

Preliminary survey and assessment of schools buildings

March 2008

Reducing Vulnerability of School Children to Earthquakes in Asia-Pacific Region-Shimla, India

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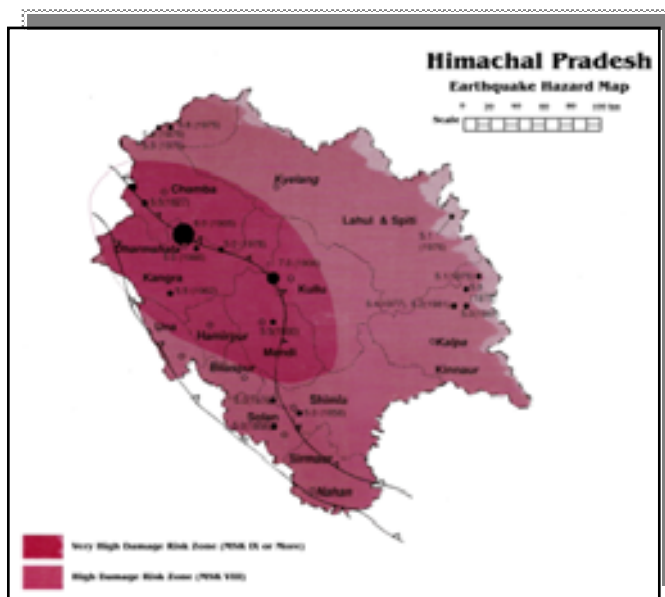


Preliminary survey and assessment of school buildings

Background:

The Asia Pacific region is home to 53% of the world's population and 20% of the land area experiences a disproportionate share of loss of life and impact to socio-economic processes. According to a United Nations' report, nearly 70% of all lives lost due to natural disasters occur within the Asia Pacific region (U.N. Living with Risk, 2002). Recognizing that natural disasters are very predominant in the Asia Pacific region, UNCRD has started implementing a project titled “*Reducing vulnerability of school children to earthquake*” in the region under project execution by UN Department of economic and social affairs (UNDESA). The project comprises retrofitting of some school building in a participatory way with the involvement of local communities, local governments and resources institutions, trainings on safer construction practices to technicians, disaster education in school and communities as demonstration cases. However the project has its focus on on-site training and capacity building program for earthquake disaster mitigation in communities and schools which would lead to sustainable development.

India is one of the project countries for “*Reducing vulnerability of school children to earthquakes*”. The unique geo-geographic setting at the northern-western fringe of the youngest mountain chain (The Himalayas) placed Himachal Pradesh in the most active seismic zone (Zone V). So, in India the project activities are to be carried out in Shimla district of Himachal Pradesh. The project envisages the development of the training manual for technicians on designing of earthquake resistant buildings and two training programs for the technician on the usage of the training manual. For training of



Source: vulnerability atlas of India, BMTPC

technician an awareness of the community living near the school building SEEDS will select school buildings for carrying out retrofitting. For selection of the school buildings SEEDS technical team surveyed different school buildings in Shimla district. This report consists of different details of the school buildings surveyed under this project. List of school building was collected from education department and they have suggested buildings to be surveyed for doing retrofitting.

Methodology

SEEDS technical team consisting of engineer and community mobiliser went for rapid visual screening of the school buildings in Mashobra block in Shimla district. We have surveyed 10

buildings in different areas of Shimla for selection of schools to be taken for retrofitting under the project. The main criteria of selection of the buildings are as follows,

- Condition of school building based on Rapid Visual Screening
- Location of the school building
- Visibility of school with surrounding locations
- Number of students and teachers in school
- Accessibility of the school building

After careful assessment of all the above factors we have decided about the school buildings to be retrofitted under this project.

Seismic evaluation of the school building

Introduction:

Problem of assessment of safety of existing structures against various loads, including earthquake load, has been recognized world over. In developing countries, about 50% of the construction industry resources are being utilized for problems associated with existing structures. In India also problem is slowly showing its extent. Performance of our structures in recent earthquakes has also forced us to think on this issue. Many agencies, within the country, are working on the different aspects of this problem.

Assessment of an existing structure is much more difficult a task than evaluation of a design on paper. Firstly, the construction of the structure is never exactly as per designer's specifications and a number of defects and uncertainties crop up during the construction. Secondly, the quality of the material deteriorates with time and the assessment of an existing structure becomes a time dependent problem. There are three sources of deficiencies in structures:

- Defects arising from original design, such as under estimation of loads as per old standards/practices, inadequate section/reinforcement, inadequate reinforcement anchorage & detailing.
- Defects arising from original construction, such as under strength concrete, poor compaction, poor construction joints, improper placing of reinforcement and honeycombing.
- Deterioration since the completion of construction due to reinforcement corrosion, alkali-aggregate reaction, etc.

