SICK BUILDING SYNDROME AND BUILDING-RELATED ILLNESS AWARENESS IN THE PHILIPPINES

by Enrico B. Tabafunda

I. INTRODUCTION

Indoor Air Quality: A Local Problem

The main objective of this research is to determine the level of awareness of the Filipinos of the existence of the Sick Building Syndrome (SBS) and the Building-Related Illness (BRI). The subjects of this research include workers in varying labor conditions professionals such as architects and experts from the fields of labor, environment, and occupational safety.

The research has chosen this objective in the light of the Filipinos' increasing concern for the environment. Much has been written about the risks posed by outdoor pollution from lead and carbon monoxide emission and industrial and domestic wastes, but an insignificant amount of literature can be found on studies on poor indoor air quality (IAQ) in the Philippine context.

As a World Health Organization (WHO) report states, as much as 90% of man's diseases are caused by pollutants. In the Philippines, the Department of Health (DOH) reported that of the ten leading causes of morbidity in a 1994 survey, three are upper-respiratory in nature: bronchitis, pneumonia, and tuberculosis.

In the United States, the Environmental Protection Agency (EPA), has come up with measures that validate the existing health problem. Divisions such as the Office of Radiation and Indoor Air are tasked to monitor indoor air quality.[1]

Based on existing literature, the above premise is foreign-oriented. The researcher, as an advocate of putting architecture and building technology in the Philippine setting, poses the following problems:

1. What is the awareness level of the Filipinos of the existence of SBS and BRI? Do they experience the syndrome?
2. Is the government aware of the SBS and BRI? What steps are they taking to monitor, prevent, and control it?

Before actually starting the investigative study, the following hypothesis were made:

1. The citizens have a low awareness level of the risks concerning SBS and BRI

3. The government has a high awareness of SBS and BRI but are taking small steps in its control and prevention.

Foreign Issues

Not much has been written on the awareness of the Filipino citizens and the sensitivity of the government to the hazards caused by poor indoor air quality. However, American and European publications exist that are significant to this study, and will be used as a take-off point. Major sources of data are the reports of a WHO international working committee convened to study the health aspects of indoor pollution.[2]

Another source similar in approach is *Improving Indoor Air Quality through Design, Operation, and Maintenance* by Meckler. All of the above publications concentrated on defining indoor air quality and its effects but excluded major solutions and policies of national scope.

Also relevant to this study is the EPA Guideline of Indoor Air Quality, since it not only identifies the problem of IAQ but also presents the U.S. government's stand on indoor pollution. Its list of federal agencies responsible for IAQ have been very helpful to this study since part of this research would be to assess the local equivalent agencies' involvement on the said matter.

II. SBS, BRI, AND OTHER INDOOR AIR FACTS

The Sick Building Syndrome

The term "Sick Building Syndrome" or SBS is used to describe health symptoms that may be common to a general population but may be health and comfort effects that can be linked to one's occupancy of a building. This means that no specific illness or cause can be identified. The complaint of SBS may be linked to a particular zone (such as the elevator) or may be attributed to the whole building.

The following symptoms may describe SBS: eyes, nose and throat irritation; sensation of dry, mucous membranes, and skin erythema; mental fatigue, nausea, and dizziness; high frequency of airway infection and cough; and hoarseness, wheezing, and unspecified hypersensitivity. Aside from these symptoms, one major indication of the SBS is that most complainants report relief upon leaving their building.

Causes of SBS are numerous, but in most cases, the main cause is unknown. Studies, however, present the major factors that can cause SBS: inadequate ventilation, chemical contaminants from indoor sources and outdoor sources, and biological contaminants.

Inadequate Ventilation

This is directly linked to building design. Inadequate ventilation may be caused by tightly-sealed buildings, non-operable windows, and tight enclosure constructions. In a Cornell University research, it was discovered that workers in poorly ventilated offices were twice as likely to report SBS than those in a well-ventilated environment. This shows that a small build-up of carbon dioxide, an indicator of poor ventilation, is related to SBS.[3]

Poor ventilation can also occur if air is not effectively distributed in the

building because of a problematic heating, ventilating, and air conditioning system (HVAC). Up to the middle of this century, U.S. building ventilation standards called for approximately 15 cubic feet per minute (cfm) of outside air per building occupant, primary to remove and dilute body odor. As a result, however, of the oil crisis in the 1970's, this was lowered to 5 cfm. In many cases, this drop in outdoor air ventilation rates was found to have caused discomfort and health-related problems in the building occupants.

