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Analysis of the Application of Ferrosement Method to Earthquake-Resistant Houses Affects Cost

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ABSTRACT

In the context of building earthquake-resistant houses, ferrosement technology can be an effective solution to face unique environmental challenges. The sustainability, strength, and earthquake resistance provided by ferrosement makes it an attractive option to improve the quality and safety of buildings in areas prone to earthquakes. This study will use a comparative method to analyse the cost needs of building earthquake-resistant houses using Ferromen technology. The total cost of materials for ferrosemen houses with type 7 x 6 amounted to 69,783,571,131. Ferrrosemen technology in home construction offers significant cost efficiency potential compared to traditional construction methods. This is mainly because the raw materials used in fermenting, such as local soil and fibre, are generally more affordable and widely available. 2. Focus on Strength Ferrocement technology focuses strength on the house's foundation, which uses an inverted T foundation with woven concrete iron, much stronger than the river stone foundation. Although further research and local adaptation are still needed, ferrrosement technology is promising as a more economical alternative in house construction. This can be a sustainable solution to improve access to affordable housing for people in various regions, especially developing countries. However, it is important to consider factors such as soil conditions, climate, and availability of local resources in effectively implementing this technology.

Introduction

Areas in earthquake-prone zones often face a high risk of disasters, especially regarding the strength and frequency of earthquakes (NADIA, 2023). Earthquakes can cause serious damage to infrastructure, including people's homes, and can result in significant human and economic losses. Therefore, constructing earthquake-resistant houses is urgently needed in these regions (Ferdinand & Pamadi, 2023).

According to the Indonesian Meteorology, Climatology and Geophysics Agency (BMKG), most parts of Indonesia are in earthquake zones with varying levels of vulnerability. For example, the islands of Java and Sumatra are located on the Pacific

Ring of Fire, one of the most seismically active regions in the world. Major earthquakes here can cause extensive damage to buildings, including people's homes (Jatmiko, 2024).

In this context, constructing earthquake-resistant houses is a key strategy to reduce the risk of damage and protect people's lives and property. By building houses specifically designed to cope with earthquake vibrations, we can reduce the adverse effects that can arise during and after an earthquake (Lauranti, Djamhari, Mawesti, Nurrahamah, & Farhan, 2017).

Ferrosement technology has emerged as an innovative alternative in constructing earthquake-resistant homes to increase the strength and resistance of buildings to earthquakes (Efendi, Taqiuddin, & Evendi, 2022). Ferrosement, also known as "cement mortar composites reinforced with metal," is a construction method that utilises regularly placed cement-metal alloys to increase the durability of a structure (Hermawan, Kusum, & Febrinita, 2022).

The main advantage of ferrosement technology lies in the even and dense distribution of the metal inside the cement matrix. A thin metal layer, often a mesh or mesh, is placed inside the cement structure to provide additional strength (Aditia & Asmariati, 2021). This increases earthquake resistance and improves the structure's tensile strength, reducing the risk of cracking and damage during earthquake events (Shomad, Djatmiati, & Suheryadi, 2018).

One of the advantages of ferrosement technology is its ability to improve adhesion and load distribution throughout the structure. Ferrosement materials offer better resistance to temperature changes, corrosion, and earthquakes, making them particularly suitable for areas within earthquake-prone zones (Mentari & Basuki, 2021).

In the context of building earthquake-resistant houses, ferrosement technology can be an effective solution to face unique environmental challenges. The sustainability, strength, and earthquake resistance provided by ferrosement makes it an attractive option to improve the quality and safety of buildings in areas prone to earthquakes.

Problem Statement

1. What are the advantages of ferrrosemen technology in building earthquake-resistant houses?
2. What is the cost of constructing a house using ferrrosemen technology?

Research Objectives

1. Assess the effectiveness of ferrrosemen technology in building earthquake-resistant houses.
2. Analyze development costs using technology.

Research Benefits

1. Can contribute to the development of earthquake-resistant construction technology.
2. As a medium of information for all stakeholders involved in earthquake-resistant house construction activities.

Research Methods

Research Design

This study will use a comparative method to analyse the cost needs of building earthquake-resistant houses using Ferromen technology.

Research Location

The research location is in Pandeglang Regency, and the selected house is one of the beneficiaries of a government program called Self-Help Housing Stimulant Assistance (BSPS).

Research Variables

a. Controlled Variables

Types of Construction Materials

b. Dependent Variables

House Construction Cost

Data Collection

a. Cost of Construction:

1. Analysis of the cost of construction materials.
2. Comparison of price and availability of ferrosement material.

Data Analysis

a. Analysis Methods:

1. Use of descriptive statistics to analyse cost data

Results and Discussion

The price of materials and work wages

The unit price of materials used is obtained from the Standard Price of Goods and Services of Pandeglang Regency in 2024.

Unit Price Analysis (Ahs)

The Unit Price Analysis (AHS) was calculated using AHSP in 2016, 2021, and 2024 as the standard units of construction work. Job analysis is obtained by multiplying the index by the regional unit price (Arham, Sjaf, & Darusman, 2019).

