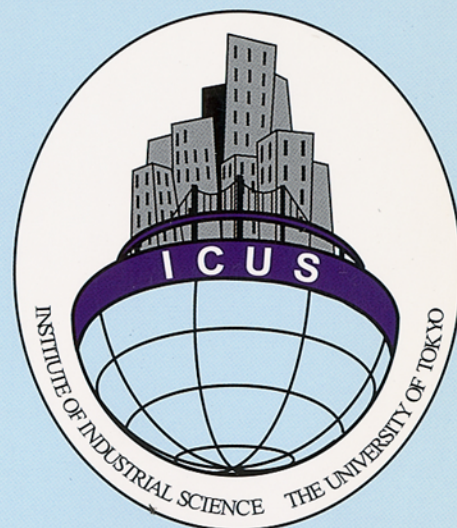


ICUS REPORT 2007-03



**BANGLADESH NETWORK
OFFICE FOR URBAN SAFETY**



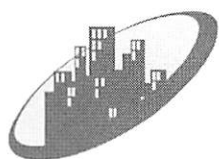
**INTERNATIONAL CENTER FOR
URBAN SAFETY ENGINEERING**

**INSTITUTE OF INDUSTRIAL SCIENCE
THE UNIVERSITY OF TOKYO**

BNUS ANNUAL REPORT-2007

Edited by

**Israt Jahan and Mehedi Ahmed Ansary
Bangladesh Network Office for Urban Safety (BNUS)
Bangladesh University of Engineering and Technology (BUET)**



**BANGLADESH NETWORK
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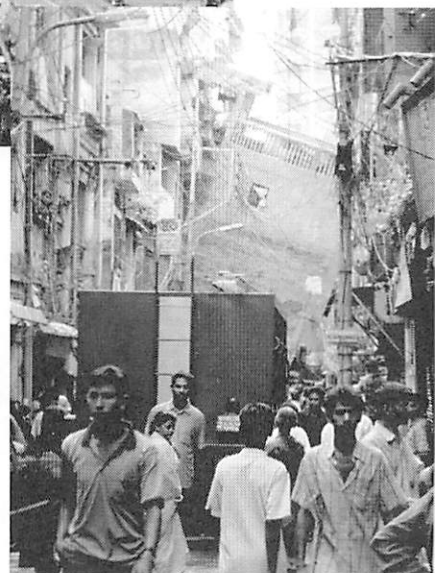
BNUS Annual Report-2007

BANGLADESH
NETWORK OFFICE FOR
URBAN
SAFETY



**BUET, DHAKA,
BANGLADESH**

Prepared By:
ISRAT JAHAN and
MEHEDI AHMED ANSARY



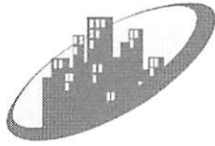


**BANGLADESH NETWORK
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**BANGLADESH NETWORK
OFFICE FOR URBAN SAFETY**



PART-I

SCHOOL EARTHQUAKE SAFETY PROGRAM (SESP) IN OLD DHAKA, BANGLADESH

**BANGLADESH NETWORK OFFICE FOR URBAN SAFETY
(BNUS),
BUET, DHAKA**

**Prepared By: Israt Jahan
Mehedi Ahmed Ansary**

SCHOOL EARTHQUAKE SAFETY PROGRAM (SESP) IN OLD DHAKA, BANGLADESH

1. INTRODUCTION

Dhaka, the capital of Bangladesh is the center of economy, commerce, politics and society, with a large population of more or less 12 million. According to a report published by United Nations IDNDR-RADIUS Initiatives, Dhaka and Tehran are the cities with the highest relative earthquake disaster risk (Rahman, 2004). Earthquakes may cause billions of Taka worth of damage (Ansary, 2004). Once a great earthquake occurs, Dhaka will suffer immense losses of life and property. This will have very severe long term consequences for the entire country. This is of particular relevance to Old Dhaka which has large numbers of densely packed very old non-reinforced masonry structures along narrow winding streets. There is no earthquake disaster management system in Dhaka and with the active involvement of the local community this system will be effective. There is a saying among the earthquake experts: "earthquakes do not kill, what kills is a building that falls, a gas escape or a column". "The human factor changes a natural hazard into a disaster" (Campo, nd). That is why it is very important to reduce human vulnerability through prevention, learning of preventive measures and drills. The earthquake risk reduction as such cannot be achieved unless consideration for earthquake safety starts from grass root levels as a part of the society's culture.

The School earthquake awareness program is important as the students are the future generation of the country and their response and contribution in this sector is more far fetching than any other group as the young. They also play a vital role in spreading out the ideas and knowledge on disaster preparedness among their friends' circle, family level and surrounding locality. Again most often the schools are considered as the Shelter place from any kind of disaster in this country. So it is an emergency task to make the school building itself safe during and after the occurrence of disaster ensuring the safety of its residing people, i.e. the students. It is of primary importance that the students of the schools should be trained up to help themselves and provides support to others. To reduce loss the inhabitants must learn what to do to cope with the disaster. If they motivate people, they can play an effective role in risk mitigation, and reduce the impacts of any urban hazard especially earthquakes.

2. PURPOSE OF THE AWARENESS WORKSHOP IN SCHOOL

- To initiate discussions with the school people and the community raising safety awareness.
- Acknowledge the important role of school buildings within the community as post-disaster shelters.
- To promote earthquake awareness through students and staffs of schools
- Safety of children in schools should be recognized as a basic human right and formally established as a national policy. To promote the earthquake awareness through students and staffs of schools.
- To Establish School Earthquake Safety Committee

- To conduct preparedness and mitigation programs like first aid training, search and rescue training and earthquake drills to reduce the loss of lives and properties due to earthquake
- The project's institutionalization efforts have focused on incorporate earthquake risk management and other disaster management activities into local people and schools.

3. RATIONALE OF THE STUDY

In Bangladesh, recently due to poor construction quality of buildings, three buildings collapsed. In June 2004 a five storied building collapsed in Sakhari bazar, Old Dhaka that killed 19 people and and injuring several others among its 30 inhabitants. In April 2005 a nine-storied factory building collapsed in Savar that killed 70 people and injuring around 200 others among its 300 workers. In February 2006 a five storied under construction building collapsed in Tejgaon that killed 18 and injured 40 workers. During an earthquake this will multiply thousand times more. Also due to poor fire preparedness in high-rise buildings of Dhaka city, many buildings may catch fire and people may die due to lack of poor evacuation facilities. If the people are aware how to cope with the disasters, the losses will be less than what happened in the above cases. Also the trained persons could help in searching the victims and rescue them from the debris. If the local people are trained up they can response earlier than the outside help such as Fire Service Department, Armed Forces, etc. In emergency case this local trained volunteer group will come handy in reducing the effects of the disaster. So the students should be trained up so that they can carry out rescue work and provide first aid to the injured of their communities and in their schools.

Schools play a vital role in every community. Schools teach civics, educating citizens of their rights and duties. In schools, students learn the lessons of history, the discoveries of science, and the rewards of public service. Schools benefit the economy by providing a skilled and literate work force. They are used for social gatherings, continuing education, and musical productions, and sports. Schools are a measure of community well-being.

But most important, earthquake-threatened communities need earthquake-resistant school to protect their teachers and children as in most cases in our country schools are used as shelter. When schools are closed because of earthquake damage, education is delayed and community life disrupted. Repair and construction of school buildings are difficult and expensive after an earthquake, when government resources are strained. In any disaster school buildings and their grounds can be used for temporary shelter and emergency response centers. Where school attendance is compulsory, communities have a moral obligation to provide a safe study and work environment.

4. SCHOOL EARTHQUAKE SAFETY PROGRAM IN DETAIL:

Meetings, structured discussions, power point presentations, interviews and an evaluation questionnaire designed to get feedback from the participants are among the tools used during the school awareness workshops. To fulfill the objective, the school awareness-training program follows step-by-step progressive ways to make the students fully capable to cope with any kind of disaster especially for earthquake that covers:

- Brief discussion on earthquake that spreads out the ideas on earthquake, techniques to cope with such an uncertain situation, how to tackle the unwanted situations, how to minimize the losses due to the earthquake disaster, etc.
- First aid training
- Search and Rescue training
- Mock drills

4.1 Schools under the program

BNUS (Bangladesh Network Office for Urban Safety) has conducted some earthquake safety related programs in several schools in old part of Dhaka city. These schools are situated in the most densely and hazardous area of Old Dhaka, which is the most vulnerable site due to earthquake in this city for its high density and unplanned build-ups. In order to increase the knowledge base and making the students fully aware of their status during and after a disaster, BNUS has undertaken this program. The safety program has been launched in Armenitola Govt. High School (located at Ward 68, Old Dhaka) in September 2006. Such other schools may come under consideration in order to cover the city as a whole. The High Schools are selected as the target for capacity building and spreading out the knowledge base to cope with any disaster and ensure a minimum loss.

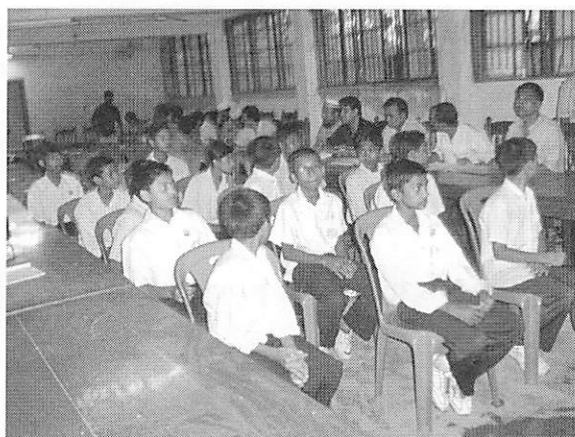
4.2 Open discussion on earthquake vulnerabilities

The earthquake school awareness program in Armenitola Govt. High School has been started with an open discussion on earthquake with the teachers, students and young volunteers of Bangladesh Red Crescent Society and Bangladesh Scout in 21 September 2006. The discussion covered general knowledge base on earthquake: What is it? How to deal with the disaster? What to do before, after and during the disaster? How to reduce the damages due to earthquake? How to manage the situation after earthquake attacks? earthquake vulnerabilities, earthquake preparedness and disaster mitigation measures that focuses the outcomes from the participants on how to manage the situation before, during and after earthquake occurs, what are the duties of each individual, what to do to minimize the loss and cope with the casualties due to earthquake, how to provide help to the helpless, what disciplines should be followed to come out in a safe open place without any injuries, etc. There remains a brief discussion on earthquake awareness decorated with lectures, slide presentation, movie show on earthquake and leaf let distribution on individual's doing to reduce losses due to a disaster. From the discussion it was realized and agreed by the participants that first aid training, search and rescue training and regular mock drill on safety issues is needed to save lives and to minimize the loss due to disasters. Mock drills must be carried out regularly to have a disciplinary technique to be followed during and after disaster occurrence to safeguard against loss.

According to the suggestion that came out from the open discussion BNUS organized training on Earthquake safety awareness that includes short course training on First Aid, Search and Rescue training and final demonstration. The full program concludes with making the students fully aware of their duties in pre, during and post disaster periods.



Prof. Ansary discussing Earthquake awareness issues.



The participants in the open discussion

4.3 Short course on First Aid

First Aid is an initial assistance or treatment given to someone who is injured or suddenly taken ill. First Aid training makes any individuals to remain aware and safe by themselves and provide help to others injured during and after any disasters. In order to make the students fully aware of any disaster especially in case of earthquake, first aid training is of utmost importance to save lives.

Objective of Giving First Aid training to any person

- Train them with the most essential survival skills to protect life, providing first aid to people in need of emergency care.
- Make them aware of what they can do in any situation requiring First Aid to people and provide help that could save a life and reduce sufferings.
- Help people avoid, prepare for and cope with emergencies.
- Learn them with the basic principles and practices of the First Aid to provide help during and after any kind of disasters that could save a life and reduce sufferings,

Items covered under First Aid Training

The general knowledge on primary treatment and special care during injuries especially with casualty due to earthquake was given emphasis in this program. The students learned practically all the techniques of giving first aid.

Introductory speech on First Aid Awareness: What is First Aid, general knowledge of the students about First Aid, Objective of First Aid, Principles of First Aid, Responsibilities of a First Aider, etc.

Spread out the ideas on:

- Techniques of giving First Aid in case of Airway, Breathing and Circulating (ABC) Disorder
- Major cause of respiratory problems, Artificial Respiration, ways of giving respiration and CPR
- Heatstroke
- Shock, Unconsciousness and Fainting

- How to treat a burn casualty, Burns Scalds and Acid burns
- Bleeding, Wounds, Dressings and Bandages, Pressure bandage and how to dress a fresh wound
- Immobilize the injured part, lower and upper arm sling, chest, leg and skull bandage.
- Fractures, Strains and Sprains
- Poisoning, Bites and Stings
- First Aid materials
- Carrying and transport of casualty
- How to place a casualty in recovery position.

4.3.1 Short course on First Aid at Armenitola Govt. High School

A short course on First Aid has been held in Armenitola Govt. High School from November 30 to December 02, 2006 with 77 students of class VI to IX selected by the school authority. The students are from general groups and the members of Red Crescent and Scout. The general knowledge on primary treatment and special care during injuries especially with casualty due to earthquake was given emphasis in this program. The course duration is for 3 days and 2 hours per day. It's very short time duration to make a person totally capable to manage a first aid requiring person. Rather it should make some help to some extent in case of reducing pain and loss of casualty. The Principal of Armenitola Govt. High School, Mr. Mahmud Ullah, has introduced the three days training program. The Program at a glance:

Date	: November 30, December 01 & 02, 2006
Training Duration	: 6 hours in 3 days
Organized by	: Safety Assistance for Emergencies (SAFE)
Supported by	: BNUS (Bangladesh Network Office for Urban Safety)
Training Facilitate by	: First Aid Instructors of SAFE
Name of Trainers	: Md. Ariful Islam Shaikath Anisul Islam Apu
No of Participants	: 77

First Aid Training in Detail:

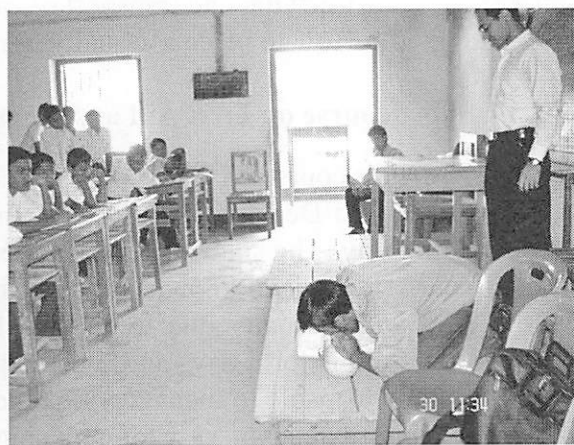
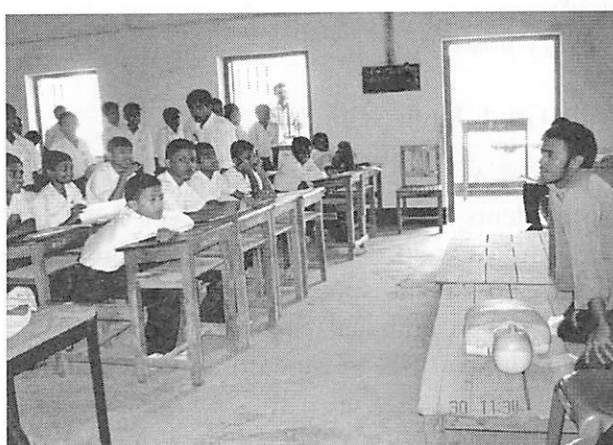
1st Day Training Details:

Session 01: 10:30 AM to 11:00 AM

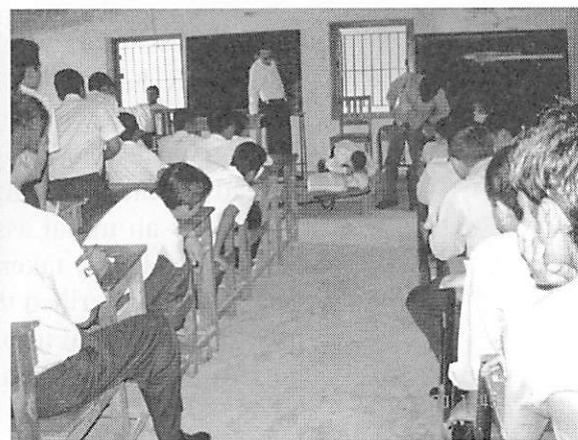
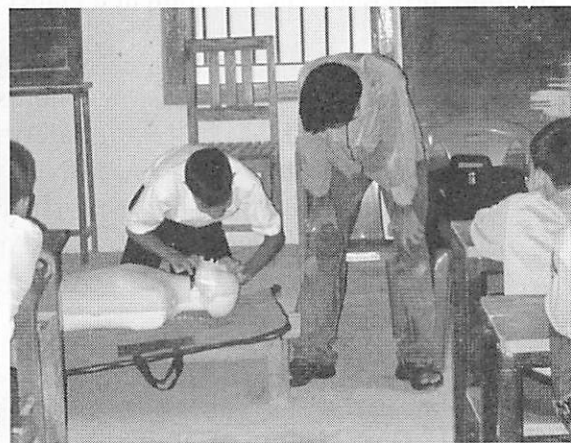
Trainer	: Moshiur R. Khandakar
Discussion on	: The general knowledge of the students about First Aid Sharing of the knowledge about principles of first aid Spread out the ideas on: What is First Aid? First Aid is an initial assistance or treatment given to someone who is injured or suddenly taken ill. The session described the sequence of priorities for giving first aid, providing essential information on how to deal with emergencies, and how to look after them. It also covers the steps involved in assessing and treating a casualty.

