GOVERNMENT OF INDIA
MINISTRY OF EARTH SCIENCES
LOK SABHA
STARRED QUESTION No. ***14**
TO BE ANSWERED ON THURSDAY, DECEMBER 05, 2013

EARTHQUAKE IN DELHI

***14. SHRI S. S. RAMASUBBU**:
SHRI SANJAY DINA PATIL:

Will the Minister of **EARTH SCIENCES** be pleased to state:

(a) whether the Government is aware of the recent jolts of earthquakes suffered by the national capital, Delhi;
(b) if so, the details of each of the earthquake detected along with their intensity and the losses incurred during the last three years and current year, year-wise;
(c) whether Delhi and the National Capital Region (NCR) comes under the category of severe seismic zone and the buildings are generally not earthquake proof; and
(d) if so, the details thereof along with the preventive measures taken/being taken by the Government in this regard?

ANSWER
MINISTER FOR MINISTRY OF SCIENCE AND TECHNOLOGY AND
MINISTRY OF EARTH SCIENCES
(SHRI S. JAIPAL REDDY)

(a) to (d): A Statement is laid on the Table of the House.

STATEMENT LAID ON THE TABLE OF THE LOK SABHA IN REPLY (a) to (d) TO STARRED QUESTION NO. *14 REGARDING "EARTHQUAKE IN DELHI" TO BE ANSWERED ON THURSDAY, DECEMBER 05, 2013

(a) Yes Madam.

(b) Low magnitude tremors (ranging from 2.5-3.3 on Richter's scale) related to 4-earthquakes along with thud like sound have occurred in surrounding regions of NCR of Delhi on 12th November, 2013 during 0040h – 03:41h of IST.
The details of earthquake related tremors recorded during last 3-years are given in the Annexure-I.

(c)-(d) Yes Madam. NCR of Delhi falls under the high active (severe) seismic zone-IV region. Bureau of Indian Standards [IS-1893 (Part-1): 2002], based on the past seismic activity history, grouped the country into four seismic zones, viz. Zone-II (least active seismic zone), Zone-III (moderately active seismic zone), Zone-IV (high active(severe) seismic zone) and Zone–V (highest active (most severe) seismic zone).

Further, the Modified Mercalli Intensity (MMI), that measures the impact of the earthquakes on the surface of the earth consisting of 12 increasing levels of intensity that range from imperceptible shaking to catastrophic destruction, is designated by Roman numerals (I-XII), for NCR of Delhi is VIII. While the magnitude for an earthquake remains the same irrespective of where it is measured, the intensity and associated impact of earthquake, however, decreases with the distance from the epicentre. Normally, damages are associated with intensity V or more. Under the MMI-VIII zone, the expected damage is given below:

- **slight** for specially designed structures;
- **considerable** for ordinary buildings with partial collapse;
- **great** for poorly built structures;
- panel walls thrown out of frame structures;
- fall of chimneys, factory stacks, columns, monuments and walls;
- overturning of heavy furniture;
- small amount ejection of sand/mud;
- change in ground water levels in wells;
- disturbed drivers in vehicles

By imparting professional training to the Engineers of the civic bodies, Delhi Government is enhancing the technical capabilities of field engineering wings to survey potentially weak buildings. Guidelines for improving Earthquake Resistance of Low Strength Masonry Buildings (IS 13828:1993) that covers the special features of design and construction for improving earthquake resistance of buildings of low-strength masonry are already in force to supplement these efforts.

Ministry of Home Affairs is keen to see atleast from now that all new buildings constructed under various National and State schemes should be made earthquake

resistant (as per the Bureau of Indian Standards detailed at Annexure-II) in the first instant so that no new additions to the stock of existing unsafe buildings are made.

The Delhi Government in coordination with the National Institute of Disaster Management (NIDM) and National Disaster Management Authority (NDMA) had organized 6-training programmes for training 300-Engineers of Municipal Corporation of Delhi and New Delhi Municipal Committee on the "Rapid Visual Screening (RVS)" with particular reference to the evaluation of safety criteria for dangerous buildings in Delhi. Sphere heading the RVS pilot of identifying 10000 buildings in East Delhi, NIDM in its last training programme, that concluded in November, 2012, had deliberated in detail the findings from RVS pilot study and made MCD engineers familiar with the special purpose RVS data management software. The above training programmes have kept a good balance between class room lectures and hands on exercise, along with some nondestructive testing exercises in the field.

