Level Of Knowledge Of Building Occupants On Dampness In Walls Of Residential Buildings In Ghana

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ABSTRACT

This paper presents the results of a questionnaire survey of 5,800 buildings in four climatic zones of Ghana which sought to assess and document the level of knowledge of building occupants on the problem of dampness in their buildings. A quantitative approach to data analysis was employed, using percentages and mean score rankings of the factors studied. The results showed some existence of knowledge on the problem of dampness among the respondents. The results also showed that dampness is often seen on the walls of residential buildings in Ghana and its level of appearance varied from one climatic zone to the other. The results further showed that the symptoms associated with damp walls are 'surface efflorescence just above skirting/floor', 'dampness at the base of walls up to 1.5m in horizontal band', 'stains, especially in horizontal band, noticeably damp in humid conditions' and 'mold growth (on cold surfaces, windows, etc.)'. The study acknowledges as a limitation the fact that most building occupants were reluctant to allow the researchers into their properties for fear of robbery. Despite this limitation, findings from this study create an awareness of how dampness as a problem is on the rise in Ghanaian residential buildings and this should lead to collective responsibility of stakeholders to find solutions to the problem.

Keywords: *Building Occupants, Dampness, Ghana, Residential Building, Rising Damp,.*

INTRODUCTION

Dampness in buildings is moisture that should not be present in a building. When the materials in a building become sufficiently damp to cause material damage or visible mold growth, it is often said that the building has a dampness problem or the building is characterized as a damp building (Burkinshaw and Parrett, 2004). Dampness in all its forms occurs often, and its enormity has been frequently reported in countries like the United Kingdom, United States of America, Australia, Denmark, Canada, Japan, Estonia, Iceland, Norway, Sweden, Taiwan, etc. (World Health Organisation (WHO), 2009; Mudarri and Fisk, 2007; Gunnbjornsdotirr et al., 2006). The situation in Ghana is not different, as field surveys carried out have shown that the problem of dampness has assumed an alarming dimension in most residential buildings in several parts of the country (Coral-ghana.com). Excessive dampness in buildings is one of the major problems faced by building occupiers and if such a problem is allowed to continue unchecked, unhealthy conditions may follow and buildings may deteriorate to the extent that they ultimately become inhabitable (WHO, 2009). It is in this respect that this study sought to assess and document the level of knowledge of building occupants on the problem of dampness in their buildings.

LITERATURE REVIEW

Dampness is the wetting of structural elements through moisture rise by capillary action (Seeley, 1976). Dampness, an indication of the moisture content of the air present in a space, is an important factor which determines the quality of the air in relation to human health and comfort and more importantly, its effects on the structural integrity of materials in buildings (Hyvarinen et al., 2002; Canadian Wood Council (CWC), 2000; Singh, 2000; King et al., 2000). Dampness in buildings can cause a number of problems, including the destruction of timber, blocks, bricks, ineffective insulation due to cold bridging and the increased risk of mold growth (Hyvarinen et al., 2002; Canadian Wood Council, 2000; Singh, 2000; King et al., 2000).Dampness in buildings can arise from a number of different sources and can cause a variety of effects, such as wall staining, mold growth, impairment of air quality and respiratory problems in humans (Ahmed and Rahman, 2010; Trotman, et al., 2004; Riley and Cotgrave, 2005; Canadian Wood Council (CWC), 2000).

Studies have shown that in 2004, about 20% of buildings in several European countries, Canada and the United States had one or more signs of dampness (WHO, 2009). This estimate agreed with those of a study of 16,190 people in Denmark, Estonia, Iceland, Norway and Sweden, which gave an overall prevalence of indoor dampness of 18% (Gunnbjornsdottir et al., 2006). In the study undertaken by Gunnbjornsdottir et al. (2006), dampness was defined on the basis of self-reported indicators, such as water leakage or damage, bubbles or discoloration of floor coverings, and visible mold growth indoors on walls, floors or ceilings. A study of 4,164 children in rural Taiwan and China showed that 12% of the parents or guardians considered their dwellings to be damp, 30% reported the presence of visible mold inside their houses, 43% reported the appearance of standing water, water damage or leaks and 60% reported at least one of these occurrences (WHO, 2009; Yang et al., 1997). In Singapore, of 4,759 children studied, the prevalence of dampness in each child's bedroom was estimated to be 5% and that of mold was 3% (WHO, 2009; Tham et al., 2007). In Ghana, a study carried out by Coral Ghana (n.d) showed that the problem of dampness in buildings is on the rise.

