



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJIRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 11, Issue 1, January 2022

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.569

9940 572 462

6381 907 438

ijirset@gmail.com

www.ijirset.com

A Review on Expanded Polystyrene Sheets (EPS)

Vijaya Dinesh Gayki¹, Mohammad Fazlekarim Abdul Nasim², Akash Prakash Wankhade³,
Swati Dadarao Chopde⁴, Ganesh Vikas Khaserao⁵

Assistant Professor, Department of Civil Engineering, MGICOET, Shegaon, Maharashtra, India¹

U.G. Student, Department of Civil Engineering, MGICOET, Shegaon, Maharashtra, India²³⁴⁵

ABSTRACT: In this paper we reviewed how increased polystyrene is mountaineering up the steps with inside the production market. India is a hastily urbanizing United States of America going through improvement demanding situations related to speedy growth. The excessive percent of exertions migration from rural regions to towns has contributed to city congestion, strain on primary facilities together with water and sanitation, etc., and maximum of all, housing shortages in towns throughout India. Expanded Polystyrene (EPS) core primarily based totally composite panel device is a promising production approach for mass housing initiatives as those homes are mild weight, power green and may be without difficulty dealt with and erected. EPS core primarily based totally composite panels encompass a layer of self-extinguishing EPS sheet (of variable thickness; now no longer much less than 60mm) sandwiched among layers of concrete/structural plaster with welded twine mesh reinforcement of 2.5mm to 3mm diameter. The use of EPS on the core reduces the load of the shape therefore making it seismically extra green and additionally acts as insulation in opposition to thermal, acoustics and vibration.

KEYWORDS: Expanded Polystyrene, Self-Extinguishing, Mass Housing Projects, Light Weight, Seismically extra green.

I. INTRODUCTION

EPS core panel system in many nations' beneathneath distinctive shape and emblem name. System is made on manufacturing facility made composite panel which includes mixture of self-extinguishing polystyrene corrugated simple sheet of minimal density 15kg/m³ and required thickness of 60mm sandwiched among layers of engineered sheet of excessive energy galvanized bloodless metallic twine mesh interconnected to every different with excessive energy metallic connector. The important characteristic of the core is to offer thermal insulation and sound insulation and its thickness and kind relies upon on its thermal resistance and layout temperature. The truss shape with the galvanized twine offers the preferred structural energy to the panel. The EPS panels are synthetic in differing types relying upon the application.

EPS panel consists of welded reinforcing meshes of excessive-energy twine, diagonal twine and self-extinguishing increased polystyrene uncoated concrete, synthetic with inside the manufacturing facility and shotcrete is carried out to the panel assembled at the development site, which offers the bearing capability of the shape.

1.1 What is EPS?

Expanded Polystyrene (EPS) core Panel system is a modern, green, secure and monetary production device for the development of homes. These panels may be used each as load bearing in addition to non-load bearing elements. EPS core panel is a 3-D panel which includes third-dimensional welded twine area body furnished with the polystyrene insulation core. Panel is positioned in function and shotcrete on each the perimeters The EPS panels encompass a third-dimensional welded twine area body using a truss idea for pressure switch and stiffness as proven in Fig. 1.1.

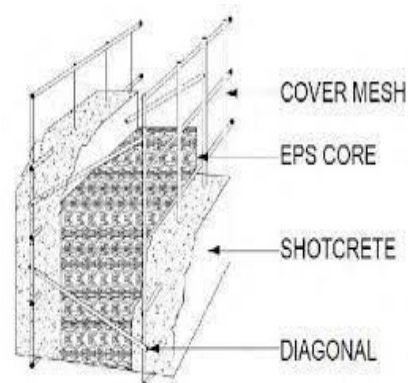


Fig no 1. EPS Components

1.2 Components of EPS Sheets

1. The outer layer of shotcrete.
2. Welded reinforcing mesh of excessive wire.
3. The core of improved polystyrene sheet.
4. Diagonal wire (stainless or galvanized wire).
5. The internal layer of shotcrete.