Annexure - I

LIST OF EARTHQUAKES OCCURED DURING YEAR 2010 OVER THE NCR DELHI

Date	Origin Time (in UTC)			Latitude (^{o}N)	Longitude (^{o}E)	Depth	Magnitude (in Richter scale)
	Hr	Min	Sec				
29-01-2010	09	41	2.4	29.17	77.01	10	3.3
03-02-2010	05	17	11.1	28.70	76.77	10	2.9
24-02-2010	19	20	52.7	28.58	76.97	10	2.6
25-02-2010	00	49	57.5	28.33	77.39	10	2.6
03-03-2010	11	48	18.7	28.83	76.97	16	2.3
05-03-2010	05	15	52.2	29.16	76.92	10	2.7
15-03-2010	08	09	22.7	28.89	76.64	10	2.3
22-03-2010	03	54	22.0	28.72	76.57	10	2.2
23-03-2010	17	46	44.0	28.66	76.62	10	2.8
15-04-2010	08	12	8.3	28.93	76.93	23	2.7
02-06-2010	18	06	4.4	28.71	76.64	10	2.6
07-06-2010	17	12	34.2	28.83	77.32	10	3.2
20-07-2010	08	31	0.8	28.76	77.02	10	2.4
30-08-2010	15	45	12.5	29.02	77.22	10	2.9
09-09-2010	22	38	39.2	28.64	76.93	12	2.3
30-09-2010	05	48	45.5	29.01	77.32	10	2.3
22-10-2010	07	04	56.5	28.69	76.59	10	2.4
03-11-2010	14	33	36.4	28.72	76.53	10	2.4
13-12-2010	09	15	1.7	29.00	76.59	10	2.3

Total number of events: 20

LIST OF EARTHQUAKES OCCURED DURING YEAR 2011 OVER THE NCR DELHI

Date	Origin Time (In UTC)			Latitude (^{o}N)	Longitude (^{o}E)	Depth	Magnitude (in Richter scale)
	Hr	Min	Sec				
05-01-2011	22	23	23.2	28.91	76.73	10	2.0
16-01-2011	12	50	51.7	28.76	76.98	10	2.3
26-01-2011	03	06	45.0	29.06	77.21	10	3.2
03-02-2011	09	33	24.7	29.03	76.65	16	2.9
18-02-2011	13	27	0.6	29.04	77.28	5	2.0
22-02-2011	10	19	2.5	28.81	76.73	10	2.2
24-02-2011	21	01	16.2	29.03	76.95	10	2.6
01-03-2011	13	26	39.2	28.44	76.59	10	1.9
15-03-2011	01	11	32.5	28.87	76.61	18	2.1
25-03-2011	07	19	25.2	28.98	77.11	17	2.8
09-04-2011	15	08	51.9	28.92	77.14	10	2.4
10-04-2011	10	45	35.7	28.69	77.40	8	2.1
27-04-2011	08	33	24.6	28.81	77.36	10	2.5
29-04-2011	11	23	45.5	28.83	77.08	10	2.2
01-06-2011	12	00	13.3	29.06	76.97	14	2.2
10-06-2011	09	11	49.2	28.96	76.78	10	2.3
11-07-2011	07	58	11.8	29.12	76.58	15	2.1
20-07-2011	20	21	15.6	28.48	76.87	10	2.1
04-08-2011	19	00	40.2	28.91	76.63	15	2.5
15-08-2011	18	22	33.7	29.07	76.67	10	2.3
23-08-2011	20	14	3.7	28.64	76.99	10	2.5
27-08-2011	20	16	10.8	28.92	76.59	10	2.0
02-09-2011	06	13	17.1	28.95	76.69	10	2.0
07-09-2011	17	58	18.6	28.63	77.11	10	3.8
09-09-2011	10	26	44.4	28.64	77.22	8	1.8
11-09-2011	21	41	54.5	28.64	77.18	12	2.0
14-09-2011	23	28	32.7	28.63	77.13	8	2.1
26-10-2011	11	21	2.2	28.14	76.93	10	2.0
04-11-2011	04	26	50.4	28.91	76.72	10	2.5
04-11-2011	15	52	54.4	28.92	77.02	15	2.6
21-11-2011	09	56	1.7	29.11	76.83	19	2.8
24-11-2011	19	09	20.5	28.70	77.15	11	2.5
27-11-2011	09	36	57.0	28.61	76.75	10	2.1
08-12-2011	01	48	34.4	28.61	77.11	10	2.6
08-12-2011	19	43	7.3	28.69	76.87	10	2.2