As seismic evaluation is the integral part of seismic retrofitting. It consists of the following three phases.

Rapid Visual Screening (RVs)

- For mass scale evaluation of buildings in city
- Only visual inspection and limited addition information
- Based on behaviour of buildings in past earthquake

- Rapid, based on checklists
- Inspecting a building from outside “side walk survey” to come to a conclusion whether the building is probably adequate for earthquake forces likely to occur at site or there are reasonable doubts that the building may not perform satisfactorily
- Should the building be subjected to more detailed evaluation?

For conducting rapid visual survey of the school buildings we have used a questionnaire as given in annexure along with this report. Questionnaire consists of information about different sections related to schools broadly it's been divided into two parts i.e. Part A and Part B.

Part A is about general information of schools like Geographical information, school information, community information, disaster history, availability of resources, and site information. **Part B** consists of detailed information about the building to be retrofitted like history, plan of the building, site condition, building block details, defects in building and retrofitting details.

We have surveyed 6 school buildings in Mashobra block of Shimla district. Name of the schools are as given in the table below,

Sr.No	Name of the school	Panchayat
1.	Government Senior Secondary School, Mashobra, Shimla	Mashobra
2.	Government Senior Secondary School, Kufri, Shimla	Kufri
3.	Government Primary School, Koti, Shimla	Koti
4.	Government Primary School, Junga, Shimla	Junga
5.	Government Secondary School for disabled Children, Dhali	Dhali
6.	Government Primary School, Mundaghat, Darbhog	Darbhog

All the above schools are situated in Mashobra block in Shimla district. Main objective of selection of schools in one block is to spread the message in entire block so awareness can be generated among the community living in the area. Out of these buildings we have selected three schools for carrying out retrofitting in the schools. Details of all the school buildings are as given below,

1. Government Senior Secondary School, Mashobra

Geographical Information:

This school is situated at about 100m from the main highway which goes to Shimla city. This school is situated in semi urban area of Shimla district. Because of the block division is situated in Mashobra this school is having more facilities. Shimla city is around 20kms from Mashobra. This school is running classes from nursery to 12th grade students. Accessibility of this school from the main road is very poor as there is no permanent road and road is going through very crowded market place.

School information:

This school is having strength of 600 students ranging from the age of 5 years to 16 years old students. There are 28 teachers in school for different subjects. This school is owned by education department of Himachal Pradesh. This school was built during 1947. There are 20 rooms in this building for running classes and school administration.

Community Information:

This school is situated in the block division and it's very near to Shimla city because of this population of block is higher than other areas. There are approximately 2081 people in Mashobra Gram Panchayat. Community is homogenous type.

Disaster History:

This area is falling under zone-IV based on Indian seismic zone map. It is also prone to landslides because of the geographical locations of the place. This place is situated about 1500m above mean sea level. As such school building doesn't experience any major disasters in the past and there is not much damage due to natural disasters. This area is also prone to snow fall during winter time so there are some damages to roof and cladding of the structure due to snowfall in the area.

School property:

School building is having G+2 stories and made up with the traditional materials like stones, wood and burnt bricks. Building is having a plinth area of more than 500 sqm. Shape of the building is nearly rectangle as at one end of the building there is offset because of the staircase block. Position of the site for the building is fairly safe from different hazards like landslide, rock fall. Sub soil condition of the building is rocky and it's been built in a right manner.



Design of the building is good when we consider earthquake resisting aspects of the buildings as there are continuous wooden bands provided at different levels in the buildings. Entire building is been divided into different infill panels of burnt brick, wood and stone as shown in the picture. As such school authorities don't have any information about the school building like plan and structural drawings. School building looks very old and there are some damages due to weather deterioration in cladding as shown in the picture.



School building is also having a big open ground at the back of the school which is situated about 8m down from the plinth level of the building. Here whole school used to pray together before starting of the classes. Over all condition of the school building is good in comparison to other school buildings in the state.

Defects in the school building:

There are lots of defects in the building due to deterioration and ageing effects. In lots of places vertical wooden members damaged and they are not strong enough to transfer the load safely to the foundation of the building. All the floors are made of the wooden planks and in lots of places wood is damaged. In many locations in the panels of infill masonry wall there are diagonal as well as vertical cracks in the building which shows that there were some subsiding at the site of building might happened in the past.



2. Government Senior Secondary School, Kufri

Geographical Information:

Kufri is very famous tourist spot in Shimla. Every year many tourists visit this place as it is situated in between pine tree dense forest. This school building is situated at the National highway and around 20kms from the Shimla city. This school building is situated at the top of the hill on a nearly flat terrain.

