

# The Deposition of Dust Fall in Vertical Direction of Buildings in Phitsanulok City, Thailand

Pajaree Thongsanit, Krisada Sonthipho, Nikom Luanthon, and Pongsathon Suktadapong

**Abstract**—This research studied of the dust fall in the vertical direction of four buildings in Phitsanulok city, located in the lower northern part of Thailand. The researchers collected the dust fall samples which were from four sites namely, the first was Buddhachinaraj Boromarajonani Nursing College, the second was Phitsanulok city hall, the third was civil engineering building in Naresuan university, the fourth was Chunsuriya Dormitory. The dust fall jar set in the terrace of each floor of those buildings. Dust fall measured using method for 30 days during rainy season during July 2010 to September 2010 and winter season during October 2010 to November 2010. The samples were analyzed by weight measurement or gravimetric method. The concentration of dust fall in Phitsanulok is 1.9 to 287.5 mg/m<sup>2</sup>/day. Some data were exceeding the dust fall in residential areas of 65 to 130 mg/m<sup>2</sup>/day. The dust fall was setting at height of 1.5 to 2.5 m had the highest of dust fall value at Buddhachinaraj Boromarajonani Nursing College and Phitsanulok city hall. Because of the environment nearby the roads, construction building and living birds area. The sources of dust were road dust and human and animal activities near the sampling area.

**Index Terms**--Dust Fall, Vertical Direction, Phitsanulok Building.

## I. INTRODUCTION

Phitsanulok province, is located in the lower northern part, is one of the important economic areas in which there is a rapid growth of industry, transportation, traffic, and construction activities. The expansion causes air pollution problem because the dust quantity increases as the city expansion increases. The dust has an adverse effect to health and visibility. It adsorbs metal, organic substances and inorganic substances on its surface. The adsorbed matters could transform to an acid when combined with water stream in the air, either rain and stream. It can damage buildings, because troubles and annoyance among people [1]. Many reports indicated that the quantity of dust has effect on human and it has been found to be associated with the daily mortality rate [2-5]. This research objective is to study of the dust fall in the vertical direction of four buildings in Phitsanulok city, northern part of Thailand.

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## II. RESEARCH METHOD

The research studied of the dust fall in the vertical direction of four buildings in Phitsanulok city, located in the lower northern part of Thailand. The researchers collected the dust fall samples which were from four sites namely, the first was Buddhachinaraj Boromarajonani Nursing College (Figure 1), the second was Phitsanulok city hall. (Figure 2), the third was civil engineering building (Figure 3) in Naresuan university, 15 Km far from Phitsanulok city, the fourth was Chunsuriya Dormitory, (Figure 4) community near Naresuan University, 15 Km far from Phitsanulok city. The dust fall jar set in the terrace of each floor of those buildings.



Fig. 1 Buddhachinaraj Boromarajonani Nursing College



Fig. 2 Phitsanulok City Hall



Fig. 3 Civil Engineering Building



Fig. 4 Chunsuriya Dormitory

**Sampling Method:** The dust fall sampling equipment was including of the water sampling cylindrical bottle with a diameter of about 13 cm, height 20 cm. The plastic cone shape with diameter of 8 inch use dust fall and rain collection. The plastic screening was cover for protecting the sample. The stand of water samples container was used 1.5 m long pipe. The basket for bottle samples was used. The dust fall equipment was shown in Figure 5. The sampling period was 30 day starting from July year 2010 to November year 2010. One spot gave four to seven dust fall samples per month. Studies parameters and sample analysis; the concentration of the dust of which dust fall was analyzed by weight measurement or gravimetric method.



Fig. 5 The Dust Fall Sampling Equipment

### III. RESULTS AND DISCUSSIONS

The statistical summary of the dust fall data from of Buddhachinaraj Boromarajonani Nursing College in Phitsanulok, across the period July 2010 to November 2010 is show in table 1. The data maximum value of 122.9 microgram per square meter per day, recorded on first floor, The four of samples at Buddhachinaraj Boromarajonani Nursing College were exceeded the residential standard value of 65-130 microgram per square meter per day.

