

**TWO DAYS AWARENESS –CUM-DEMONSTRATION PROGRAMME ON
EARTHQUAKE RESISTANT CONSTRUCTIONS IN HIMACHAL
PRADESH FOR THE JUNIOR ENGINEERS AND MASONS OF
KANGRA DIVISION, HIMACHAL PRADESH**



**With the Technical Collaboration of
CENTRAL BUILDING RESEARCH INSTITUTE, ROORKEE
With the Financial Assistance
SEISMOLOGY DIVISION, MINISTRY OF EARTH SCIENCES
GOVERNMENT OF INDIA, NEW DELHI**

**Organized by
STATE COUNCIL FOR SCIENCE TECHNOLOGY & ENVIRONMENT, 34 SDA
COMPLEX, KASUMPTI, SHIMLA-9**

**PROGRAMME FOR TWO DAYS AWARENESS -CUM- DEMONSTRATION
WORKSHOP ON EARTHQUAKES AND EARTHQUAKE RESISTANT HOUSES FOR
THE JUNIOR ENGINEERS AND MASONS OF KANGRA DIVISION, HIMACHAL
PRADESH, ON 28-29th JULY 2011 AT CSK AGRICULTURE UNVIERSITY
PALAMPUR, DISTRICT KANGRA,HIMACHAL PRADESH.**

VENUE: Seminar Hall, Director Extension, CSK Agriculture University, Palampur, District Kangra, H.P.

PROGRAMME: 28th July 2011

Registration of participants: 1000-1030 hrs

1030-1130	Inaugural Function	
1130-1200	TEA BREAK	

TECHNICAL SESSION :

1200-1330	Technical Exposure and Philosophy on Appropriate Rural Housing materials and Technologies	Sh.S.G.Dave, CBRI Roorkee
1330-1415	LUNCH	
1415-1500	Earthquake and its effects	Dr.S.S.Randhawa SCSTE SHimla
1500-1600	Design of Disaster Resistant Housing	Sh.I.A.Siddiquie ,CBRI Roorkee
1600-1730	Demonstration of Appropriate Housing Techniques	Sh.H.K.Jain & Sh.Rajeev,CBRI Roorkee

Day II: 29th July 2011

0900-0930	Exhibition	
0930-1000	Film Show	
1000-1045	Quality control constructions	Sh.S.G.Dave, CBRI Roorkee
1045-1130	Making good quality cement concrete and mortars	Sh.H.K.Jain,CBRI Roorkee
1130-1145	TEA	
1145-1230	Ferro cement Technologies	Sh.S.G.Dave, CBRI Roorkee
1230-1330	Parallel Session-Quality Control in Construction for Engineers/ Practice Session for Masons	Sh.I.A.SiddiquieSh.H.K.Jain/Sh.Rajeev,CBRI Roorkee
1330-1415	LUNCH	
1415-1515	Demonstration of Technologies	Sh.H.K.Jain/Sh.Rajeev,CBRI Roorkee
1515-1630	Interactive Problem Solving Session	All faculty
1630-1700	Concluding Function	All faculty & participants

During the last century the state has been shaken by a number of micro as well as macro earthquakes. A number of damaging earthquakes has struck the state and the adjoining parts of Punjab,U.P.and J& K. Some of the prominent earthquakes that rocked the state are Kangra earthquake 1905(M=8.0) in which 18,815 people were killed, Kinnaur earthquake 1975 (M=6.7) in which 60 people lost their lives and Dharamshala earthquake 1986 (M5.7). During the last century the state experienced 141 earthquakes with the magnitude between 3-3.9 on Richter scale, 22 earthquakes having magnitude 4-

4.9, 43 having magnitude between 5-5.9, 7 earthquakes having magnitude 6-6.9 and only 1 earthquake having magnitude 8 on Richter scale and there are about 1130 earthquakes with magnitude less than 3 on Richter scale. As per the earthquake hazard map of state, the areas falling in



districts Chamba, Kangra, Mandi, Kullu, Hamirpur Bilaspur and Una are very sensitive as they fall in Very High Damage Risk Zone (MSK IX or More) where as the rest of the areas falls in High Damage Risk Zone (MSK VIII) Fig.1. Some of the major devastating earthquake that have rocked the state during the last century are as under:

**EARTHQUAKES HAVING MAGNITUDE 4 OR MORE ON RICHTER SCALE IN
HIMACHAL PRADESH DURING THE LAST 200 YEARS**

S.No	Year	Month	Day	Magnitude	Coordinates	Tentative location
1.	1809	-		5.5	30 ⁰ 42'00" 78 ⁰ 30'00"	Near Labrang (Distt.Kinnaur)
2	1827	9		5.5	32 ⁰ 30'00" 76 ⁰ 00'00"	Near Dalhousie (Chamba Distt.)
3	1856	4	7	5.0	31 ⁰ 00'00" 77 ⁰ 00'00"	Near Ranhog(Distt.Solan)
4	1858	8	11	5.0	31 ⁰ 7'12" 77 ⁰ 10'12"	Shimla(Distt.Shimla)
5	1865	04	11	---	Shimla region	
6	1905	4	4	8.0	32 ⁰ 18'00" 76 ⁰ 15'00"	Karari Dal(Distt.Kangra)
7	1906	2	28	7.0	32 ⁰ 00'00" 77 ⁰ 00'00"	Near Karshing(Distt.Kullu)
8	1930	5	11	5.5	31 ⁰ 42'00" 77 ⁰ 00'00"	Shila Kiepr (Mandi Distt.)
9	1940	04	07	-----	31 05 77 00	Near kali Hatti ,District Shimla
10	1945	06	22	6.5	32 ⁰ 36'00" 75 ⁰ 54'00"	Minu (Chmaba Distt.)
11	1947	7	10	6.2	32 ⁰ 36'00" 75 ⁰ 54'00"	Minu (Chmaba Distt.)
12	1950	8	12	5.5	32 ⁰ 36'00" 75 ⁰ 54'00"	Minu (Chmaba Distt.)
13	1951	09	22	6.4	32 36 76 30	East of Dhan Kanda ,District Chamba
14	1962	9	15	5.5	31 ⁰ 54'00" 76 ⁰ 12'00"	Near Dehra Gopipur (Distt.Kangra)
15	1965	02	21	4.5	32 14 76 54	Near Bara Banghal, District kangra
16	1967	09	20	---	32 36 76 06	Near Rajpura, District Chamba
17	1968	05	11	4.9	32 22 76 22	Near Atrori, District Chamba
18	1969	01	23	4.0	32 14 76 03	Near Trilokpur, District Kangra
19	1970	03	05	4.9	32 24	Near Sani, District