II. LITERATURE REVIEW

This studies discusses approximately the Properties of EPS, fabrication, Construction information of EPS Core Panel Systems, and Training Modules for Professionals & Artisans and Manpower Requirement. Expanded Polystyrene (EPS) core primarily based totally composite panel system is a promising production method for mass housing initiatives as those homes are mild weight, strength green and may be without problems treated and erected. EPS core primarily based totally composite panels include a layer of self- extinguishing EPS sheet (of variable thickness; now no longer much less than 60mm) sandwiched among layers of concrete/structural plaster with welded twine mesh reinforcement of 2.5mm to 3mm diameter. The twine mesh reinforcement on the 2 facets is interconnected the usage of galvanized metal twine connectors of 3- 4mm diameter, pierced absolutely thru the polystyrene core for growing the power. The panels are completed at the web website online with the aid of using making use of mortar or with the aid of using shotcreting on each facets. The use of EPS on the core reduces the load of the shape for this reason making it seismically greater green and additionally acts as insulation towards thermal, acoustics and vibration.

2.1 Abhijit Mandlik et al. (2007) - They have observed that cost of EPS is less compared to that of normal concrete. Increase in the EPS beads content in concrete mixes reduces the compressive and tensile strength of concrete. All the EPS concrete without any special bonding agent show good workability and could easily be compacted and finished. The replacement by using EPS has shown a positive application as an alternate material in building non-structural members, and it also serves as a solution for EPS disposal. Obtained results suggest that expanded polystyrene concrete has scope for non-structural applications, like wall panels partition walls, etc.

2.2 G. Carbonari et al. (2012) - Authors worked out an experimental study about the flexural behaviour of light-weight sandwich panels with perpendicular connectors. For that they performed three experimental programs to assess the influence of different supports and loading conditions.

2.3 Anthony Nkem Ede (2014) - Author has executed questionnaires consisting diploma of pride of consumer tormented by improved polystyrene wall panel production. Questionnaires consisting of various parameters which includes client's notion of EPS recyclability, notion of EPS reliability, versatility, moisture resistance and subsequently summarized the end result of the studies. The studies became accomplished specially for the Nigerian peoples. In the studies it became proven that greater peoples of the country are accepting the improved polystyrene core panel system for the development of low-priced housing.

2.4 Anthony Nkem Ede et al. (2014) - Author inspect the thermal conduct of 3-D wall shape with insulation core of polystyrene with various thicknesses of 50mm to 150mm and ranging density of among 10kg/m³ to 30kg/m³. Author



used useful resource of laptop software for the calculation of thermal transmission and reactance of diverse wall panels. Author located that the consequences of the studies will improve the acceptability of this new revolutionary constructing system into the world.

2.5 Poluraju et al. (2014) - Authors defined the strain and stress distribution in three-D panels below flexure of various kinds of panels particularly absolutely composite, in part composite and non-composite. They additionally inspect the conduct of 3D wall panel below axial compression loading, below in-aircraft lateral loading and below out of- aircraft loading (flexure). The traces with inside the twine mesh, the metal member of the panel, and stays nicely with inside the yield limit. The panels behaved as composite contributors until failure.

2.6 Rohit Raj et al. (2014) - Authors cautioned the suitability of expanded polystyrene embedded in bolstered concrete on the premise of value reduction, CO₂ emission, strength requirements, durability, sound insulation and earthquake resistance. In order to offer a potential technique as according to IS requirements. Authors have studied numerous behaviours of composite, non-composite and partial composite ESPCSR panels under outside loads.