In an effort to improve indoor air quality, the American Society of Heating, Refrigerating, and Airconditioning Engineers (ASHRAE) revived the 15 cfm of outdoor air per person. In offices, 20 cfm is required, while in special zones such as smoking lounges, 60 cfm is the provided standard.

Chemical contaminants from indoor sources

Most indoor air pollutants come from within the building. These contaminants may also emit varying quantities of volatile organic compounds (VOC). Examples are carpeting, building materials, cleaning agents, tobacco smoke, pesticides, and copy machines.

Formaldehyde, a VOC and also a potential carcinogenic and sensory irritant, can be found in building materials such as foam insulation, bonded and pressed wood products, particle boards, hardwood plywood and medium density fiberboard (MDF).

Other indoor pollutants are bioaerosols from humidifiers, airconditoning units, and combustion by-products such as carbon monoxide and nitrogen dioxide that can come from unvented kerosene, gas space heaters, and gas stoves.

Chemical contaminants from outdoor sources

The outdoor air entering a building through air intake vents and other openings can be a source of indoor air pollution. Examples of this are pollutants from vehicle exhausts and plumbing vents.

Biological contaminants

Examples of these contaminants are bacteria, molds, pollen, and viruses. These may breed in stagnant water collected in ducts, humidifiers, drain pans, ceilings, carpetings, and insulations. Others sources of contaminants are insect and bird droppings. Illnesses related to biological contaminants include cough, chest tightness, fever, chills, and allergies.[4]

It is worth noting that all sources of SBS may be the sole cause of illness or may act in combination with other contaminants or other factors such as temperature, humidity, and lighting. However, even after a building investigation, the specific causes of the complaints may remain unknown.

BRI and other IAQ-Related Illnesses

In contrast to the definition of SBS, Building-Related Illness (BRI) is used when diagnosable illnesses are identified and can be attributed directly to airborne building contaminants (although in some sources, both terms are used interchangeably). This means that BRI symptoms can be clinically defined and have identifiable causes. Nevertheless, both SBS and BRI are directly linked to poor indoor air quality.

According to the EPA's report (Indoor Air Facts No. 4) on SBS, BRI's symptoms include cough, chest tightness, fever, chills, and muscle aches. Complaints, however, may result from other causes such as illnesses contracted from outside the building, acute sensitivity (e.g. allergies), or other psychological factors.

There also other illnesses not covered under SBS and BRI that are worth presenting since poor IAQ is the common source of these problems:

- *Rhinitis* - involves the nasal mucous, often resulting to itching and sneezing, or running or blocking of the nose; may be due to infection, allergy, or non-allergic causes such as air pollutants or dryness or coldness of the air.
- *Sinusitis* - involves the sinuses; causes headaches and pain or fullness of the face; causes similar to that of rhinitis.
- *Otitis* - inflammation of the linings of the external or internal parts of the ear; causes pain and in some cases, loss of hearing; may be due to infection, allergy, or non-allergic mechanisms.
- *Conjunctivitis* - involves the conjunctival mucous; causes itching, soreness, watering, and discharge from the eyes; causes similar to that of rhinitis.
- *Pneumonia* - infection of the gas-exchanging part of the lung. Condition is acute and may be fatal. A specific type is the Legionnaire's disease, caused by *Legionella pneumophila*, which accounts for less than 5% of community-acquired pneumonia. This is building-related in about 30% of the cases, mostly contracted in hotels and hospitals.
- *Asthma* - airways obstruction with bronchial irritability; may be triggered by bioaerosols, smoke, particulates, and allergens.
- *Alveolitis* - inflammation of the gas-exchanging parts of the lung resulting in breathlessness; most building-related alveolitis is caused by fungi and bacteria from humidifiers; chronic exposure may lead to permanent lung damage.
- *Humidifier Fever* - influenza-like illness triggered by exposure to aerosols from microbiologically contaminated humidifiers.
- *Bronchopulmonary Aspergillosis* - rare form of asthma due to allergy to the fungus *Aspergillus fumigatus;* may cause blockage of major airways and infiltrates.
- *Contact Dermatitis* - acute or chronic inflammation of the skin due to allergic, toxic, or irritant effects; may be triggered by aerosols.
- *Atopic Eczema* - chronic relapsing itching skin rash sometimes aggravated by biologically derived aerosols.
- *Contact Urticaria* - acute or chronic itching skin rash caused by allergic or non-allergic effects, sometimes by bioaerosols.
- *Mycotoxicosis* - rare toxic response to certain moulds such as the *Stachybortys atra;* causes fatigue, irritability, and inflammation of the heart.
- *Allergy* - result of immunological mechanisms induced by allergens.

