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**Cracks on Cement Plaster Walls of Buildings in Uyo Metropolis, Akwa Ibom State:  
Causes and Remedies**

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**ABSTRACT**

*Cracks on plaster walls are not just unpleasant, but they are indications that something is wrong in material selection or procedure used for application. Vertical and horizontal cracks in drywall or plaster walls typically indicate drying and shrinkage, which is normal after construction. Jagged cracks, stair step cracks and 45-degree angle cracks generally signify structural movement or settling issues that are occasionally serious but usually harmless. Plastic shrinkage crack could be found when an excessive amount of water is lost from the plaster in the first few hours after its application. These cracks are hairy in nature and if proper care is not put in place to solve the problem, there is the possibility for future occurrence. This paper will look into the causes and possible ways of solving plaster cracks in buildings. Uyo Urban area according to 2006 census has population of 554,906 with a density of 1,300/km<sup>2</sup>. The Uyo Metropolis covers a radius of 10,000km from the city center known as Ibom plaza.*

**KEYWORDS: Cracks, Cement plaster, Wall, Uyo Metropolis**

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**INTRODUCTION**

Pumnia (1993) defined plastering as a process of covering rough surfaces of walls, columns, ceilings and other building components with thin coat of plastic mortars to form a smooth durable surface. The coating of plastic material (i.e. mortar) is termed as plaster. During the many centuries before Portland cement first came into general use, in the later part of the nineteenth century, lime was the material used as the matrix (binding agent) for plaster. From the beginning of the twentieth century, the new wonder material Portland cement largely replaced lime as the material used for undercoat of plaster.

The advantage of cement is that it sets and dries to form a hard, dense surface coating, resistant to knocks. The disadvantage of cement is that it is more labourous to spread and level

than lime and as it dries it shrinks fiercely and may develop cracks and lose adhesion to weak surfaces over which it is spread (Barry. 1999).

### **Objectives of Cement Plastering**

According to (Zeni, A.C. 2000) Plastering is done to achieve the following objectives

- To protect the external surfaces against penetration of rain water and other atmospheric agencies
- To give smooth surface in which dust and dirt cannot lodge
- To give decorative effect
- To protect surface against vermit
- To conceal inferior materials or defective workmanship
- To prepare the surface to receive paint.

### **Requirements of a Good Cement Plaster**

According to Ogunrayewa, (2009) the plaster material should fulfill the following requirements: It should adhere to the background, and should remain adhered during all variations in season and other atmospheric conditions

- It should be hard and durable
- It should possess good workability.
- It should be possible to apply it during all the weather condition.
- It should be cheap
- It should effectively check penetration of moisture.

### **Factors which affect the Development of the Cracks in Cement Plaster**

According to (Arayela, O. and Adam, J.J. 2001) Cracks in cement plaster can be caused by the following:

- i. Fineness of sand: With the change in grain of sand, water grain size of sand more will be the water required to make a workable paste also changes. The smaller the grain size of sand, the more will be the water required to achieve the required workability. This will cause bleeding and the drying of this excess water from the surface causing shrinkage, and eventually causing cracks to occur.
- ii. Cement to Sand Ratio: The richer the cement mix, the greater will be the value of hydration of cement. Greater value of hydration of cement will cause high drying shrinkage which will cause cracking on the plaster surface. External and Internal walls should be strictly done with cement mortar ratio between 1:4 to 1:6 mix.

- iii. **Water to Cement Ratio:** Higher value of water to cement ratio induces greater shrinkage which will cause more cracks. The water-cement ratio is the ratio of the weight of water to the weight of cement used in a mix and has an important influence on the quality of plaster produced. A lower water-cement ratio leads to higher strength and durability, but may make the mix more difficult to place. It appears that excessive free water content leads to the formation of capillary pores, which seriously affect the plaster strength and the plaster durability. A mix with too much water will experience more shrinkage as the water leaves, resulting in cracks.
- iv. **Temperature:** Mortar made in hot weather needs more water for same workability. Hence, more shrinkage and cracks will be noticed.
- v. **Curing:** Curing is the process of controlling the rate and extent of moisture loss from plaster during cement hydration. It may be either after it has been placed in position thereby providing time for the hydration of the cement to occur, or during the manufacture of concrete products. Since the hydration of cement does take time – days, and even weeks rather than hours, curing must be undertaken for a reasonable period of time if the plaster is to achieve its potential strength and durability.
- vi. **Spalling of plaster:** Spalling is when a patch of plaster falls off from a wall or ceiling. The common reasons are lack of bonding with the base member and difference in expansion or shrinkage coefficients of bricks work and plaster. To prevent this, wet the block surface well before applying the plaster, and use a chicken mesh above all vertically running conduits carrying electrical or plumbing lines.
- vii. **Junction with Beams, Columns or Lintels:** In case of junction with any reinforced concrete member, there is a high risk of the plaster and block work developing a crack. This is due to the difference in expansion of two structures, which is a result of heat and weather conditions. To prevent this, in place of junction between columns or any other reinforced concrete member, a chicken mesh is nailed in between the two layers that will take the apparent load caused due to varying expansions.