Session 02: 11:00 AM to 11:30 AM

Trainer : Md. Ariful Islam Shaikath
Discussion on : Major cause of respiratory problems and ways of giving respiration and CPR.
Practical on : Artificial respiration: How to check for response, how to open the airway, how to check breathing and how to give rescue breathes and abdominal thrust.



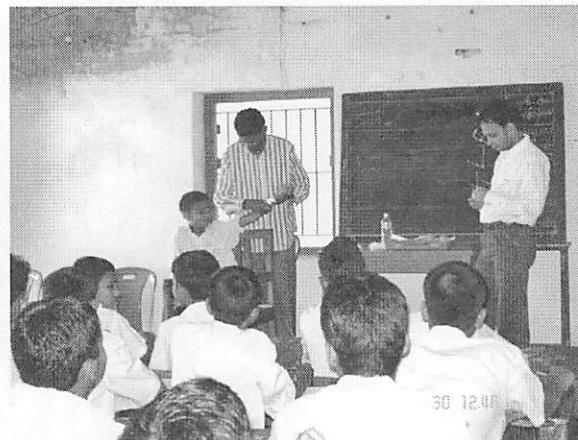
The ABC techniques of the First Aid



The students practicing the ABC techniques of the First Aid

Session 03: 11:30 AM to 12:30 PM

- Trainer : Anisul Islam Apu
 Discussion on : Different types of bleeding, different types of wound, several bleeding, cuts and grazes, bruising and some methods to stop severe bleeding. Uncontrolled blood loss may occur before clotting can take place if proper measure is not taken and shock may develop. Ways to recover from shocks.
 Practical on : Pressure bandage and how to dress a fresh wound.



The technique to manage & stop the bleeding

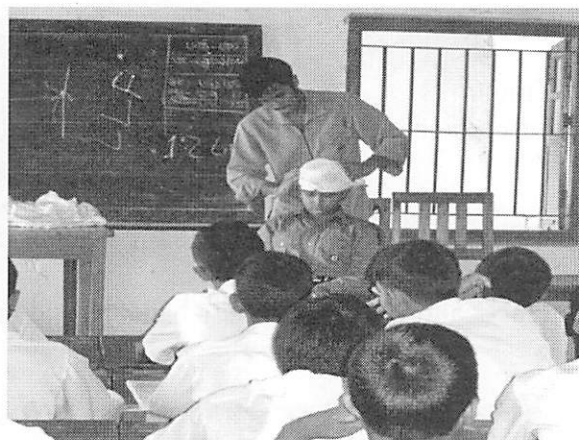
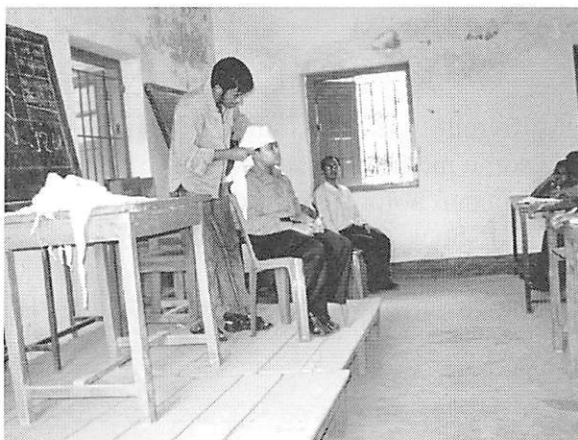
2nd Day Training Details:

Session 04: 10:00 AM to 11:00 AM

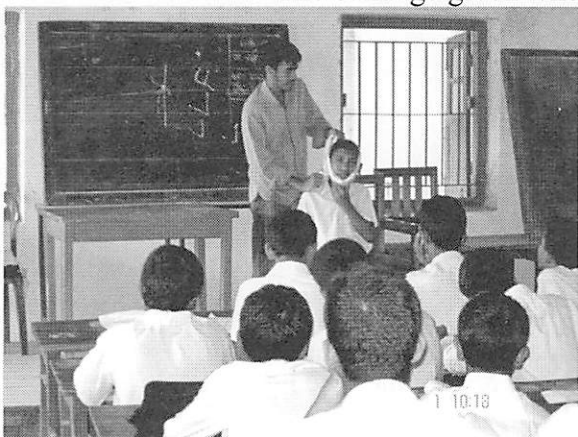
- Trainer : Anisul Islam Apu
 Discussion on : Severe burns and scalds, minor burns and scalds, Heatstroke, hypothermia and acid burn and its first aid treatment procedure, Different types of burns and its possible cause, How to assess a burn, depth of burns and burns that need hospital treatment.
 Practical on : How to treat a burn casualty.

Session 05: 11:00 AM to 12:30 PM

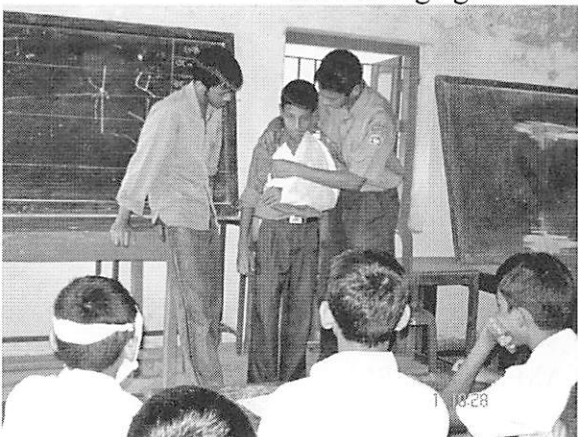
- Trainer : Md. Ariful Islam Shaikath
 Discussion on : Fracture. A fracture is a break or crack in a bone. A fracture may be stable or unstable, open and closed fractures. First Aid training covered treatment for most injuries, from major fractures to sprains and dislocations.
 Practical on : immobilize the injured part, lower and upper arm sling, chest, leg and skull bandage.



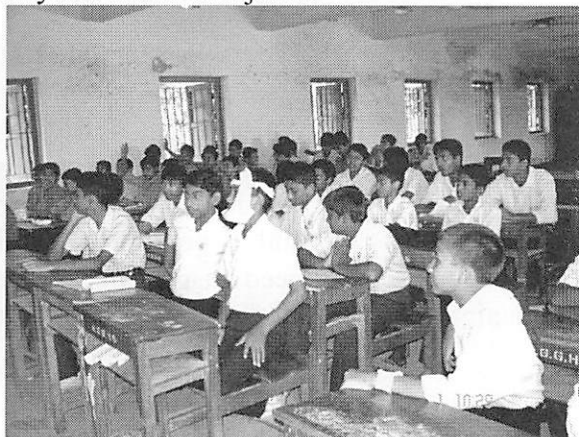
The bandage given when anyone's head is injured



The bandage given when anyone's chin is injured



The ways settling down the injured arm:



Students who attended the First Aid course

3rd Day Training Details:

Session 06: 10:00 AM to 11:00 AM

Trainer : Md. Ariful Islam Shaikath

Discussion On : Poisoning:

how poisons affect the body, types of poison, recognizing and treating the effects of poisoning.

Bites:

Bites from snakes are rarely fatal, but some of them are poisonous. Bites from sharp, pointed teeth cause deep puncture wounds that

can carry bacteria and other microorganisms (germs) far into the tissue.

Practical On : How to handle a snake bite victim.

Session 07: 11:00 AM to 12:30 PM

Trainer : Md. Ariful Islam Shaikath

Discussion on : Nervous system and level of consciousness and nervous break down and shock.

Practical on : How to place a casualty in recovery position.

4.3.2 Short course on First Aid at Narinda Govt. High School

A short course on First Aid has been successfully completed on 18 and 19 November, 2006 with selected 30 students of class VII to IX selected by the school authority. The students are from general groups. The course duration was 2 hours per day and for 2 days. The Assistant Headmaster of Narinda Govt. High School, Dhaka has introduced the training program. Lectures were delivered and training was given by two trained members of Youth Wings, Bangladesh Red Crescent Society, Dhaka. The students are trained up by enriching the practical and theoretical knowledge base.

The Program at a glance:

Training Duration	: 4 hours in 2 days
Organized by	: BNUS (Bangladesh Network Office for Urban Safety)
Date	: November 18 and 19, 2006
Name of Trainers	: Md. Ariful Islam Shaikath Md. Abed Hossain Billah
No of Participants	: 30

First Aid Training in Detail:

1st Day Training Details:

Session: 1:00 PM to 3:00 PM

Trainer : Md. Abed Hossain Billah

Discussion on : The general knowledge of the students about First Aid
Sharing of the knowledge about principles of first aid
Spread out the ideas on: What is First Aid?

First Aid is an initial assistance or treatment given to someone who

is injured or suddenly taken ill.

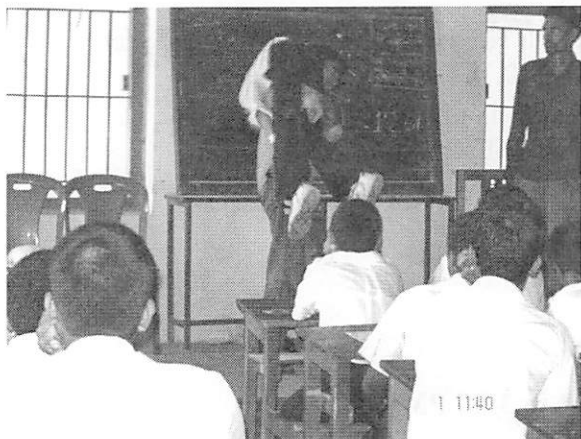
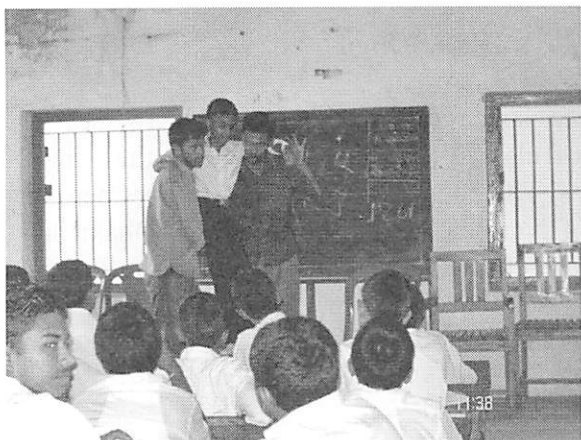
The session described the sequence of priorities for giving first aid, providing essential information on how to deal with emergencies, and how to look after them. It also covers the steps involved in assessing and treating a casualty.

The students have taught the ABC technique of the First Aid that is the Airway, Breathing and Circulating Disorder
Artificial Respiration and CPR
Heatstroke, Shock, Unconsciousness and Fainting

2nd Day Training Details:

Session: 1:00 PM to 3:00 PM

Trainer : Md. Abed Hossain Billah
Discussion on : Bleeding, Wounds, Dressings and Bandages
Fractures, Strains and Sprains
First Aid materials
Carrying and transport of casualty



Carrying and transport of casualty

Concluding Remarks

This is a very short course on first aid that may make a person primarily aware of what should they do at the preliminary stage to handle an injured person. The complete first aid training course is more detail than the provided course and requires much time. It is quite impossible for the students to manage the time frame besides continuing their regular studies at the school. The school authority has ensured that they will make such programs in the future to make the students fully capable of handing the situations requiring first aid also with the techniques to react in any disasters. BNUS is providing training on Earthquake safety awareness of which short course training on First Aid is a part. The full program concludes with giving the students search and rescue training and make them fully aware of their duties in pre, during and post disaster periods. More pictures on the short course are added at the appendices of the report.

4.4 Search and Rescue Training Program

The third step of the program covered Search and Rescue (SAR) training on how to deal with casualty after a disaster. A three days program with 5 hours per day has been organized by BNUS in Armenitola Govt. High School from December 11 to 13, 2006. The students who got the first aid training are selected for the next step of search and rescue training program that is the required doings in the after disaster part. There were 33 students from the 77 first aid trainee students.

4.4.1 Topics covered under SAR training

Different Steps in SAR:

- Survey
- Observation
- Information
- Plan
- Actions

General knowledge on different Stage of Search and Rescue (SAR):

i) Lectures on:

- What is Survey?
- How can they do the survey work?
- Types of Survey:
 - Primary Survey
 - Detailed Survey
 - Specialized Survey
- Ways of observing the damaged part of the area.
- Necessity and methods of collecting information on damaged property
- Plan to handle the situations perfectly. How to make an appropriate plan with the importance of making appropriate and successful plans? What is the right plan in that moment with details? Ways to develop the plan.
- Finally, why and how an action can take place?

ii) Stage of Rescue:

- 1st Stage: Emergency Rescue
- 2nd Stage: Search in of slightly damaged building.
- 3rd Stage: Immediate rescue
- 4th Stage: selected debris clearance

iii) General Techniques of Rescue:

- Lecture on different techniques of rescue
- Practical on the specific topics

iv) Different styles of rescue from a damage sector:

- Technique of Stretcher use with casualties
- Casualty leave with fireman using a chair knot

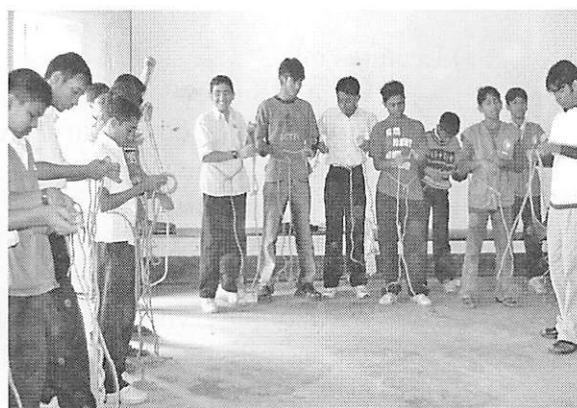
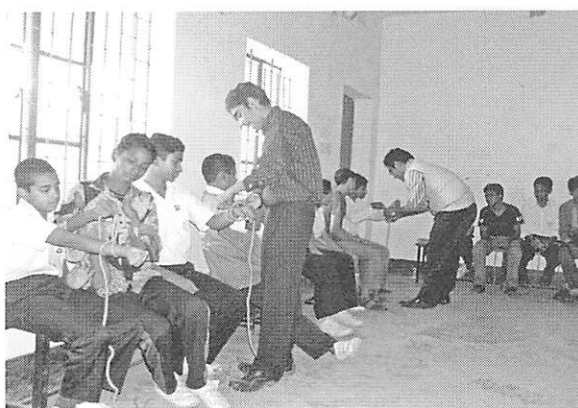
v) Technique of Debris cleaning's

4.4.2 Search and Rescue Training in Detail:

The lecturer with the help of facilitators has taught the students by hand the various techniques of making knot and hitches with ropes. The students are divided into 4 groups to have learnt the lesson well and good. Sufficient resource personnel have been provided to give them direction and making correction of their errors.