- *Pseudo-allergic reactions* - may be triggered by allergens but with immunological specificity.[5]

Radon and Asbestos

Both are not counted among SBS and BRI pollutants because they cause long-term diseases that occur years after exposure. SBS and BRI are associated only with acute and immediate health problems, identifiable or not. However, it may be useful to present them as serious health risks.

Asbestos is used for electrical and thermal insulation and architectural finishing materials because of its insulating and fire-resisting properties. Adverse health effects range from *asbestosis* to *bronchogenic carcinoma*.

Radon, on the other hand, is a radioactive gas which travels from the soil to the building through open sumps, concrete hollow block walls, and cracked concrete slabs. In multi-storey buildings, the main source is the building material. The primary health hazard is the increased possibility of cancer of the internal organs such as the lungs.[6]

Building Investigation

The U.S. EPA. sets the standard procedures for building investigation, the goal of which is to identify and solve the indoor problem in a way that prevents it from recurring and causing other problems. It is mainly a walk-through of the problem zone wherein the investigator gets to discover whether a complaint is indoor pollution-related, identify the pollutant, and recommend the most appropriate solution.

In the walk-through, the following basic factors are considered: the occupants, the HVAC system, the possible pollution pathways, and the possible contaminant sources. Prior to this, the investigator should prepare the documentation of the complaints, check the building history, and identify the known HVAC areas and complaints.

The walkthrough provides the investigator with possible explanations for the complaint. The data gathered at this point is used to formulate and test a hypothesis. If the problem is not solved, additional information is gathered for the formulation of new hypotheses.

Although sampling of air for pollutant identification provides useful information on the state of the building, it seldom reveals the possible cause of illness. The investigator concentrates more on his comprehensive understanding of the building system and the nature of the complaints.

Solutions To The Sick Building Syndrome

Pollutant source removal or modification is used effectively when sources are known and control is feasible. Examples are:

- routine maintenance of HVAC systems;
- replacement of water-stained ceiling, tile, and carpeting;
- implementation of smoking restrictions;
- storage and use of paints, adhesives, solvents, and pesticides in well-ventilated areas, and use of these materials during periods of non-occupancy; and

- allowing time for building materials in new or remodeled areas to release gas pollutants before occupancy

Increasing ventilation rates and air distribution can be a cost effective means of reducing indoor pollutant levels. Mechanical systems should at least meet standards set by local building codes and ASHRAE. Problems may occur, however, when ventilation rates are not maintained or operated to meet the standards. Local exhaust ventilation is recommended in areas such as rest rooms, copy rooms, and printing facilities to expel pollutants directly from the building.

Air cleaning may be used with other solutions but has limited applications. Examples include:

- particle control devices - effective for larger pollutants, ineffective in capturing very small particles;
- high performance air filters - more expensive method but effective in capturing small particles;
- mechanical filters - ineffective in filtering gaseous pollutants; and
- absorbent beds - effective in filtering gaseous pollutants but are expensive

Education and communication are important in both remedial and preventive IAQ management programs. Occupants, building managers, and maintenance personnel are encouraged to communicate among themselves and understand the nature of IAQ.[7]

III. THE PROBLEM IN THE PHILIPPINE CONTEXT

As mentioned in the introduction, this research aims to assess the level of awareness of SBS among Filipinos, in particular among office workers. In this study, the researcher uses the descriptive method, initially using other sources to define SBS and related subjects, and then conducting an informal survey on the workers' level of awareness of the said symptom.

