Study of Radon Exposure from Granite Quaries and Usage of Granite

Sushma N[1], Ganesh Rathod[2], Dr.V.Krishnamurthy[3]

[1]Assistant Professor Department of Civil Engineering, Student[2], Chairperson[3]

Department of Civil Engineering PES University

Abstract – Radon is a dangerous gas belonging to ionizing property, because it has no taste odour and colour. Exposure arising from soil, water and internal sources, these produces the radon gas and ionizing radiation are of course natural. The main danger from high radon exposure is an increased risk of developing lung cancer. An extensive study carried out on both outdoor and indoor activities and the concentration of radon exposure measured at granite dwelling region and building structures in the state of Karnataka, India .It has been carried out by using 'hand held personal dosimeter'(Atomtex-AT6130), nine different granite quarries and a university campus were selected for the measurement. The average annual outdoor and indoor concentration of radon at the study area varies from 1.36 to 3.23 mSv/y and 1.95 to 1.98 mSv/y respectively. Exposure levels are within the recommended values for both indoor and outdoor has no effect on work environment.

Keywords- Radon, ionizing radiation, dosimeter, quarry, granite

I. INTRODUCTION

Radon is a radioactive gas produced naturally by the decay of uranium in the earth crust. The concentration level and the production of the radon are not uniform because it is odourless colourless and tasteless. Radon is chemically inert it can easily escape from the earth crust into the air, once it is produced, it moves through the ground to the air and some part dissolves in water and remains below the earth surface and flows under the ground surface. When radon undergoes decay it emits the ionizing radiations in the form of alpha particles and also emits the short-lived decay products.

The WHO 〖2011〗^((1)) report cleared, that there is significant risk of lung cancer from living with radon in work environment. In most human radiation exposure studies, the contribution of thoron is usually neglected 〖concentration〗^((2)) because of generally low. Radon gas and low level ionizing radiation are the natural component parts of the environment; to which we are exposed every day. Exposure arising from soil, water and internal sources, these produces the radon gas and ionizing radiation are of course natural, granite and other building materials.

It is worldwide issue and in some countries has been affected by it. The main danger from high radon exposure is an increased risk of developing lung cancer. It is reported that radon emission is a concern to health of granite workers and is to the investigated in a systematic manner. It is important to find out for what extent people are being exposed to radon, because long term exposure in granite quarries and indoor. This project explores quantifying environmental radon by using probable ionizing radiation meter. The places would be work environment that exist as granite quarries in all around Bangalore. The work involves both environmental monitoring for radon, all collection of general health data of workers by questionaries' all un favouring techniques

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II. SYSTEM MODEL

HAND HELD PERSONAL DOSIMETER (ATOMTEX-AT6130), was used to measure the concentration levels of Radon exposure from granite quarry which measures exposure levels based on 'SPOT SAMPLING TECHNIQUE'. This device operating principle is based on the process of count rate measurement of impulses generated in Geiger Muller counter tube under the influence of x-gamma and beta radiation. This radiation monitor measures the up to 2,000 measurement results can be stored in non-volatile memory with information about measurement date and time.

III. PREVIOUS WORK

Radon exhalation from building materials for decorative use was reported and determined for 53 different samples of drywall, tail and granite available on the Canadian market for interior home decoration[Jing Chen, Naureen

M Rahman, Ibrahim Abu Atiya, 2010 (2)]. Radon or Thoron and their decay products in granite quarries around Bangalore city, India was measured in both indoor and outdoor radon exposure using solid state nuclear track detector (SSNTD, LR-115, type-2 plastic track detector). During summer and winter period (2006-2007) [C.Ningappa, j. Sannappa, M.S. Chandrasekhar, l. Paramesh, 2009 (3)]

IV. PROPOSED METHODOLOGY

Concentration levels of Radon exposure from granite quarry and usage of granite, is measured using 'HAND HELD PERSONAL DOSIMETER'(ATOMTEX-AT6130), which measures exposure levels based on 'SPOT SAMPLING TECHNIQUE'. This device operating principle is based on the process of count rate measurement of impulses generated in Geiger Muller counter tube under the influence of x-gamma and beta radiation. This radiation monitor measures the up to 2,000 measurement results can be stored in non-volatile memory with information about measurement date and time.