					76 29	Chamba
20	1972	01	29	4.7	32 51 75 54	
21	1973	12	16	4.9	32 17 76 01	Near Mordhu, District Chamba
22	1974	11	16	4.8	32 50 76 08	Tissa, District Chamba
23	1975	10	30	5.2	32 54 76 00	Near Bhujara, District Chamba
24	1975	12	11	5.1	32 50 76 58	Near Jankar, Sumdo, Lahaul & Spiti
25	1975	12	10	5.0	32 49 76 11	Near Chhajaut, District Chamba
26	1975	1	19	6.7	31 ⁰ 56'24" 78 ⁰ 31'48"	Distt. Kinnaur
27	1975	2	2	5.1	32 ⁰ 33'36" 78 ⁰ 53'00"	Indo China Border
28	1975	7	19	5.1	31 ⁰ 57'00" 78 ⁰ 35'24"	Near Chnago (Kinnaur Distt.)
29	1975	7	29	5.5	32 ⁰ 34'12" 78 ⁰ 29'24"	Near Kanum (Distt. Kinnaur)
30	1975	2	10	5.3	32 ⁰ 57'00" 76 ⁰ 06' 00"	Near Janu Pass (Chamba Distt.)
31	1975	2	11	5.0	33 ⁰ 00'00" 76 ⁰ 10'12"	Near Sathrundi (Chamba Distt.)
32	1976	1	7	5.3	32 ⁰ 58'12" 76 ⁰ 7'12"	Dunchili Gad (Chamba Distt.)
33	1976	01	09	4.7	32 59 76 01	Along J&K Border
34	1976	02	05	5.0	31 ⁰ 14'24" 77 ⁰ 01'48"	Near Chebri (Distt. Shimla)
35	1976	04	10	4.5	32 43 76 30	Near Balthal Got, District Chamba
36	1976	04	16	4.0	32 52 76 00	Near makkan, District Chamba
37	1976	7	6	5.1	32 ⁰ 26'24" 78 ⁰ 21'00"	Near Raksham (Kinnaur Distt.)

38	1976	9	8	5.3	32 ⁰ 14'08" 78 ⁰ 45'36"	Near Baspa origin(Kinnaur Distt.)
39	1977	2	19	5.4	31 ⁰ 48'00" 78 ⁰ 25'48"	Near Rangbar Thachang (Distt.Kinnaur)
40	1977	3	27	5.1	32 ⁰ 40'12" 78 ⁰ 39'36"	Lenchichi (Kinnaur Distt.)
41	1978	6	14	5.0	32 ⁰ 14'24" 76 ⁰ 36'36"	Near SinghauPass, along Kangra Border District.Chamba
42	1979	01	19	4.1	32 22 76 28	Near Chandota Pass, District Chamba
43	1980	05	29	4.2	31 33 76 33	
44	1980	09	04	4.0	32 00 76 54	Near Pajaund,District Mandi
45	1980	11	26	4.0	32 29 76 24	Near Khaddar,District Chamba
46	1981	02	14	4.0	32 35 76 37	Near Bara Kanda,District Chamba
47	1981	06	19	4.5	32 43 76 00	Near Lohari,District Chamba
48	1981	6	13	5.0	31 ⁰ 49'12" 78 ⁰ 27'36"	Nalpaya Thach (Distt.Kinnaur)
49	1981	5	28	5.2	31 ⁰ 49'48" 78 ⁰ 25'48"	Barling (Kinnaur Distt.)
50	1982	05	18	4.0	32 25 76 24	Near Chagrauta ,District Chamba
51	1983	2	27	5.3	32 ⁰ 36'00" 78 ⁰ 34'12"	Khadi Thach (Distt.Kinnaur)
52	1983	04	13	4.0	32 46 76 14	Near Tikkri Khas, District Chamba
53	1985	03	11	4.8	31 15 77 00	Near Malaun,District Shimla
54	1985	12	29	4.9	32 37 76 06	Near Theru, District Chamba
55	1986	4	26	5.5	32 ⁰ 19'00" 76 ⁰ 24'00"	Near Nag Dal (Boundary of Chamba and Kangra distt.)
56	1987	06	10	4.7	31 55 76 26	Near Daton, District Chamba
57	1987	12	26	4.3	32 07	Near Dewal