School information:

This school is running classes from nursery to standard 12th. Students are having age between 5 years to 16 years old. There are around 300 students in entire school and there are 14 teachers in the school. This building is also run by State Education department of Himachal Pradesh. There are about 15 rooms in the entire school campus.

Community Information:

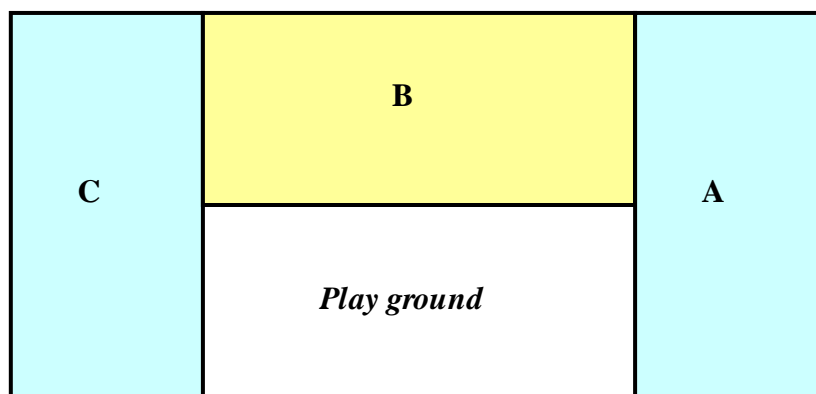
This school is situated at the top of the hill and there are around 250-300 families are living around the school building. As this is famous tourist spot in Shimla all the community living near by are involved with tourism sector and they are getting there livelihood from that only. This school building can be a good school which can be taken under this project because of its location which can spread the message in entire area.

Disaster History:

This school building is falling in very high risk seismic zone based on the vulnerability map of India. Another big hazard over here is the snow fall. During last winter this area received a snow fall around 5' and this area was also cut-off from the other part of the state. There are lots of damages in the buildings in this area because of the snow fall.

School Property:

Entire school buildings can be divided into three blocks as shown in the picture below.



There are main three blocks in the school campus namely block A, B and C. Block A and C are similar in size and shape while there is a height difference in block B in comparison with the other blocks. All the blocks are G+1 type. Block A and C are having storey above it while block C is having storey below it. Block C was constructed initially while other two blocks were added to the building afterwards. Based on the information given by the school staff this school building was designed by the government engineers and it's been maintained by Education department's technical staff. There is a small play ground within the campus of the school as shown in the figure above.



Defects in the school building:

We have done a rapid visual survey of the block B as shown in the figure. There were lots of flaws in the design of the building and it seems that they have used very poor quality of materials for the construction of the building. At many places we can see the spill out of the concrete covers from the slab of the building and you can see the corroded reinforcement from the bottom as shown in the picture. There are lots of shear cracks in wall of the building which shows that load is not being transfer in a proper way. There are also some columns which are not properly oriented in the building which can attract lots of stresses during the time of an earthquake. This school building can be one of the good examples for the community and administration for spreading earthquake safety in Himachal Pradesh.



3. Government Primary School, Koti

Geographical Information:

This school building is situated in the Koti Gram Panchayat which is about 40kms from the Shimla city. This place is located at the top of the mountain. This is government Primary school where students of nursery to 5th standard are coming for the education. Accessibility of the school is good and it's also located in very visible place.

School information:

There are total 78 students studying in this school all students are coming from near by location. There are 4 teachers in this school. This building is also owned by education department of Himachal Pradesh.

Community Information:

There are about 300 families living around the school location. Normally people are having farming as a source of income. This place is situated bit inside from the main road. Road condition to reach this place is quite good compare to other places.

Disaster History:

This area is falling in very high seismic zone. There were some minor earthquake happened in this based on the information given by the community members but no significant damage has been caused by the same. Apart from earthquake this area is also liable to landslide due to location of the school building.

School Property:

School is having only one building and huge play ground in front of the building. This school building was constructed during 1953 and some rooms were added during 1990. This school building is having five rooms and construction materials used for the building are different based on the year of construction. Old portion was constructed with the wooden bands and flat stones. There is no sign of mortar used as binding materials between two stones. Thickness of the walls is 18". Plan of the building is simple rectangle as shown in the picture.



Because of the condition of the rooms classes are also going outside of the building another reason of classes are running outside is the cold weather in this area because of the height of the place. This can also be taken up as one of the schools to be retrofitted under this project because of its location and visibility.

Defects in school building:

As this school building was constructed during 1953 due to aging of the building and technology used for the construction of building there are lots of defects in the building. As there is no proper use of the mortar we can see lots of separation in the building. At every cross wall of the class room there is no proper bonding and huge vertical cracks have been developed at every corner of the building as shown in the picture. There are lots of cracks developed at the corner of each opening which shows that building might have experienced a lateral thrust in the past.