AHS = SNI coefficient x Material Unit Price.

Calculation of the house cost budget plan with the concept of FEROSEMEN

Table 1
Calculation of the volume of work

No	Types of Jobs	Bahan Material	Unit	Coeff icient	Volume of Work		Volume Material	
1	Pack. Sand under Foundation							
		Pasir Urug	m3	1.200 0	2.73	m3	3.28	m3

2	Pack. Foundation Ironing							
		Iron Concrete (plain/threaded)	KG	1.0500	53.67	Batang	53.67	Batang
		Sons of Cut	KG	0.0150	397.35	Kg	5.96	Kg
3	Pack. Formwork							
		Multiple 12mm or 18 mm	m3	0.1280	31.50	m2	4.03	m3
		Kaso 5/7 cm	m3	0.0050	31.50	m2	0.16	m3
		Spikes of 5 cm and 7 cm	Kg	0.2200	31.50	m2	6.93	Kg
		Formwork Oil	Litre	0.2000	31.50	m2	6.30	Litre
4	Pack. Foundation							
	Beton Mutu 7.4 Mpa	Semen Portland	kg	227.0000	1.37	m3	6.20	zak
		Pasir beton	kg	869.0000	1.37	m3	0.85	m3
		Krikil (Maks 30mm)	kg	1000.0000	1.37	m3	0.76	m3
		Air	Litre	215.0000	1.37	m3		
	Quality Concrete 12.2 Mpa	Semen Portland	kg	299.0000	4.93	m3	29.47	zak
		Pasir concrete	kg	799.0000	4.93	m3	2.81	m3
		Krikil (Maks 30mm)	kg	1017.0000	4.93	m3	2.78	m3
		water	Litre	215.0000	4.93	m3		
5	Pack. Red Brick Wall							
		Red Brick	buah	71.9100	112.93	m2	8120.94	Buah
		Portland Cement	kg	9.6800	112.93	m2	21.86	zak
		Install Sand	m3	0.0450	112.93	m2	5.08	m3
6	Pack. Plastering							

		Semen Portland	kg	5.8880	112.97	m2	13.30	zak
		Install Sand	m3	0.0360	112.97	m2	4.07	m3
7	Pack. Weaving Wire							
		Weaving Wire 1mm 2.5cm x 2.5cm	Calculation Results Based on Independent Analysis		134.23	m2	134.23	m2
		Paku Payung			3355.84	Buah	3355.84	Buah
		Bendrat Wire			22.55	Kg	22.55	Kg
8	Pack. Floor Rebates							
		Portland Cement	kg	227.0000	2.10	m3	9.53	zak
		Concrete sand	kg	869.0000	2.10	m3	1.30	m3
		Krikil (Maks 30mm)	kg	1000.0000	2.10	m3	1.17	m3
		water	Litre	215.0000	2.10	m3		
9	Pack. Roof Frame							
		Main Truss C075-75	m'	2.8000	83.14	m2	38.80	Stem
		Roof Bottom/Reng R 33-0,45	m'	5.1000	83.14	m2	70.67	Stem
		Self Drilling Screw dia 6 x 20 (Truss Screw)	buah	25.0000	83.14	m2	20.79	Bungkus
		Self Drilling Screw dia 4 x 16 (Roof Batten Screw)	buah	35.0000	83.14	m2	29.10	Bungkus

		Dynabol dia 12 x 120 mm	buah	1.0000	83.14	m2	83.14	Buah
10	Pack. Roof Coverings							
		Sandy Metal Roof	m2	1.6250	80.28	m2	130.46	m2
		Ordinary nails	Kg	0.2000	80.28	m2	16.06	Kg
11	Pek. Nok Genteng							
		Nok genteng metal 100cm	buah	1.1000	9.00	m'	9.90	buah
		Nail skrup 1/2' - 1'	Kg	0.0500	9.00	m'	0.45	Kg

Table 2
Amount of Fees

No	Item Name	Volume		Price	Sum
1	Pasir Urug	3.28	m3	410,000.00	1,343,160.00
2	Pasir Beton	4.96	m3	534,000.00	2,650,225.79
3	Install Sand	5.08	m3	543,000.00	2,759,493.42
4	Fattening Concrete 10 mm	53.67	Batang	111,000.00	5,957,000.00
5	Sons of Cut	28.51	Kg	37,640.00	1,073,171.54
6	Multiplek 12 mm	4.03	m3	367,000.00	1,479,744.00
7	Caso 5/7cm	0.16	m3	2,339,000.00	368,392.50
7	Formwork Oil	6.30	Litre	30,000.00	189,000.00
8	Mixed Spikes	22.99	Kg	57,000.00	1,310,202.00
9	Semen Portland @50kg	80.36	pocket	73,000.00	5,866,593.67
10	Krikil (max 30mm)	4.71	m3	414,000.00	1,949,541.53
11	Red Brick	8120.94	Buah	1,000.00	8,120,940.12
12	Kawat Anyam 1 mm 2.5cm x 2.5cm	134.23	m2	83,000.00	11,141,388.80
13	Paku Payung	3355.84	Buah	114.00	382,565.76