					76 41	Khas, District Kangra
58	1991	06	23	4.6	32 18 76 42	Near Gataunda, District Shimla
59	1992	01	26	4.5	32 16 76 24	Near Bhagsu Nath, District Kangra
60	1992	02	13	4.5	32 37 76 30	East of Dhan Kanda, District Chamba
61	1992	09	06	4.6	32 25 76 20	Near Darkund, District Chamba
62	1996	05	09	4.0	32 50 76 19	Near Kuntka Matha, District Chamba
63	1996	05	23	4.2	32 42 76 29	Near East of Kagal Dhar, District Chamba
64	1996	07	14	4.1	32 37 76 31	Near East of Dhan Kanda, District Chamba
65	1996	09	14	4.6	32 49 76 22	Near Kala Ka Bhandar, District Chamba
66	1997	07	29	4.7	31 33 76 48	Near Baldwara, District Mandi
67	1997	08	13	4.2	31 12 76 41	Near Jajjar, District Solan
68	1998	10	17	4.5	32 12 76 32	Near Kandha, District Kangra
69	1999	05	30	4.9	31 48 36 78 54 36	Near Miyang Lung, District Kinnaur
70	1999	01	08	4.2	31 26 24 77 18 00	Near Mehog, District Mandi
71	1999	05	30	4.9	31 48 36 78 54 36	Near Miyang Lung, District Kinnaur
72	1999	01	08	4.1	31 22 48 77 17 24	Near Karsog, District Mandi
72	2000	04	28	4.1	31 30 36 78 15 00	Near mehbar, District kinnaur
73	2000	08	28	4.5	32 01 48 78 18 00	
74	2000	09	26	4.0	30 55 12	

					75 39 00	
75	2000	06	17	4.3	31 48 00 78 27 00	Near Nalpaya, District Kinnaur
76	2001	06	17	4.2	32 42 36 78 26 24	
77	2001	01	22	4.0	31 04 12 77 55 48	Along Uttranchal Border
78	2001	02	23	4.0	30 55 48 78 00 00	Along Uttranchal Border
79	2001	09	18	5.1	33 13 12 75 36 36	
80	2001		14	4.7	32 31 12 76 06 00	Near Pundla, District Chamba
81	2001		23	4.6	33 07 12 75 40 12	
82	2002	01	27	5.1	33 06 36 75 49 48	
83	2002	03	17	4.1	32 46 48 75 55 48	
84	2002	02	17	4.1	33 06 00 75 40 48	

(Source: IMD: India Meteorological Department, DLDH- Oldam (1883), ISS: International Seismological Summary, PDE: Preliminary Determination of Earthquakes).

Kangra earthquake of 1905 (M=8.0) and Dharamshala earthquake of 26th April 1986 (M=5.7) indicates that the region surrounding Dharamshala is marked by complex tectonic environment where the slow accumulation of strain and its sudden release along the regional or local thrust sheets may lead to earthquake activity. Dharamshala region had also witnessed an earthquake of magnitude 5.0 on 15th June 1978. Similarly Kinnaur area had experienced an earthquake on 19 Jan. 1975 (M=6.7). As per the recent study done by Remote Sensing Cell of the Council using the satellite data and the past epicenter data of Himachal Pradesh there are certain gaps which may be referred as micro seismic gaps in the northwestern and south eastern parts of the state where stresses are still accumulated and can be the possible areas for future seismicity.

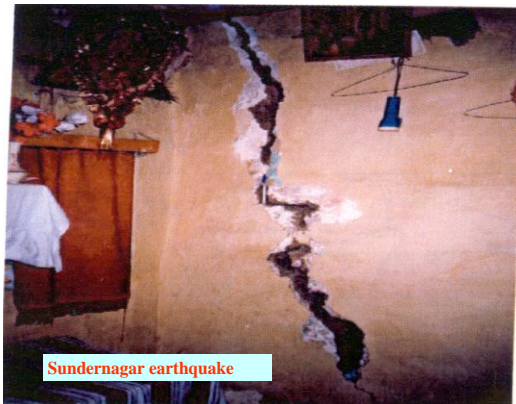


Palampur Town



Kangra Temple

After 1905 Kangra Earthquake



It is also seen that according to seismic zoning map of the State, mainly Chamba(53.2%)Hamirpur(90.9%) Kangra(98.6%) Kullu(53.1%) Mandi(97.4%) have 53 to 93.6% of their area liable to severest design intensity of MSK IX or more, the remaining area of these districts being liable to the next severe intensity VIII. Two districts Bilaspur(25.3%) and Una (37.0%) also have substantial area in MSK IX and rest in MSK VIII. The remaining districts also are liable to intensity VIII. As a whole about 32% of the total geographical area of

Himachal Pradesh falls in the High Seismic Zone, zone V. Kangra earthquake of 1905 (M=8.0) and Dharamshala earthquake of 26th April 1986 (M=5.7) indicates that the region surrounding Dharamshala is marked by complex tectonic environment where the slow accumulation of strain and its sudden release along the regional or local thrust sheets may lead to earthquake activity. Dharamshala region had also witnessed an earthquake of magnitude 5.0 on 15th June 1978. Similarly Kinnaur area had experienced an earthquake on 19 Jan. 1975 (M=6.7). As per the recent study done by Remote Sensing Cell of the Council using the satellite data and the past epicenter data of Himachal Pradesh there are certain gaps which may be referred as micro seismic gaps in the northwestern and south eastern parts of the state where stresses are still accumulated and can be the possible areas for future seismicity.

Unfortunately in spite of the probable maximum seismic intensities being very high, the house types mostly fall under category A consisting of walls of clay mud, unburnt bricks or random rubble masonry without any earthquake resistant features. (Table -II) Even in the seven districts cited in the above table, the category A houses account for very high percentage even (96%). The situation in the remaining five districts is not much different. Now all such houses are liable to total collapse if intensity IX or more actually occurs in future and will have sever damage called destruction with very large cracks and partial collapse even in intensity VIII areas.

Also the burnt brick constructions classified as category B do not have the earthquake resistant features, namely good cement mortar, seismic bands and roof types etc. Therefore they will also be liable to severe damage under intensity IX, as well as in VIII..