4. Government Primary School, Junga

Geographical Information:

This school building is situated in Junga subdivision. It is developed division in terms of resources as it is a centre for different administration activities. This place is situated about 40kms from the Shimla city. Altitude of this place is not as high as other places and its kind if valley with lots of flat land.

School information:

This is Government Primary school with is having classes from nursery to 5th standard. There are about 120 students in this school. This school building is one of the oldest buildings as this was constructed during the British time by the King of that time. There are 5 teachers in this school who are running the classes. This school is also a part of education department of Himachal Pradesh. The campus where this school is situated is also having middle and higher secondary school in the same campus.

Community Information:

Because of the subdivision and location of the area there are lots of families residing in this area. There are about 400 families living in this area. Road from Shimla to this place is very good in condition and it's is easily visible place because of the huge campus of the school.

Disaster History:

This place is also falling under very high seismic zone. There were some incidents of past minor earthquakes in the area but with very less damages. This area is also prone to landslide during the time of monsoon. As such there are no major disasters in this area in the past and awareness among the community about disaster management is also very low.

School Property:

This school building is situated in very large campus. There are five other buildings situated in this place with the huge play ground in front of it. The block for Primary school was constructed in 1931 A.D. main construction materials used for the construction of the school building is stone and wood with mud mortar. Thickness of the wall is 18" and partitions are made out of the plywood. This school building is having G+1 type structure. There is one storey below the building shown in the figure. Plan of the building is simple rectangle. There is a veranda in front of cladding as shown in the figure. Roofing is made out of CGI sheets. There is also a falls ceiling at the roof level for better thermal comfort. There is a huge play ground in front of the school building with the dimensions about (100MX200M). This school campus is also having other facilities like library for students.



Defects in school building:

This school building is having lots of defects into building because of the aging of the structure and poor quality of materials used for the construction of the building. There are lots of cracks in the walls and around the openings of the building. Plaster is being chipped of in many places. There is no continuous band provided in the building for resisting any lateral loads. Condition of roof structure and roof covering is



better in comparison with the other elements of the building. Veranda is being built with the wooden planks and condition of the same is not good as there are some places where these wooden pieces are missing which reduces the diaphragm effect of the floor. One of the major problems with this building is that there is a bulging of the wall in front face of the building as shown in the picture. This gives a sign that there is no integrity in the structure and in future even a minor earthquake can lead to major disaster in this school building.

This school building can be taken up as one of the school to be retrofitted because of the location and other schools are also in same campus so we can train more students and teachers by doing programme in one school. Apart from that this school give be good example for the other schools in surrounding areas.

5. Government school for differently abled children, Dhali

Geographical Information:

This school is run by the state government for deaf and blind children from Himachal Pradesh. This school is situated on top of the mountain in a remote area. This place is far away from the main market of Dhali. This place is located on the way from Shimla city to Kufri. It is surrounded by resort and small hotels because of the location of the school building.

School information:

There are 120 students in this school from nursery to 10th standard and 12 teachers are there for taking classes who are coming from near by area. In order to support differently abled children 8 people are there apart from teaching staff. This school is running by Himachal Pradesh state government.

Community Information:

This school is located at remote place on the top of the mountain where there is no community is residing. Apart from that all the children studying in this school are coming from different parts of Himachal Pradesh therefore school campus is also having a hostel facility for the children. There are families living which is at lower level they do not have daily interaction with the school children.

Disaster History:

This area is also falling in very high risk earthquake zone. There is no major disaster happened in this area in the past but condition of the students studying in this school make them more vulnerable than the normal schools. This area also receives snowfall during the time of winter and because of that students and school authorities are facing more problems.

School Property:

This school campus is having four building blocks which are situated at different levels because of the hilly terrain. They are running separate classes for deaf and blind children in different buildings. Two blocks are used as the hostel for the students.



We have conducted a rapid visual survey one of the building blocks which is being used as hostel for the students. This block is having three rooms and shape of the block is simple rectangle as shown in the picture. This school building is having three rooms with partition wall in between them of wooden board. This is a load bearing structure and built with brick masonry in 1980s. This building is built on nearly flat ground with the pavements around plinth. It is having a IPS flooring with very bad condition. As this building is being used as a hostel there are lots of beds kept inside the rooms which can also be dangerous during the time of an earthquake.

Defects in school building:

This school building is built during 1980s and because of weather and aging it have developed lots of defects. There are diagonal cracks around openings. There are lots of vertical cracks also on exterior wall of the building. Condition of the flooring is really deteriorated and students are facing lots of problems due to the same.