There are many knots which can be used and practiced. The participant should be able to tie the following knots automatically and in pitch:

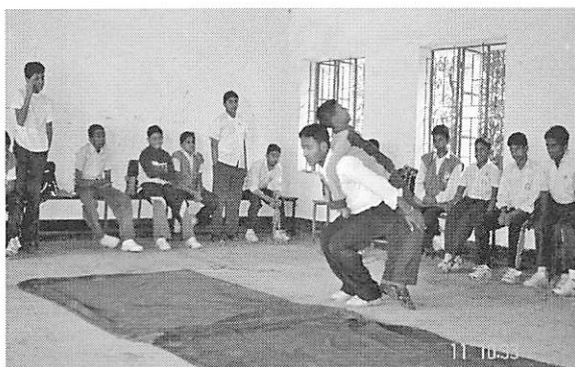
- Thumb knot
- Half Hitch
- Clove Hitch
- Reef Knot
- Chair Knot
- King Knot
- Chain Knot
- Ship Shank
- Timber hitch



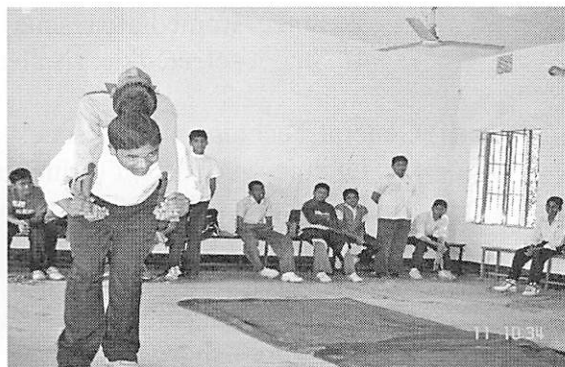
The Knot Making using the rope

Different styles of rescue from a damage sector are:

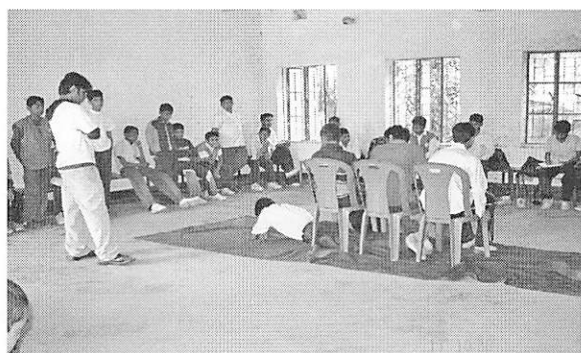
1. Crutch method (one & two
2. Pick a back
3. Pick a back reverse



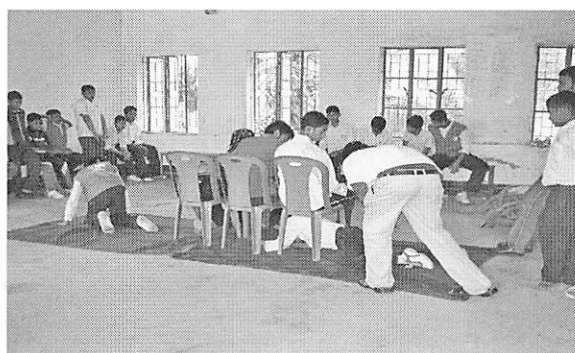
Pick a back (reverse) Technique (rescue crawl)



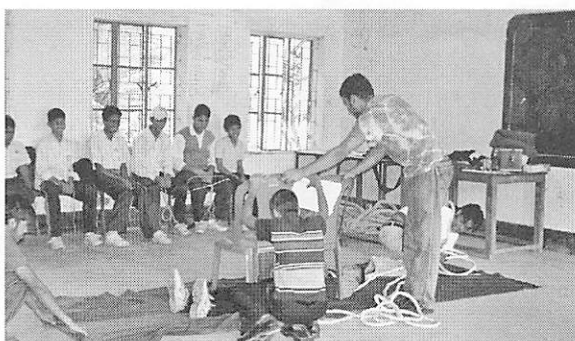
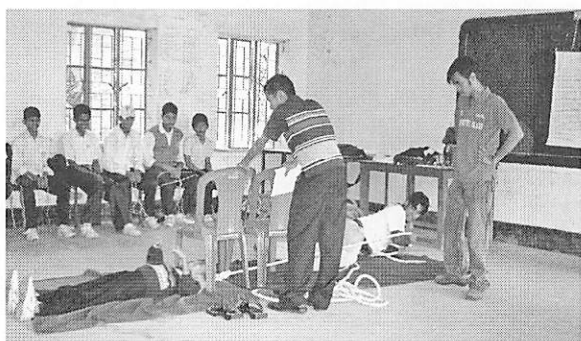
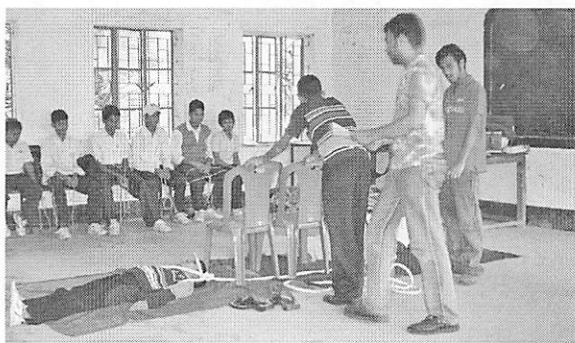
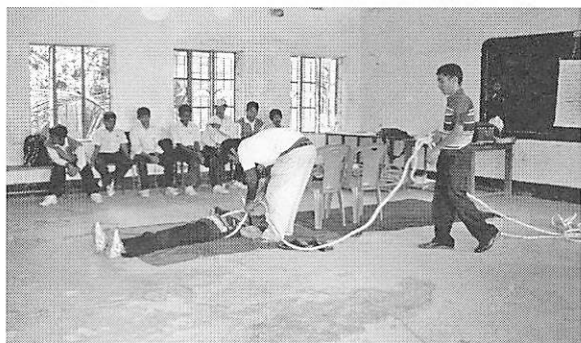
Chest to back



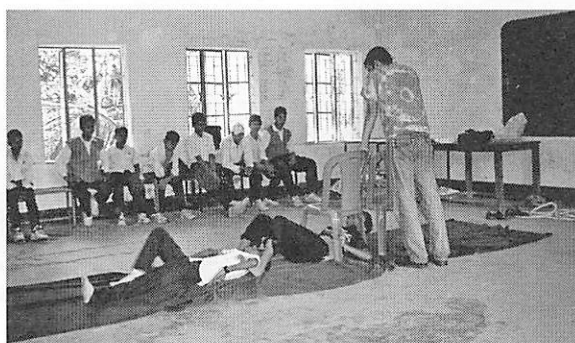
The Crawling technique (Fore and AFT carry)



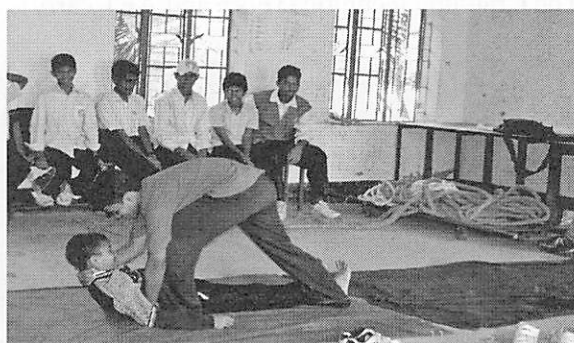
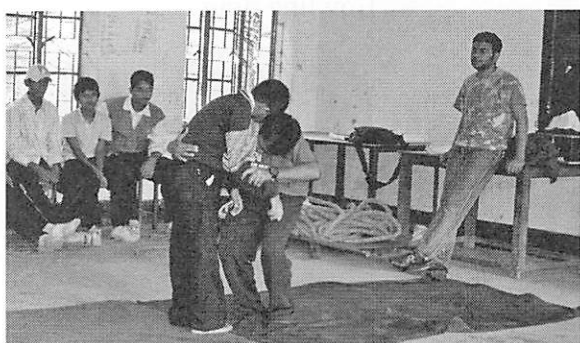
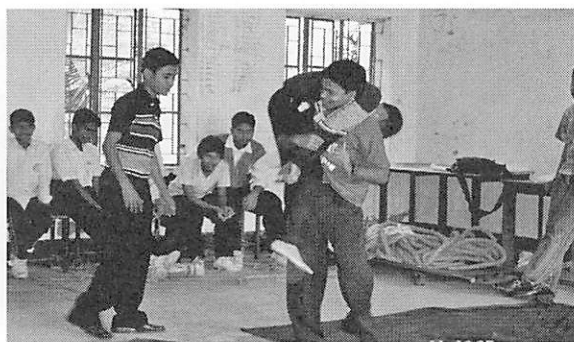
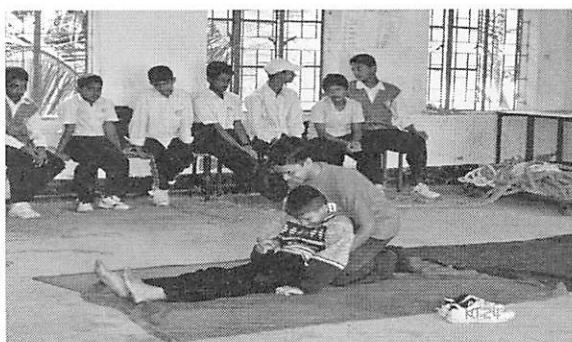
Bowling drag



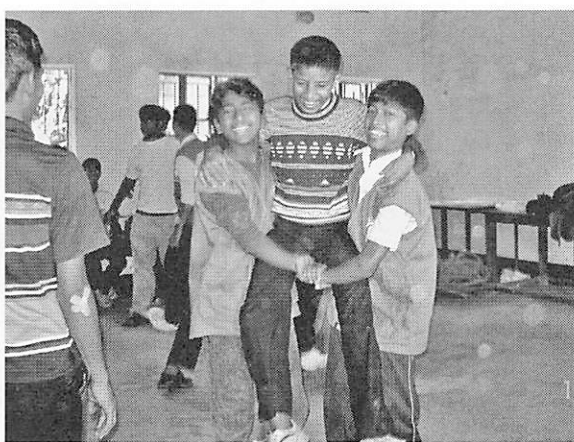
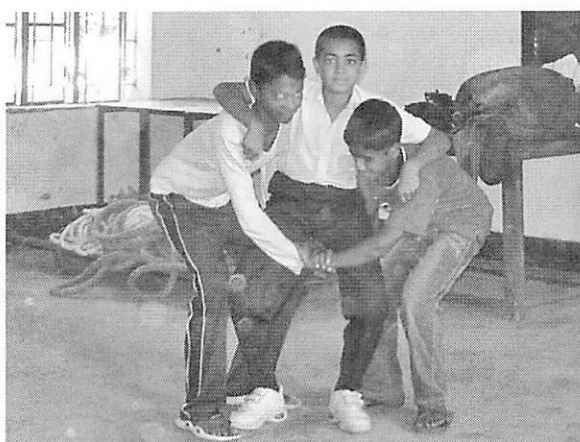
The different steps of Bowline dragging



Toe Dragging



The different stage of Fireman Lift



Technique of four hand carry (seat carry)



The Technique of Three men carry

Technique of Stretcher use with casualties in Rescue:

The use of stretcher

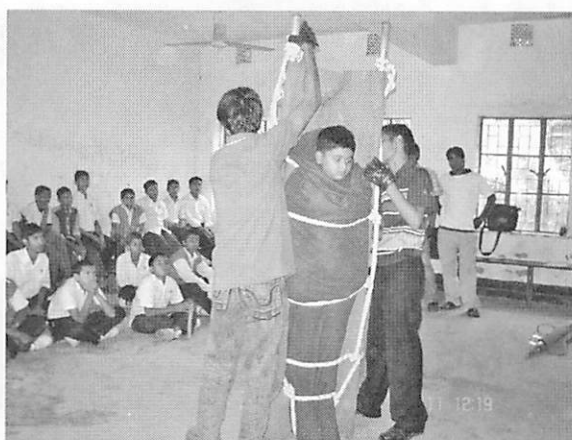
- The technique of using stretcher to rescue the casualties from high rise building
- Blanket and poles used to improve stretcher
- What types of knots & hitch will be used in which parts of stretcher.
- Methods of blanketing the casualties in stretcher.

Practical:

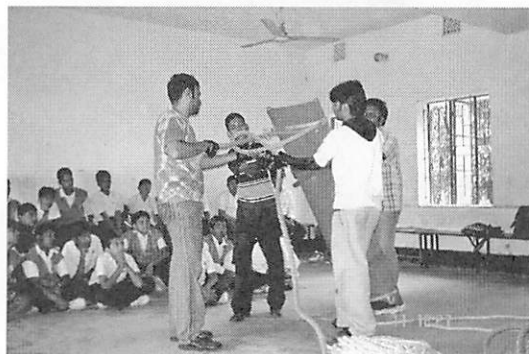
How to blanket the casualty

- The participant or trainee group wise blanketed the dummy casualty.
- Practically showing the rescue technique of casualty with stretcher.

Each of the group by themselves practiced the rescue technique with the use of stretcher. The facilitator and supported facilitator helped the groups in practicing the techniques perfectly.



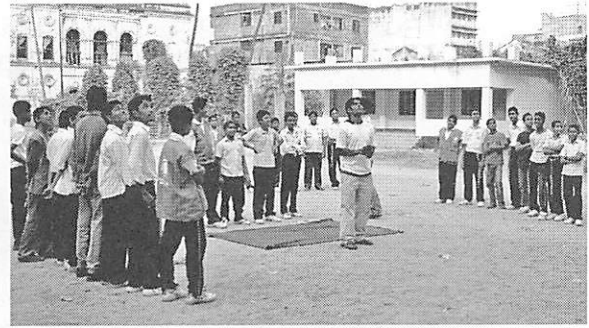
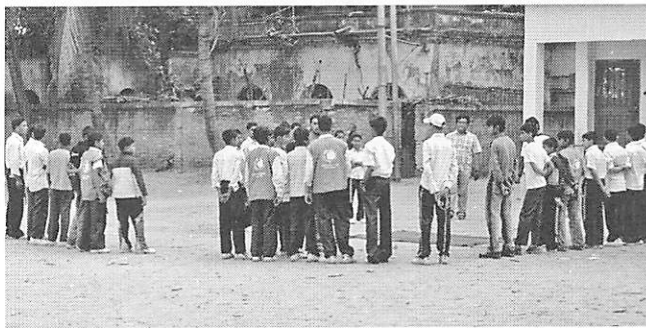
Stretcher blanketing with rope



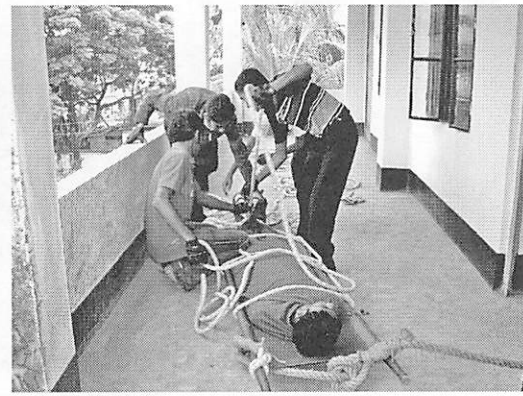
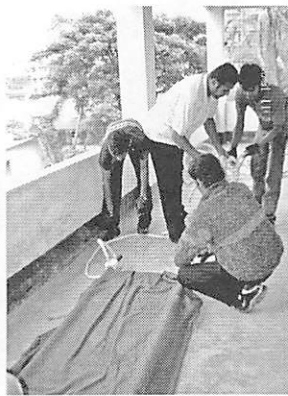
Bowline knot with Stretcher



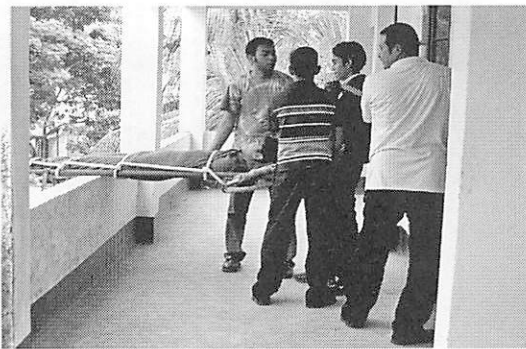
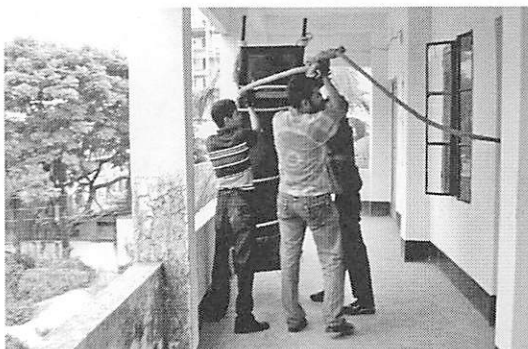
The students participating in stretcher blanketing