A survey was conducted in Metro Manila with the SBS/BRI questionnaire distributed among 30 respondents chosen by non-random convenience sampling with workplaces scattered around the said region. The researcher also went to government agencies which were assumed to have control over the worker and the environment. Private research agencies and professional organizations (such as mechanical engineers' associations) not included in this study. Also excluded are commercial enterprises dealing with air filtration and ionization. The researcher accepts the non-conclusive and exploratory nature of the study due to time and budget constraints which affected the size of the sample population among others.

Survey of Thirty (30) Respondents

The survey results showed the age range of the respondents to be 22 to 56 years old, 90% of which work in offices. The remaining 10% work either in a construction site, in a department store, or in a restaurant. Their workplaces are either within or near the outskirts of Metro Manila.

The average age of their workplace is 10.7 years old, with average time spent inside at 8.29 hours per day. 40% of the respondents consider their workplace in good physical condition (the choices were very poor, poor, ade-

quate, and excellent). Only one of them rated his workplace as poor.

Existing illnesses among them were headaches, respiratory problems, and allergies. When asked what illness they contracted could be attributed to the workplace, 43.3 % answered headache, 6.66 % had allergies, 6.66 % had itchy eyes, and 3.33 % contracted pneumonia. 96 % of them would report to their employers if they think they contracted an illness or disease that is building-related.

43 % of them were not aware that health risk factors may exist in their workplaces. However, given the options, they rated the following as possible sources of illness: materials used (16.6 %), pests and animals (10 %), aircon (10 %), poor ventilation (6.6 %), elevator (6.6 %), and the building condition itself (6.6 %).

83.3 % of them have never heard of the Sick Building Syndrome and Building-Related Illness. 73.3 % consider their awareness level for both syndromes low, 6.6 % have a moderate level of awareness, and only 3.3 % have a high awareness level.

These results show that more than half of the sample population might consider the fact that they may experience illness or discomfort because of their workplace, and they are willing to report it to their employers. However, knowing the existence of a particular health syndrome (such as SBS and BRI) and knowing it by name are just as important as experiencing the symptoms. To illustrate, a person may experience chronic headaches and he may think that his office has something to do with it. The problem is he does not know that such a problem is also experienced by other people, that such an illness could exist, and that it can be called SBS or BRI. To a person who has not even heard of these terms, a health concern would just be attributed to other factors.

Survey of Government Agencies and Institutions

Based on the survey, there is an indication of awareness of the health risk factors present in the workplace. It would be safe to assume that the government also has an awareness of it, if not on a much higher level. The question, however is, are they taking any measures to solve this problem?

Department of Environment and Natural Resources

The monitoring of indoor air pollution is not within the scope of services of this department. Although are sections which exist that monitor air pollution, like the Metro Manila Air Improvement Sector Development Program and the Air Quality Management, the research they conduct mostly involves measuring pollution through instruments which require large volumes of air. Presently, there are no concrete plans to include indoor air as one of this agency's concerns. According to Mr. Cesar Siador, head of both divisions, it is within the jurisdiction of the DOH and the DOLE.

College Of Public Health, U.P. Manila

Although this college has an understandably high sensitivity towards the SBS and BRI, it is not a priority issue. Since health factor classification is disease or illness-specific, there was no available data on reported cases of BRI. Another reason no illness could be attributed to SBS is the Filipinos' constant exposure to other pollutants outside the

workplace. There was, however, a research project participated in by Prof. Lina Sumera of the Department of Environmental and Occupational Health which focused on indoor/outdoor air quality in relation to building design and climate. According to her, there are no Filipino standards yet for indoor spaces other that the industrial workplace. A study on an office building or residence would entail much difficulty since a thorough investigation would cause disturbance and inconvenience for the occupants.

Bureau Of Working Conditions, DOLE

According to Dr. Melba Sacro of the Occupational Health and Safety Division, no reports or researches have been made on SBS and BRI. The department, however, keeps track of medical records of company clinics nationwide. The most common illness is the common cold, a health concern which can not be directly attributed to the workplace, since causes may also be allergic or viral in nature.