2.7 Piyush Bhandari et al. (2016) - Author select the material which includes cement, sand, water, thermocol, wire mesh and pick the combination percentage of cement sand (1:2) and water cement ratio (0.4) for the reason of producing sandwich panels. Then he executed the numerous check particularly water content material check, density check, water absorption check, flexural power, vertical load carrying capacity test, compressive strength test, thermal conductivity test, panel impact resistance test, acid resistance test, ultrasonic pulse velocity test and rebound hammer test. In all aspects of construction like men, materials, machinery, money, etc., the sandwich panel method of construction proved to be much cheaper than conventional method of construction.

2.8 Avirup Sarkar et al. (2016) - In this research, they supplied the development technique and structural assessment of a constructing built the usage of the EPS core-concrete panels. They mentioned the layout factors and the development technique of EPS core panel primarily based totally constructing systems. In this research, they supplied the development technique and structural assessment of a constructing built the usage of the EPS core-concrete panels. They mentioned the layout factors and the development technique of EPS core panel primarily based totally constructing systems. Author concluded that the minimal thickness of concrete used to carry out the checks and metal twine mesh diameter is sufficient to resist layout forces as according to IS456:2000.

2.9 Pradeepa Reddy et al. (2016) - Author describes production method of extended polystyrene in three different tiers particularly pre-expansion, intermediate maturing and very last moulding. And additionally offers the cloth specification for roof slab panel and wall panel. Author accomplished compressive strength and flexure strength take a look at on targeted cloth panels. Flexural strength accomplished with one of a kind strategies three factor loading and 4 factors loading respectively. Author additionally labored out value contrast among mild weight sandwich panel and brick paintings and cement block.

2.10 Akshay Kumar Bacha et al. (2016) - He found that the supply of the traditional constructing production cloth is in most cases acquired from nature. Due to the call for of society and additionally to facilitate the infrastructure the substances are getting used because a while of times. Then he mentioned the price of production, time taken to finish the precise project. To counter act the above reasons they taken into consideration EPS wall panel be the feasible replacement to the traditional constructing production. They accomplished diverse assessments at the EPS wall panel and made consequences. After all of the experimental investigation, end had been made that EPS panel offers greater power minimizing the vertical and horizontal joints. Also, EPS wall production reduces the load of shape and is thermally insulated because of the presence of polystyrene.

III. ADVANTAGES AND LIMITATIONS

3.1 Advantages:

1. Reduce the value of production and time of production.
2. The set up does now no longer want heavy production equipment's.
3. Ensure excessive ranges of thermal insulation, sound insulation, in addition to sanitary and hearth place safety.
4. Being mild weight truly makes it a splendid choice.



5. Ensure excessive ranges of thermal insulation, sound insulation, in addition to sanitary and hearth place safety.
6. Strength and durability - used extruded polystyrene simply inert and does not no longer soak up moisture, is long lasting and immune to decay.

3.2 Limitations:

1. EPS Panel production system may also best be used withinside the production of basis partitions assisting four storeys or much less.
2. Compressive strength of concrete shall now no longer be much less than 20 MPa.
3. Improper production time table may also cause deterioration of EPS panels (yellowing of panels) which may also cause degradation of insulation assets of EPS.
4. The bearing ability is low and strengthening is required.
5. It needs specialized and absolutely professional labour.
6. The metal reinforcement shall have a minimal allowable stress (f_y) of 415 MPa.

IV. DISCUSSION

1. Proper production time table need to be observed for making sure the time among erections to shotcreting is finished inside forty eight hours. This will keep away from deterioration of EPS panels, which ends up in decreased insulation properties.
2. Government need to take energetic tasks to make public privy to EPS Core panel housing generation through organizing seminars, schooling program, and construction of demo systems in deferent elements of the country.
3. Proper waste disposal system need to be in place, making sure minimal wastage and spillage of concrete with inside the surrounding areas.
4. The partitions have to be plaster nicely on each the edges and right completing need to be done.
5. EPS core Panel system is a modern, efficient, secure and financial production system for the development of buildings. It has were given the capacity in attaining the Government of India's bold project "Housing for all through 2022".
6. The EPS Core panel system is surroundings pleasant and aesthetically appealing. It may be built quick ensuing in financial savings in production time and money.
7. The generation has been in use effectively in lots of African in addition to European international locations with involvement of various agencies.