Dampness in the elements of a structure can arise from rainwater penetration in exterior walls, ground water intrusion into basements and crawl spaces, condensation and indoor moisture sources (Ahmed and Rahman, 2010; Riley and Cotgrave, 2005; Trotman et al., 2004).

RESEARCH METHODOLOGY

The study was conducted through field survey to assess and document the level of knowledge of building occupants on the problem of dampness in their buildings. The main instruments used for data collection were structured questionnaire survey and on-site building investigations. Both closed and open-ended questionnaires were administered to building occupants of residential buildings in the four different climatic zones of Ghana between the months of November 2012 and March 2013.

Four main climatic zones are distinguished in Ghana; South-Western Equatorial (SWE), Dry Equatorial (DE), Wet Semi-Equatorial (WSE) and Tropical Continental or Savanna (TC) (Abass, 2009). The principal characteristics of each climatic zone are based on rainfall, temperature, humidity, etc. The South Western Equatorial Climatic zone is the wettest in Ghana. The rainfall regime is the double maximum type. Mean annual rainfall is above 1900mm and on the average, no month has less than 25mm of rain. The highest mean monthly temperature of about 30°C occurs between March and April and the lowest of about 26°C in August. A typical station for this climatic zone is

Axim (Abass, 2009).The Dry Equatorial climatic zone has two rainfall maxima: but the dry seasons are more marked and the mean annual rainfall is considerably less (between 740 and 890mm). This zone is the driest in Ghana. Temperatures are almost the same as in the South-Western Equatorial climatic zone, and average monthly relative humidity is higher in the rainy seasons than during the rest of the year. A typical station for this climatic zone is Accra. Cape Coast, Sekondi Takoradi and Ho also fall within this zone (Abass, 2009).The Wet Semi Equatorial Climatic zone has two rainfall maxima, but the mean annual rainfall is between 1250mm and 2000mm. Some of the wetter areas include the Akwapim-Togo ranges and the Southern Voltarian plateau where annual rainfall sometimes exceeds the second rainy season (from September to October). A typical station for this climatic zone is Kumasi. Other towns located in this zone include Sunyani, Koforidua and Enchi (Abass, 2009).The Tropical Continental climate has a single rainy season from May to October followed by a prolonged dry season. The mean annual rainfall is about 1000mm to 1150mm. Mean monthly temperatures vary from 36°C in March to about 27°C in August. A typical station for this climate is Zuarungu. Among the other towns in this zone are Navrongo, Bawku, Wa, Tamale, Salaga and Yendi (Abass, 2009).

Buildings located in the major towns in the four main climatic zones were considered in the survey. This resulted in the survey being conducted at eleven locations in ten administrative regions in Ghana. According to the Ghana Statistical Service (GSS) (2000), the number of buildings located in each town are as follows: Sekondi-Takoradi in the Western region (with 24,817 buildings), Axim in the Western region (with 2,694 buildings), Cape Coast in the Central region (with 6,847 buildings), Accra in the Greater Accra region (with 131,355 buildings), Ho in the Volta Region (with 6,853 buildings), Koforidua in the Eastern Region (with 7,318 buildings), Kumasi in the Ashanti Region (with 67,434 buildings), Sunyani in the BrongAhafo Region (with 5,611 buildings), Tamale in the Northern Region (with 15, 873 buildings), Bolgatanga in the Upper East Region (with 3,932 buildings) and Wa in the Upper West Region (with 5,539 buildings). A sample size of 5,800 buildings from the total population of 278,273 buildings in the selected locations was determined for the entire survey using the formula$n = {}^{N}/_{1+N(e)^2}$ *Where N = the total population size; e= the standard error of sampling distribution assumed to be 0.013 and n is the sample size.* Proportionate or quota sampling technique was used to select the sample size for each location as follows: Sekondi-Takoradi (517 buildings), Axim (56 buildings), Cape Coast (143 buildings), Accra (2,738 buildings), Ho (143 buildings), Koforidua (153 buildings), Kumasi (1,406 buildings) Sunyani (117 buildings), Tamale (330 buildings), Bolgatanga (82 buildings) and Wa (115 buildings). The convenience purposive sampling approach was then used to select the residential buildings within each location (representing a cross section of buildings in the four climatic regions of Ghana). In all, 1% of the buildings (56 out of 5,800) was selected from the South Western Equatorial, 61% (3,541 out of 5,800) were selected from the Dry Equatorial, 29% (1,689 out of 5,800) were selected from the Wet Semi Equatorial and 9% (545 out of 5,800) were selected from the Tropical Continental Climatic Zones respectively.