14	Main Truss C075-75	38.80	Batang	152,000.00	5,897,459.58
15	Roof Bottom/Ring 33-0.45	70.67	Batang	98,000.00	6,925,635.10
16	Self Drilling Screw dia 6 x 20 (Truss Screw)	20.79	Bungkus	21,700.00	451,039.26
17	Self Drilling Screw dia 4 x 16 (Roof Batten Screw)	29.10	Bungkus	74,000.00	2,153,348.73
18	Dynabol is 12 x 120 mm	83.14	Buah	32,000.00	2,660,508.08
19	Sand-coating metal tile	130.46	m2	44,750.00	5,837,861.25
20	Nok genteng metal 100cm	9.90	buah	126,000.00	1,247,400.00
21	Paaku Scruple 1/2' - 1'	0.45	Kg	42,000.00	18,900.00
Total					69,783,571.13

Conclusion

The conclusions of this study can be outlined as follows:

1. Cost Efficiency

Ferrrosement technology in home construction offers significant cost efficiency potential compared to traditional construction methods. This is mainly because the raw materials used in fermenting, such as local soil and fibre, are generally more affordable and widely available.

2. Power Focus

Ferrocement technology focuses strength on the house's foundation, which uses an inverted T foundation with woven concrete iron, much stronger than the river stone foundation.

Although further research and local adaptation are still needed, ferrrosement technology holds promise as a more economical alternative in house construction. This can be a sustainable solution to improve access to affordable housing for people in various regions, especially developing countries. However, it is important to consider factors such as soil conditions, climate, and availability of local resources in effectively implementing this technology.

Bibliography

Aditia, Ezra, & Asmariati, Rini. (2021). Kajian Arahan Pemanfaatan Ruang Berdasarkan Tingkat Kerentanan Abrasi Pantai Di Kecamatan Koto Tangah Kota Padang. *Jurnal Rekayasa*, *11*(2), 85–101.

Arham, Ihsan, Sjaf, S., & Darusman, D. (2019). Perencanaan Pembangunan Desa Pertanian Berkelanjutan Berbasis Citra Drone (Studi Kasus Desa Sukadamai Kabupaten Bogor) Ihsan Arham. *Bogor (ID): Institut Pertanian Bogor*.

Efendi, Iwan, Taqiuddin, Muh, & Evendi, Azhari. (2022). Konstruksi Sosial Pengurangan Risiko Bencana Berbasis Masyarakat di Kawasan Ekonomi Khusus Mandalika. *RESIPROKAL: Jurnal Riset Sosiologi Progresif Aktual*, *4*(1), 73–93. https://doi.org/10.29303/resiprokal.v4i1.129

Ferdinand, Ferdinand, & Pamadi, Mulia. (2023). Perbandingan Biaya Pembangunan Rumah: SNI 2008, AHSP 2022 atau Perhitungan Kontraktor? *Jurnal Ilmiah Telsinas Elektro, Sipil Dan Teknik Informasi*, *6*(2), 172–187.

Hermawan, Muhammad Khoirudda'I, Kusum, Abdi Pandu, & Febrinita, Filda. (2022). Perancangan Sistem Pengelolaan Keuangan Hasil Panen Pertanian Di Desa Sidodadi Kabupaten Blitar. *JATI (Jurnal Mahasiswa Teknik Informatika)*, *6*(2), 773–781.

Jatmiko, Koko. (2024). *Studi Pembangunan Jalan Perkotaan Berdasarkan Kinerja Jaringan Jalan Ruas Jalan Layar*. Universitas Sangga Buana Ypkp.

Lauranti, Maria, Djamhari, Eka Afrina, Mawesti, Dia, Nurrahamah, Baiti, & Farhan, Farhan. (2017). *Ekuitas Kesehatan Bagi Masyarakat Miskin dan Hampir Miskin di Indonesia (JKN)*. Perkumpulan PRAKARSA.

Mentari, Yunita, & Basuki, Imam. (2021). *Analisis Karakteristik Pengguna Angkutan Online Di Kota Palembang Pada Masa Pandemi Covid-19*.

NADIA, NADIA. (2023). *Dampak Pembangunan Kafe Terhadap Kebiasaan Generasi Millenial Ditinjau Dari Segi Sosial Dan Ekonomi (Studi Kafe Teras Teduh Desa Pattimang, Kab. Luwu Utara)*. Institut Agama Islam Negeri (Iain) Palopo.

Shomad, Abd, Djatmiati, Tatiek Sri, & Suheryadi, Bambang. (2018). *Rancangan Model Pemberdayaan Aparatur Desa melalui Peningkatan Profesionalitas Dalam Pengelolaan Dana Desa*.