

**Cracks in the walls around the windows and doors openings
(CASE STUDY)**

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Abstract: In this study the problem of cracks appearing in walls especially around door openings and windows was addressed Which takes approximately a slope at an angle (45°) and the door and window openings are the weakest part of the wall we also sometimes notice the appearance of horizontal cracks above the windows lintels which are caused by the impact Thermal the appearance of cracks in buildings leads to distortion of the general appearance of the walls whether from the inside or outside it also leads to the leakage of rain water through it and the emergence of this problem is due to many some of the reasons are related to the method of implementation and some are related to the type of bricks used in construction work the other is due to the seasonal change in temperature and humidity in addition to the misuse of opening operations and the lock for doors and windows and therefore the dimensions of the windows compared to the dimensions of the wall it was also discussed the steps that can be taken to avoid the appearance of cracks some of which are related to in proper materials and structural issues-foundation and soil movement and the method of implementation for walls windowsills and doors.

Keywords: cracks, walls, building, horizontal cracks.

Introduction

Cracks around doors and windows in construction are one of the common aesthetic defects when refer to aesthetic is because in most cases these cracks are not caused by major structural damage cracks are the presence of faults or breakage of building materials mainly caused by uneven internal stress or stress concentration [1] it is necessary to ensure the safety durability and serviceability of the buildings [4-6].

Crack can be classified as either structural cracks or non-structural cracks depending on the way of internal stress failure of the building material. Structural defects consist of complete or incomplete separation within a single element or between continuous element of construction or a line along which a material is broken into parts [2-5]. Non –structural cracks develop due to the inducement of initial stresses in building materials and their depth

is less only a few mm they exist on the surface only [3]. The cracks around the doors and windows openings are attributed to various effects ranging from humidity and temperature fluctuations poor construction in proper materials and structural issues –foundation and soil movement. To evaluate this problem required to visit one of the houses as case study.

Problem statement:

Due to the prevalence of cracks around the opening s of doors and windows in many new and old buildings implementation for importance the topic requires us to prepare a study to find out the reasons of this problem in the study targeted residential building in the city of Bani Walid it has been implemented for more than thirty years and it has helped me.

The owner of this building that he suffers from the problem of cracks the openings of doors

and windows which it appeared in the building shortly after the completion of the finishing work for the building and despite an operation maintenance of the building and its attempt to hide these cracks but they reappeared without knowing the reasons for this problem and accordingly I made a field visit as case study to the building concerned with the study and it was written down notes and information that can help us to determine the reasons that lead to the emergence of this problem which is next:

- 1- The building has been implemented since 1993
- 2- The building was executed without re-structuring plans.
- 3- There's no soil investigation tests.
- 4- The building was executed without engineering supervision.
- 5- The wall was built from hollow cement blocks.
- 6- The dimensions of the window openings (1×1.2 meters) and the dimensions of the doors (1.0×2.10 meters)
- 7- Most of the width dimensions of the walls with window openings (4.50 meters)
- 8- The building was maintained after twenty years of its implementation.
- 9- The building has inclined cracks approximately at an angle (45) above the door and window openings it is wider at the corner of the door and window and becomes smaller when it moves up as shown in the figures (1,2,3,4). And cracks down the openings windows and horizontal cracks above the lintel of the window openings as shown in the figures (1,2,3,4)
- 10- There's diagonal cracks in the outer and inner walls.
- 11- The building still in good condition structurally (there's no cracks in the main structural elements) .



Fig. 1: shows cracks at the bottom of the window



Fig. 2: shows the cracks at the top of the window



Fig. 3: shows the cracks at the top of the window



Fig. 4: shows cracks at the bottom of the window



Fig. 5: shows the method of supporting the walls with an iron grid of diameter (\varnothing 10mm)

Causes of cracks around the doors and windows openings:

- 1- The lintel is implemented structurally incorrectly as the lintel based on small distances it may not exceed 20 cm
- 2- The subsidence of the foundations leads to the appearance of such cracks
- 3- Poor implementation as sometimes construction operations are not carried out in accordance with the technical requirements in addition sometimes twice the cement mortar.
- 4- Poor quality of bricks used in construction work as they are not made in most brick factories all types of testing are required to determine the quality of the product.
- 5- The dimensions of the window openings compared to the dimensions of the wall sometimes the window openings are large compared to the dimensions of the wall which leads to the weakness of the wall.
- 6- The seasonal change in temperature and humidity has a significant impact on the walls as this results in stress leads to the appearance of cracks in the walls.
- 7- Doors and windows are elements that produce constant movement and impacts when opening and closing in many occasions slamming doors that cause a lot of vibrations these vibrations or

shocks create tensions in the plaster or surface coatings.

- 8- This type of cracks caused by differential settlements in the ground is something that cannot be avoided after construction is done.

Recommendations:

- 1- Recommended to execute reinforce concert frame around the doors and windows openings to resist appearance cracks at the angles.
- 2- The walls must be constructed by using good quality of blocks according the specifications.
- 3- The walls must be placed steel mesh each three layers of blocks according the picture (5) to be resist the temperature change and humidity and shear force.
- 4- Lintel must be supported of each side of windows or door opening at least 40 cm to support the weakest part of the door and window.
- 5- Recommended to cast the lintels in situ and the thickness of lintels maximum of (20 cm - 1/8 width of opening).
- 6- Must be used skills labors for masonry work.
- 7- Must be done the steel or plastic mesh in the area around the cracks during the plaster work.

References

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