A pilot survey was carried out to test the questionnaire with 50 occupants in 50 buildings in Kumasi. The questionnaires were modified and distributed. The questionnaires sought information on three issues. The first part of the questionnaire sought information on the designations of respondents in the houses (owners, tenants, etc.) and the ages of the buildings. The second part of the questionnaire sought information on major issues of dampness including how often dampness was seen in the buildings, when the dampness first appeared in the buildings and how often the dampness disappeared from the buildings. The third part of the questionnaire asked respondents to rank on the Likert scale of 1-5 the directions of their buildings severely affected by dampness, where1='Not severe' and 5 = 'Very severe'. Respondents were further asked to rank on the Likert scale of 1-5 the level of severity of symptoms associated with dampness in the walls of their buildings. The data from the questionnaire survey were analyzed by means of mean scores rankings and percentages

RESULTS AND DISCUSSIONS

Demography of Respondents

The results in Table 1 show that in the Wet Semi Equatorial climatic zone, 63% of the respondents were owners and 36% were tenants. In the Dry Equatorial climatic zone, 60% of the respondents were owners whereas 40% were tenants. Building owners in the South Western Equatorial climatic zone constituted 44% and tenants constituted 56%. In the Tropical Continental climatic zone, 58% of the respondents were owners and 42% were tenants. The findings therefore show that for the WSE, DE and TC climatic zones, owners constituted majority of the respondents. The results in Table 1 also show that in the WSE climatic zone, the proportions of buildings aged 5 to over 20 years old were 91%, the proportion aged 5 to over 20 years old in the DE climatic zone were 86%, in the SWE climatic zone, the proportion of buildings with ages of 5 to over 20 years old were 90%and in the TC climatic zone the proportions were 92%. This shows that the buildings were susceptible to dampness attacks and therefore, considered reliable for the survey. Studies have shown that the age of buildings is very significant to any dampness study and the older the building the more susceptible it is to dampness (Halim and Halim, 2010; Ahmed and Rahman, 2010).

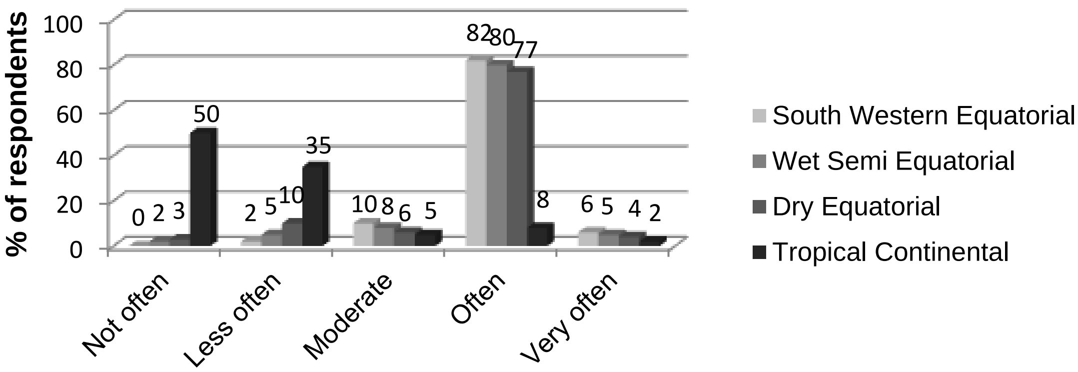
Table 1. Demographic characteristics

	CLIMATIC ZONES			
Characteristics of respondent	**Wet Semi Equatorial**	**Dry Equatorial**	**South Western Equatorial**	**Tropical Continental/ Savanna**
Respondent				
Owner	63%	60%	44%	58%
Tenant	36%	40%	56%	42%
TOTAL	***100%***	***100%***	***100%***	***100%***
Age of dwelling				
1-4 years	9%	14%	10%	8%
5-10 years	20%	25%	30%	23%
11-20 years	28%	27%	6%	19%
Greater than 20 years	43%	34%	54%	50%
TOTAL	***100%***	***100%***	***100%***	***100%***