The student participated in rescue using stretcher blanketing in field



Ready to leave the Casualty from high raise building



Going to leave the Casualty



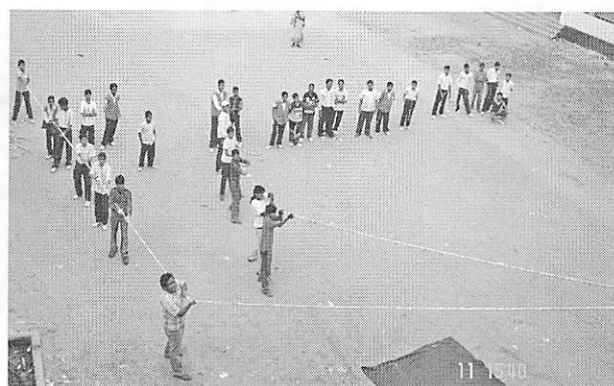
Ready to receive the Casualty from down stair



Casualty coming down vertically



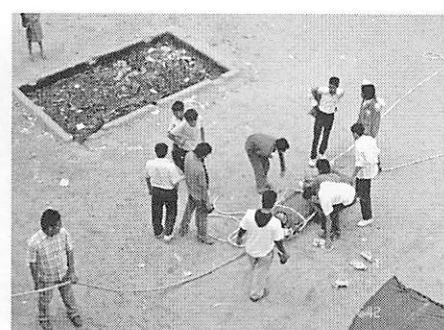
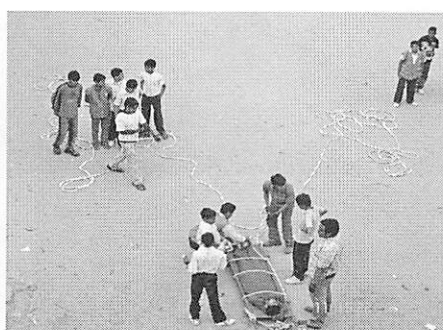
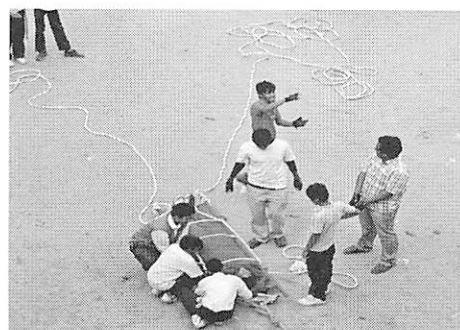
Casualty is hanging on air



Participant bring down the Casualty by rope



Participant bring down the Casualty by rope



After rescue, participants are busy to release the Casualty

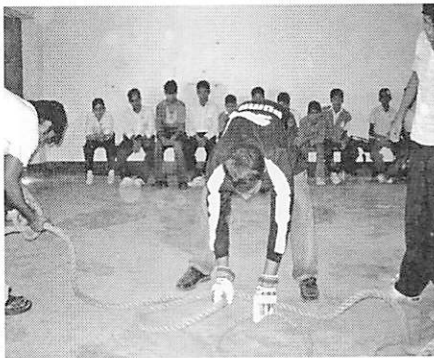
Causality leave with fireman Chair knot in Rescue :

The technique of chair knot use

- How to make a chair knot with rope
- How to replace the casualty on the knots loop and
- How to leave it from a high rise building by throwing a liner to the down

Practical:

The practical is done to make the students fully conscious of their doings. The students practiced the whole technique with the help of trainers to have perfection in their works.



Fireman chair knot

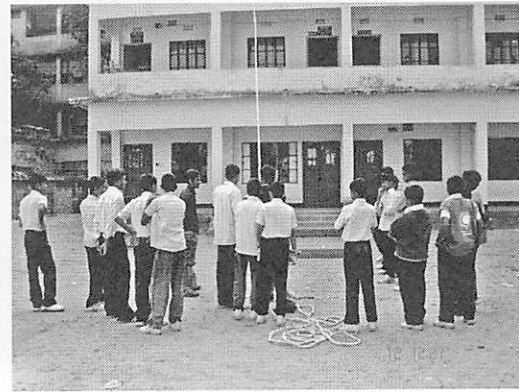


Casualty with chair knot

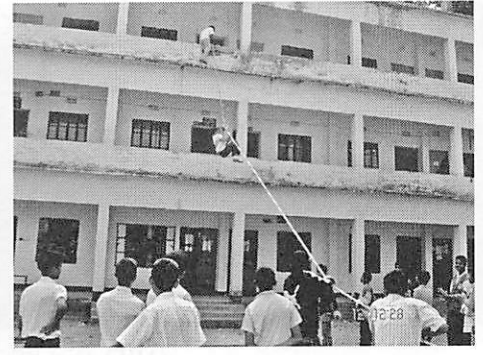
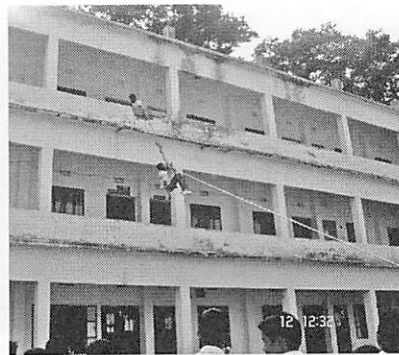


Casualty is hanging up

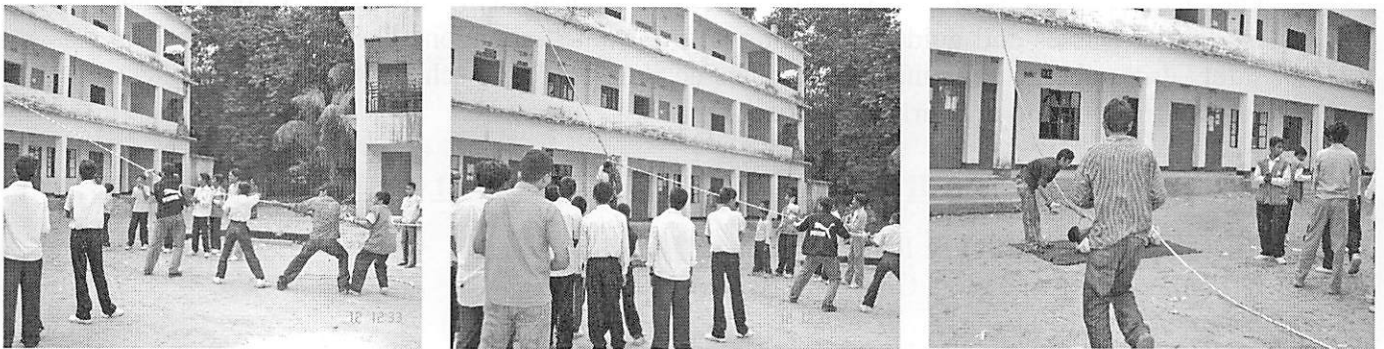
The Casualty lift using Fireman chair knot



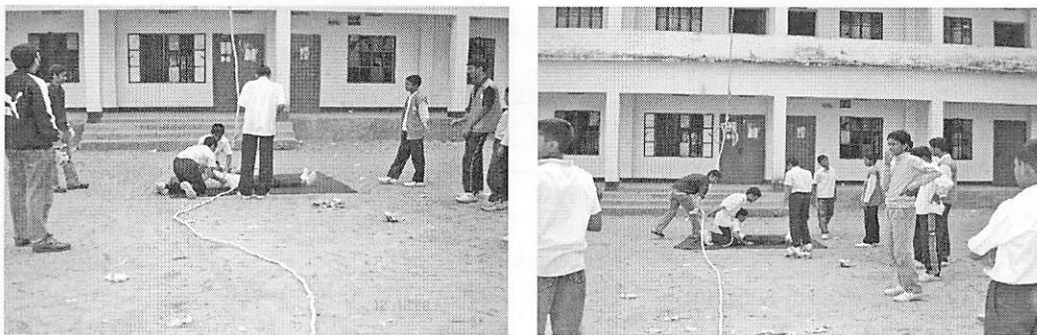
Participants are ready to practice in field



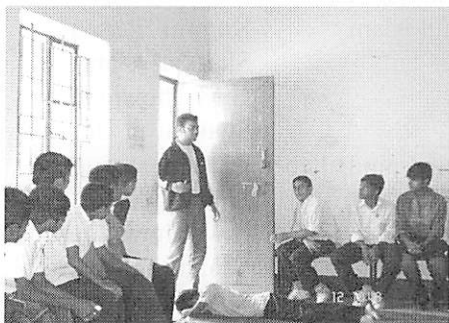
Demonstration of fireman chair knot with Casualty



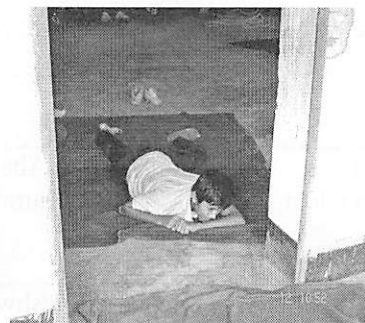
Participant are showing Fireman chair knot with Casualty



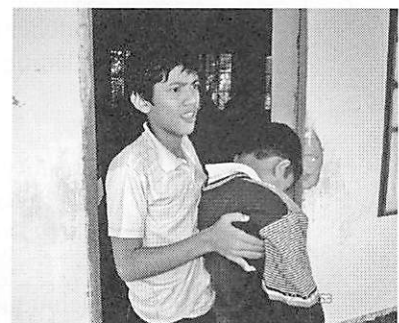
Participant bring down the Casualty



Technique to go in smoke field



Participant in practice
Rescue Technique from the smoke field



Technique of Debris cleaning's:

Different techniques of Debris cleaning

- What to do - the works which should be done before and after the debris cleaning.
- The dress code of a rescuer and
- Ways to operate a mission in the smoke field.

The restriction and caution during debris cleaning.

4.4.3 General Outcome of the training

The Search and Rescue training program is very effective after any disaster occurs in respect of reducing the losses. The loss due to any hazard becomes greater if an appropriate measure is not taken in time. The trained up students are themselves a great

resource considering the future prospects. They will also work in spreading out the knowledge base in awareness creation. These 33 students will work as the leader in their respective classes and guide in tackling any unwanted situation. They will also lead in safety drill undertaken in their school. The headmaster of the school wishes to under take safety drill program regularly in their school.

SEARCH & RESCUE TRAINING AT A GLANCE

Training name: Search & Rescue training.

School name: Armenitola Govt. high school.

Venue: School yard.

Date: 10/12/06 – 12/12/06

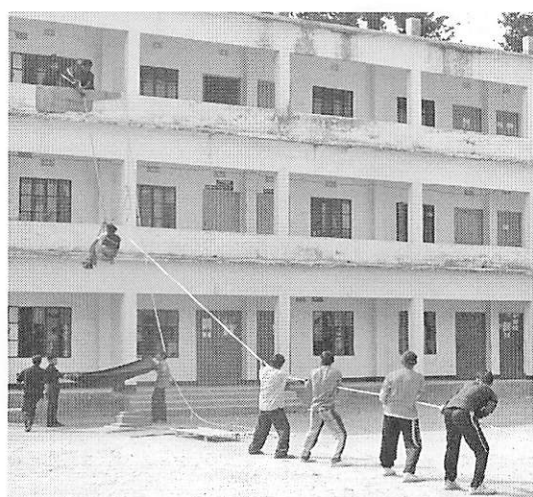
Date	Time	Event	Method	Facilitator	Supported Facilitator
10/12/2006	9.00 – 10.00	Introduction of SAR	Lecture	Md.Abed Hossain Billah	
	10.30 – 1.00	Step's of SAR	Lecture	Md. Abed Hossain Billah	
	2.00 – 4.30	Rescue with Rope a. Rope. b. Knot & Hitch, c. Uses.	Lecture & Practical	Md. Ariful islam & Rajeshwar singha.	Shafiqul islam H.M.Thowid rashed Shakhawat Hossain
11/12/2006	9.00 – 12.45	General technique of rescue	Lecture & Practical	Md. Ariful islam & Md.Abed Hossain Billah	Shafiqul islam H.M.Thowid rashed Shakhawat Hossain
	1.45 – 4.30	Technique of Stretcher use with causalities	Lecture & Practical	Md.Abed Hossain Billah & Md. Ariful islam	Rajshar singha Kamrul Hassan Shafiqul islam, H.M.Thowid rashed Shakhawat Hossain
12/12/2006	9.00 – 1.00	Causality leave with fireman Chair knot	Lecture & Practical	Md.Abed Hossain Billah & Kamrul Hassan	Rajeshwar singha, Shafiqul islam, H.M.Thowid rashed Shakhawat Hossain
	2.00 – 3.30	Technique of Debris cleaning's	Lecture & Practical	Rajeshwar singha	Shakhawat Hossain

4.5 Mock Drill

Finally a mock drill has been organized showing all the techniques of search and rescue, ways of first aid, demonstration showing the duties before, during and after an earthquake to have a clear cut view of the earthquake situation. It is the way of disseminating what they have learnt. The earthquake mock drill was organized by BNUS with assistance of 12 Trainers from Bangladesh Red Crescent Society at Armenitola Govt. High School, Dhaka on 23 February 2007. The drill lasted for 100 minutes. Total 150 students participated in the drill among them 33 was SAR trainees, rest were first aider and other general students. The program was under the leadership of already SAR trained 33 students. The Guardians of the students and the School teachers were also present in the program in order to spread out the knowledge on earthquake safety. In the program the students presented their duties before, during and after an earthquake. Photographs show different scenes of the mock drill. To increase awareness each school student has given an earthquake awareness poster already made for the Dhaka city (Appendix-D).



A Scene of Earthquake Mock drill



Casualty leave using Firemen Chair knot



Casualty leave using Stretcher



First Aid Post beside the affected area



Carrying a casualty



The participants in the Mock drill

5. SUSTAINABILITY OF THE PROGRAM

The training program is very effective in facing a disaster in respect of reducing the losses. The loss due to any hazard becomes greater if an appropriate measure is not taken in time. The trained up students are themselves a great resource considering the future prospects. They will also work in spreading out the knowledge base in awareness creation. The students will actively take part in reducing the loss from any disaster. Living in the affected or surrounding areas the local community may response most effectively before the outside help reaches in their area. And a trained up community can reduce the loss much more than the untrained. The students will spread out the ideas and knowledge on earthquake safety awareness activities and necessary duties to minimize the sufferings from disasters.

Emergency first aid service and other life saving measures can drastically reduce sufferings and save more lives. These students will work as the leader in their respective classes and guide in tackling any unwanted situation. They will also lead in safety drill in their school. The students who got the search and rescue training and the first aid training will be selected for the next step of earthquake safety drill. Afterwards the safety drill will be undertaken regularly in their school.

The Search and Rescue training program is very effective after any disaster occurs in respect of reducing the losses. The loss due to any hazard becomes greater if an appropriate measure is not taken in time. The trained up students are themselves a great resource considering the future prospects. They will also work in spreading out the knowledge base in awareness creation. These 33 students will work as the leader in their respective classes and guide in tackling any unwanted situation. They will also lead in safety drill undertaken in their school. The headmaster of the school wishes to under take safety drill program regularly in their school.

The trainee students will work as the following and help in risk reduction:

- Save lives providing first aid and service to minimize the risk of death and future injury.
- Immediate transfer to minimize the shock and reduce suffering
- First Aid team at local community level.
- The students will actively take part in reducing the loss from any disaster.
- The students will spread out the ideas and knowledge on earthquake safety awareness activities and necessary duties to minimize the sufferings from disasters.
- Emergency first aid service and other life saving measures can drastically reduce sufferings and save more lives.
- The teachers and students of the schools have, on their own initiative, taken several actions to try to assess and decrease the risk of their neighborhoods.
- The enthusiasm and potential of these groups has been exciting and such school community work should be a part of future efforts.
- Living in the vulnerable areas the local community may response most effectively before the outside help reaches and a trained up community can reduce the loss much more than the untrained.
- Common people started taking interest in earthquake issues and raising questions shortly after the project began.

6. CONCLUSIONS

Earthquake risk reduction action plan cannot be successful unless the people at risk in the hazardous zone aware themselves about the risk and considers earthquake safety issues as part of their life and society's culture. The enthusiasm and potential of the school people was exciting and such school community work should be a part of future efforts of any Safety related Project. Schools play a vital role in every community. Schools teach civics, educating citizens of their rights and duties. They foster an appreciation of culture through the study of literature and the arts. Schools are a measure of community well being. Earthquake threatened communities need earthquake-resistant school to protect their teachers and children. In order to reduce Old Dhaka's earthquake risk, the processes started by this project need to be continued for at least several years.