DISTRICT WITH EQ INTENSITIES AND BUILDING TYPES:

Sr. No.	Name of Distt.(Total No. of Housing Units)	MSK IX or more %are a	MSK VIII %are a	A-cat (clay)	A-cat (Stone)	B-cat (Brick)	C-cat (concrete)	X-cat (GI and other metal sheets)
1.	Kangra(397728)	98.6	1.4	75.60	5.77	16.19	0.72	1.72
2.	Mandi(313362)	97.4	2.6	19.12	73.90	3.47	3.14	0.37
3.	Hamirpur(144408)	90.9	9.1	77.25	8.47	13.40	0.33	0.56
4.	Chamba(145344)	63.2	36.8	7.95	84.30	3.25	3.03	1.46
5.	Kullu(123455)	53.1	46.9	1.22	88.69	3.0	6.80	0.30
6.	Una(129538)	37.0	63.0	47.96	4.72	44.86	0.59	1.87
7.	Bilaspur(111107)	25.3	74.7	48.35	40.23	9.33	1.24	0.86
8.	Solan(139261)	2.4	97.6	29.97	39.09	28.24	1.25	1.45
9.	Lahaul &Spiti(14521)	1.1	98.9	31.83	64.25	0.14	1.02	2.77
10.	Kinnaur(39351)	----	100.0	0.36	73.41	1.31	22.64	2.28
11.	Shimla(266871)	----	100.0	8.68	69.96	12.96	6.88	1.52
12.	Sirmour(150990)	----	100.0	8.29	74.45	13.46	1.02	2.77

(Source: Vulnerability Atlas of Himachal Pradesh,1997)

In one of the case studies, damage potential of an earthquake of magnitude 8.0 on Richter scale to the housing in Kangra district has been worked out by referring to what happened during 1905 earthquake. The potential damage to various types of houses has been attempted for a hypothetical earthquake with a magnitude of 8.0 on the Richter scale based on 1991 census. The following scenario has emerged:

- | | | |
|-----|--|----------|
| (a) | Completely collapsed houses | 1,36,000 |
| (b) | Those partly destroyed and partly having large and deep cracks which require reconstruction | 2,63,000 |
| © | Those without total or partial collapses but with large cracks. Some of these may have to be reconstructed but most repairable with 15 to 20% of the cost of reconstruction. | 9,16,000 |
| (d) | Those with small cracks, repairable with evacuation | 3,58,000 |
| (e) | Those with only fine cracks or no damage | 1,43,000 |

(f) Number of potential deaths 65,000

Economic losses may amount to Rs. 5000 Crores besides amount spent on relief and temporary sheltering (Price index of 1997)

If on the other hand all such houses were initially built with earthquake resistant feature in kutcha as well as pukka houses, the damage scenario will change as follows:

Total collapsed houses	8300
Destroyed with partial collapse	95000
Deep large cracks	312400
Small cracks	648000
Estimated loss of human lives	12000

Economic loss estimated is reduced to Rs.1960 Crores. Besides the cost of relief and temporary sheltering will also be reduce to one third of the above.

From the above discussions it is clear that the state of Himachal Pradesh has a history of earthquakes and the buildings by and large are vulnerable to damage in the event of an earthquake. The largest earthquake recorded (January 31,1906) in Columbia –Ecuador and March 2,1933 in Japan had a Richter magnitude of above 8.9 because the rocks can only be strained so much before breaking. This magnitude is about the limit, which can be produced by tectonic means in Earth. Most sensitive modern seismographs can measure earthquakes that can be felt by human beings.

OBJECTIVES:

In order to create awareness at the grass root level about the construction of earthquake resistant houses in Himachal Pradesh, the State Council for Technology & Environment approached Seismology Division (Ministry of Earth Sciences, GOI) New Delhi for providing funding support for organizing three demonstration workshops in Himachal Pradesh. The Ministry of Earth

Sciences, GOI supported the proposal for organizing three workshops in Himachal Pradesh. The first workshop was organized at Appropriate Technology Centre of State Council for Science Technology & Environment in the Govt. Polytechnic Sundernagar on 14-15th May 2010 . The second workshop in this series was organized at University of Horticulture & Forestry Nauni, Solan from 17-18th February 2011 for the participants of Shimla Division and now the third workshop was organized at CSK Agriculture University Palampur from 28-29th July 2011 for the participants of Kangra Division. Central Building Research Institute(CBRI) Roorkee provided the full technical support during the two days workshop. The workshop was organized with the following objectives:

- To create awareness about the disaster in general and the earthquakes in particular and amongst the grass root level Junior Engineers and Masons of Development Blocks of Kangra Division comprising Kangra, Chamba and Una Districts.
- To impart hands-on training to the Masons and Junior Engineers about the different earthquake resistant features to have earthquake resistant houses in rural areas of Himachal Pradesh.
- Capacity building of trained human resource development in having earthquake resistant constructions in Himachal Pradesh.

APPROACH:

The two organizations, HPCST&E Shimla and CBRI Roorkee accordingly shouldered the responsibilities jointly and worked together for successful organization of the training programme at Sundernagar, Mandi. In the second workshop now HPCST&E mobilized the trainee participants from 27 blocks of the 3 districts of the Kangra division viz. Kangra, Chamba and Una

Districts and looked after for all local arrangements of venue, stay of the faculty and trainees including travel and meals of the trainee participants. CBRI on its part provided full technical support, faculty, Readers and course materials and planning & arranging of technical sessions, demonstrations, hands on practice sessions, film show etc.

Dr.S.K.Sharma, Vice Chancellor, CSK Agriculture University Palampur, District Kangra, Himachal Pradesh was very kind enough to provide full logistics support in terms of boarding & lodging for the participants, space for the demonstration and auditorium facilities for the presentation purpose. Dr.K.S.Rana , Professor , Department of Environment was the local coordinator for this training programme.

PROBLEMS OF HOUSING IN HILLS

The study of Rural Housing in the hills of HP identified some of the following problems which predominantly affect quality of housing constructions and living as –

- Difficulty of getting suitable orientation on the hill slopes.
- Problems of soil erosion and land slides.
- Dense forest area and Restrictions by the forest department
- Limitations on the height of the building due to earthquake risk.
- High cost involved in the site development due to the cutting and the filling of hill slopes to obtain a flat terrace for construction.
- Non-availability of motorable roads to construction site making transport of material to site difficult and costly.