Issues on Dampness

Frequency of dampness seen on the walls of the buildings

Among the issues on dampness, respondents of buildings in the four climate zones were asked to indicate how often damp was seen on the walls of their buildings. Figure 1shows a graphical representation of the views of the respondents. From Figure 1, 82% of the respondents in the South Western Equatorial opined that dampness was often seen in walls of buildings within this climatic zone. Eighty percent (80%) of respondents in the Wet Semi Equatorial climatic zone indicated that dampness was often seen in the walls of their buildings. In the Dry Equatorial climatic zone, 77% of the respondents often saw dampness in the walls of their buildings. However, in the Tropical Continental climatic zone, only 8% of respondents indicated that they often saw dampness in the walls of their buildings. Figure 1 also depicts that in the Tropical Continental climatic zone, the issue of dampness does not occur often as 50% of the respondents attested to this fact. The results from this study show that dampness occurs everywhere, but is more prevalent in the SWE, WSE and Dry Equatorial Climatic zones of Ghana. The results further show that the problem of dampness dominates in the wetter areas in Ghana, in this case the South Western Equatorial climatic zone. The extreme South-



Western part of Ghana is the wettest part of the country which receives more than 1,900mm of rain a year (Abass, 2009), and this could be a reason for dampness being very prevalent in this climatic zone. The differences in how often dampness was experienced in walls of buildings in the four climatic zones could result from the fact that the effect of the tropical maritime air mass (mT) and the tropical continental air mass (cT) is felt less the further one goes from South to North (Abass, 2009). The regularity in the pattern of rainfall distribution, temperature, relative humidity, etc. in all the four climatic zones of Ghana is broken in a number of places which receive larger or smaller amounts of these conditions owing to the local effect of relief (Abass, 2009), and these could also be a reason for the differences in how often dampness was experienced in the four climatic zones of Ghana. This finding agrees well with literature which showed that dampness occurs often and is the most frequently reported cause of building defects in most European countries(WHO, 2009; Mudarri and Fisk, 2007; Gunnbjornsdotirr, 2006).

Figure 1.Frequency of dampness seen in walls of buildings

First Appearance of Dampness In The Masonry Walls Of Buildings

The study also sought the views of respondents on the first time they observed dampness in the walls of their buildings.

The results from Figure 2 show that 63% of the respondents who live in the WSE climatic zone observed dampness in the walls of their buildings within the period of 1- 2 years after occupying the buildings. In the Tropical Continental climatic zone, 70% of the respondents observed dampness within a period of 1-2 years after occupying their buildings. Fifty three percent (53%) and 60% of the respondents who live in the DE and the SWE climatic zones respectively observed dampness in the walls of their buildings within the periods of 1-2 years. Only 20%, 12%, 10% and 2% of the respondents who live in the WSE, TC, DE and the SWE climatic zones respectively, attested to the fact that the problem of dampness persisted before they occupied their buildings. Thus, dampness in the majority of buildings surveyed in the four climatic zones was seen by respondents between the periods of 1-2 years after they occupied those buildings.