This building not only lacking the proper earthquake resisting features but it also lacking the universal design for differently abled children. This will be good school building to choose for this project.



6. Government Primary School, Mundaghat

Geographical Information:

This school building is situated in a remote place which is 30kms from the Shimla city. This school is situated away from the habitation area. This school is situated very close to main road going from Kufri to Koti.

School information:

This school campus is consisting of three blocks. It is having Primary as well Secondary schools. We have surveyed Primary school because of the area and condition of the school building. In primary school there are total 30 students and 3 teachers. This school is running classes from nursery to 5th standard.

Community Information:

As it was mentioned this school is situated away from the habitation and there is no major habitation around the school. Students are coming from near by villages. There are some shops around the school building.

Disaster History:

This area is also falling in very high risk seismic zone and vulnerable to earthquakes and landslides. During winter it also receives a snowfall which leads to damages in the roof and cladding system. There is no major disaster happened in this area and awareness among the community is less for disaster management.

School Property:

There are total 3 blocks in the school campus and one open ground. Building block of primary school is situated below the building block of the Secondary school. This building block was constructed during 1950s with stone masonry and mud mortar. Workmanship of the building is very poor as there are lots of elements missing in the structure. This building is having G+1 type of building but storey above the ground floor is in very bad condition and it's not being used by the school authorities.



As you can see in the picture there are slender brick columns which cannot transfer the load of the roof it was done by government department as part of maintenance. There are five rooms in school building out of which only three rooms are used by school authority. They don't have any open ground also at the ground level which can be very dangerous during the time of an earthquake.

Defects in the school building:

There are lots of defects in the school building. Walls are not in a good condition there are lots of cracks in every wall. There is no coherent load path available in the building. There is a broken veranda which can be very dangerous for the school children even during normal time. There is no cross walls available in the building which makes it more vulnerable. This building is in such a bad shape that retrofitting won't solve the problem. This building cannot be taken for retrofitting.



Outcome of Rapid Visual Survey

After careful observation and based on the rapid visual survey SEEDS technical staff decided to take up three building out of surveyed building. Those buildings are,

- Government Primary School, Kufri
- Government Primary School, Junga
- Government School for differently abled children, Dhali

EARTHQUAKE VULNERABILITY ASSESSMENT OF SCHOOL BUILDINGS

NAME OF SCHOOL	CODE NO.	
DATE OF SURVEY		
NAME OF SURVEYOUR		

SURVEYER INFORMATION

Name	Designation	
Institution		
Contact Address		
Telephone No.		FAX No.
e-mail address		

(Signature / Date) _____

The purpose of survey is to prioritize schools for seismic safety enhancement and to help to develop long-term national program to reduce vulnerabilities to earthquakes.

This survey consists of three parts as follows

- PART A: General Information
- PART B: Specific on Building Block

Please answer each question.

* PART B is made for each building block, if there are more than one building block in one school, please make copies PART C and use it accordingly.

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**EARTHQUAKE VULNERABILITY ASSESSMENT OF EXISTING BUILDINGS
Part A**

100. General Information

101	Name of School						
110 Geographical Information							
111	Name of State / Province / Prefecture						
112	Name of District						
113	Name of City / Village Municipality						
114	Name of Ward / Borough						
115	Locality (mark appropriate one)	Urban	Sub-urban	Rural			
116	Accessibility						
117	School Visibility						
120 School Information							
121	Type of School (mark appropriate one)	Nursery	Primary	Secondary	High School		
		University	Vocational	Others ()			
122	School Ownership	Private	Public				
123	Name of Owner						
124	Number of Students	Male	Female				
125	Student's Age Range	From	to				
126	Number of Faculty Members						
130 Community Information							
131	Size of School District?	Population	No. of Households				
132	Settlement Type	New	Old				
133	Community Group	Homogeneous	Heterogeneous				
	Note any Significance, if any						
134	Profession of Locals / Major Industries						
135	Economic Status of Majority Community Member						
140 Disaster History							
141	What are the major natural disasters in this area?						
142	What were the recent disasters? Please specify the type, year and major damages	year	type	damages			
143	Has this schools damaged by natural disasters in the past?	Yes	No				
If yes,							
144	When and what type of disasters?	year	type	damage			
144	Was the building strengthened or repaired or reconstructed after damaged?	Repaired / Strengthened	Reconstructed				
		Nothing	Others				
145	Is the school building retrofitted?	Yes	No				
150 Availability of Resource							
151	Materials	Brick	Cement	Rod	Timber		
		Formwork	Others ()				
152	Labors	Masons	Unskilled Labors				
153	Mode of Contribution	Cash	amount				
		Labor	amount				
		Material	amount				
154	Commitment of Contribution by	Teachers	Management Committee	Community			