Recommendations for school based disaster management plan

- Emphasize preparedness for natural and technological disasters.
- Prepare charts, outlining who does what in disaster prevention, mitigation, preparedness and response.
- Define the tasks to be fulfilled by the team and the support they need from the authorities.
- Include the BNCC, Red Crescent more fully in support of response to warnings and disasters at all level.
- Reinforce cooperation between different organizations (Fire service, Red Crescent Society) and school.
- In order to reduce earthquake risk of Old Dhaka, the processes started by this project need to be continued for at least several years

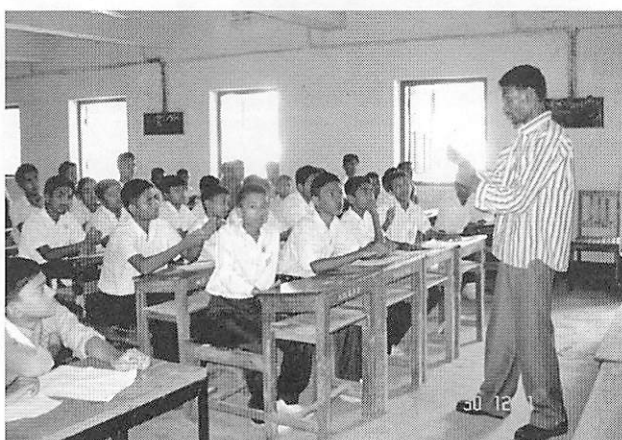
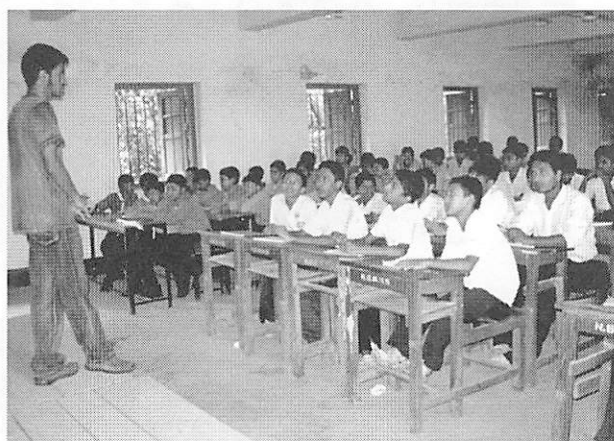
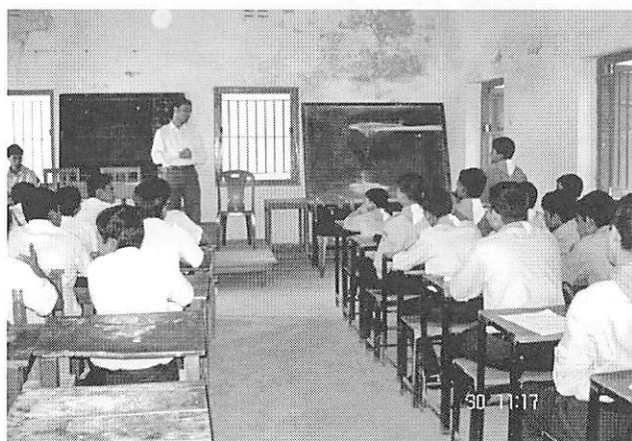
REFERENCES

- Ansary, M.A., 2004. *Seismic Loss Estimation of Dhaka for an Earthquake of Intensity VII*. Oriental Geographer, Dhaka University.
- Campo, M. A., nd, 2006. *Study of Awareness of Earthquake Risk in the population of Mendoza*. URL: <http://proventionconsortium.org/files>.
- Rahman, M. G. F., 2004. *Seismic Damage Scenerio for Dhaka City*. M.Sc. Engg. Thesis, Department of Civil Engg., BUET, Dhaka.

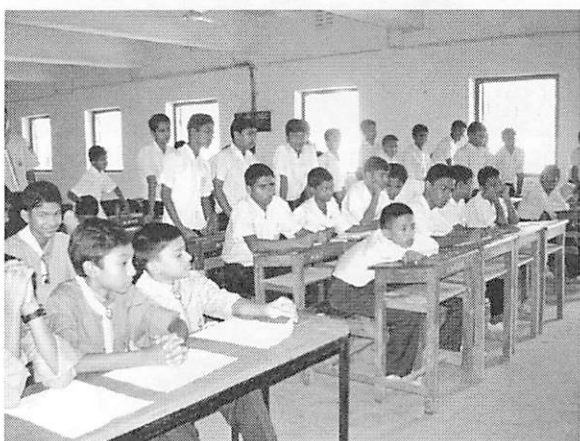
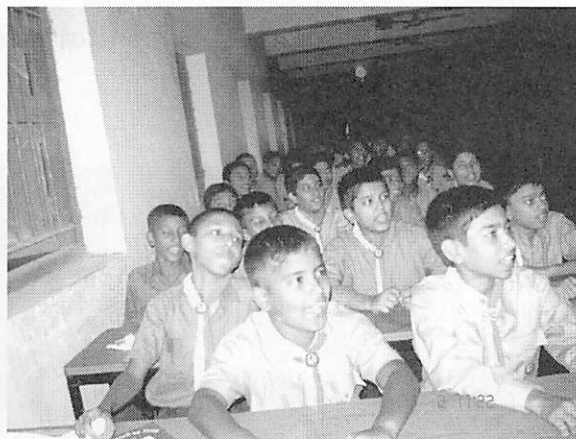
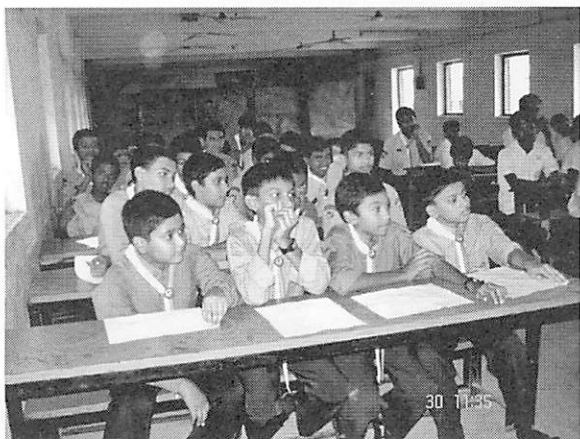
**Pictures of the Short course on First Aid Training
at
Armenitola Govt. High School**



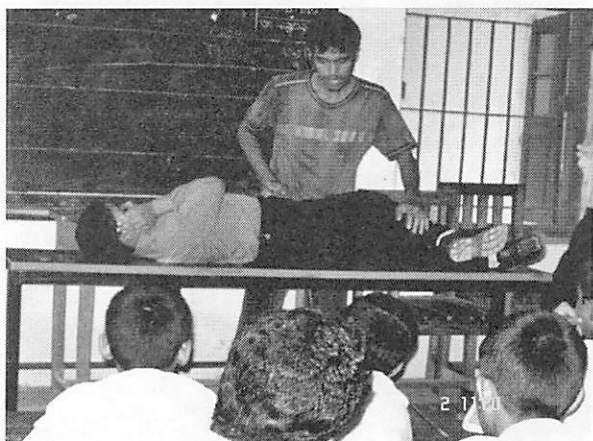
Introductory speech has been given by the Principal of Armenitola Govt. High School



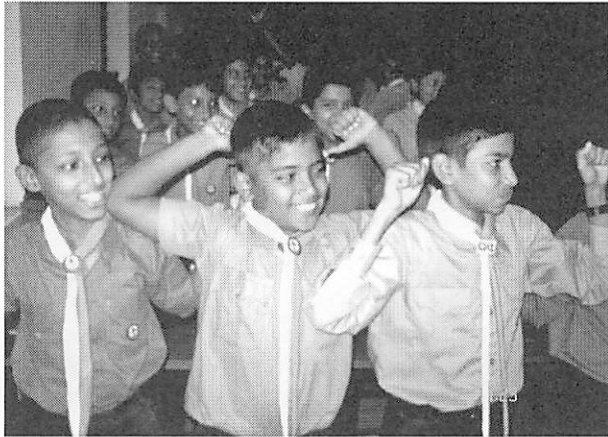
Lecturers



Participants/Trainees:



Managing a patient to stay in a more comfortable condition

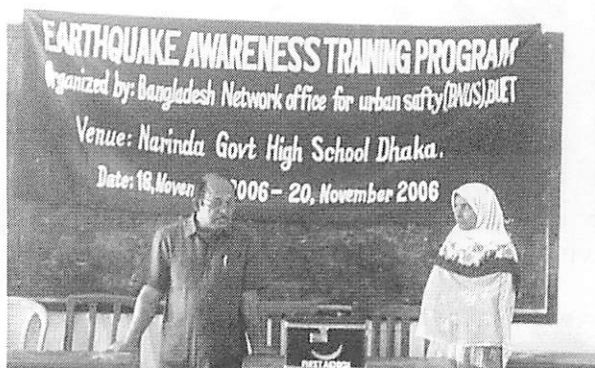


Making fun during the training to revitalize the attention of the students

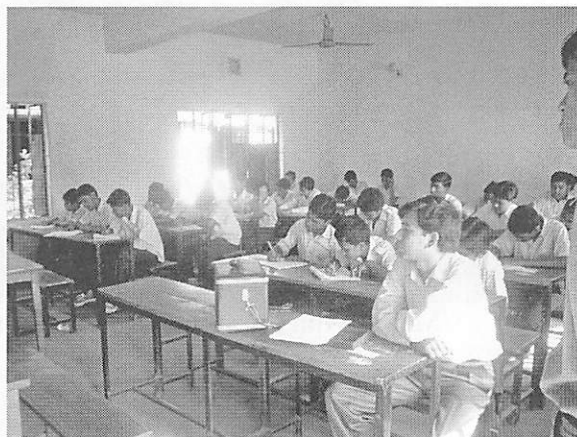


Students participated in the first Aid Training Program

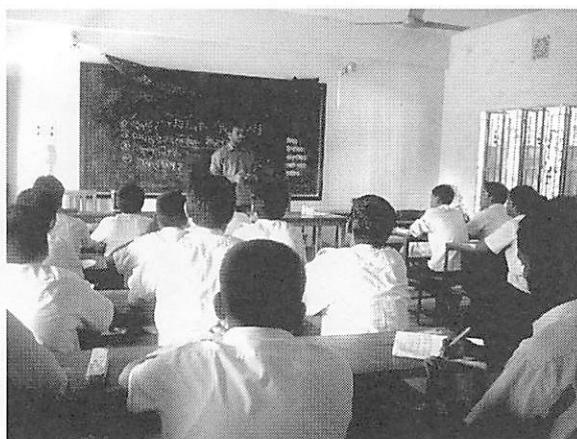
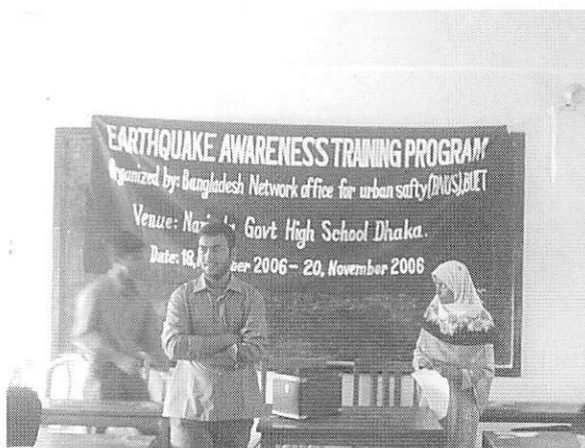
**Pictures of the Short course on First Aid Training
at
Narinda Govt. High School**



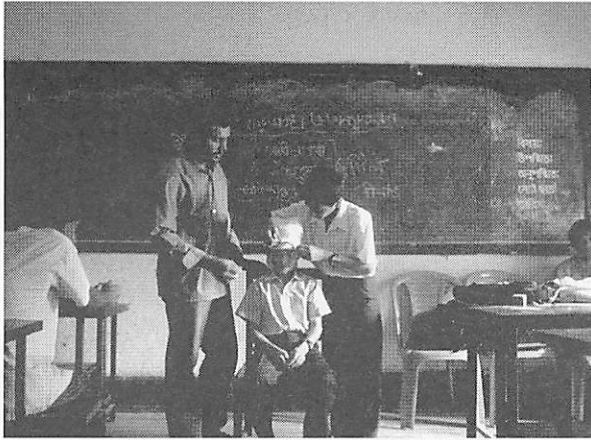
Introductory speech has been given by the
Assistant Head Master of Narinda Govt.
High School



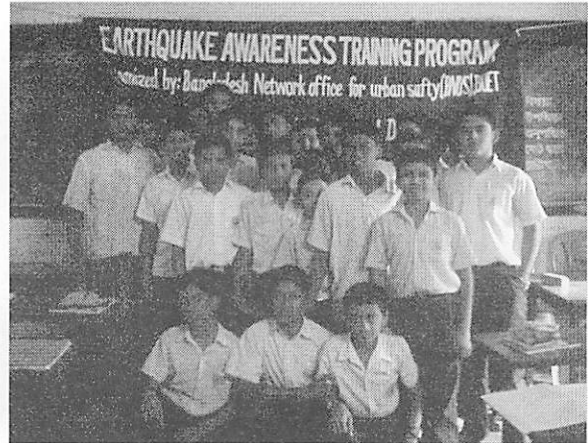
Participants



Lectures



Students practiced how to bandage when anyone's head is injured

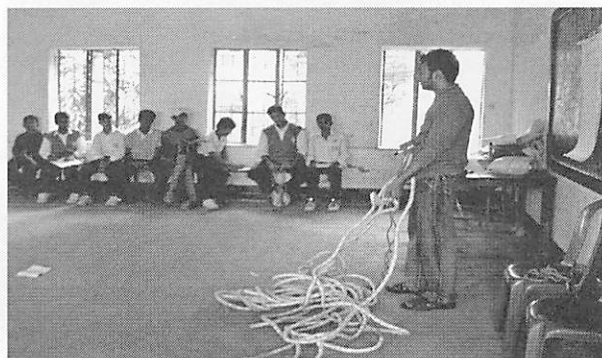


Students participated in the first Aid Training Program

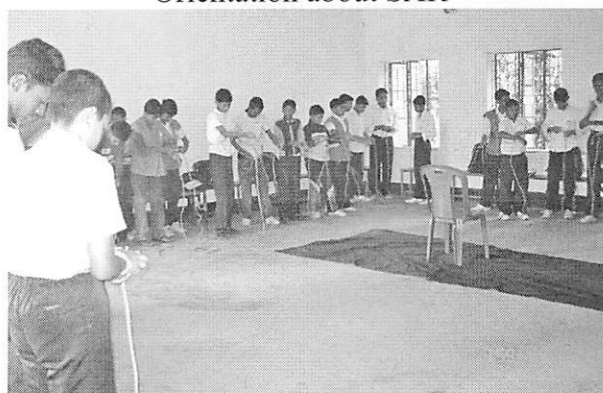
Pictures of the Search and Rescue Training at Armenitola Govt. High School