Occupational Safety And Health Center, DOLE

No studies here have been made specifically pertaining to SBS and BRI, although a number of their researches have focused on indoor air quality and labor conditions.

IV. ASSESSING THE SITUATION

There is a relatively moderate level awareness of the health risk factors brought about by SBS and BRI, even if a only minority can identify them by name and know that these types of syndromes exist. Although the size of sample population is too minute to make the survey conclusive, the idea remains that the Filipino would consider his workplace as a probable source of health risk. This awareness level should be an indication that we should start taking concrete measures to safeguard the health of the labor force through the appropriate design of their environment.

However, lack of government-initiated quantitative research on SBS and BRI indicate the low priority placed on this issue. Notable causes for this are the low, if not negligible, incidence reports and the presence of other outdoor pollutants and stress factors (such as the traffic situation) to which health and comfort problems may be attributed by the Filipinos.

Unlike in the U.S. where indoor air quality is part of the jurisdiction of the Environmental Protection Agency,[8] in the Philippines, the DENR excludes indoor environment from their responsibility. Monitoring and control is given to the DOLE, an agency whose major concern is the work force, and the DOH, which can claim responsibility for both the working and non-working areas such as residences.

Since SBS is associated with various illnesses and comfort problems for which no specific cause can be identified, data collection for research on this field can have certain limitations. Hence, quantitative data can also be limited and qualitative data analysis can not be easily conducted.

V. A PLEA FOR CLEANER INDOOR AIR

A more thorough government-sponsored SBS and BRI research should be conducted on existing buildings, preferably starting with public facilities which, upon visual survey, may be po-

tential health hazards. This should produce generally acceptable conclusions which may pave the way for legislative action on indoor air pollution.

A counterpart of the U.S. EPA Office of Radiation and Indoor Air should be created under the DENR. This should be provided with investigative and police capabilities which may be used upon recommendation of other agencies such as the DOH and the DOLE. In essence, it should be an inter-agency effort to be spearheaded by the DENR. Consequently, appropriations for research and development should be made.

One essential approach to implementation is to involve the private sector such as the building owners' and managers' associations and the organizations of mechanical engineers, architects, and other building industry professionals. This should provide more technical and practical means of understanding the program and eventually solving the indoor air problem.

This should lead to introduction of training programs for professionals involved from building design conceptualization up to post-occupancy maintenance. On the government level, standards and building codes should identify which environment and health risk materials are to be avoided or totally banned.

Raising the awareness of the citizens on the issues concerned should be viewed as instrumental in prevention and control since much of the pollutants identified are basic consumer products. Vigilant consumerism should also be promoted to expose to the public possible health hazards that may be present in the products, hence, indirectly pressuring manufacturers to be more environment-sensitive.

ENDNOTES

[1] U.S. Environmental Protection Agency (EPA) Fact Sheet 1991

[2] WHO Regional Publications European Series No. 31, Indoor Air Quality: Biological Contaminants, report on a WHO Meeting at Rautavaara 29 Aug.- 2 Sept. 1988. (1991). pp. 4-9.

[3] Susan Lang, "A new Cornell study finds bad office air, not vibes, may cause symptoms of sick building syndrome (1998)" http:///www.sdearthtimes.com/et0398/et0398s12.html. Accessed 16 July 1999.

[4] EPA Fact Sheet 1991

[5] WHO Regional Publications European Series No. 31

[6] WHO European Reports and Studies No. 21, Health Aspects Related to indoor Air Quality, report on WHO Working Group at Bilthoven 3-6 April 1979, pp. 10-11.

[7] EPA Fact Sheet 1991

[8] U.S. Environmental Protection Agency, Building Air Quality Agenda for Building Owners and Facility Managers (1991), p.157-161.

BIBLIOGRAPHY

Books and Publications

U.S. Environmental Protection Agency. Building Air Quality Agenda for Building Owners and Facility Managers. 1991.

WHO European Reports and Studies No. 21. Health Aspects Related to Indoor Air Quality. Report on WHO Working Group at Bilthoven 3-6 April 1979.

WHO Regional Publications European Series No. 31. Indoor Air Quality: Biological Contaminants. Report on a WHO Meeting at Rautavaara 29 Aug.- 2 Sept. 1988. 1991.

