SUSTAINABLE INFRASTRUCTURES

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RISING DAMP STUDY IN UITM PERAK'S ACCOMMODATION: A PILOT STUDY

Zaimah Zainal Abidin[1*,] Nur Azfahani Ahmad[2] and Alia Abdullah Salleh[3]
[1,2,3] Faculty of Architecture, Planning and Surveying, Universiti Teknologi MARA, Perak Branch, Seri Iskandar Campus, Seri Iskandar, 32610 Perak, Malaysia.
eymahzainal@gmail.com*

Abstract **-** Building defects are critical as they can physically affect the building appearance as well as damage the building structure. This can subsequently affect the safety of the building users. Therefore, appropriate solutions to mitigate building defects in academic buildings should be carried out in order to ensure the buildings do not easily fall into defect. If the defects were not taken seriously, it may consequently lead to structural failure. There are many types of dampness that will contribute towards defect as for example rising damp, falling damp and penetrating damp. However, this research focus only on single type of dampness defect, namely rising damp. The aim for this study is to identify the level of rising damp defects and to identify the main contributing factors of humidity defects. Particularly, for rising damp issues happened in the student's accommodation in University Technology Mara (UiTM), Seri Iskandar, Perak. Methods that were used for this research are observations and also by using tools namely Thermal Imager for field work. For this study, I look at the kind of humidity that often occurs in student accommodation. Where the moisture that is always valid and was found in student accommodation will be taken to a more detailed study. Moreover, it also can minimize the number of this type of defects. Results from pilot study that contributed for future researchers to identify and survey details about defects on the buildings at UiTM Perak accommodation and given the many information about the dampness and humidity currently happens at the accommodation. Besides that, it's also can help the management of the building as a guideline to prevent from humidity defects such as rising damp happens to the building. Moreover, it also can minimize the number of this type of defects, humidity and dampness. In addition, by using this tool also, it can provide an accurate result for any findings of study. The findings that have been found by any researcher is important to make any peoples understood. By using thermal imager also, all peoples can save their time to think about any problems that are related to reports, analyse and document the findings. It is because, with this tool, it becomes easy to manage this process and then insert it into any software without any problems.
Keywords **-** Building Defects, Pilot Study, Rising Damp, Thermal Imager.

1 INTRODUCTION

Humidity can be defined as one of the major sources of defect comes from humidity. According to Othman et. al., (2015) humidity is defined as the water-vapour content of the air. It is expressed in various ways and normal atmospheric air in most of the cases is humid. Humid air is also called moist air. The capacity of air to hold moisture increases with temperature. Othman et. al., (2015) mentioned that dampness can be defined as water penetration through the walls and certain elements of the building where it is near to a water source. In addition, dampness can also be defined as extreme moisture that will lead to dampness problems, for instance rising damp (Othman, et al, 2015).

Rising damp can occur in many types of buildings that have high water vapour, moisture and humid in the wall. In this case, student's accommodations are usually prone to this situation since this building have high occupancy. In addition to the age of the building, the location, the function, this factor will lead to higher dampness in the building (Burkinshaw., 2012). The cause of wall damage in the student building is due to the humidity. Residents begin to feel uncomfortable when there is dampness (Karouglou et al, 2007). One of the critical issues in Sick Building Syndrome (SBS) that will affect student‟s health. Sign of SBS are headache, dizziness, nausea, eye, nose or throat irritation and dry or itching skin, (Rirsch, 2010). This is because have a humidity in building. Therefore, this paper will try to explore on one of the common dampness defects in the building, which known as Rising Damp. This paper will use a pilot study to explore on the sequences of rising damp to student accommodations.

2 LITERATURE REVIEW

Typical issues for student's accommodation are the circulation of the moisture (Abass, K., 2009). Many problems occur to the building due to of moisture which leads to defects as for example corrosion, fungal attack and decay (Trotman et al, 2004). Usually the mold at the buildings will happen because of the level of humidity in the building increase (World Health Organization, WHO, 2009). Defect in student's accommodations is one of the issues that exist because of high level of humidity in the buildings (Abass, K., 2009). Therefore, one of the strategies to avoid from this problem to continue is to consider on the design of the building, where contractor should be selected properly in order to construct the building and also should follow schedule of maintenance to ensure the building also is in a good condition (Nicol, 2006). In this situation, moisture happen in student's accommodation can affect the health of students through respiratory as for example they will expose to mold, microbial agents and dust mites (Halim et al., 2012).