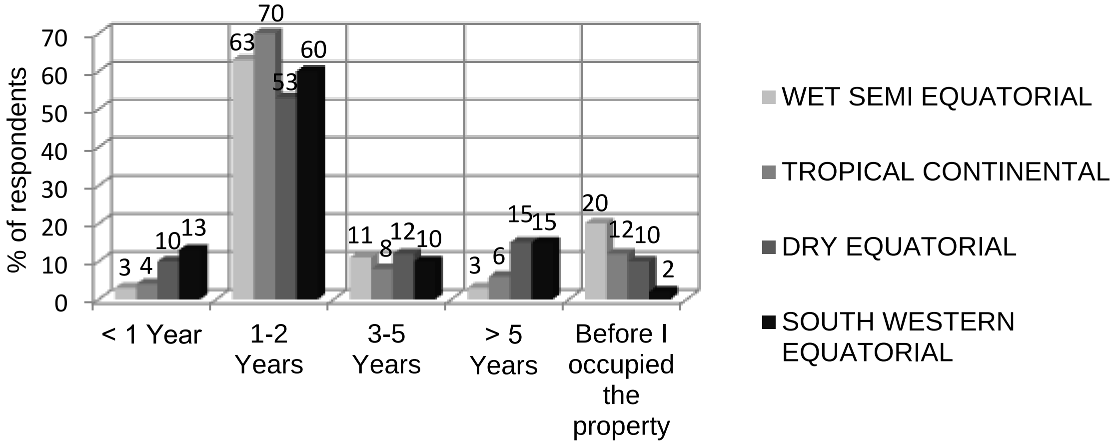


Figure. 2 First appearance of dampness

Frequency of Disappearance of Dampness from Walls of Buildings

On the frequency of disappearance of dampness from the walls of buildings, Figure 3 shows the views of respondents who live in the four climatic zones of Ghana. In the opinion of 34% of respondents in the Wet Semi Equatorial, 30% in the Dry Equatorial and 20% in the South Western Equatorial, dampness does not often disappear from the walls of their buildings. Only 4% of the respondents in the Tropical Continental climatic zone indicated that dampness rarely disappears from the walls of their buildings.

Thirty one percent (31%), 16%, 38% and 42% of respondents occupying buildings in the Wet Semi Equatorial, Tropical Continental, Dry Equatorial and South Western Equatorial climatic zones respectively were unsure whether dampness disappeared from their buildings or not. The reason assigned to this problem by the respondents was that at certain times in the year, the problem seems to disappear but at other times, the problem resurfaces. Moisture problems in buildings are influenced by a variety of simultaneously existing conditions such as daily and seasonal changes in the sun, prevailing winds, rain, temperature and relative humidity (inside and outside), as well as seasonal or tidal variations in ground water levels (Park, 1996). These are all conditions that affect the rate at which dampness appears and disappears from the walls of buildings (Park, 1996). The southern section of Ghana, because of its nearness to the sea and the influence of mT air mass, is more humid than the northern section (Abass, 2009). Relative humidity levels on the coast are generally between 95% and 100% during the night and early morning when the air over the land is cooler than that over the sea; but they decrease in the afternoons when the water vapour fills a volume of air whose holding capacity has increased through heating by the sun (Abass, 2009). Thus, in the afternoons, relative humidity on the coast is about 75% in the South-West and about 65% in the south-East. It reaches a low value of between 20 and 30% or less north of Salaga, when the area comes under the influence of the dry cT air mass, and increases to between 70 and 80% when the area comes under the influence of the humid mT air mass (Abass, 2009).Therefore, this is a possible cause of the variations in the disappearance of dampness from the walls of buildings in the four climatic zones of Ghana. The size of a damp zone in a wall may also fluctuate with seasonal changes in climate (Lieff and Trechsel, 1988).

The results also show that the disappearance of dampness from the walls of buildings in the four climatic zones was very prevalent in the Tropical Continental Climatic zone. This is because 57% of the respondents who live in buildings in this climatic zone indicated that disappearance of dampness from the walls of buildings happened very often. The prolonged dry season in the Tropical Continental climatic zone (Abass, 2009), could be a reason why dampness in the walls of buildings in this zone disappears frequently. During a dry time, the soil around the base of the wall may draw moisture out of the masonry (Lieff and Trechsel, 1988) and this will decrease the amount of moisture present in the wall. The results further show that 3% of respondents who live in the Wet Semi Equatorial Climatic zone, 3% who live in the Dry Equatorial climatic zone and 8% who live in the South Western Equatorial Climatic zone indicated that the disappearance of dampness from the walls of their buildings did not often happen. These three climatic zones are wetter than the Tropical Continental climatic zone (Abass, 2009) and this condition affected the rate at which dampness disappeared from the walls of buildings in these zones. Wet season accompanied by a rise in the water table can result in an increase in the height of the capillary rise of moisture and vice versa (Lieff and Trechsel, 1988).

In buildings located in some parts of the United Kingdom and Northern Ireland, dampness problems are reported to arise due to seasonal changes (Ryan, 2002).In Ghana, daily and seasonal changes in the sun, prevailing winds, rain, temperature and relative humidity (inside and outside), as well as seasonal or tidal variations in ground water levels are among the conditions which affect dampness in walls of residential buildings in Ghana.

