



Comparing Of Conventional Roofing Material And Advanced Roofing Material And Their Limitations With Special Reference To Foundry Industries At Kolhapur.

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Abstract: Different roofing materials and methods are available to enhance functionality and require less maintenance. Pre- Paint Galvanized iron (PPGI) sheets and conventional cement roofing sheets are recommended, but asbestos cement sheets have limitations due to fragility and potential accidents during replacement. Pre- Paint Galvanized iron sheets have additional maintenance requirements due to corrosion, noise, and heat issues. Foundry industries face frequent maintenance and production cycle disruptions due to roofing cracking. The use of new materials for industrial roofs has not received much research, so selecting the latest materials techniques is crucial to increase production while minimizing roofing-related problems.

Investing in long-lasting, resilient, and low-maintenance roofs is necessary since the firm has difficulties in sustaining continuous production and corrective roof maintenance. There is a demand for new, high-tech materials that can enhance roofing performance while remaining reasonably priced. Due to a lack of knowledge about its qualities and financial advantages, individuals still choose conventional roofing. In this research, new developments in roofing materials for foundry industries are explored.

Index Terms - Foundry Industries, Conventional Roofing Material, Advance Roofing Material, Limitation.

I. INTRODUCTION

The roofing sector is crucial for the economy due to globalization and liberalization, requiring consistent quality, less maintenance, and cost-effectiveness. Consumers demand long-lasting performance, quality, and affordability. Historically, asbestos cement sheets were fragile and easily shattered in extreme temperatures. Galvanized iron sheets, however, caused noise, corrosion, and increased heat. New materials like bare galvalume sheet, color-coated aluminum roofing sheet, and pre-painted galvalume sheet (PPGL sheet) are being used to produce long-lasting roofing that minimizes costs, enables continuous manufacturing, and reduces heat. These materials offer improved resistance to heat, chemicals, corrosion, and cracks. Architects and engineers must choose economical roofing materials that meet industry requirements.

II. RELEVANCE OF STUDY

The Kolhapur district foundry in India faces challenges like durability, corrosion, temperature control, ventilation, and leak-proof roofing. Despite limited research, new materials have emerged to address these issues. These safer and more cost-effective options are crucial for architects and engineers. The study suggests exploring the feasibility of using other materials and sheets available in the Kolhapur market for industrial roofing, considering the limitations of conventional roofing.

III. AIM

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IV. OBJECTIVES

- To study the conventional roofing materials used and their limitations.
- To collect the data about the study of different types of roofing materials available in the market for foundry industries, which will overcome the difficulties of conventional roofing.
- To compare the analysis of roofing with special reference to the Cost factor.
- To evaluate parameters of roofing sheet like durability, corrosion, temperature control, etc.

V. RESEARCH METHODOLOGY

The following methodology will be adopted to meet the objectives of the proposed work.

- To study the conventional roofing materials used and their limitations by various manufactures Boucher of product articles, handbooks, etc.
- To collect the data about the study of different types of roofing materials available in the market for foundry industries, which will overcome the difficulties of conventional roofing by case study method and also data analysis of questionnaire survey.
- To compare the analysis of roofing with special reference to the Cost factor by comparative analyses method.
- To evaluate parameters of roofing sheet like durability, corrosion, temperature control, etc. Based on the industrial visit, physical observation, and interviews, data analysis of roofing sheet and conclusion.

VI. DATA COLLECTION

1. Type of Conventional Roofing Sheet and Its Limitation.

• Asbestos cement sheet (A.C Sheet)

Asbestos cement sheet, a composite building material combining cement and asbestos fibers, gained popularity in the late 19th century due to affordability, fire resistance, and availability. Its versatility in flat and corrugated sheets makes it a popular choice in construction.



Figure 1. Asbestos Cement Sheet.

a) **Limitations of Asbestos Cement Sheet Are Given Below:**

- **Health Risks:** Asbestos cement sheets release asbestos fibers into the air when broken, drilled, or disturbed, increasing the risk of asbestosis, lung cancer, and mesothelioma when inhaled.
- **Environmental Impact:** Releasing asbestos fibers into the air, water, or soil can increase public concerns.
- **Maintenance of Sheet:** Asbestos cement roofing sheet, due to its brittle nature, poses significant risks and challenges in construction, making repair efforts costly and time-consuming.