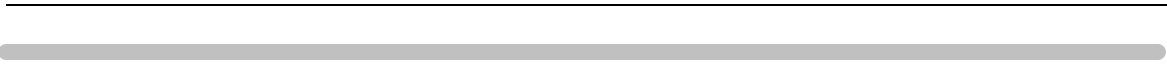
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200. Site Information

210 School Property										
211	How many building blocks are there in the school property?									
212	Please fill the building details in the following table.									
Block Name	No. of Stories	Wall		Floor		Roof		Overall Condition	Plinth Area	
		Material	Condition	Type	Condition	Type	Condition			
A										
B										
C										
D										
E										
213	Short description of building blocks.									
214	Building Components to be repaired / Replaced									
215	Note if any									
220 Site Condition										
221	Is there any landslide area in the site?				Yes				No	
222	Is there any rock fall area in the site?				Yes				No	
223	Is the site of the school building subsiding?				Yes				No	
224	Is the school building standing on filled site?				Yes				No	
225	Is the site closed costal line?				Yes				No	
226	If there are any other local hazards, please specify.									
230 Open Space										
231	Is there open space in the school property				Yes				No	
232	If yes to 231, how many open spaces are there?									
233	If yes to 231, how big is the open space?				m		x	m	=	m ²
234	Is there open space outside of school property?				Yes				No	
235	If yes to 234, how far is the open space from the school?								m	
236	What is width of street / road leading to the building?								m	
240 Comments										

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250 Site plan (Please use following space to draw a site plan, and indicate building blocks in alphabet.)



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**EARTHQUAKE VULNERABILITY ASSESSMENT OF EXISTING BUILDINGS
Part B**

Indicate the building block in alphabet	
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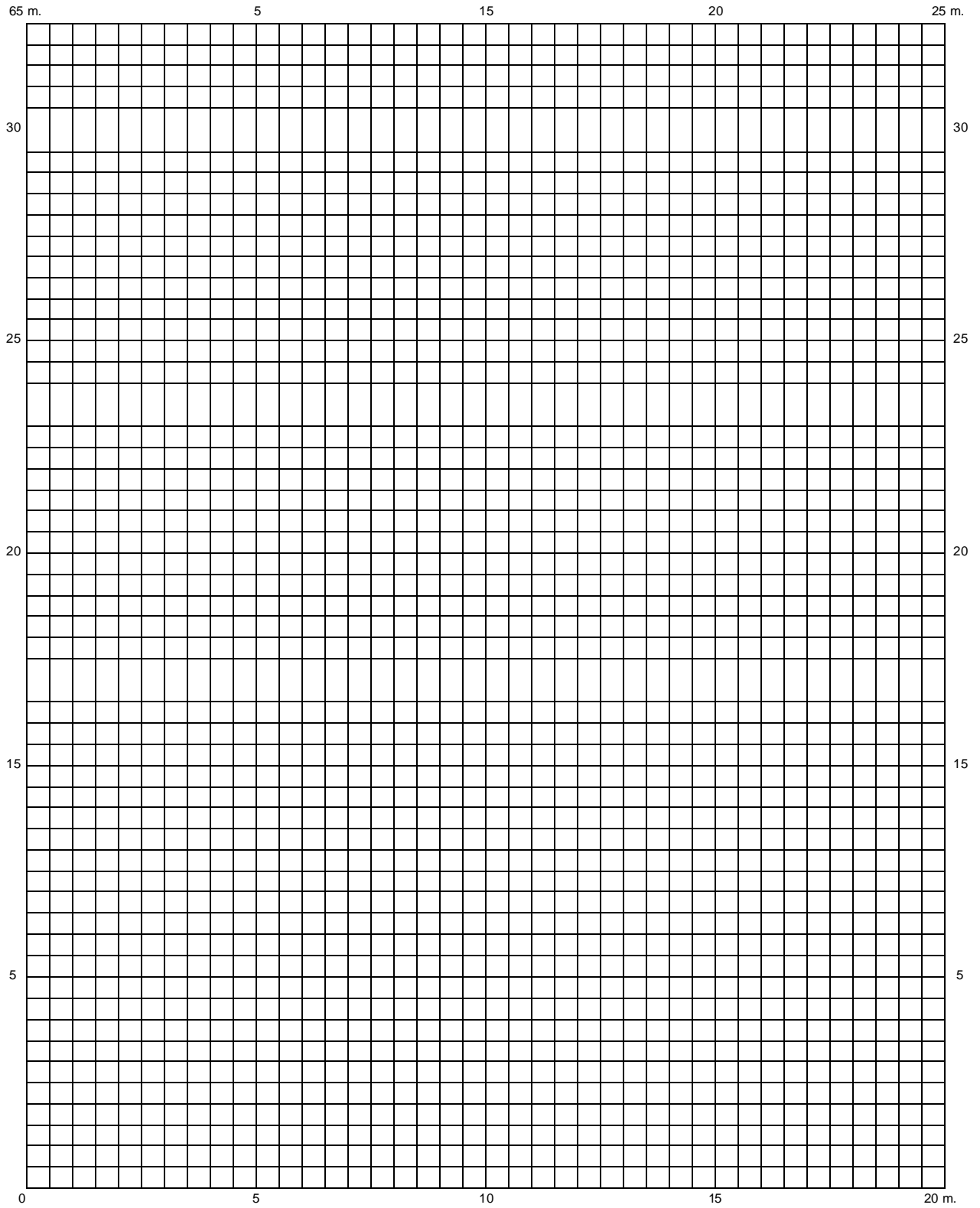
300. General Information