INAUGURAL PROGRAMME

Prof. S.K.Sharma, Vice Chancellor, CSK Agriculture University Palampur, District Kangra, Himachal Pradesh was the Chief Guest and Sh.E.Vikram, IFS, Joint Member Secretary SCST&E, Shimla presided over the Inaugural Function along with other dignitaries, Director Extension CSK Agriculture University Palampur.



Sh.E.Vikram, IFS Joint Member Secretary HPCST&E Shimla extended his warm welcome to the Chief Guest . He appreciated that CBRI, the pioneer R&D institute of the country is presently here along with its experts to conduct this is a training on earthquake resistant housing

technologies which is very important for the Himalayan region and desire to have such programme al over the state so as to introduce the newer EQ resistant economical technologies and green building technologies in the remote areas of the hills. He further briefed about the Council's new initiative on cleaner technologies, carbon foot prints, rainwater harvesting etc. Sh.Vikram also briefed the house that this is third programme in this series which is being organized for Kangra Division.

Prof Sharma, Chief Guest of the Inaugural Function appreciated the efforts made by the Government in creating awareness at the grass root level about the designs for earthquake resistant constructions in H.P. he also apprised the house about the vulnerability of the state especially the Kangra district about

earthquakes. He expressed the utmost need of taking immediate actions to disseminate housing technologies for the construction of good quality, durable and affordable houses in the hills of Himachal Pradesh. He further said that the construction artisans-masons play a very important role in the



construction of most of the houses and therefore they should not only be well informed but should be properly trained and oriented to feel and own their responsibility towards the society for the enormous loss of life and property caused by the earthquakes and other disaster. The chief guest appreciated the joint effort of HPCST&E and CBRI, Roorkee for taking up an interesting societal programme. He advised the trainee participants to learn appropriate techniques with full dedication and commitment to take and transfer them further for field implementations in all future construction activities. The Chief Guest also suggested to include suitable retrofitting techniques in the training curriculum so as to get them implemented in the improvement of the existing houses and making them earthquake resistant.

Shri S.G. Dave, Senior Scientist, CBRI, Roorkee highlighted the programme details and training schedule of 2 days which has equal stress on theoretical and onsite demonstration/training aspects. He briefed on CSIR-800 RSWNET programme of the XIth Five Year Plan



and informed about CBRI contribution for Dissemination, training and demonstration of Rural Housing Technologies under the CSIR-800 programme.

He then introduced the resource group of CBRI Scientists team and briefed on the contents of technical literature provided to the participants in their training kit. The two technical readers one in Hindi especially for mason artisans in simple language with illustrative sketches and another in English technical containing brief on some 20 selected technologies for the engineer-trainees.

FACULTY

Besides Prof. SK Bhattacharyya, Director, CBRI the following 5 faculty members from CBRI participated in the programme:

Shri SG Dave, Scientist-G, Civil Engg

Shri H K Jain, Tech. Officer Civil Engg.

Shri Rajiv, Tech Officer, Civil Engg

The main officials from HPSCST&E, Shimla associated with the organization of the Programme included;

Dr. S S Randhawa, Scientific Officer, HP SCST&E, Shimla

Sh.Gopal Jain, Head Draughtsman

Sh.Roop Ram, HPSCSTE

Sh.Surinder Singh, HPSCSTE

PARTICIPANTS

The programme was designed for junior engineers and masons from different Blocks of Kangra Division which comprises of Kangra, Chamba and Una districts of Himachal Pradesh. In the first two workshops at Sundernagar and Nauri , Junior Engineers and Masons from Mandi





and Shimla Divisions were trained. Some Scientists, NGOs and individuals engaged in rural development, civil construction and housing activities also participated in the programme. The programme was attended by about 123 trainees consisting of Junior Engineers,

Masons and Scientists from UHF Nauri and also some local masons participated.



LIST OF PARTICIPANTS FOR TWO DAYS AWARENESS –CUM- DEMONSTRATION WORKSHOP ON EARTHQUAKES AND EARTHQUAKE RESISTANT CONSTRUCTIONS IN HIMACHAL PRADESH AT CSK PALAMPUR FROM 28-29th JULY 2011

Sr. No	Name of the participant	Designation	PWD Division/Block	Contact Number	Email Address	Signature
A PWD Circle Nurpur						
1	Sh.Anup Kumar	J.E.	Nurpur Division	94184-70717		
2	Sh.Chander Shekhar	J.E.	Nurpur Division	94186-22972		
3	Sh.Kuldeep Singh	J.E.	Jawali Division	98169-32692		
4	Sh.Balvinder Singh	J.E.	Jawali Division	94183-31736		

5	Sh.Upender Singh	J.E.	Fatehpur Division	94182-53554		
6	Sh.Balbir Singh	J.E.	Fatehpur Division	94180-71010		
PWD Circle Palampur						
7	Sh.Swaroop Chand Gharia	J.E.	Palampur Division	94181-42803		
8	Sh.Kalyan Bhatt	J.E.	Dharamshala	94181-21136		
9	Sh.S.S.Jamwal	J.E.	Palampur Circle	94180-52039		
10	Sh.Manoj Kumar Sood	J.E.	Palampur Circle	94187-37773		
11	Sh.Rajneesh Kumar Sood	J.E.	Kangra Division	94180-16476		
B DRDA District Kangra						
Block Development Office Dharamshala						
12	Sh.Angesh Dhiman	J.E.	Dharamshala	94180-54500		
Block Development Office Rait						
13	Sh.Rajeev Kumar	J.E.	Rait	94182-52732		
14	Sh.Pawan Kumar	J.E.	Rait	94592-08210		
Block Development Office Nagrota Surian						
15	Sh.Sushil Kumar	J.E.	Nagrota Surian	94183-63424		
16	Sh.Umesh Chand	J.E.	Nagrota Surian	98052-86055		
Block Development Office Indora						
17	Gurjeey Singh Sandhu	J.E.	Indora	98167-02555		
18	Sh.Davinder Singh	J.E.	Indora	98168-27902		
Block Development Office Lambagaon						
19	Sh.Sansar Chand Thakur	J.E.	Lamabagaon	98163-33601		
20	Sh.Satish Kumar	J.E.	Lambagaon	94188-13404		
Block Development Office Fatehpur						
21	Sh.Balwan	J.E.	Fatehpur	98058-		