TABLE I  
THE MEAN OF DUST FALL LEVEL IN THE VERTICAL DIRECTION OF  
BUDDACHINARAJ BOROMARAJONANI NURSING COLLEGE  
IN JULY TO NOVEMBEFR

	Buddhachinaraj Boromarajonani Nursing College				
	July	Aug	Sep	Oct	Nov
Frist Floor	<b>122.9</b>	104.7	81.7	36.4	22.9
Second Floor	1.9	15.4	21.8	2.9	<b>94.7</b>
Third Floor	5.1	7.7	34.8	6.5	6.5
Fourth Floor	11.2	4.7	37.3	3.8	11.8
Fifth Floor	23.9	29.5	59.2	63.0	13.7
Sixth Floor	-	-	-	-	-
Seventh Floor	-	-	-	-	-

The statistical summary of the dust fall data from of Phitsanulok City Hall in Phitsanulok, across the period July 2010 to November 2010 is show in table 2. The high concentration of dust data were in first floor those were exceeded the residential standard value of 65-130 microgram per square meter per day.

TABLE II  
THE MEAN OF DUST FALL LEVEL IN THE VERTICAL DIRECTION OF  
PHITSANULOK CITY HALL IN JULY TO NOVEMBEFR 2010

	Phitsanulok City Hall				
	July	Aug	Sep	Oct	Nov
Frist Floor	-	<b>287.5</b>	<b>207.5</b>	<b>146.7</b>	<b>120.1</b>
Second Floor	-	13.7	39.8	18.9	16.6
Third Floor	-	<b>95.4</b>	47.6	44.3	62.3
Fourth Floor	-	15.4	5.9	5.1	39.6
Fifth Floor	-	31.8	30.4	40.0	<b>73.3</b>
Sixth Floor	-	7.0	6.2	61.7	<b>97.9</b>
Seventh Floor	-	13.6	4.1	21.7	32.6

The statistical summary of the dust fall data from of Civil Engineering Building in Phitsanulok, across the period July 2010 to November 2010 is show in table 3. The five samples of dust fall were higher the residential standard value of 65-130 microgram per square meter per day.

TABLE III  
THE MEAN OF DUST FALL LEVEL IN THE VERTICAL DIRECTION OF CIVIL  
ENGINEERING BUILDING IN JULY TO NOVEMBEFR 2010

	Civil Engineering Building				
	July	Aug	Sep	Oct	Nov
Frist Floor	63.8	58.5	50.1	42.7	58.4
Second Floor	56.3	59.6	<b>67.8</b>	30.7	5.5
Third Floor	17.8	33.06	<b>148.5</b>	<b>108.7</b>	25.0
Fourth Floor	12.0	42.61	<b>96.5</b>	<b>73.2</b>	49.5
Fifth Floor	-	-	-	-	-
Sixth Floor	-	-	-	-	-
Seventh Floor	-	-	-	-	-

The statistical summary of the dust fall data from of Chunsuriya Dormitory in Phitsanulok, across the period July 2010 to November 2010 is show in table 4. The dust data in July and August 2010 were higher the residential standard value of 65-130 microgram per square meter per day.

TABLE IV  
THE MEAN OF DUST FALL LEVEL IN THE VERTICAL DIRECTION OF  
CHUNSURIYA DORMITORY IN JULY TO NOVEMBER 2010

	Civil Engineering Building				
	July	Aug	Sep	Oct	Nov
Frist Floor	5.1	11.8	45.9	4.1	23.9
Second Floor	141.5	66.2	42.8	41.8	16.2
Third Floor	110.7	71.3	56.0	77.9	14.7
Fourth Floor	166.3	112.1	57.3	41.5	26.7
Fifth Floor	151.1	113.3	11.9	31.5	39.6
Sixth Floor	-	-	-	-	-
Seventh Floor	-	-	-	-	-

#### IV. CONCLUSION

The concentration of dust fall in Phitsanulok is 1.9 to 287.5 mg/m<sup>2</sup>/day. Some data were exceeding the dust fall in residential areas of 65 to 130 mg/m<sup>2</sup>/day. The dust fall was setting at height of 1.5 to 2.5 m had the highest of dust fall value at Buddhachinaraj Boromarajonani Nursing College and Phitsanulok city hall. Because of the environment nearby the roads, construction building and living birds area. The sources of dust were road dust and human and animal activities near the sampling.

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