310 History				
311	When was this building block constructed?			
312	Has this building block ever renovated? If yes, when was the last renovation?	Yes	No	When?
313	Has any parts been extended to original building block? If yes, when was it?	Yes	No	When?
320 Construction				
321	Who designed this building block? (Technician includes engineers/architects)	Self	Technician	Mason
		Contractor	Others ()	
321	Who supervised construction of building blocks? (Technician includes engineers/architects)	Self	Technician	Mason
		Contractor	Others ()	

400. Plan and Photograph

401	Please take photograph for building block	
Photo 1	Photo 2	



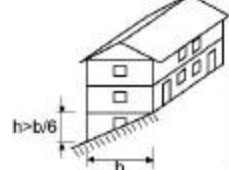

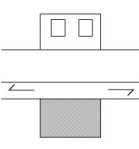

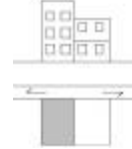



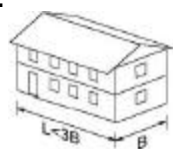



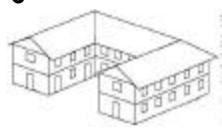

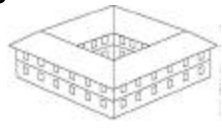




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Floor Plan



500. Condition and Planning

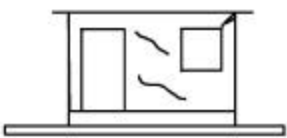
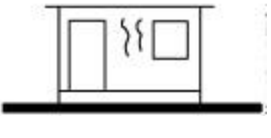
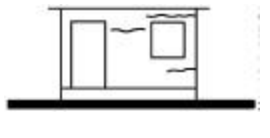
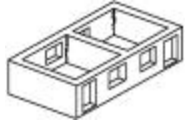
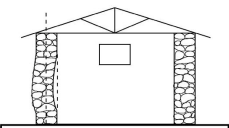
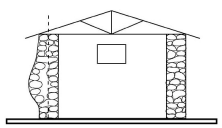
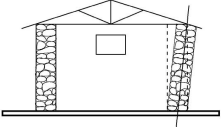
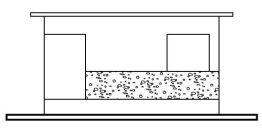
510 Site Condition									
511	Terrain Type (encircle the appropriate number)								
1		2		3		4			
Flat Terrain		Gentle Slope		Steep Slope		Terraced Land			
512	Position of the building block (encircle the appropriate number)								
1		2		3		4		5	
Free Standing		Confined by other building in one side		Confined by other buildings in two adjacent sides		Confined by other buildings in two opposite sides		Confined by other buildings in three sides	
520 General Planning									
521	Shape of building block in plan								
1		2		3		4		5	
Square		Rectangular (L < 3B)		Narrow Rectangular (L > 3B)		T-Shaped Building		L-Shaped Building	
6		7		8		9		10 Others (Please specify)	
U-Shaped Building		E-Shaped Building		Building with Central Courtyard		H-Shaped Building			
522	Shape of the building block in plan								
1		2		3					
Not Stepped		Stepped near the Center		Stepped near the end					