	Slng			89277 94187- 57322		
22	Sh.Surjeet Kumar	J.E.	Fatehpur	98164- 78558		
Block Development Office Sulah						
23	Sh.Kulbir Singh Guleria	J.E.	Sulah	98160- 45543		
24	Sh.Navneet Sharma	J.E.	Sulah	98171- 11057		
Block Development Office Nagrota Bagwan						
Block Development Office Kangra						
25	Sh.Lakhwin der Singh	Block Engineer	Kangra	94592- 92491		
26	Sh.Satish katoch	J.E.	Kangra	98052- 29393		
Block Development Office Bhawarna						
27	Sh. Gur Bir Singh Goyal	J.E.	Bhawarna	94188- 61500		
28	Sh.Gulshan Rai	J.E.	Bhawarna	94181- 37382		
Block Development Office Baijnath						
29	Sh.Sudesh Dixit	J.E.	Baijnath	94182- 91465		
30	Sh.Sanjeev kumar	J.E.	Baijnath	94185- 61405		
Block Development Office Dehra						
31	Sh.Gurmeh ar Singh	J.E.	Dehra	98166- 98987		
32	Sh.Arvind Kumar	J.E.	Dehra	94180- 64058		
Block Development Office Pragpur						
33	Sh.Ajit Pal Singh	J.E.	Pragpur	98164- 40041		
Block Development Office Nurpur						
34	Sh.Pawan Kumar	J.E.	Nurpur	98166- 43391		
35	Sh.Rajnees h Pathania	J.E.	Nurpur	98161- 19870		
Block Development Office Panchrukhi						
36	Sh.Suman Sharma	J.E.	Panchrukhi	98054- 30185		
37	Sh.Surinder	J.E.	Panchrukhi	98164-		

	Kumar			87059		
C	DRDA District Chamba					
	Block Development Office Salooni					
38	Sh.Mukesh Kumar	T.A.	Salooni	98166-15960		
39	Sh.Pankaj Dhawan	J.E.	Salooni			
	Block Development Office Mehla					
40	Sh.Brij Mohan	J.E.	Mehla			
41	Sh.Jatinder Nayer	J.E.	Mehla	94181-21055		
	Block Development Office Tissa					
42	Sh.Kalu Ram Thakur	J.E.	Tissa	98164-14969		
43	Sh.Akash Daniel	J.E.	Tissa	94181-37879		
	Block Development Office Bharmour					
44	Sh.Manoj Kumar	J.E.	Bharmour	98057-51250		
45	Sh.Chaman Lal	J.E.	Bharmour	98056-64761		
	Block Development Office Pangi					
46	SH.Raj Kumar	J.E.	Pangi	94189-18336		
47	Sh.Om Parkash	J.E.	Pangi	94599-92868		
	Block Development Office Bhattiyat					
	Block Development Office Chamba					
48	Sh.Rakesh Kumar Sharma	J.E.	Chamba	94183-98972		
49	Sh.Parvinder Thakur	J.E.	Chamba	94181-92514		
C	DRDA UNA DISTRICT					
	Block Development Office Una					
50	Sh.Arun Lath	J.E.	Una	94180-75924		
	Block Development Office Amb					
	Block Development Office Gagret					
51	Sh.Arun Sharma	J.E.	Gagret			

52	Sh.Rajiv Kumar	J.E.	Gagret	98161-74785		
Block Development Office Bangana						
53	Sh.Sunil Verma	J.E.	Bangana	94189-75365		
Block Development Office Haroli						
54	Sh.Rakesh Kumar	J.E.	Haroli	94181-79400		
55	Sh.Rajinder Singh	TA	Haroli	98160-69793		
56	Er.Arun Sharma	AAE	CSK Palampur	94183-30365		
57	SH.Vinod Chaudhary	WI	CSK Palampur	94186-73980		
58	Sh.Ashwani Kumar	WI	CSK Palampur	94164-78966		
59	SH.Vipan Nag	AE Civil	CSK Palampur	94183-31322	vipan023@gmail.com	
60	Sh.P.S.Thakur	AAE Civil	CSK Palampur	94180-43688		
61	Sh.Rajinder Sharma	WI	CSK Palampur	94181-66418		
62	Sh.Mohan Lal Sharma	WI	CSK Palampur	94186-97300		
63	Sh.Kamaljeet	TA	BDO Indora	96258-13433		
64	Dr.Ranbir Singh Rana	Scientist	CSK Palampur	94181-06167		
63	Sh.Sudhir SOod	AAE	CSK Palampur	94180-10263		
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66	Sh.Rasish Misra		CORD	98164-51240		
67	Sh.P.R.Rana		CSK Palampur			
68	Sh.Milap Chand	TA	BDO Kangra	94187-89857		
69	Sh.Sanjeev Kumar	TA	BDO Kangra	98169-31584		
70	Sh.SUman Kumar	Scientist	CSK Palampur	94180-30491		
71	Sh.Manmohan Singh	TA	BDO Pragpur	94187-91329		