Figure 1: The example of building defects occurs at building due to high humidity
(Source: Halim et al., 2012)

The moisture problem that occurs at buildings is usually take place on the connection between the floor and the wall of a building. This situation can be seen in Figure 1. The occurrence of water seepage that is related to the improper waterproofing installation may lead to mould growth, flaking of paint and water stain (Luca, 2014). The affected area is usually occurring on vinyl or carpet floorings (Shuib & Baharum, 2015).

However, in student's accommodation one of the highest humidity areas in the building is the toilet since the high usage of the areas. The water seepage from the toilet areas can also affected the internal wall buildings. The peeling paint and blistering of wallpaper finishes occurred due to failure of water proofing layers on the toilet wall that caused water to penetrate through the toilet wall and affect the perimeter wall outside as shown as in Figure 1. This also may cause due to the age of the building, since the Damp Proof Course (DPC) is deteriorate through time (Shuib & Baharum, 2015)

2 RESEARCH APPROACHES

This study has a combination of qualitative and quantitative research methods which also known as mixed method (Leedy, 2011). However, in this paper, it will only focus on the pilot study.

For pilot study the tool used to collect defect assessment on humidity, which is known as the Infrared Thermal Imager device (Song, 2007). Thermal camera is one of the tools that can be used as the inspection testing component under the (non-destructive testing) NDT categories. (Shuib & Baharum, 2015). The use of thermal imaging tool is to identify moisture in interior walls. With thermal imager, they can detect water damage in a better image, reducing unforeseen conditions and later requests for more abatement. A thermal imager can show the presence of water below a surface because

of properties such as heat capacitance which is the normal method of choice when looking for failures in flat or low slope roofs (Shuib & Baharum, 2015).

The observation pilot study took around 7 days, the location for this observation pilot study at colleges which are located in the UiTM Sri Iskandar, Perak. For a pilot study this only focus on 7 female colleges at the uitm. The 7 colleges at UiTM were tested and found that the majority of the 7 colleges had the dampness which is rising damp. This pilot study only focused only on the room next to the toilet.

Traditional investigative methods might include "tracking" with either an invasive moisture meter or a newer non-invasive moisture meter. This method would try to determine if the water is coming through the wall, from the window, or running down the wall cavity from some other penetration location (Fluke, 2017).

Figure 2: The Thermal Imager used during pilot study

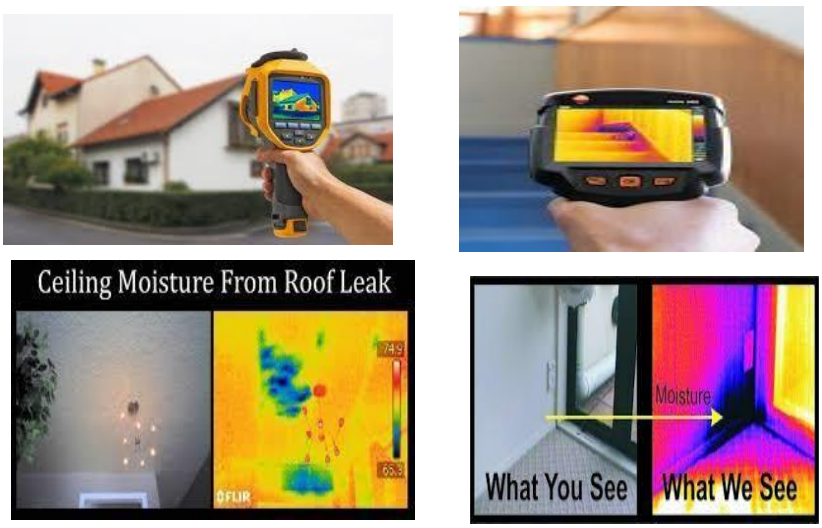

Figure 3: Function of thermal imager (Centers et al., 2017)

Figure 2 and 3 shows the function of thermal Imager. Thermal imager is one of important tool that can be used by Building Surveyors to get an accurate result about defects happened toward the buildings that is related to dampness. It can give many benefits to Building Surveyors during inspection works especially when they want to inspect the buildings which are related to issue of humidity in buildings. Some of the fact about thermal imager, the image that have been taken by Building Surveyors can be recorded on videotape and can be viewed through the eyepiece of a video scanner (Szokolay, S.V 2008). According to Roos, (2008) the difference of contamination of inside air temperature between outside temperature can be reduced, this tool will be showed the greatest contrast between the parts of the building which is in cold area and warm area on the video image.Besides, according to Chris Linville, (2002) thermal imaging also can identify root sources of defects happen to buildings and can make the owner take an immediately action to repair their building and through this way, they can solve their problems early. Roos, (2008) stated that thermal imaging camera can assist a building diagnostic inspection through:

- Visualize energy losses
- Detect missing or defective insulation
- Source air leaks
- Find moisture in insulation, in roofs and walls, both in the internal and the external structure
- Detect mold and badly insulated areas
- Locate thermal bridges
- Locate water infiltration in flat roofs
- Detect breaches in hot-water pipes
- Detect construction failures Monitor the drying of buildings
- Find faults in supply lines and district heating
- Detect electrical faults

3 PILOT STUDY

After the data collection using the thermal imager device, the data will be compiled in a standard table in order to investigate the temperature occurrence of the location. From the table, the data have been included:

i. Location (Block and Room)
ii. Justification (Description of defects)
iii. Temperature
iv. Date and time

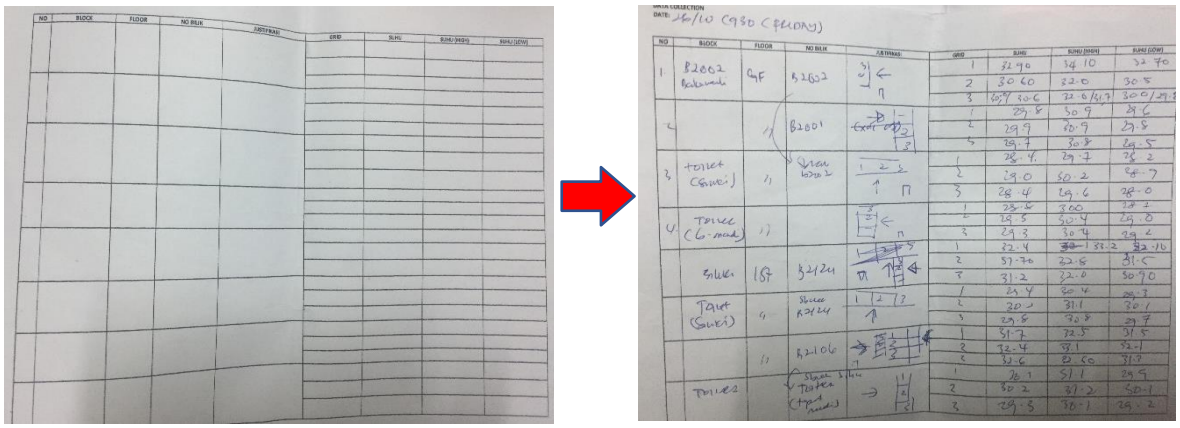

Figure 4: The example of data compiled in the standard table for Pilot study

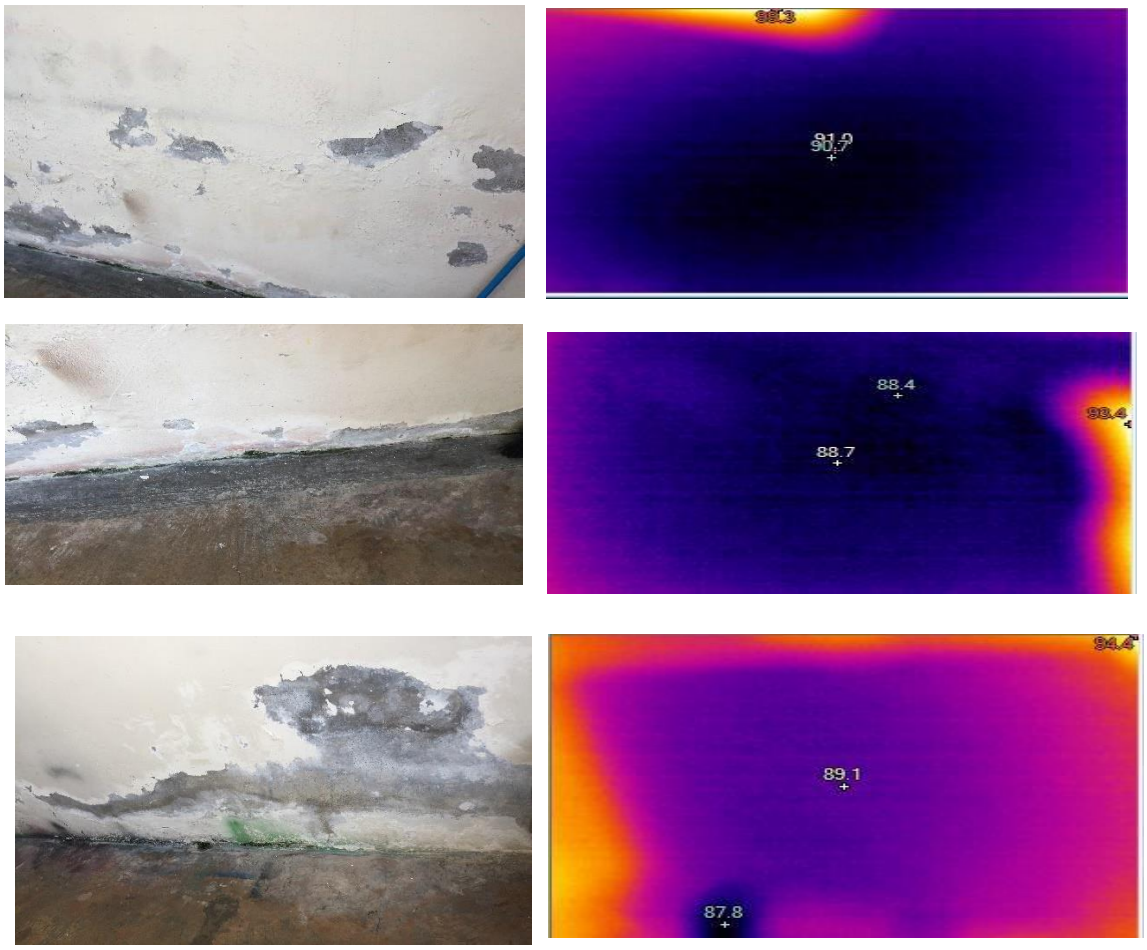

Figure 5: For example, the pilot study taken using thermal Imager device (toilets area).

Figure 4 and 5 above shows the example of data compiled in the standard table for Pilot study and the result when taken the thermal imager devices. The highest number of students with BRI's symptoms will be tested on the pilot study and it will be expanded to create a case study. Sampling for this study will be based on Random Sampling where data will be collected from the selected colleges, based on the location of the rooms. The focus will be located near to bathrooms and toilets.