The outdoor radon Exposure levels were measured at corners, intermediate points of quarry and work positions of workers such as drilling place, blasting place, drivers, and stone cutting and after 30 min and 60 min of work complete. Also measured in all directions around the quarry site during morning sessions, afternoon session and evening session at a distance of 100 m and 500 m respectively. Similarly the indoor radiations also measured at every floors of a building structure.

V. SIMULATION/EXPERIMENTAL RESULTS

The outdoor concentration of radon exposure levels where measured in different granite dwellings in Bangalore rural, Ramanagara, Koppal, Vijayapura, Bagalkot and Raichuru districts in the state of Karnataka, India The average outdoor radiation levels observed in different quarries is presented in Table 3 the monitored data observed at morning afternoon and evening is detected. it can be observed that Maximum levels were noted M/S GEM Granites at all the times of the day during action work the value varied 3.00 mSv/y to 3.23 mSv/y. the next higher level of radiation was we viewed at BTC stones that varied from 2.83 mSv/y to 3.18 mSv/y.. In other queries the value of radiations varied at 1.53 to 2.82 however all the values of radiations monitored at different quarries at different times during day file within the recommended dose 20 mSv/y occupationals.

The average indoor radiation levels observed in a University Campus. the concentration levels observed at morning afternoon and evening is estimated and maximum concentration levels were noted in University Campus at all the time of the day the value varied from 1.95msv/yto 1.98 mSv/y however all values of radiation estimated at a University Campus at different time of day fell within the recommended dose of 2.4 mSv/y for public exposure and indoor.

Table 2: Average radon exposure at corners of different granite quarries.

Sl.No	**Name of the quarry**	**Avg. Exposure at corners of quarry site in mSv/y**
1	Sadahalli stone quarry	2.62
2	SSKT stone quarry	1.58
3	Keppadoddi stone quarry	1.66
4	Kumar stones and minerals	2.13
5	Kabini minerals	2.29
6	GEM granites	3.22
7	BTC stones	3.15
8	Pink granite quarry	2.15
9	Amar granite quarry	2.48

A comparison of radiation levels at corners in different quarries sowed slightly higher levels compare to other spots in the same quarry. The radiations are presented in table 2. The radiation range observed was 1.58 to 3.22 mSv/y., the radon distribution was at corners the phases of the work surface would be more when compared to the other places. In the present study at M/S GEM an at M/S BTC stones, the radiation levels were relatively higher, largely owing to these quarries spread over large areas and explores in grey granite quarrying. Also at these quarries maximum number of workers were observed (about 4500-5000 workers at GEM) compared to other quarries.

The Fig 1 shows the maximum outdoor concentration of Radon where observed in the granite quarries of Bulkundi village, Vijayapura district. These village granite quarries produce white piracema granite and raw silk granite. The lower outdoor concentration of Radon where observed in the granite quarries of Gabbadi and Keppadoddi villages and provides Azul crystal granite. This may be because of topographical conditions, type of rock, presence of water or due to the environmental condition

Table 3: Average radon exposure at different granite quarries.