72	Sh.Sharda Gautam	Press	Divya Himachal	94188-35111		
73	Sh.Geetash Singh Bhaji	Press	Punjab Kesari	94180-45533		
74	Sh.Jaswant Singh	Press	Amar Ujala	98161-35488		
75	Dr.Hirdey Pal Singh	Jt.Director (I&PR)	CSK Palampur	94180-97070		
76	Sh.Munish Dixit	Press	Daink Jagran	94180-00273		
77	Sh.P.D.Sharma	Asst.Editor (I&PR)	CSK Palampur	98171-56052		
78	Sh.Suresh Melita	TA G&L	CSK Palampur	98052-27708		
79	Sh.Rakesh Kumar	TA		94182-50395		
80	Sh.Parbhat Chauhan	WI	CSK Palampur	94590-79119		
81	Sh.Kuldeep Chand		CSK Palampur	98161-13510		
82	Sh.Ajit Pal		CSK Palampur	98171-37792		
83	Sh.T.K.Sharma		CSK Palampur	98163-37687		
84	Sh.Mahinder Sharma		CSK Palampur	98822-99194		
85	SH.S.G.Dave	Head	CBRI Roorkee	94111-21354		
86	Sh.H.K.Jain	Technical officer	CBRI Roorkee	93196-59656		
87	Sh.Rajeev	Scientist	CBRI Roorkee	94120-74553		
88	Er.Kuljeet Gupta	AAE	TCP Dharamshala	94180-64313		
89	Sh.Anish Gupta	AE	HPSEB Palampur	94184-63890		
90	Sh.Ashwani Mahajan	AAE(Civil)	HPSEB Palampur	94180-21642		
Sr. No	Name of the participant	Designation	Name of the Block	Contact Number	Address	Signature
Block Development Office Rait						
1	Sh.Hem Rah	Mason (GP Mundla)	Rait	88944-22039	BDO Office Rait	

2	Sh.Satish Kumar	Mason (GP Rait)	Rait	98162- 68462	-Do-	
Block Development Office Nagrota Surian						
3	Sh.Raghuvir Singh	Mason	Nagrota Surian	88940- 73165	BDO Nagrota Surian	
4	Sh.Sanju Ram	Mason	Nagrota Surian	97368- 95294	-Do-	
Block Development Office Indora						
5	Sh.Ramesh	Mason	Indora		BDO Indora	
Block Development Office Dharamshala						
Block Development Office Lambagaon						
6	Sh.Raj Kumar S/o Sh.Jagat Ram	Mason	Lambagaon	98165- 24274	Village Bhilla, P.O. Bachbai,Te hsil Palampur	
7	Sh.Gurjeet Singh S/o Sh.Rattan Singh	Mason	Lambagaon		VPO Jhamoon, Tehsil Jaisnghpur	
Block Development Office Fatehpur						
Block Development Office Sulah						
8	Sh.Harbans S/o Sh Paras Ram	Mason	Sulah	94188- 77475	VPO Raipur	
9	Sh.Suresh/o Bhola Ram	Mason	Sulah	98163- 96216	VPO Jamula	
Block Development Office Nagrota Bagwan						
Block Development Office Panchrukhi						
Block Development Office Dehra						
10	Sh.Sushil Kumar	Mason	Dehra	94181- 87389	Village Karyara PO Gummar Tehsil Jawalamukh i,Kangra	
11	Sh.Partap Singh	Mason	Dehra	98164- 83331	Vill. Panjiara,PO ADhwani,Te hsil Jawalamukh	

					i,Kangra	
Block Development Office Pragpur						
12	Sh.Subhash Chand S/o Sh.Chabanu Ram	Mason	Pragpur	97365- 48274	VPO Bani,Tehsil Rakkar	
13	Sh.Kesari Das Sh.Chuauru Ram	Mason	Pragpur	94183- 42315	Village Tehsil Jaswan	
Block Development Office Baijnath						
14	Sh.Birsa Ram	Mason	Baijnath	98827- 33917		
Block Development Office Nurpur						
Block Development Office Bhawarna						
Block Development Office Kangra						
C DRDA District Chamba						
Block Development Office Salooni						
15	Sh.Karmo Ram S/o Jagta Ram	Mason	Salooni	98173- 24702	VPO Drekadi	
16	Sh.Nand Lal S/o Lekh Raj	Mason	Salooni	94187- 10151	VPO Bihali	
Block Development Office Mehla						
Block Development Office Churah						
17	Sh.JHassan Deen	Mason	Tissa (Churah)	98163- 89882	Vill.Tatsog Po Kharsh Nagri	
18	Sh.Razak Mohd	Mason	Tissa	98158- 58286	Vill Gehla PO Khushn Agri	
Block Development Office Bharmour						
19	Sh.Vijay Kumar	Mason	Bharmour	98160- 57051	Vill. Chachui PO Bharmour	
20	Sh.Chaman Lal	Mason	Bharmour	98059- 30353	VPO Chachui	
Block Development Office Pangri						
21	Sh.Mangi Ram	Mason	Pangri	94189- 02492	V.Kuthal PO Sach	

22	Sh.Karam Singh	Mason	Pangi	94189-60802	Vill Ismahaigat PO Killar	
Block Development Office Bhattiyat						
Block Development Office Chamba						
23	Sh.Chaman Kumar S/o Sh.Parkash Chand	Mason	Chamba	98168-20359	VPO Mihla	
C DRDA UNA DISTRICT						
Block Development Office Una						
24	Sh.Harnam Singh	Mason	Una	88945-46290	VPO Raisari	
Block Development Office Amb						
25	Sh.Kishan Chand	Mason	Amb	94185-84941	Vill Ladoli PO Panjo Ladah the Amb	
Block Development Office Gagret						
26	Sh.Rakesh Kumar	Mason	Gagret	98823-78716	VPO.Sangne, Tehsil Amb	
27	Sh.Kaku	Mason	Gagret	94185-77191	VPO Sangneh	
Block Development Office Bangana						
28	Sh.Ravi Das S/o Sh.Boru Ram	Mason	Bangana	94182-60243	Vill. Alsan, POP Bhiambi	
29	Sh.Chander Parkash S/o Sh.Julfi Ram	Mason	Bangana	94182-87655	Vill. Chukani,PO Charara	
Block Development Office Haroli						
30	Sh.Raj Kumar	Mason	Haroli	98823-50790	VPO Nangal Kalan	
31	Sh.Gurmail Singh	Mason	Haroli	88941-01468	-do-	
32	Sh.Kishori lal	Mason	CSK Palampur			
33	Sh.Ramesh Kumar	Mason	CSK Palampur			

COURSE CONTENTS

Based on the geographical study, availability of construction resource materials and skills, living pattern of the villagers and also looking into the strengths, weaknesses and future possibilities, the course contents of the programme were designed to meet various housing needs of the region.