Figure 6: Example taken from a pilot study of this study: Rising damp at Student's accommodation, UiTM Perak.

Figure 6 above is an example of rising damp found in student's accommodation, UiTM Perak. The figure has shown a clear defect occurs due to moisture. All photos related comes from rooms that are located next to the toilet. It is significant to carry out this research based on the proof shown, where the defect is due to fungus attack because of high humidity (Abass, K., 2009).

4 DISCUSSION

Halim et al, (2012); Ahmad and Abdul Rahman, (2010); Hetreed, (2008); Burkinshaw and Parrett, (2004) defined that rising damp is one of the common defects that is always occur in any buildings which cause decay of masonry buildings and can affect the buildings in future. Commonly, rising damp happen because of water rises to the wall and it usually happen in horizontal or upwards movement.

Alfano et al. (2006) highlighted that one of the reasons that damp-proof course (DPC) was no longer function well is the condition of the base of the wall was changed because of pressure increased.

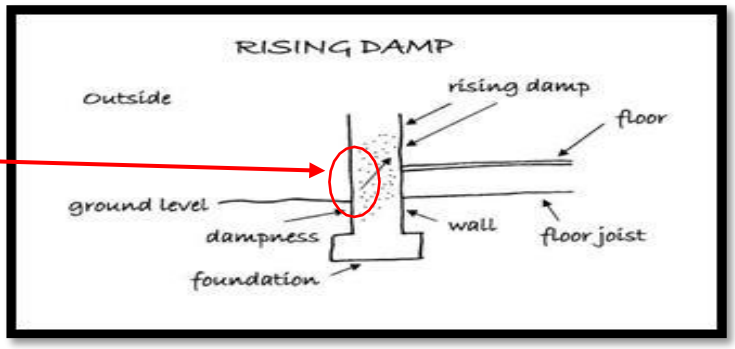

Figure 7*:* Rising damp
Source: ((http://www.1stassociated.co.uk/dampness-basics.asp, 2001)

Figure 7 shows rising damp where water is literally drawn up by capillary action into the wall. Typically, although not exclusively, a brick wall will have rising damp to approximately a metre in height. Different types of construction, such as stone construction or where the property sits on a sloping site, may have slightly different readings, but in our experience generally rising damp rises to about a metre (Corp, 2005).