600. Building Block Details





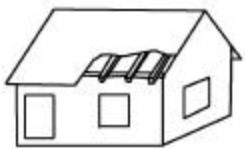

610 Information on the building block			
611	How many stories are there in this building block?		
612	What is the average height (floor to floor)?		m
613	What is the average width of hallway?		m
614	What is the average width of stairs?		m
615	Where the stairs located?		
620 Foundation			
611	Type of Foundation Sub Soil	Rock	Gravel or Sand
		Soft or Med. Soil	Other if Any ()
612	Type of Foundation	Strip	Isolated Pad
		Pile	Other if Any ()
613	Basic construction material of Foundation	Adobe	Stone
		Reinforced Concrete	Plain Cement Concrete
		Steel	Other if Any ()
614	Mortar Type in Foundation	Dry Masonry	Mud
		Cement / Sand	Other if any ()
620 Wall			
621	Basic structural system and Construction material, Wall/Frame		
1	2	3	
Adobe or Mud wall	River boulder wall	Quarry stone wall	
4	5	6	
Dressed Wall	Fired brick wall	Hollow concrete block wall	
7	8	9	
Reinforced concrete framed bldg	Timber frame w/ stone brick wall	Timber frame w/ wattle daub	
622	Mortar Type in walls	Dry Masonry	Mud
		Cement / Sand	Lime
			Other if any
623	Wall Thickness	Interior	Exterior
	100 mm to 150 mm thick hollow concrete block wall		
	115 mm thick brick wall		
	200 mm thick hollow concrete wall		
	230 mm thick brick wall		
	350 mm thick brick wall		
	460 mm (two brick) or more thick brick wall		
	Stone wall – less than 450 mm thick		
	460 mm (two brick) thick earth wall		
	Stone wall – more than 450 mm thick wall		
	Others please specify		

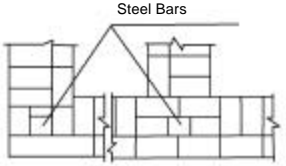
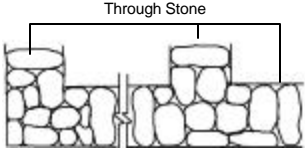
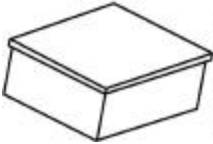

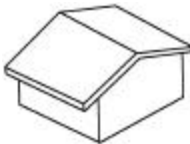
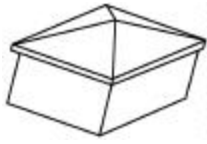
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700. Defects

710 Cracks								
711		712		713		714		
	Types of Cracks			None	1-2	3-5	6-10	more
711	No. of diagonal cracks.							
712	No. of vertical cracks							
713	No. of horizontal cracks							
720 Separation of Wall								
				None	1 corner	2 corner	3 corner	More corners
721	Separation of walls at T and L junction							
730 Wall Failure								
731		732		733		734		
	Types of Cracks			None	1 wall	2 walls	3 walls	more
731	No. of Bulging of walls							
732	No. of Delamination of walls							
733	No. of Tilting of walls							
734	No. of Dampness in wall							

800. Other Weakness

810 Lintel							
811	Types of Lintel						
1		2		3		4	
	No lintel	Individual lintel	Combined lintel	All around lintel			
812	Material of Lintel			Wood	Brick		
				Reinforced Brick	Reinforced Concrete		
820 Roof band / Wall Plate							
821	Type of Roof Band / Wall Plate						
1				2			
	Wall plate			All around Roof band			
822	If wall plate / roof band used, then types of material used?			Wood	Reinforced brick	Reinforced Concrete	

830 Corner			
831		832	
831	In case of masonry building, are steel bars introduced at corners and/or junctions?	Yes	No
832	Are through stones used in walls, at corners and junctions of the stone masonry building?	Yes	No
840 Wall			
840	Are there gable wall in the building ?	Yes	No
841	If there are, what is the height of parapet wall?		m
843	Are there parapet walls or Railing on roof or verandah?	Yes	No
844	If there are, what is the thickness of parapet wall?		m
850 Floor			
851	Floor structure and floor finish (encircle the appropriate number)		
	Floor Type	Stories	
	Wooden joist + plank		
	Wooden joist + plank/wood or bamboo chirpat or brick + mud.		
	Wooden joist + plank/wood or bamboo chirpat or brick + concrete		
	Reinforced concrete / Reinforced brick and concrete / Reinforced brick slab		
	Jack arch floor		
	Others, please specify ()		
860 Roof			
861	Type of roof?		
1		2	
3		4	
Flat roof	One side slope	Two side slope	Four side slope
862	Roof structure and roof covering (encircle the appropriate number)		
	CGI sheet on tubular / angle(steel)/timber / bamboo structure		
	Tile or slate on steel / timber/bamboo structure		
	Jhingati on earth laid over timber / bamboo structure		
	Thatch roof over timber / bamboo structure		
	Reinforced concrete / Reinforced brick and concrete / Reinforced brick slab		
	Jack arch roof		
	Other Please specify		

900. Retrofit Details

901	Has any retrofitting done to the building complex?	Yes	No
902	If yes, Method of retrofitting of masonry building.	Splint / Bandage	Beam / Column Bolting
		Jacketing Walls	Other if any
903	Method of Retrofitting of RC framed building.	Column Jacketing	Add. Of Shear Walls

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