The training course mainly covered;

- Planning of Rural Housing
- Earthquake, wind and fire resistant Housing.
- Earthquake features & Tips for housing in Zone 'V' region.
- Plinth protection of existing mud+stone walls
- Selection, treatment and structural use of bamboo
- Rural sanitation – 2 pit sanitary latrine and waste water disposal system
- Quality Control in Rural Housing
- Improved Building Materials and Construction Technologies for Rural Housing
- Precast RC Plank and Brick Panel roofing Systems, C-Bricks and Concrete Blocks,
- C-Bricks, sand+cement bricks
- Ferrocement Products and Applications
- Rural Housing for Improved Quality of Life: Cooling, Ventilation, day lighting, smokeless chullah, chimney etc
- Rain water harvesting, Terrafill water filter etc

The programme was adequately supplemented with field demonstrations, models, power point presentations, and a technical exhibition that was also put up at the venue.

Himachal Pradesh being prone to earthquakes, landslides, heavy rains, winds and fire hazards, all the faculty members stressed on the design and construction of hazard resistant houses using locally available materials and skills.

DEMONSTRATIONS

Hands –on – training and demonstrations were arranged live or using models and AV display of the following for the engineers and masons;

- Correct method of providing vertical steel bars in brick masonry, laying earthquake bands in buildings and mud houses, bonds at corners and junctions of walls
- Rat-trap bond brick masonry
- Production of cement sand bricks
- C-brick machine and process
- Precast RC plank and Brick panel systems of roofing
- Concrete & stone masonry blocks
- Two pit rural latrine
- Rural waste water disposal system
- Methods of protecting mud walls against floods and rains





HANDS-ON CLIPPINGS

FILM SCREENING

A film on Stone and Concrete masonry Blocks and another on Earthquake resistant construction of rural houses were also screened on the second day of the programme. The film together with live demonstrations of several technologies and a hands-on-practice opportunity to the mason trainees has significantly helped in understanding of the details of technicalities, working methodologies which are important for the field implementation.

COURSE MATERIALS

Technical Books, containing details of technologies and materials covered in the programme, in English for engineers and in Hindi for masons was specially prepared to meet the housing requirements of the Himalaya region. Bound volume of the book was distributed among all participants along with a simple training kit. The book provides adequate details of all topics that were covered in the training programme and additional technical details on topics that could be of interest to engineers and masons engaged in rural housing in Solan region of Himachal Pradesh.

Topics covered in the book are;

1. Central Building Research Institute (CSIR), Roorkee
2. Institute Publications
3. Cost Effective Innovative Materials and Technologies
4. Building Foundations
5. Precast Stone Masonry Block Walling Scheme
6. Solid Stone Concrete Block Masonry Scheme
7. Concrete Block Making Scheme
8. Rat Trap Bond
9. C Brick Machine
10. Precast R.C. Plank Flooring/ Roofing Scheme
11. Prefab Brick Panel System for Roofing/ Flooring
12. Ferro Cement
13. Improved Method of Making Durable and Fire Retardant Thatch Roof
14. Non-Erodable Mud Plaster on Mud walls for Rural Houses

15. Set of posters on earthquake preparedness.
16. Bhokamp Ek Bhanyak Anubhav
17. Do's and Don'ts on earthquakes

INTERACTIVE AND CONCLUDING PROGRAMME



The interactive session and concluding programme was Chaired by Prof P.S.Ahuja, Director, IHBT (CSIR Lab) at Palampur. Dr Ahuja was of the opinion that the CSIR should not restrict themselves to the labs only but they should come forward and disseminate

the technology to the masses, then only the working is fruitful. On the concluding day a problem solving session was also organized that evoked a very good response from the participants wherein housing



construction problems, appropriate economical rural housing technologies, disaster resistant housing, use of local stone and sand in the construction were some of the main issues discussed. The trainees freely participated in the interactive session and expressed their



views which mainly pertained to the usefulness for the field engineers and construction workers. Most of the participants were of the opinion that duration of two days seems to be less for such courses and it should be for four days instead of two days. Masons also shared their problems with the experts. Trainees expressed their satisfaction about the contents of the training technical readers and the method of imparting training which stressed more on clarity, field

demonstration and hands-on practice sessions for mason artisans. Chief Guest also had around to the field demonstration sites where in the mason have themselves had hands-on training and he appreciated their efforts as well as the Govt of H.P. and CBRI Roorkee.

MEDIA PUBLICITY

The training attracted wide attention of all local media people, who highlighted the programme. There was a wide circulation of the programme on print as well as electronic media.

ACKNOWLEDGEMENT

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.S.K.Bhattacharyya, Director, Central Building Research Institute Roorkee for providing full technical support in terms of resource faculty and the resource material etc. for organizing the training programme successfully. The guidance and the moral support extended by worthy Additional Chief Secretary (Env.S&T) to the Govt. of Himachal Pradesh and the Member Secretary (EC) State Council for Science, Technology & Environment is duly acknowledged. Logistic support extended by the Vice Chancellor, CSK Agriculture University Palampur and the Director Extension and Dr R.S.Rana ,CSK University Palampur for his kind support is duly acknowledged without which it was very difficult to organize the programme.. The local electronic as well as the print media is also acknowledged for the wider circulation of the event.