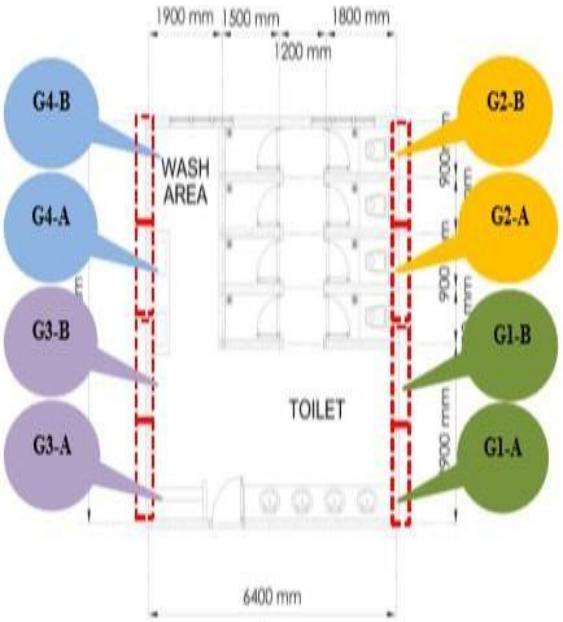

Figure 8 Location report for pilot study: Rising damp (gridline)

Figure 8 shows the location that spot the rising damp area during pilot survey are carried out. When the water rises up through the pores of masonry, water come from the bottom of the wall which is from the ground, and also from the cracks on the floors of the buildings which is in or out of the buildings (Burkinshaw and Parret, (2004). According to Trotman et al, (2004) if in the porous material to capillary action, and the moisture moving upward, it is call as a rising damp. While, according another study by Trotman (2007) usually rising damp will occur if there are any salty brownish-yellow at the wall of the

buildings which is can effect the wall plaster or decoration at wall. which is highest than skirting height at the wall. This is also happened due to the aging of dampness – proof course (DPC) in the floor. In this pilot study finding, the age of the building (has reached the age of 15 years) is the main reason why the building has a high moist (UiTM Report, 2014).

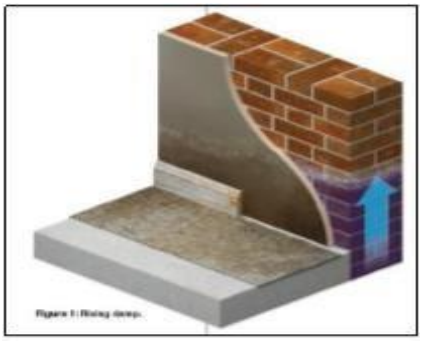

Figure 9 Rising damp
Source: (www.safeguardeurope.com, 2012)

Humidity defects such as rising damp, lateral damp and penetrating damp usually occur because of rain penetration in the roof, walls and windows that lead to leaks because of problem of the buildings (Halim et al., 2012). In addition, moisture problems also can occur inside the wall and then can damage the internal structure of the building. This is happening in the student's accommodation at UiTM Perak now. As attached this is the phenomenon that is taking place at the student's accommodation in UiTM Perak today.

The moisture will be dry up at the face of wall either inside or outside of the building. Generally, the height of the moisture happen on the wall is around 0.5 to 1.5 metres from ground level is a normal limit of rising damp rates (Rirsch 2010). Rising damp may existed as a high tide like stain on wallpaper and other interior finishes and when more severe, as blistering of paint and loss of plaster (Burns 2010). Damp walls encourage the growth of moulds which with the high humidity, can lead to health problems for occupants. This is what happening at pilot study.

Rising damp that were occur in any buildings can be increase progressively and will depends on several factors such as the condition of moisture inside the wall (Burns, 2010). There are bad effects happen in future if UiTM does not make any repairing works to the buildings, such as decorative spoiling.

Figure 10 Decorative Spoiling

Source: (www.safeguardeurope.com, 2012)

Decorative Spoiling can happen when moisture and ground salts existed and it will call as a rising damp and can cause peel of wallpaper, deteriorate of plaster and blister of paint (Burns, 2010). This issue is usually found in many high-rise accommodations, for example flat, apartments, condominium, including hostel and student‟s college. Burkinshaw, (2012) has highlighted that rising damp always occur inside student accomodation which affect the health condition of the room.

5 CONCLUSIONS

From pilot study, many buildings need the treatment. In these issues, treatment for rising damp is one of the important things to ensure the building can prolong their life with a good performance in the future. There are many types of treatment that professional teams can provide, but the best one is needed to identify the cause, know the cause and then provide the suitable repairing works for the defects.

Nowadays, many ways had been done to reduce humidity problems such ad dilapidation survey or study and make some analysis then also make immediately repairing works. Through this way, building‟s owner can hire professional person to analyse their building through condition survey. Besides, through this way also, they can make an observation and also can use some of tools to get accurate data about the humidity defects. From the tools which is thermal imager all the reading level of rising damp defects were recorded. It can make the reading level of rising damp defects become clearer and more accurate.

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