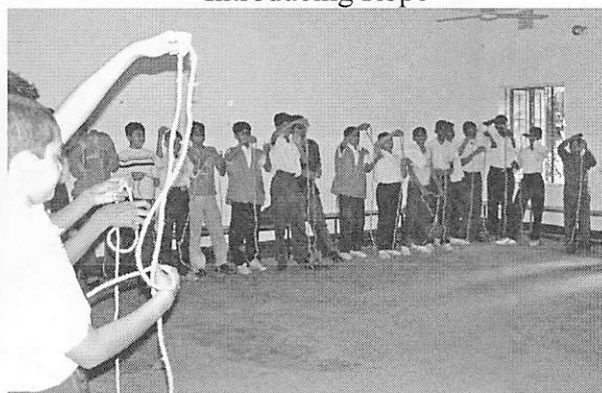
Orientation about SAR



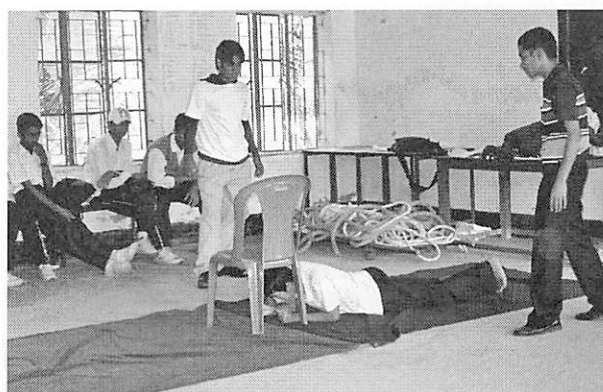
Introducing Rope



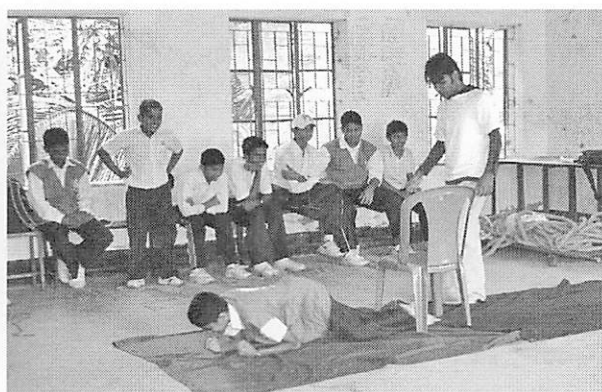
Making Knot using the rope

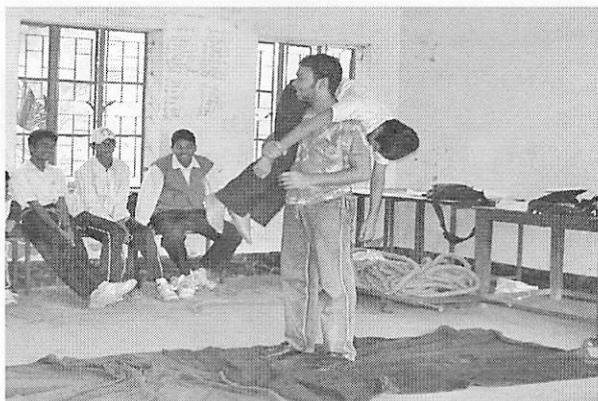
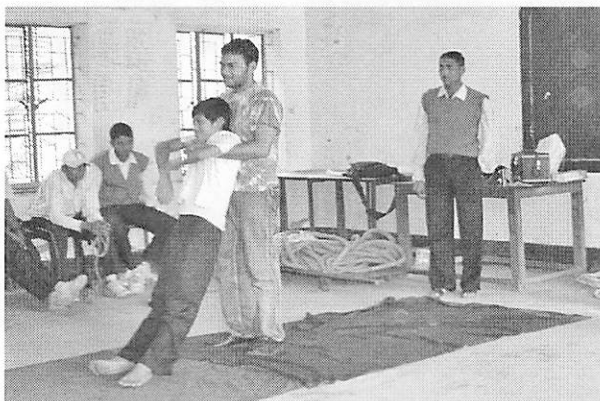
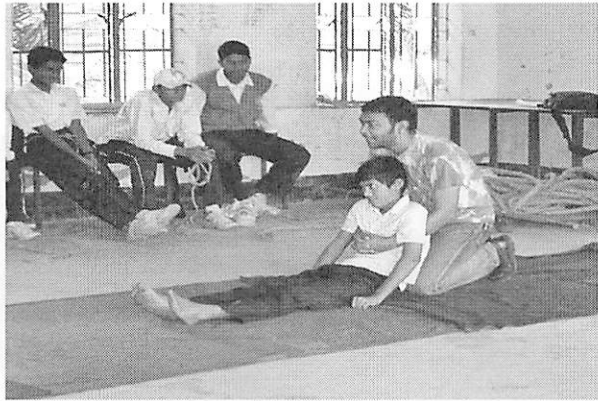
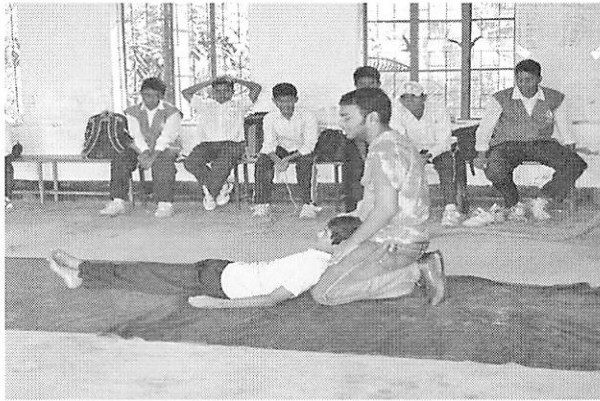


The students practiced knot making with the help of trainers

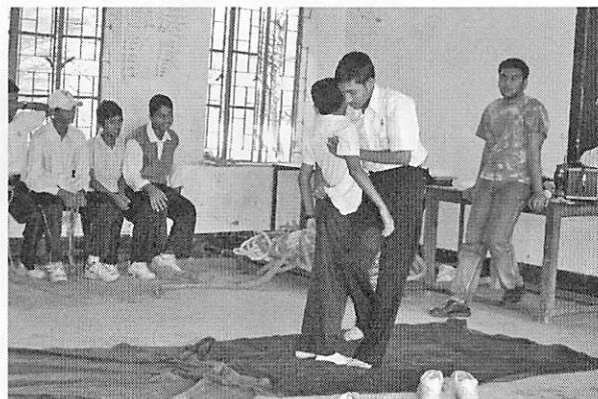
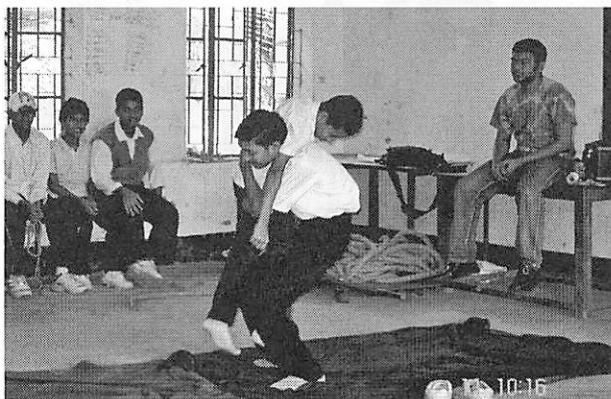
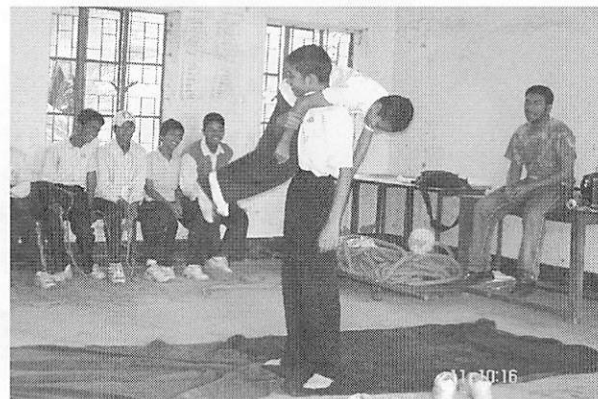
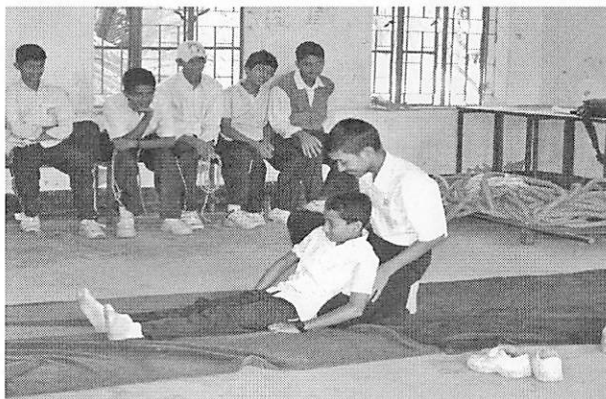


Crawling





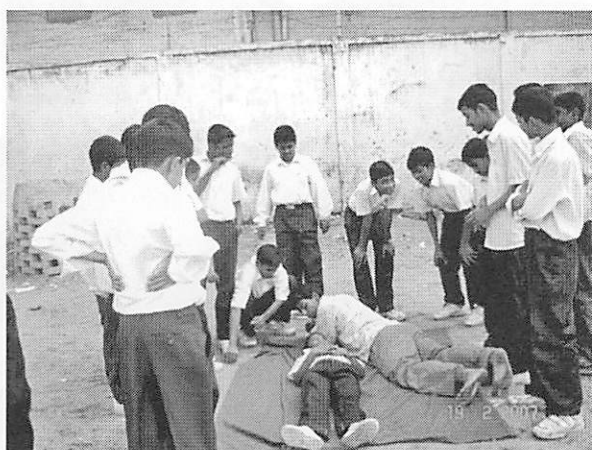
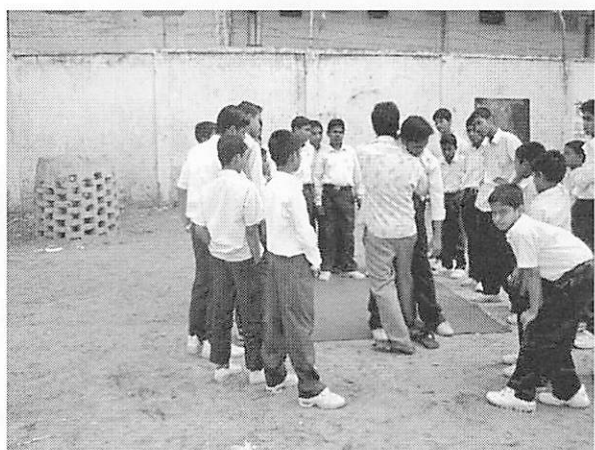
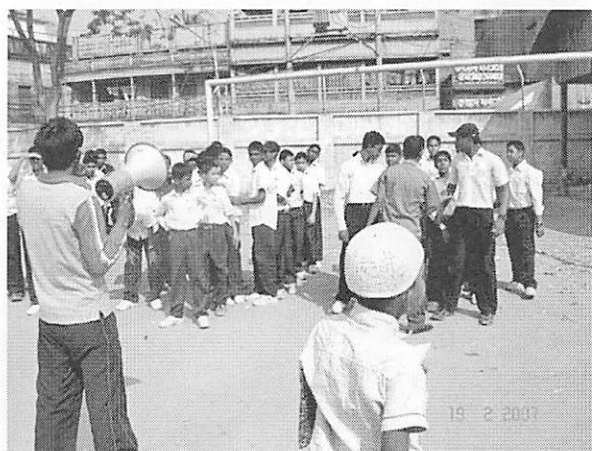
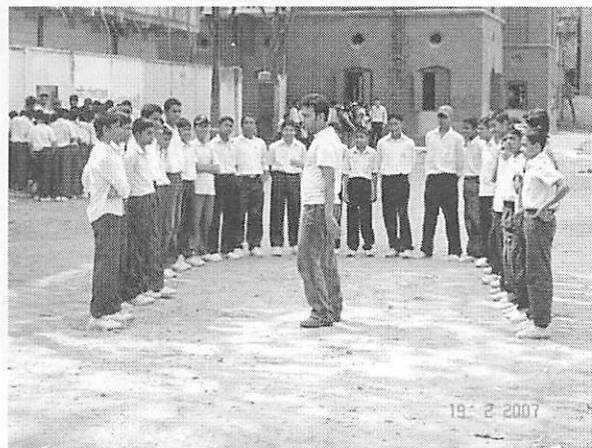
Technique of Fireman lift



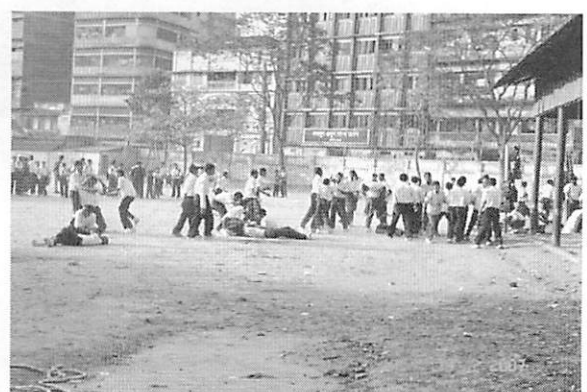
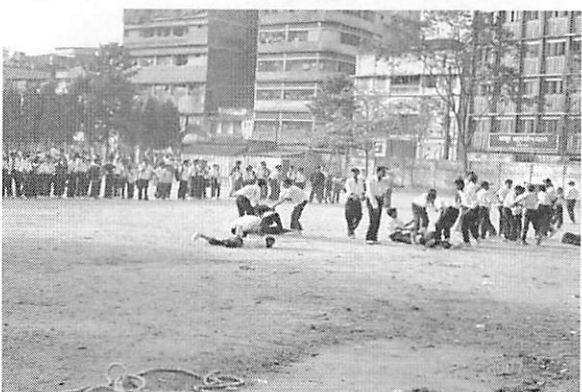
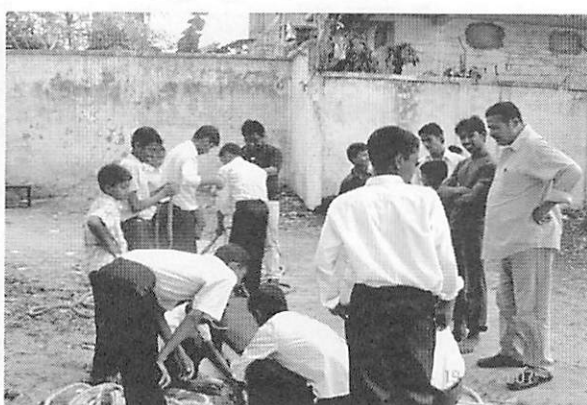
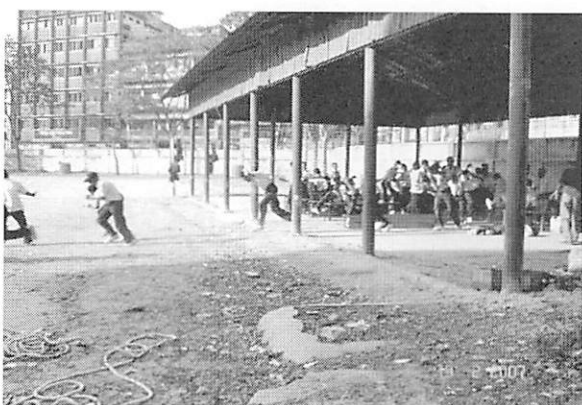
The students have practically learned the Fireman lift technique

Pictures of the Mock Drill at Armenitola Govt. High School

Pictures of 1st day Dress rehearsal of the Drill

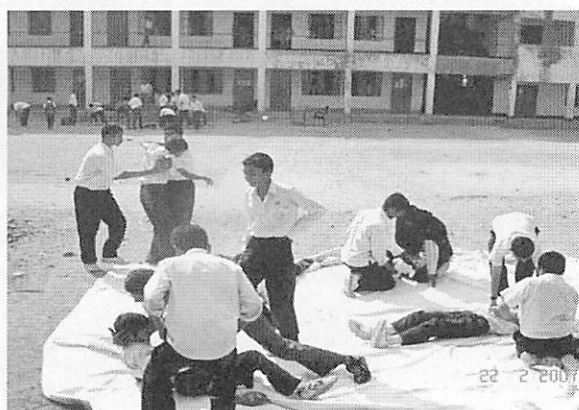
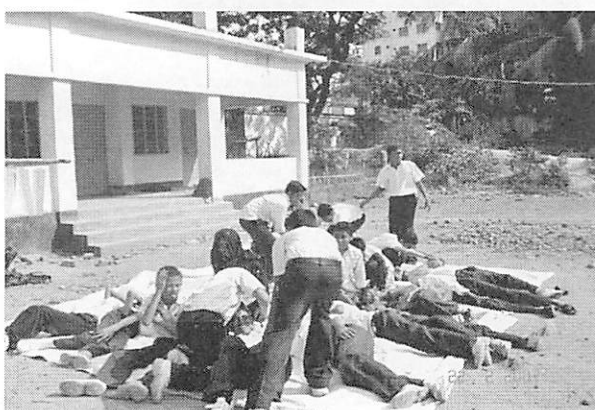
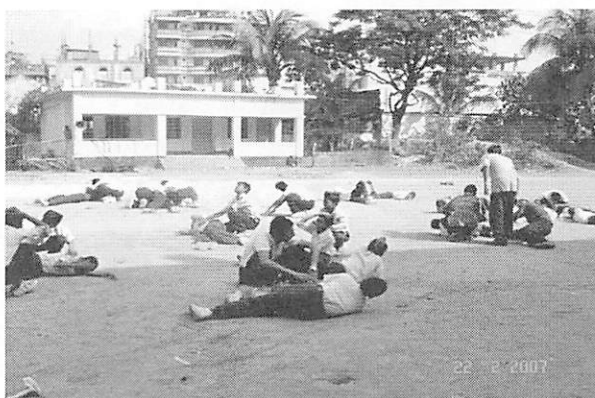
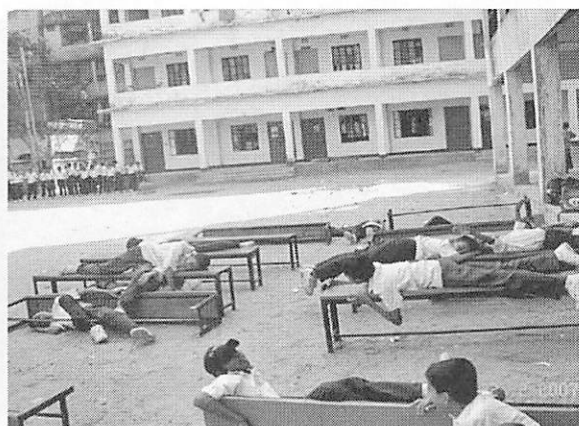
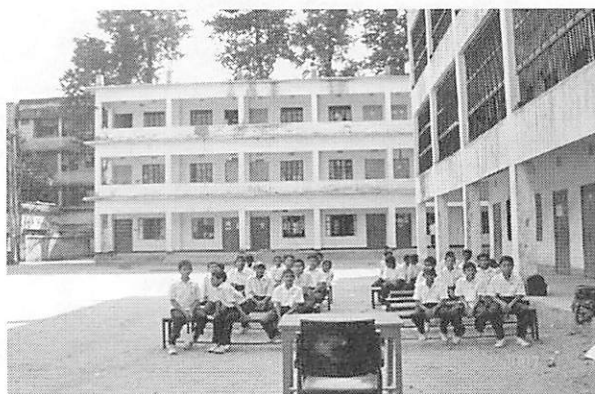