Total number of events: 39

LIST OF EARTHQUAKES OCCURED DURING YEAR 2012 OVER THE NCR DELHI

Date	Origin Time (In UTC)			Latitude (^{o}N)	Longitude (^{o}E)	Depth	Magnitude (in Richter scale)
	Hr	Min	Sec				
22-01-2012	04	38	22.2	28.79	76.78	14	3.0
28-01-2012	23	24	52.5	28.82	76.75	15	3.7
29-01-2012	21	37	5.5	28.84	76.75	10	3.2
12-02-2012	22	20	1.5	28.75	76.82	16	2.6
15-02-2012	06	26	53.7	28.70	76.81	16	2.6
05-03-2012	07	41	4.0	28.70	76.59	14	5.1
12-03-2012	22	07	21.7	29.04	76.97	10	3.6
24-03-2012	07	45	17.5	28.52	76.75	18	3.0
04-04-2012	01	10	26.7	28.76	76.84	18	2.4
17-05-2012	13	39	19.0	28.90	76.70	27	3.5
13-06-2012	03	16	3.0	28.70	76.60	10	2.8
19-6-2012	14	00	8.0	28.70	76.60	5	3.8
22-06-2012	02	44	42.0	29.00	77.10	7	3.5
22-06-2012	04	38	47.0	29.00	77.00	15	3.4
19-11-2012	06	25	21.0	28.70	76.60	5	3.5
19-11-2012	22	32	0.0	28.60	76.80	10	2.9
20-12-2012	03	44	15.0	28.60	76.70	20	2.7

Total number of events: 18

LIST OF EARTHQUAKES OCCURED DURING YEAR 2013 (till 28th November, 2013) OVER THE NCR DELHI

Date	Origin Time (in UTC)			Latitude (^{o}N)	Longitude (^{o}E)	Depth	Magnitude (in Richter scale)
	Hr	Min	Sec				
06-02-2013	08	22	45.0	28.80	76.50	5	2.7
10-04-2013	20	10	1.0	29.00	76.60	10	3.5
29-04-2013	00	57	5.0	29.00	77.20	5	3.0
18-07-2013	12	55	28.0	28.70	76.60	10	3.0
11-10-2013	18	05	34.0	28.80	76.70	10	3.3
11-11-2013	19	11	19.0	28.62	77.19	16	3.1
11-11-2013	19	12	34.0	28.61	77.24	13	2.2
11-10-2013	19	15	56.0	28.67	77.05	5	1.0
11-11-2013	19	37	17.0	28.61	77.18	10	1.3
11-10-2013	20	11	33.0	28.63	77.20	15	3.3
11-11-2013	20	25	08.0	28.64	77.16	15	2.5
11-10-2013	20	29	33.0	28.66	77.13	5	1.8
11-11-2013	20	33	42.0	28.66	77.07	8	1.7
11-10-2013	20	39	43.0	28.61	77.23	13	1.7
11-11-2013	20	40	23.0	28.61	77.24	12	1.8
11-10-2013	21	03	42.0	28.59	77.34	9	2.0
11-11-2013	22	10	45.0	28.65	77.14	13	2.8
11-10-2013	23	25	39.0	28.66	77.12	13	1.9
13-11-2013	10	38	22.0	28.69	77.05	7	1.5
13-10-2013	11	06	11.0	28.65	77.15	13	1.3
15-10-2013	03	06	32.0	28.64	77.04	11	1.6
15-11-2013	22	17	10.0	28.66	77.08	6	2.6
17-10-2013	06	48	25.0	28.61	77.27	12	1.7
18-11-2013	07	15	35.0	28.53	76.97	5	1.8

Total number of events: 24

Annexure-II

Bureau of Indian Standards (BIS) has published various standards/codes on earthquake engineering. A list of standards is enclosed.

LIST OF RELEVANT INDIAN STANDARDS ON EARTHQUAKE RESISTANT DESIGN AND CONSTRUCTION

S. No.	IS Number	Title
*1.	IS 1893: 1984	Criteria for earthquake resistant design of Structures
2.	IS 1893(Part 1): 2002	Criteria for earthquake resistant design of structures: Part 1 General Provisions and buildings
*3.	IS 1893(Part 4) : 2005	Criteria for earthquake resistant design of Structures: Part 4 Industrial structures including stack like structures.
*4.	IS 436:1993	Code of practice for earthquake resistant design and construction of buildings
5.	IS 4991:1968	Criteria for blast resistant design of structures for explosions above ground
6.	IS 6922:1973	Criteria for safety and design of structures subject to underground blasts
7.	IS 13827: 1993	Improving earthquake resistance of earthen building – Guidelines
8.	IS 13828:1993	Improving earthquake resistance of low strength masonry building – Guidelines
9.	IS 13920:1993	Ductile detailing of reinforced concrete structures subjected to seismic forces- code of practice.
10.	IS 13935: 2009	Seismic evaluation repair and strengthening of masonry buildings – Guidelines

* Under Revision

FINALISED DRAFTS UNDER PRINT

S. No.	DOC Number	Title
1	DOC.CED 39 (7231)	Criteria for Earthquake Resistant Design of Structures; Part Liquid Retaining Tanks
2.	DOC.CED 39 (7620)	Seismic Evaluation and Strengthening of Exiting Reinforced Concrete Building - Guidelines.
3	DOC.CED 39 (7620)	Earthquake Resistant Design and Construction of Building – Code of Practice (Third revision of IS 4326)
4.	DOC.CED 39 (7739)	Draft Indian Standards criteria for Earthquake Resistant Design of Structures: Part 3 Bridges and Retaining Walls.