REFERENCES

- [1] Mandlik, A., Sood, T.S., Karade, S., Naik, S. and Kulkarni, A. (2013) Lightweight Concrete Using EPS. ISSN (Online): 2319-7064, International Journal of Science and Research (IJSR),4, 2007.
- [2] Carbonari G., Cavalaro S. H. P., Cansario M. M. and Aguado A. Flexural behaviour of light-weight sandwich panels composed by concrete and EPS. Construction and Building Materials, 35, 792–799, 2012.
- [3] Anthony Nkem Ede; Use of Advanced Plastic Materials in Nigeria: Performance Assessment of Expanded Polystyrene Building Technology System; American Journal of Engineering Research (AJER) e-ISSN: 2320-0847 p-ISSN: 2320-0936 Volume-03, Issue-04, pp-17-23, 2014.
- [4] Anthony Nkem Ede and Abimbola Ogundiran, "Thermal behaviour and admissible compressive strength of Expanded Polystyrene wall panels of varying thickness", Current Trends in Technology and Science, ISSN: 2279-0535. Volume: 3, Issue: 2, 2014.
- [5] Poluraju and G. Appa Rao, "Behaviour of 3D-Panels for structural applications under general loading: A state-of-the-art", International Journal of Research in Engineering and Technology (IJRET), ISSN: 2319-1163/ P-ISSN: 2321-7308, Volume:3, Special Issue:16, Dec- 2014.
- [6] Rohit Raj, "Prospects of Expanded Polystyrene Sheet as Green Building Material", International Journal of Civil Engineering Research, ISSN: 2278-3652, Volume: 5, No.2 (2014), pp. 145-150.
- [7] Piyush Bhandari, "Evaluating Properties of Lightweight Sandwich Wall Panels", International Journal for Scientific Research and Development (IJSRD), vol.4, Issue 06/2016/041.
- [8] Avirup Sarkar, Adil Ahmad and Yogendra Singh; Seismic Design of Expanded Polystyrene Core Panel Based Building Systems; International Conference on Earthquake Engineering and Post Disaster Reconstruction Planning, 24 – 26 April, 2016, Bhaktapur, Nepal.



- [9] Pradeepa Reddy, “A study on use of Reinforced Thermocol Panels as an Alternate Material”, International Journal of Research on Advent Technology, Vol.4, No.3, March 2016 E-ISSN:2321-9637.
- [10] Akshay Kumar Bacha, Rahul Patil, Shrinath Hogade; A Replacement for Conventional Building Materials by EPS-Wire Mesh Panel; International Journal of Advanced Scientific Research and Publications ,ISSN-2454–9878, 2016.
- [11] Ahmad Qidwai, Structural Behavior of Precast Lightweight Concrete Sandwich Panel Under Eccentric Load: An Overview., 2008 .
- [12] Bajracharya R. M., Lokuge W. P., Karunasena W. and Lau K. T. Structural evaluation of Concrete Expanded Polystyrene sandwich panels for slab applications 2011.
- [13] Gara F., Ragni L., Roia D. and Dezi L. Experimental tests and numerical modelling of wall sandwich panels. Engineering Structures, 37, 193–204 <http://doi.org/10.1016/j.engstruct.2011.12.027>, 2012
- [14] Herki, B.M.A. (2017) Absorption Characteristics of Lightweight Concrete Containing Densified Polystyrene. Civil Engineering Journal, 3.
- [15] IS: 456-2000, Plain and Reinforced concrete - Code of Practice, Bureau of Indian Standards, New Delhi, India.



**Impact Factor:
7.569**



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  ijirset@gmail.com



www.ijirset.com

Scan to save the contact details