- **Pre-Paint Galvanized Iron Sheet (PPGI)**

Galvanized steel that has been painted or coated with another organic substance is called pre-painted galvanized sheet, or PPGI (Pre-Painted Galvanized Iron Sheet). This method gives the galvanized sheet more visual appeal and protection against corrosion.



Figure 2. Pre-painted galvanized sheet (PPGI).

a) **The following are the Major Limitations of the Pre-painted galvanized sheet (PPGI) sheet:**

- **Limited Lifespan of Paint Coating:** The paint layer, while providing protection, can deteriorate over time, especially in harsh environments like extreme weather or UV exposure, causing peeling, fading, or cracking.
- **Maintenance:** Pre-painted galvanized sheets may require routine cleaning and inspections to maintain their appearance and corrosion resistance. In some cases, repainting may be necessary to prolong their lifespan.
- **Temperature Limitations:** PPGI may not be suitable for high-temperature environments due to the potential damage to the zinc coating if the paint layer is overheated, causing blisters, melts, or burns.

2. **Different Types of Advance Roofing Materials Available In the Market for Foundry Industries.**

- **Pre-Paint Galvalume Sheet (PPGL Sheet)**

Pre-painted galvalume roofing sheets are a popular option due to their strength, corrosion resistance, and aesthetic appeal for both residential and commercial buildings. To enhance adhesion and temperature resistance, they are made of galvalume, a steel substrate coated with a mixture of zinc (43.5%), aluminum (55%) and a tiny quantity of silicon (1.5%). Extra color and defense are provided by the pre-painted finish.

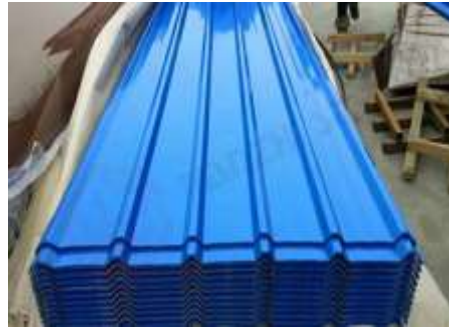


Figure 3. Pre-Paint Galvalume Sheet (PPGL Sheet).

a) **Major Features and Advantages of Pre-painted galvalume are given below :**

- **Corrosion Resistance:** Because of its superior corrosion resistance, the aluminium-zinc alloy coating is more durable than galvanised steel.
- **Long Lifespan:** Galvalume roofing, due to its strong corrosion resistance, can last for 20-25 years, depending on environmental conditions.
- **Lightweight:** Galvalume sheets are lighter and easier to install than conventional roofing materials, reducing the load on a building's structural integrity.
- **Reflectivity and Energy Efficiency:** The aluminium-zinc alloy's strong reflectivity lowers heat absorption, which can increase energy efficiency in hotter areas.
- **Low Maintenance:** The galvalume substrate and pre-painted finish reduce the need for routine maintenance.

b) **The Limitations Of Pre-Painted Galvalume Are Given Below :**

- **Cost:** Pre-painted galvalume, although typically cheaper than pure aluminum, may be more expensive than alternative roofing materials like PPGI Sheets.
- **Scratches and Abrasion:** Scratches or scrapes on pre-painted surfaces can expose the underlying galvalume, leading to unique corrosion in that area.
- **Limited Reparability:** The repair of the damaged area may be challenging if it has noticeable seams or mismatched colors.
- **Noise:** Certain metal roofs, like galvalume, may produce greater noise when it rains or hails.
- **Environmental Impact:** Galvalume, despite being durable and recyclable, its mining and production processes have a significant environmental impact.

Aluminium Roofing Sheet

Aluminum roofing sheets, color-coated for environmental resistance, longevity, and aesthetic appeal, are commonly used in the construction sector for roofing and cladding due to their lightweight and corrosion-resistant properties, and are coated with protective paints like polyester, silicone, or PVDF..