Sl.No	Name of the quarry	Avg. Exposure at quarry site (mSv/y)	Avg. Exposure around the quarry during morning (mSv/y)	Avg.Exposure around the quarry during afternoon (mSv/y)	Avg. Exposure around the quarry during evening (mSv/y)
1	Sadahalli stone quarry	2.52	1.52	1.58	1.53
2	SSKT stone quarry	1.67	1.67	1.57	1.67
3	Keppadoddi stone quarry	1.64	1.36	1.37	1.47
4	Kumar stones and minerals	2.08	1.67	1.57	1.67
5	Kabini minerals	2.21	1.82	1.66	1.65
6	GEM granites	3.23	3.05	3.09	3
7	BTC stones	3.18	2.97	2.97	2.82
8	Pink granite quarry	2	1.59	1.55	1.54
9	Amar granite quarry	2.4	1.88	1.69	1.65

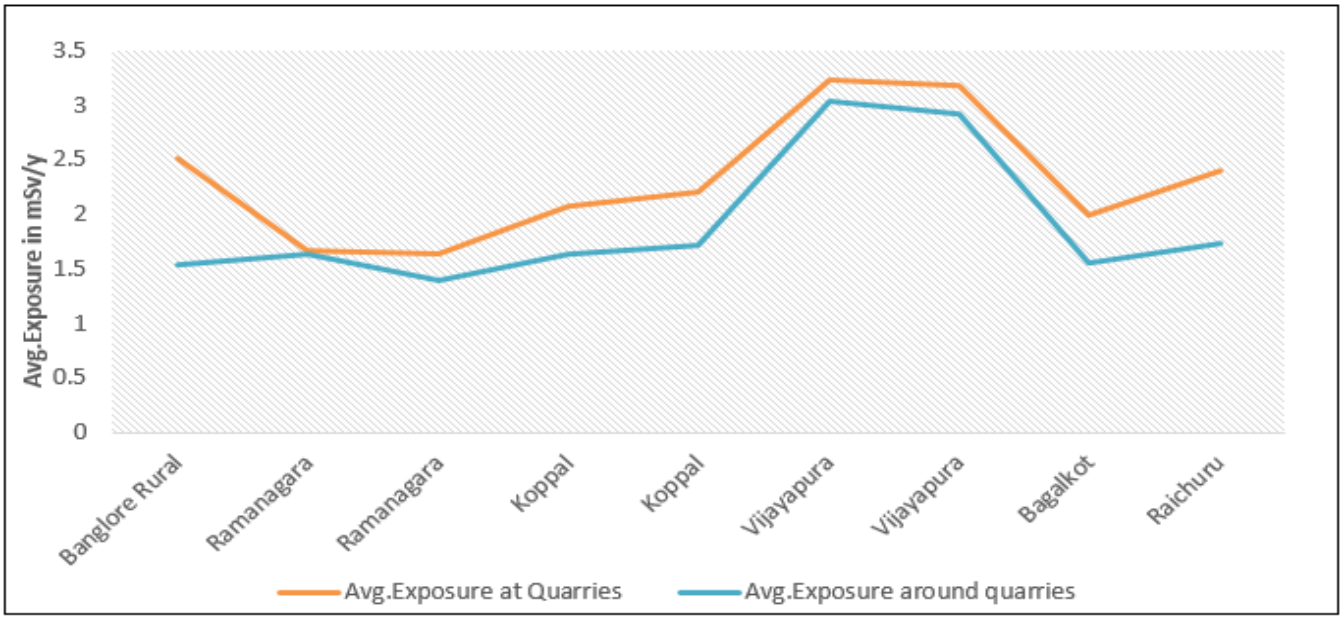

Fig.1 comparission between avg.radon exposure at different granite quarries and around the granite quaries.

VI. CONCLUSION

Annual radon concentration levels from different granite dwelling places and indoor concentrations from a university campus were calculated using the spot sampling technique. The results showed that the outdoor and indoor concentration level are approximately same. The higher concentration of radon depends on the intensity of work carried out. The annual average radon exposure level are, below the action level of 20 mSv/y for outdoor workers and 2.4 mSv/y for indoor households which are recommended by the WHO (2011). This present case study cleared that do not pose a significant radiation hazard to the workers, and thus it is safe for work environment and the use of granite materials in the construction of buildings and is considered to be safe for the indoor households.

VII. FUTURE SCOPES

Further studies can be carried out for more number of outdoor quarry sites and also for indoor households to identify significant radiation hazards to workers and for work environment.

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