Students are divided into different groups and are briefed on their duties during the situation on earthquake

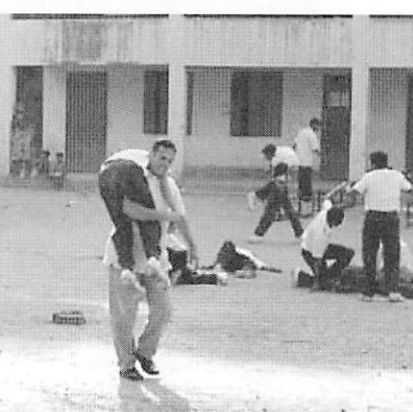
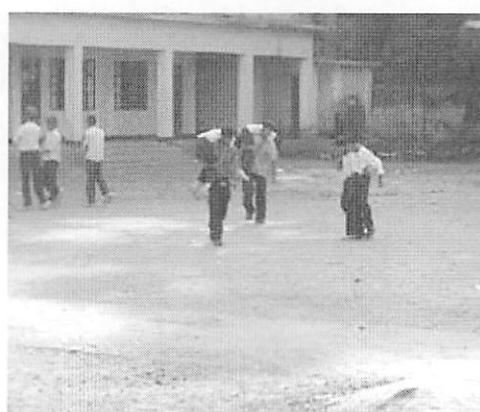
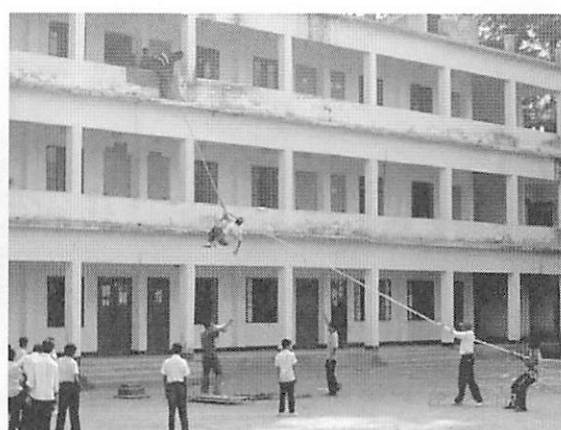


Different photo shots on the 1st day rehearsal by the school students

Pictures of 2nd day Dress rehearsal of the Drill

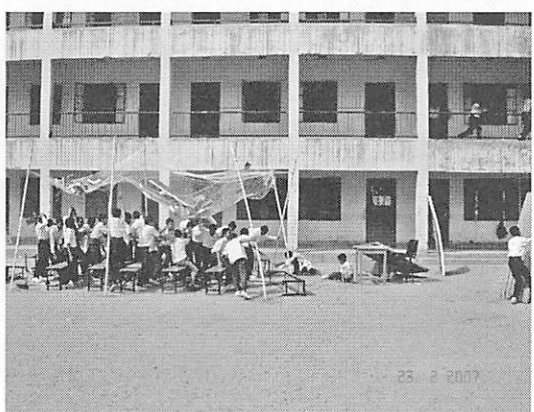


Different photo shots on the 2nd day rehearsal by the school students

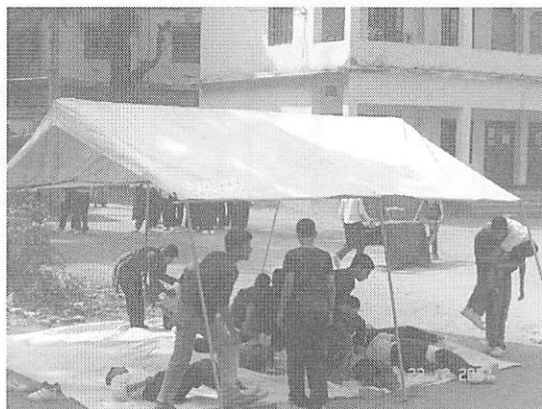
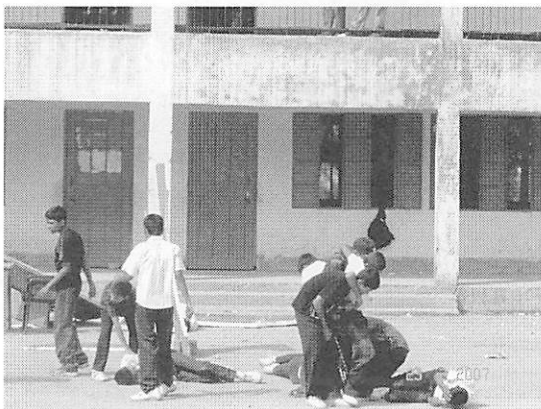
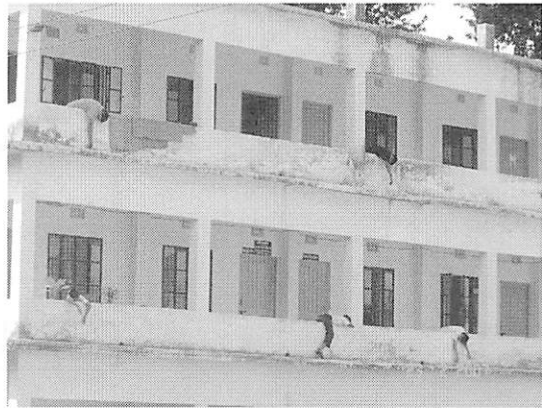
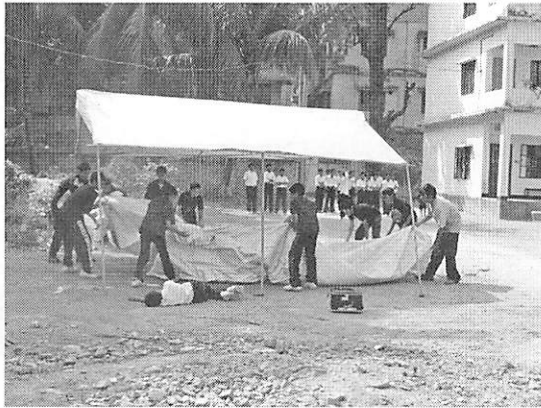


Different photo shots on the 2nd day rehearsal by the school students

Pictures of Final Mock Drill



Different photo shots on final mock drill presentation by the students



Different photo shots on final mock drill presentation by the students

Appendix-A

The poster on 'Earthquake Safety Awareness' has been given to the School authority.

[illegible]

Appendix-B

List of Students attending the First Aid Training course

Venue: 'Armenitola Govt. High School'

Date: 30 September'2006; 01 & 02 December' 2006

Sl no.	Name	Class	Sec	Roll
1	Md. Nure Alam	VI	A	13
2	Md. Abul Kashem Khan	VI	A	17
3	Ariful Islam Pulak	VI	B	16
4	Rasedul Islam	VI	B	34
5	Md. Tanvir Ahmed	VI	B	6
6	Hasibur Rahman	VI	B	20
7	Sazzad Hossain	VI	B	19
8	Md. Adib Hossain	VI	B	7
9	Md. Sharier Sajedin	VI	B	4
10	Md. Nahid	VI	B	2
11	Md. Yakub Ali Ashik	VI	B	54
12	Redowan Ahmed Rajib	VI	C	12
13	Md. Hannan	VI	C	20
14	Mirza Alia mahdi	VI	C	13
15	Dipak Kumar dey	VI	C	47
16	Mehdfi Hassan	VI	C	36
17	Mir Safikul Islam safin	VI	C	25
18	Saurav Das	VI	C	41
19	Manjur Hossain Akash	VI	C	42
20	Md. Khairul Islam	VI	-	-
21	S.M. Jarib	VII	A	8
22	Md. Ali Masum	VII	A	26
23	Jubayer Hossain	VII	A	1
24	Md. Shahedul Islam	VII	A	1
25	Md. Ashekul Islam	VII	A	2
26	Md. Nure Alam Uzzal	VII	A	10
27	Khairul Bashar	VII	A	55
28	Sujan Chandra Sheel	VII	A	17
29	Md. Akib	VII	A	35
30	Md. Kawsar Hossain	VII	B	6
31	Md. Fazle Rabbi	VII	B	44
32	A. A.M. AN. Sadik	VII	B	1
33	Yasin Arafat	VII	B	2
34	Milon Ahad Ali	VII	B	10
35	Saddam Hossain	VII	B	61
36	Syed Hasan Ashik	VII	B	24
37	Md. Yanur Rahman	VII	B	39
38	Kamal Uddin Sarker	VII	C	6
39	Md. Ataur Rahman	VII	C	15

Sl no.	Name	Class	Sec	Roll
40	Md. Sajib	VII	C	23
41	Hassan Shariar	VII	C	41
42	Saurav Ahmed	VIII	A	23
43	Saurav Mandal	VIII	A	10
44	Abdul Ahad	VIII	A	18
45	Sanjay Jumar mandal	VIII	A	15
46	Shahadat Hossain	VIII	A	17
47	Md. Faisal Hossain	VIII	A	53
48	Abdullah Al Arif	VIII	A	56
49	Md. Nazmul Islam	VIII	B	14
50	Rahi	VIII	B	28
51	Md. Anisur Rahman	VIII	B	47
52	Rafsan Bin Hossain	VIII	B	32
53	Galib Saifullah	VIII	B	15
54	Ahmed Jisan Al Adnan	VIII	B	11
55	Badsha Alamgir	VIII	C	25
56	Ruhul Amin	VIII	C	30
57	Md. Jweel Parvej	VIII	C	14
58	Mehdi Hassan Nayme	VIII	C	44
59	Md. Suman Islam	IX	A	18
60	Ifat Hasan Manju	IX	A	28
61	Md. Parvej Hossain	IX	B	-
62	Md. Nur Amin Shapwam	IX	B	39
63	Md. Shamim Ahmed	IX	B	30
64	Md. Moshir Rahman	IX	B	15
65	Md. Mursalin	IX	B	21
66	Md. Nahid Hassan	IX	B	10
67	Md. Rumen	IX	B	27
68	Md. Asaduzzaman	IX	C	8
69	Md. Nasir Uddin	IX	C	48
70	Md. Ibrahiim Khalil	IX	C	3
71	Md. Ashraful Islam	IX	C	31
72	Syed Ataulah Ibrahim	IX	C	10
73	Md. Nahian Ferdous	IX	C	4
74	Md. Gulam Shadat	IX	C	36
75	Md. Mansor Hellal masum	IX	D	8
76	Md. zahirul Islam	IX	D	40
77	Asiful Haque Jwell	IX	D	1

Appendix-C

List of Students attending the First Aid Training course

Venue: 'Narinda Govt. High School'

Date: 18 November' 2006

Sl no.	Name	Class	Sec	Roll
1	Dip De	VII	C	4
2	Avajit Modak	VII	C	5
3	Md. Saiful Islam	VII	C	1
4	Nazmul Ahsan	VII	C	2
5	Nihar Adhikari	VII	C	3
6	Shishir Das	VII	D	1
7	Md. Hasanuzzaman	VII	D	4
8	S. M. Sazzad Hossain	VII	D	5
9	Md. Abul Hasnat	VII	D	6
10	Shourav Bishwas	VII	D	2
11	Md. Sahed Dewan	VIII	C	7
12	Md. Rafi Ahmed	VIII	C	3
13	Md. Mehedy Hasan	VIII	C	2
14	Md. Mamunur Rahim	VIII	C	6
15	Toukir Ahmed	VIII	C	1
16	Md. Akid Hossain	VIII	D	5
17	Suvro Kamlesh Shaikat	VIII	D	2
18	Md. Mainuddin	VIII	D	9
19	Md. Ashiqul Islam	VIII	D	1
20	Md. Omar Faruq	VIII	D	29
21	Suvo Majumdar	IX	C	5
22	Md. Rafiqul Islam	IX	C	4
23	Md. Safiqul Islam	IX	C	2
24	Md. Maruful Islam	IX	C	1
25	Sagar Sarkar	IX	C	6
26	Rayhan Uddin	IX	D	2
27	Amit Pal	IX	D	1
28	Md. Omar Faruq	IX	D	3
29	Md. Arif Hossain	IX	D	9
30	Md. Taufiqul Islam	IX	D	8

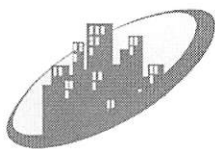
Appendix-D

List of Students attending the SAR Training course

Venue: 'Armenitola Govt. High School'

Date: 10 -12 December' 2006

SI No.	Name	Class & Sec	Roll	Phone Number
1	S. M. Himel	7-A	31	01913258040
2	Shajib Chowdhury	7-A	6	01715079267
3	Md. Kawser Hossain	7-B	6	01190621959
4	Md. Jubair Hossain	7-C	1	01552455957
5	Md. Tusher	7-C	37	01912175873
6	Muhammad Moshiur	9-B	23	01712295762
7	Md. Nur-Amin (Shopon)	9-B	39	01817561108
8	Md. Faisal Hossain	8-A	53	027319920
9	Md. Abul Kashem Khan	6-A	17	01552339424
10	Md. Sumon Islam	9-A	18	01716599055
11	Md. Nasir Uddin	9-C	48	01911788422
12	Md. Parvez Hossain	9-B	41	01722031200
13	Md. Yeanur Rahman	7-B	39	01712295762
14	Md. Mahabob	7-C	40	-
15	Md. Milon Ahad Oly	7-B	10	01712080108
16	Md. Shamim Ahmed	9-B	30	01911318436
17	Md. Pulock	6-B	16	01819603965
18	Md. Monsur Helal Masum	9-D	08	01819225025
19	Shuvo Majumder	9-A	03	01716616544
20	Md. Mursalin Polash	9-B	21	01913388228
21	Ifath Hasan Monju	9-A	28	01712862220
22	Md. Solaman Sajib	7-C	23	01554333164
23	Md. Bashar	6-A	24	01711248916
24	Md. Kamal uddin Sarker	7-C	06	01818048389
25	Md. Asik Imam	7-A	02	01712731203, 027315605
26	Md. Shahedul Islam	7-A	01	01717525200, 027318267
27	S.M. Jarif	7-A	08	01719525200, 027770807
28	Md. Sujon	7-A	17	01717631456
29	Md. Ataur Rhaman Shaheen	7-C	15	01913390917
30	Md. Nahid	6-B	02	01711697610
31	Md. Sazzad Hossain	6-B	19	01912831470
32	Md. Rahat	6-B	34	01715538601
33	Md. Akib	7-A	35	-



**BANGLADESH NETWORK
OFFICE FOR URBAN SAFETY**



PART-II

**EARTHQUAKE EVACUATION
PLAN FOR OLD DHAKA,
BANGLADESH**

(WARD NO-68)

**BANGLADESH NETWORK OFFICE FOR URBAN SAFETY
(BNUS),
BUET, DHAKA**

**Prepared By: Israt Jahan
Mehedi Ahmed Ansary**

1. INTRODUCTION

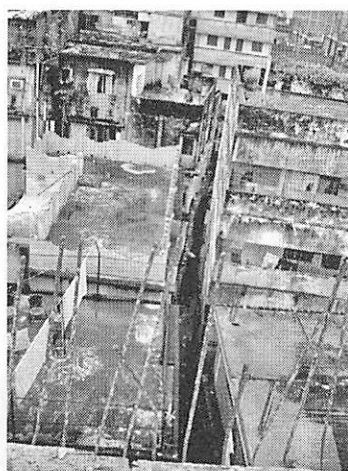
Old Dhaka is the most densely and vulnerable part of Dhaka city and it is considered as earthquake vulnerable zone due to its high population density, vulnerable structures, low preparedness, etc. BNUS is developing the earthquake evacuation plan for Ward no. 68 located in old Dhaka. The site is also characterized by a high density of population living in a very compact land area with close proximity of buildings along a very narrow local street. Some times it is difficult to differentiate the buildings from one another. The prevailing circumstance gives a very nervous view of buildings to be collapsed without any disaster like earthquake. The condition is unthinkable and unimaginable what may happen with an attack of earthquake. In order to reduce the loss due to an earthquake, BNUS has taken attempt to make an evacuation plan of the area considering the existing situation, let it publicize to the local community with their doing as per the plan, also provide them training on their activities during evacuation according to the evacuation plan.