Figure 5. Color-Coated Aluminum Roofing.

a) **The following are Characteristics of Aluminum Roofing Sheets:**

- **Durability:** The color coating gives an extra line of protection from the environment, moisture, and UV light because aluminum naturally resists corrosion.
- **Lightweight:** Aluminum's lightweight nature makes it easier to install and carry, making it a valuable choice in construction situations where weight is a concern.
- **Aesthetic Appeal:** Color-coated sheets offer a wide range of colors and finishes, allowing for visual customization to complement architectural designs.
- **Recyclable:** These sheets are an eco-friendly option due to their high recycling rate compared to other materials.
- **Resistance to Weathering:** These sheet coatings assist in their resistance to bad weather, wind, rain, and sunlight.
- **Thermal Reflectivity:** Because aluminum is a good reflector of sunlight, buildings may be kept cooler.
- **Flexibility:** Aluminum is pliable, thus roofing designs can include a range of profiles and forms.

b) **The Limitations of Color-Coated Aluminum Roofing Sheets are given below:**

- **Cost:** Aluminum sheets are often more expensive than conventional roofing materials like steel or A.C. sheets.
- **Installation Challenges:** Aluminum requires secure means to prevent damage or dislodging because of its lightweight nature, which makes installation challenging in high-wind settings.
- **Limited Acoustic Insulation:** When there is a lot of rain or hail, aluminum is less effective at blocking out noise than other roofing materials.

VII. Comparing Of Conventional Roofing Material and Advanced Roofing Material and Their Limitations with Special Reference to Foundry Industries at Kolhapur.

Table 7.1 Comparative Analysis of Different Types of industrial Roofing Sheets.

Comparative Analysis of Sheets:					
S.N 0	Points Of Comparison	Asbestos Cement Sheet(A.C sheet)	Pre-Paint Galvanized Iron Sheet (PPGI sheet)	Pre-Paint Galvalume sheet (PPGL sheet)	Color-Coated Aluminum sheets.
1.	Cost	195/sheets	82/kg	104/kg	345.75/kg
2.	Thickness of sheet	6 mm	0.45 mm	0.55 mm	0.91mm, 0.65mm
3.	Life Span	30 years	10-15years	20-25years	40 years
4.	Paint Coating	-	RMP	SMP, HDP	HDP,PVDF
5.	Paint thickness	-	18-20µm Micron Top and 5-7µm Micron Bottom	18-22µm Micron Top and 5-8µm Micron Bottom	25-35µm Micron Top and 15-18µm Micron Bottom
6.	Strength	16 Mpa	245Mpa	550 Mpa	550Mpa
7.	Metallic standard coating	-	Z 120 max	AZ 150 max	AA 190 max ASTM - B - 209M, Aluminum Association
8.	Strength And Weight	Heavy compared to metal. Prone to cracking. Needs heavy structures.	Low strength compared to galvalume and aluminum	High strength	High strength, but one-third the weight of G.I. Hence, requires lesser structural work.

9.	Temperature	Absorbs heat, hence warmer than the outer temperature	Absorbs heat, hence warmer than the outer temperature	Reflects heat. Hence, keeps the interior 3°C - 5°C cooler in the summer, and warmer in the winter	Reflects heat. Hence, keeps the interior 6°C cooler in the summer, and warmer in the winter
10.	Indoor Working environment	Warm	Moderate	Comfortable	Excellent
11.	Zero Maintenance	No, Every once in 2-3 years.	No, Every once in 2-3 years.	No, Every once in 5years.	Yes
12.	Leakage and corrosion	The use of J-hooks and Bolts in Roofing makes it prone to leakage and corrosion.	No, use of a self-tapping screw.	No, use of a self-tapping screw.	No, use of a self-tapping screw.
13.	Rust proof	Yes	No because of low coating.	Yes, but for certain periods, depending on the environmental condition and it rusts if you don't maintenance regularly.	Yes
14.	Resale value	No	Very low	Very low	Up to 60% of initial investment
15.	Green metal	Environmentally-hazard	No	No	Yes. 100% recyclable
16.	Aesthetic Appearance	Average	Excellent	Excellent	Excellent

VIII. CONCLUSION

Pre-Painted Galvalume Sheet (PPGL) and Aluminum Sheet are more cost-effective than conventional roofing sheets, offering better performance. However, they also increase maintenance costs and can disrupt production cycles. Conventional roofing is easy to install but expensive in the long run, leading to delays and reduced efficiency. Funding disputes often prioritize short-term benefits over long-term advantages. Technological advancements have made materials more resistant to heat, chemicals, corrosion, and cracks. Architects and engineers must choose suitable roofing materials that meet requirements while being reasonably priced.

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