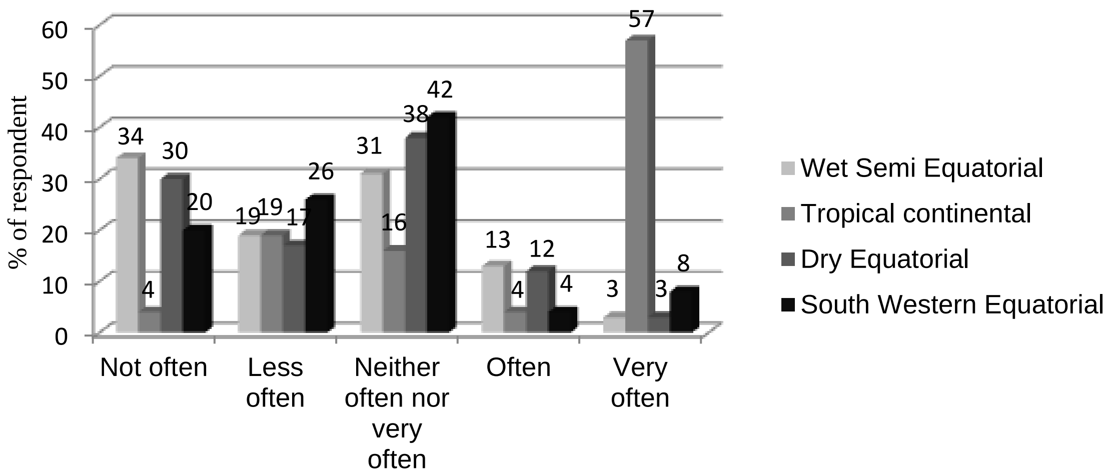


Figure 3. Frequency of disappearance of dampness

Directions of Buildings Severely Exposed To Damp

The study sought the views of respondents on the directions of their buildings severely exposed to damp. The results are presented in Table 3. For this study, a factor is deemed severe if it has a mean value of 2.5 or more (Field, 2005).

The results show that the mean scores of the four major directions considered in buildings in the Dry Equatorial climatic zone are all greater than the mean value of 2.5. This is an indication that all the four directions of the buildings studied in this climatic zone are susceptible to dampness attacks. The findings further show that the Eastern part of buildings located in this climatic zone is the most severely affected direction by dampness. The results also show that in the Tropical Continental and the Wet Semi Equatorial climatic zones, the Eastern directions of buildings are severely exposed to dampness with mean values of 2.65 and 2.52 respectively.

Table 3. Directions of buildings exposed to severe damp

	Dry Equatorial			**Tropical Continental**			**Wet Semi Equatorial**			**South Western Equatorial**		
Wall Direction	**Mean**	**Std. Dev.**	**Rank**	**Mean**	**Std. Dev.**	**Rank**	**Mean**	**Std. Dev.**	**Rank**	**Mean**	**Std. Dev.**	**Rank**
North	2.73	1.16	*4*	2.21	0.69	*2*	2.39	1.16	*2*	2.41	1.19	*3*
East	3.25	1.17	*1*	2.65	1.24	*1*	2.52	0.83	*1*	2.55	1.18	*2*
South	3.09	0.96	*3*	2.41	0.89	*3*	2.42	1.14	*3*	3.30	1.62	*1*
West	3.18	1.17	*2*	1.85	0.82	*4*	2.34	1.01	*4*	2.40	1.34	*4*

In the South Western Equatorial climatic zone, the study showed that the southern direction of buildings (with mean score of 3.30) is severely exposed to dampness. The findings from this study show that despite the characteristics exhibited by each of the four climatic zones in Ghana, dampness is still very severe. As a result, the eastern directions of buildings located in the DE, TC and WSE climatic zones are severely exposed to damp, whereas in the South Western Equatorial climatic zone, the Southern directions of buildings experience severe exposure to dampness. In Aberdeen in the United Kingdom, North and North-East facing walls of buildings are more frequently affected by severe dampness (Young, 2007).