Holcomb, Larry and Milton Meckler. "IAQ - Definitions and Sources of Indoor Air Contaminants." In Improving Indoor Air Quality Through Design, Operation and Maintenance . Georgia: The Fairmont Press, 1996.

Internet Sources:

Hendrickson, Donald. "Building Related Illnesses (Sick Building Syndrome)." http://www.hml.com/new_sickbuilding.html Accessed 16 July 1999.

"Indoor Air Facts No. 4 (revised) Sick Building Syndrome (SBS)." http://www.epa.gov/iedweb00/pubs/sbs.html. Accessed 16 July 1999.

Lang, Susan. "A new Cornell study finds bad office air, not vibes, may cause symptoms of sick building syndrome." http://www.sdearthtimes.com/et0398/et0398s12.html. Accessed 16 July 1999.

Sawnor, Marcia. "Avoiding Sick Building Syndrome." http://www.isdesignet.com/isdesignet/Magazine/Jun'95/SickBuilding.html. Accessed 16 July 1999.

Personal Interviews with author:

Sacro, Melba. Department of Labor and Employment. 2 August 1999.

Siador, Cesar. Department of Environment and Natural Resources. 26 July 1999.

Sumera, Lina. UP College of Public Health. 2 August 1999.

Tecson, Agnes. Department of Labor and Employment. 26 July 1999.

Timbang, Rene. Department of Health. 28 July 1999.

Vitasa, Benjamin. UP College of Public Health. 28 July 1999.

Appendix A

United States Federal Agencies with major air responsibility for public and commercial buildings

U.S. Environmental Protection Agency

- conducts non-regulation indoor air quality program that emphasizes research, informative discussion, technical guidance and training
- issues regulations and carries out other activities that affect indoor air quality under the laws for pesticides, toxic substances, and drinking water

Public Information Center

- distributes air quality (including IAQ) publications

Natural Pesticides Telecommunications

- provides information on pesticides

Occupational Safety and Health Administration

- promulgates safety and health standards
- trains and consults
- enforces regulation

Natural Institute for Occupational Safety and Health

- research, recommends standards to U.S. Department of Labor
- conducts trainings
- undertakes investigations

Private U.S. Organizations with same resposibilities

Building Management Association

Professional and Standard Setting Organizations

- American Society of Heating, Refrigerating, and Airconditioning Engineers
- American Industrial Hygiene Association
- National Conference of States on Building Codes and Standards

Appendix B

MORBIDITY: TEN (10) LEADING CAUSES
No. & Rate/100,000 Pop.
PHILIPPINES
5-YEAR AVERAGE (1989-1993) & 1994

CAUSE	5-Year Average (1989-1993)		1994	
	NUMBER	RATE	NUMBER	RATE
1. DIARRHEAL DISEASES	1,011,922	1611.9	1,376,669	2006.1
2. BRONCHITIS	887,935	1414.4	1,146,951	1671.3
3. INFLUENZA	440,229	701.3	840,611	1224.9
4. PNEUMONIAS	281,263	448.0	610,731	890.0
5. ACCIDENTS	128,866	205.3	211,288	307.9
6. TUBERCULOSIS (all forms)	156,456	249.2	167,763	244.5
7. DISEASES OF THE HEART	87,786	139.8	141,594	206.3
8. VARICELLA	35,302	56.2	76,553	111.6
9. MEASLES	57,386	91.4	59,041	86.0
10. MALARIA	67,612	107.7	58,615	85.4

MORBIDITY: TEN (10) LEADING CAUSES
No. & Rate/100,000 Population
PHILIPPINES, 1994

CAUSES	NATIONAL CAPITAL REGION	
	NUMBER	RATE
1. BRONCHITIS	95,350	1069.2
2. DIARRHEAS	75,895	851.1
3. PNEUMONIAS	68,457	767.7
4. INFLUENZA	41,078	460.6
5. T.B. (all forms)	21,028	235.8
6. ACCIDENTS	10,707	120.1
7. MALIGNANT NEOPLASMS	10,339	115.9
8. DISEASES OF THE HEART	8,571	96.1
9. CHICKEN FOX	5,229	58.6
10. MEASLES	3,699	41.5