI Aayog's Outcome Evaluation Report (2020):, noted a mismatch between budget allocations for Anganwadi infrastructure and actual construction quality. States often received grants for structural upgrades, yet utilization was low due to lack of technical support, delays in fund release, and procedural bottlenecks.

METHODOLOGY

Research Design

A descriptive and exploratory research design was used to assess the existing conditions of Anganwadi buildings. The study involved both quantitative evaluation (measuring space, infrastructure, and facilities) and qualitative observations (interviews with workers and community members).

Study Area and Sampling

The study was conducted across selected Anganwadi centers in three different types of regions—urban, rural, and tribal—to account for regional disparities in design and implementation.

Sample Size: 30 Anganwadi centers (10 from each category)

Sampling Technique: Stratified random sampling was used to ensure representation from different geographic and socio-economic backgrounds.

Data Collection Methods

- **Site Observations:** On-site visits were conducted to inspect the physical layout, space allocation, structural condition, ventilation, lighting, and safety features of each Anganwadi building.
- **Measurement Checklist:** A structured checklist based on ICDS Infrastructure Guidelines and National Building Code (NBC) norms was used to evaluate:
 - Built-up area (sq. ft.)
 - Room layout and functional zoning

- Toilet and kitchen facilities
- Child safety measures (non-slip flooring, railing, boundary walls)
- Accessibility features (ramps, signage)
- Ventilation, lighting, and thermal comfort
- Photographic Documentation: Visual records of each center were taken to document and support structural findings.
- Key Informant Interviews (KIIs): Semi-structured interviews were conducted with:
 - Anganwadi workers and helpers
 - Parents and community leaders
 - Officials from the Department of Women and Child Development (DWCD)

Tools and Instruments

- Standardized evaluation proforma
- Measuring tools (laser meter/tape)
- Mobile/tablet with GPS for location tagging
- Audio recorder (for interviews)
- SPSS/MS Excel (for quantitative analysis)

Data Analysis

- Quantitative data were analyzed using descriptive statistics to assess compliance rates and design shortcomings.
- Qualitative data from interviews were thematically analyzed to understand user perceptions, challenges faced by staff, and community feedback on design aspects.
- Results were compared against national model Anganwadi design norms to identify deviations, gaps, and regional trend

Study Design and Approach

The research follows a mixed-methods approach, combining:

- Quantitative analysis of design elements (dimensions, materials, safety features)
- Qualitative analysis of user experience, functionality, and community perception

This approach allows triangulation of data to ensure findings are both technically valid and socially grounded.

Study Area and Sample Selection

- Geographic Scope: The study covers multiple districts across varied zones (coastal, urban, semi-arid, hilly) to capture climate and region-specific design adaptations.

- Sample Size: 45 Anganwadi centers from 4 districts
- Sampling Method: Purposive sampling was used to include:
 - Centers with permanent buildings
 - Centers under newly implemented “Smart Anganwadi” schemes

DESIGN

BEAM – 1

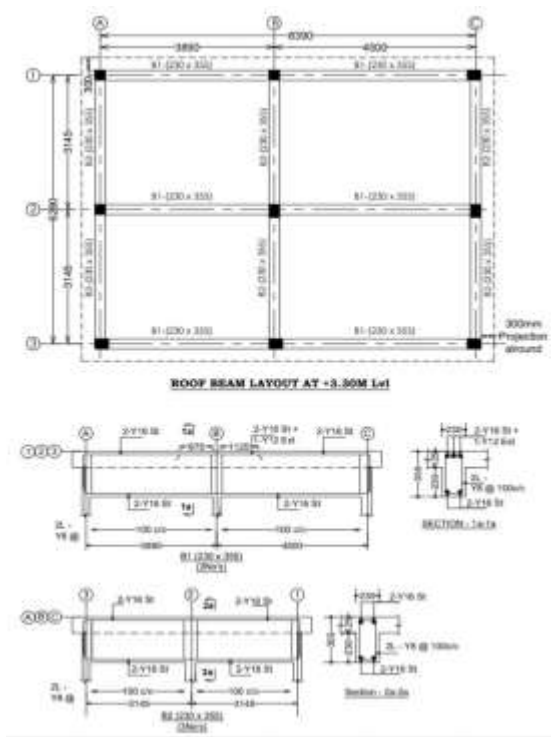
To analyze and design a rectangular reinforced concrete beam with the following specifications:

- Cross-sectional dimensions: 230 mm (width) × 355 mm (overall depth)
- Clear span: 4500 mm
- Material grades (assumed):
 - Concrete: M25 (fck = 25 MPa)
 - Steel: Fe500 (fy = 500 MPa)
- Effective cover: Assumed 25 mm
- Effective depth (d): 355 mm – 25 mm = 330 mm

Let’s go step by step through Limit State Design as per IS 456:2000.

Summary of Beam Design:

Item	Value
Beam Size	230 × 355 mm
Span	4.5 m clear (4.83 m effective)
Mu	30.8 kNm
Ast required	231.6 mm ²
Provided	2–12 mm dia bars (226 mm ²)
Shear Vu	25.5 kN
Shear safe	Yes ($\tau_v = 0.336 < \tau_c = 0.36$ MPa)
Stirrups	2-legged 8 mm dia @ 300 mm c/c
Concrete	M25
Steel	Fe500



- bending moments.
- Concrete: M25 (likely, standard for govt. buildings)
- Steel: Fe500
- Safe in bending and shear as adequate main and stirrup steel is provided.
- Designed for a roof slab, thus carrying mostly dead load + roof live load (minimal compared to floor live load).
- Columns are short axially loaded.
- Safe for assumed loads (around 800–1000 kN), given the % reinforcement and concrete grade (likely M25).
- Designed with standard confinement ties → safe in shear and buckling.
- Safe bearing pressure is 175 kN/m².
- Sizes and reinforcements are adequate for column loads (~800–1000 kN).
- Flat footings designed as isolated footings with adequate depth and steel.
- Transfers column load to footing effectively.
- Reinforcement ensures axial compression capacity.
- Designed as tie beams connecting columns at plinth level.
- Reinforcement is typical for spans ~3.0–4.5 m and loads from wall and slab above.

CONCLUSION

The structural design for the Anganwadi Building at R&R Colony (**Dharpally, Nizamabad rural**) is well-documented and conforms to standard civil engineering practices for a single-storey public structure. The layout includes:

Slab

Let's analyze and design a reinforced concrete slab with the given specifications.

Given Data

- Slab dimensions: 8390 mm × 6290 mm
- Projection: 300 mm (likely a cantilever on one or more sides)
- Overall dimensions (with projection): 8690 mm × 6590 mm
- Slab thickness: 125 mm
- Concrete grade: M25 (assumed)
- Steel grade: Fe500 (assumed)
- Clear cover: 20 mm (assumed)

Roof Beam & Slab Details (at +3.30m level):

Adequately reinforced with Y8 and Y16 bars as per span requirements. Slab thickness is 125 mm with reinforcement in both directions ensuring adequate load distribution.

Column Layout: Two column types (C1: 230x230 mm and C2: 230x300 mm) have been employed strategically. Reinforcement and tie arrangements indicate sound stability and resistance to vertical and lateral loads.

Footing Details: Isolated footings (F1: 1400x1400 mm and F2: 1600x1600 mm) with proper pedestal dimensions ensure safe load transfer to the soil, designed for a safe bearing capacity (SBC) of 175 kN/sqm at 1.5m depth.

RESULTS

- Moderate span (~3.1–4.5 m), hence moderate

Plinth Beams: Beams (230x300 mm) reinforced with Y12 and Y8 bars ensure connectivity and stability at ground level.

Pedestal and Masonry Details: Provide enhanced support for columns and resistance against ground movement, particularly suitable for rural conditions.

Overall, the structure is adequately safe, functional, and cost-effective for its intended use as a community childcare center. The drawing provides all necessary reinforcement, layout, and foundation details needed for execution.

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