Symptoms Associated With Dampness In The Walls Of Buildings

Dampness in the masonry walls of buildings are associated with symptoms, some of which are hidden and others visible. Respondents who live in buildings in the four climatic zones were asked to indicate the severity of symptoms associated with dampness in the walls of their buildings. The results in Table 4 show that all the 10 symptoms (100%) were considered severe in buildings in the Dry Equatorial climatic zone, 9 out of 10 symptoms (90%) were identified as severe in buildings in the Tropical Continental climatic zone, 8 out of 10 symptoms (80%) were considered severe in buildings in the Wet Semi Equatorial climatic zone and 6 out of 10 symptoms (60%) were considered severe in buildings in the South Western Equatorial climatic zone.

Mean scores of all the symptoms associated with dampness in walls of buildings in the Dry Equatorial climatic zone evaluated are greater than the mean value of 2.5. This indicates that in the opinion of respondents, all the ten symptoms are highly associated with dampness and very severe in the walls of buildings. The results further show that 'mold growth (on cold surfaces, windows, etc.)', 'stains, especially in horizontal band, noticeably damp in humid conditions', 'dampness at the base of walls up to 1.5m in horizontal band' and 'surface efflorescence just above skirting/floor' are the first four symptoms severely associated with dampness in buildings in the Dry Equatorial Climatic zone. In the Tropical Continental Climatic zone, 'surface efflorescence just above skirting/floor', 'free surface water, water run marks, etc', 'dampness at the base of walls up to 1.5m in horizontal band' and 'mold growth (on cold surfaces, windows, etc.)' are symptoms which are severe and associated with dampness in buildings.

The results in Table 4 further show that the four most severe symptoms associated with dampness in buildings in the Wet Semi Equatorial climatic zones are 'stains, especially in horizontal band, noticeably damp in humid conditions', 'dampness at the base of walls up to 1.5m in horizontal band', 'mold growth (on cold surfaces, windows, etc.)' and 'surface efflorescence just above skirting/floor'. In the South Western Equatorial climatic zone, 'surface efflorescence just above skirting/floor', 'mold growth (on cold surfaces, windows, etc.)', 'dampness at the base of walls up to 1.5m in horizontal band' and 'free surface water, water run marks, etc.' were considered by respondents to be the four most severe symptoms associated with dampness in buildings in this climatic zone.

Mold growth does not require the presence of standing water: it can occur when high relative humidity or the hygroscopic properties of building surfaces allow sufficient moisture to accumulate (www.epa.gov/laq/largebldgs/). The relative humidity and temperature often vary within a room, therefore if one side of the room is warm and the other side is cool, the cool side of the room has a higher relative humidity than the warm side (www.epa.gov/laq/largebldgs/). The highest relative humidity in a room is always next to the coldest surface and this is likely to be the location where the first condensation occurs (www.epa.gov/laq/largebldgs/). Though 'mold growth (on cold surfaces, windows, etc.)' is a symptom which was highly associated with buildings in the four climatic zones of Ghana, a critical look at Table 4shows that it is on the rise in the South Western Equatorial climatic zone (the first most severe symptom highly associated with buildings). This is so because in the SWE average monthly relative humidity levels (based on figures recorded each day at 12 noon) are highest and range between 75-80%. These values reduce for the other climatic zones, which is an indication of the ranks attached to its level of severity in these climatic zones.

Cyclic wetting and drying brought about by seasonal changes is an important driver of salt attack or efflorescence (Young, 2007). Efflorescence can occur simply through changes in humidity. During the dry period when the water evaporates from the walls, the salt is always left behind (as salts cannot evaporate) and the salt solution in the wall becomes more concentrated (Young, 2008). As more salts are brought into the wall the salt solutions are further concentrated as the moisture evaporates. When the solution reaches a condition known as saturation or super - saturation, crystals will begin to form (Young, 2007). In the Dry Equatorial climatic zone, 'surface efflorescence just above skirting/floor' was ranked first as the most severe symptom associated with dampness in buildings in this zone. As this climatic zone exhibits some level of dryness, the rate at which water evaporates from the walls of buildings is affected. As most of the water in these walls contains salts, the salts are left behind due to the rapid evaporation caused by the drying condition.