### **Guidelines to Avoid Cracks in Cement Plaster**

- Prevent the plaster from sun and wind to avoid drying too quickly. Initiate plastering timing to avoid direct sunlight and strong wind on plastering surface.
- Saturate the masonry wall adequately with water before weather is hot, windy and dry (less humid).
- Do not use sand which lacks fine material (less than 15% by mass passing 0.150mm sieve or use sand of fineness modulus between 2.4 to 2.6. Some sand gotten from some sand box called borrow pit within the Uyo metropolis are not suitable for a good plastering purposes. This is because most of them have high characters of clay and the tendency for shrinkage is very high resulting in more cracks. Suitable plastering sand are gotten from the river site around Ntak Inyang, Abak and in Ibesikpo (Barry. R. 1999).

- Do not use rich plaster mix (with high cement content). Use cement mortar mix of ratio between 1:4 to 1:6.
- If sand lacks fine material, then add some lime into the cement.
- Plaster applied in layers that are too thick (ie.>20mm) will tend to crack. Once plaster thickness is more than 12mm, it should be applied in layers of 12mm coat with a gap of 3 days. This will help to reduce cracks.
- Do the curing immediately after the setting time of plaster mortar for a period of minimum of 7 days. (Zeni, A.C. 2000)

### **How to Repair Cracks in Plaster Walls**

Shrinkage cracks are small (up to 20mm) taking random directions appearing in plaster walls and ceilings. These are nothing to worry about as they are not structural cracks.

Shrinkage cracks in plaster should first be widened so that filler can be pushed right in and has something to key on to. The corner of a scraper or filling/putting knife is ideal for the removal of any loose plaster and for opening up and deepening the crack. Dry paint brush can be used along the line of the crack to remove any loose dust or dirt.

Mix a quantity of filler as per the manufacturer's instructions and before applying it, dampen (but don't soak) the inside of the crack using a small paint brush dipped in clean water. Use a filling/putting knife to apply along the line of crack Chudley R. and Greeno R. (2003).

### **RECOMMENDED MORTAR MIXES**

<b>S/N</b>	<b>SITUATION</b>	<b>MORTAR COMPOSITION</b>
1.	External plaster in localities where rainfall is less than 500mm per year and where subsoil water is not within 2.5m below the ground water.	1 Cement 6 Sand
2.	External plaster in localities where rainfall is more than 1300mm per year and where subsoil water is not within 2.5m below ground surface.	1 Cement 4 Sand
3.	External plaster in localities where the subsoil water is within 2.5m of the ground surface.	1 Cement 3 Sand
4.	Internal plaster in all localities	Between 1:4 to 1:6

**SUITABLE NUMBER OF PLASTER COAT**

S/N	BACKGROUND	NO. OF COATS
1.	Stone work	2 or 3
2.	Brickwork or Hollow clay tiles	1,2 or 3
3.	Concrete cast in situ	1 or 2
4.	Building blocks	1,2 or 3
5.	Wood or metal lath	3
6.	Fibre building board	1 or 2
7.	Wood wool slabs	2 or 3
8.	Cork slabs	1 or 2

**Conclusion**

As clearly shown in the above study, cracks cannot just occur without a cause. Hence, it is the duty of the building owner termed client to ensure that his construction works are handled by certified professionals. Also, ensure that the right materials with correct mixture and application are adhered throughout the process of the building construction. But peradventure you have cracks in your house the highlighted steps in amending these cracks could be adhered to.

**Recommendations**

1. When cracks are noticed in building surfaces, the client or building owner should seek professional advice of Architects or other building professionals like Engineers as well as builders.
2. These professionals will visit the site and find out the root causes of the crack whether it is a structural failure or a surface plaster cracks.
3. I would also recommend strict adherence to the recommended mix for mortar components as clearly stated above.

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