Whereas literature identified mold growth to be the most dominant symptom associated with condensation in the UK and Northern Ireland (Young, 2007; Ryan, 2002), the results from this study show that 'surface efflorescence just above skirting/floor', 'dampness at the base of walls up to 1.5m in horizontal band', 'stains, especially in horizontal band, noticeably damp in humid conditions' and 'mold growth (on cold surfaces, windows, etc.)' are symptoms which are severe and associated with dampness in buildings in the Dry Equatorial, Tropical Continental, Wet Semi Equatorial and the South Western Equatorial climatic zones respectively.

Table 4. Symptoms associated with dampness in buildings

	Dry Equatorial			**Tropical Continental**			**Wet Semi Equatorial**			**South Western Equatorial**		
Symptom	**Mean**	**Std Dev**	**Rank**	**Mean**	**Std Dev**	**Rank**	**Mean**	**Std Dev**	**Rank**	**Mean**	**Std Dev**	**Rank**
Decayed skirting	2.58	0.78	*9th*	2.65	1.52	*9th*	2.55	1.44	*8th*	2.67	0.71	*6th*
Dampness around edges of solid floor	3.47	1.31	*6th*	3.82	0.92	*6th*	2.17	1.29	*9th*	1.58	0.83	*10th*
Surface efflorescenc e just above skirting/floor	4.45	0.54	*1st*	4.16	0.98	*3rd*	4.22	0.90	*4th*	4.38	0.80	*2nd*
Dampness at the base of walls up to 1.5m in horizontal band	4.32	0.70	*3rd*	4.22	0.75	*1st*	4.44	0.54	*2nd*	4.32	0.65	*3rd*
Stains, especially in horizontal band, noticeably damp in humid conditions	4.34	0.59	*2nd*	4.05	1.08	*5th*	4.83	0.37	*1st*	4.20	0.47	*5th*
Mold growth (on cold surfaces, windows,	4.29	0.82	*4th*	4.06	1.01	*4th*	4.24	0.62	*3rd*	4.52	0.50	*1st*

Fig 1.Frequency of dampness seen in walls of

etc.)												
Free surface water, water run marks, etc.	3.84	0.73	*5th*	4.22	0.88	*2nd*	4.18	0.82	*5th*	4.30	0.67	*4th*
Blistering and flaking of paint	2.67	0.71	*8th*	2.71	0.75	*7th*	1.99	1.03	*10th*	2.44	1.03	*7th*
Softening and deterioration of plaster	3.07	1.07	*7th*	2.68	0.91	*8th*	3.05	0.72	*6th*	1.92	0.80	*8th*
Dampness on first floor and above	2.55	1.44	*10th*	1.39	0.58	*10th*	3.05	0.91	*7th*	1.70	0.84	*9th*

Conclusions

This paper sought to assess and document the level of knowledge of building occupants on the problem of dampness in their buildings. The results from the study showed that building occupants in the four climatic zones of Ghana demonstrated some level of knowledge regarding dampness in the walls of their buildings. The results further showed that dampness is everywhere, but more prevalent in the South Western Equatorial, Wet Semi Equatorial and Tropical Continental Climatic zones of Ghana. However, its dominance is experienced most in the wettest area of Ghana, thus the South Western Equatorial climatic zone. The opinion of the respondents also showed that dampness in majority of the buildings surveyed occurred between the periods of 1-2 years in all the four climatic zones of Ghana. On the issue of directions of buildings severely attacked by dampness, building occupants in the DE, TC and the WSE climatic zones indicated that the eastern directions of their buildings were severely exposed to dampness, whereas in the South Western Equatorial climatic zone, building occupants identified the southern parts of buildings to be severely attacked by dampness. The results from this study also showed that ‘surface efflorescence just above skirting/floor’, ‘dampness at the base of walls up to 1.5m in horizontal band’, ‘stains, especially in horizontal band, noticeably damp in humid conditions’ and ‘mold growth (on cold surfaces, windows, etc.)’ are symptoms which are severe and associated with dampness in buildings in the Dry Equatorial, Tropical Continental, Wet Semi Equatorial and the South Western Equatorial climatic zones respectively. The study acknowledges as a limitation the fact that most of the building occupants were reluctant to allow the researchers into their properties for fear of robbery. Despite this limitation, the findings from this study should create an awareness on how dampness as a problem is on the rise in our residential buildings and this should lead to all stakeholders coming together to find a solution to address this problem. Recommendations are made for further studies into the severity of the symptoms associated with the various problems of dampness experienced in buildings.

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