2. OBJECTIVE OF PREPARING EVACUATION PLAN

An effective evacuation plan can reduce loss due to a disaster to a great extend. Evacuation plan for a locality can make them self-dependent in facing a disaster and make them be able to cope with a disaster. For this purpose BNUS has taken an attempt to prepare an Evacuation plan considering all the prevailing site condition and other criterion relevant to prepare an effective plan.

3. STUDY AREA

Ward no. 68 of Old Dhaka is selected as the study area due to its high density, close proximity of buildings, narrow road strips and earthquake vulnerability.



One of the road channels in the site and close proximity of buildings

4. METHODOLOGY

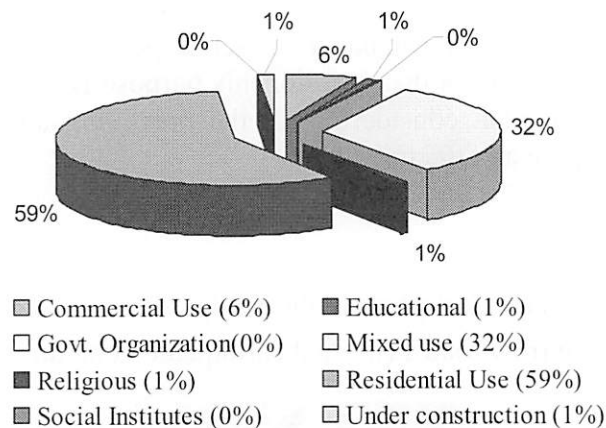
To have an effective plan, data on vulnerability of the existing buildings in the target area have collected. In analyzing the vulnerability of the buildings Rapid Visual Screening (RVS) Method has been used. The religious sites like mosques, the community centers, educational institutes like schools, colleges and other public places along with the open spaces like park, playground are considered as evacuation sites. The detail evaluation of

the proposed buildings for evacuation is made applying the Turkish Level-2 method. Finally after collecting data from field level, A GIS based evacuation plan will be generated based on the existing site condition like buildings, road network system, and proposed places for evacuation, etc. by applying different evacuation techniques. The whole area will be segregated into different groups according to the vulnerability and capacity of evacuation places. Over all a 3D elevation model of the area showing the escaping route with the shortest path directing to evacuation site from each specified group segment is to be prepared.

5. FINDINGS

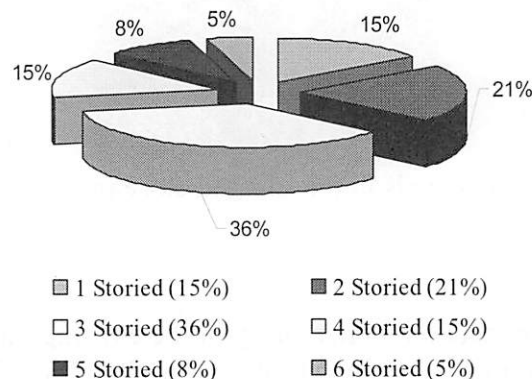
5.1 Land Use Pattern

The data collected from field is under process and are being analyzed to have an effective plan for the target area. In preliminary stage, the land use distribution pattern of the study area is shown. It is found that the residential and mixed type land use is predominant there. Figure shows the Land use pattern in the study area (Ward No. 68)



5.2 Buildings by height

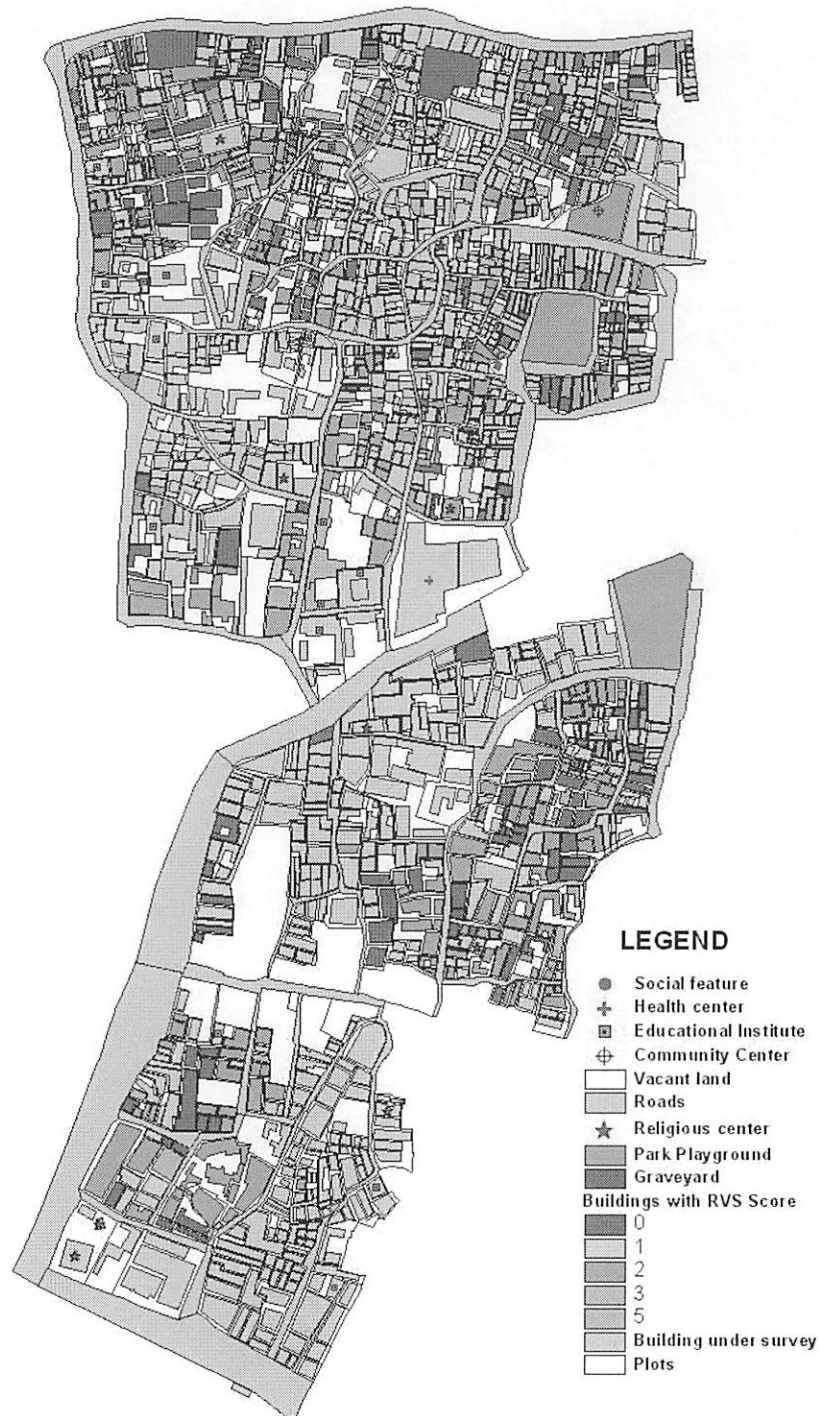
It is interesting to notice that the 3 storied buildings are more in number followed by 2 storied buildings in the study area. Figure shows the distribution of buildings according to their height:



5.3 Vulnerability Analysis

The earthquake vulnerability of the buildings are measured using the Rapid Visual Screening (RVS) Method and detail evaluation of the proposed evacuating buildings are made using the Turkish Level -2 method. The survey process is going on and very soon it will end with a successful result focusing the actual site condition.

Map shows the buildings with RVS score, the buildings that are under survey process and the proposed evacuating buildings with the location of parks and playgrounds:

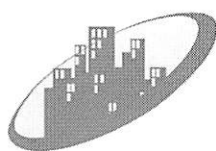


5.4 GIS 3-D Model preparation

Finally a GIS based 3-D evacuation model will be prepared showing detail evacuation techniques with evacuation paths.

Figure shows an example of the 3D Model with land use





**BANGLADESH NETWORK
OFFICE FOR URBAN SAFETY**



PART-III

STRONG MOTION MONITORING SYSTEM IN BANGLADESH

**BANGLADESH NETWORK OFFICE FOR URBAN SAFETY
(BNUS),
BUET, DHAKA**

**Prepared By: Md. Shamsur Rahman
Mehedi Ahmed Ansary**

ABSTRACT

Earthquake is one of the most feared natural disasters, which has caused incalculable destruction of properties and human lives. An examination of the historical catalogue of Bangladesh and its surrounding region reveal that several earthquakes of large magnitude with epicenters within this region have occurred. The 1897 Great Indian earthquake with a magnitude of 8.1 is one of the strongest earthquakes in the world, had its epicenter only 230 km from Dhaka. While the earthquake affected almost whole of Bangladesh, damages were severe particularly in Sylhet, Rangpur, Dhaka and Mymensingh. In the city of Dhaka most of the brick masonry buildings either collapsed or were severely damaged. The relationship between magnitude, epicentral distance and peak ground acceleration of those earthquakes constitute the basic parameter needed for assessing seismic hazard at a given site. The objective of this study is to present a predicting model for acceleration-attenuation for earthquakes in Bangladesh and its neighboring region. For this purpose, 34 analog SMAs were recently deployed all over Bangladesh. The Operating and Monitoring Phase of the project started on April 01, 2005. This accelerometer records data in East-West, Up-Down and North-South direction. For the last two and half years, six earthquakes are recorded by these SMAs. This paper presents acceleration, velocity and displacement data of these earthquakes. Response Spectrum for 5% damping for various free field stations are also computed and presented.

INTRODUCTION

Earthquake is one of the most feared natural disasters, which has caused incalculable destruction of properties and human lives. An examination of the historical catalogue of Bangladesh and its surrounding region reveal that several earthquakes of large magnitude with epicenters within this region have occurred in the past. The 1897 Great Indian earthquake with a magnitude of 8.1 (Oldham, 1899) is one of the strongest earthquakes in the world, had its epicenter only 230 km from Dhaka. While the earthquake affected almost whole of Bangladesh, damages were very severe particularly in Sylhet, Rangpur and Mymensingh. The low incidence of severe earthquakes during this century has led to a situation where most of the population and policy makers don't perceive seismic risk to be important. The rapid urbanisation, development of critical engineering works, industrialisation of cities with modern types of buildings and the concentration of populations living or settling in hazardous areas are matters of growing concern, as they contribute to heavier loss of life and increase considerably the costs of disaster damage. In recognition of the threat to the major investment at risk in this part of the world from strong earthquakes, government of the respective countries should multiply and join their efforts to continue the study and analysis of the seismicity of the region with a view to reducing the earthquake risk. The first step in mitigating the risk of the community from earthquake hazard is an assessment of the hazard itself.

Macroseismic earthquake data of the large historical earthquakes are important for seismic hazard analysis. The relationship between magnitude, epicentral distance and peak ground acceleration of these earthquakes constitute the basic parameter needed for assessing seismic hazard at a given site. The purpose of this study is to present a predicting model for acceleration-attenuation for earthquakes in Bangladesh and its neighboring region.

OBJECTIVES

During the last two centuries, Bangladesh and its neighbouring region have experienced several large earthquakes. The peak ground acceleration of these earthquakes has been estimated using different existing attenuation laws for different parts of the world. The current research is one opportunity to develop attenuation law for Bangladesh and its surrounding region.

The objective of the study is to install a seismic network system to record earthquakes, which may occur within any location of Bangladesh and surrounding region. The seismic network system will specifically help to achieve the following:

- To obtain strong motion data which can be used to update BNBC 1993
- To obtain building response during an earthquake
- To compare free-field and building earthquake responses
- To develop attenuation law for Bangladesh
- To use collected data for realistic earthquake hazard assessment
- To exchange earthquake data with neighboring countries

METHODOLOGY

Instruments called strong motion accelerographs measure the motion of the ground during earthquakes; the records of ground acceleration versus time produced by accelerographs are called accelerograms. Accelerograms provide a description of the ground motion in a form suitable for analysis of structural response and, hence, they play a fundamental role in the study of all phases of earthquake engineering.

Thirty-four accelerographs recently obtained from USGS were deployed in the free-field (on ground) at different PWD offices of Bangladesh. Also three accelerographs were put on buildings to get their response during an earthquake. For free-field deployment concrete pads were constructed on the ground at those selected stations and accelerographs were directly bolted on them.

The initial goal of the project is to develop an earthquake time history database for different soil condition and different earthquakes of Bangladesh. After compilation of a number of earthquakes, this database will be used to develop attenuation law for Bangladesh. This database can also be used to develop site-specific response spectra for different damping conditions. Ultimately the data will be used to update the seismic zonation map of Bangladesh.

DESCRIPTION OF INSTRUMENT

Data processing is always facilitated by a thorough knowledge of the instrumentation, which has produced the basic information. Acceleration due to earthquake may be collected through an instrument known as Strong Motion Accelerographs (SMA-1). These accelerographs are battery powered; rugged; compact, portable and transportable over rough terrain by vehicle; and capable of being installed and calibrated with a minimum of adjustment. After installation, the accelerograph remains in a standby condition with infrequent maintenance until acquitted manually or by strong ground motion. The accelerograph are capable of recording numerous earthquakes on photographic film.

Figure 1 is a schematic diagram of the basic transducer system in the type of mechanical-optical photographic recording accelerograph, which produces the records. Although details may differ considerably in various models, the general ideas are much the same. The single degree-of freedom transducer element usually consists of some form of the “swinging gate” mass, with either a torsional spring or a gravity restoring force produced by including the hinge axis of the gate. The detail in the lower left corner of Fig. 1 indicates that in many models the axis of rotation is fixed by some type of flexure pivot, and that the viscous damping is often the electromagnetic type involving motion of a coil in a permanent magnet field. Amplification of a transducer motion is usually carried out optically as indicated, with a light source and a system of cylindrical lenses and prisms to focus the light spot on the recording medium.

A typical strong motion accelerograph contains three transducer components of the type shown in Fig. 1 recording on one film, along with associated timing and calibration circuits, controlled speed drive for the recording drum, and a suitable power supply. Figure 2 shows photograph of the SMA-1 accelerograph.

FOUNDATION FOR SMA INSTRUMENT

At first, the location of the SMA instruments is selected. The Strong Motion Accelerograph are situated on the ground surface. The soil condition must be dense sand/stiff clay. The trench size is 1050mm x 1050mm x 450mm. The combined thickness of the sand filling and brick flat soling (B.F.S) is 450mm. A concrete base is constructed on it having a size of 900mm x 900mm x 150mm and RCC casting ratio of 1: 2: 4. Finally another concrete base with a size of 400mm x 400mm x 100mm is constructed on the top. Figure 3 shows the concrete base for the SMAs.

Iron grill fencing is put around the SMA-Instrument and the top surface is protected with Galvanized steel sheet. To identify the SMA-Instrument a nameplate is set-up. Location names, Serial No, Date of Installation, are written on the nameplate. Figure 4 shows a complete SMA setup.

DATA DIGITIZATION PROCESS

To digitize earthquake data recorded by the SMAs, SMA Scan View Plus software (after KMI, 1997) is used. The steps of data processing are as follows:

- Scan the film image
- Reformat image data
- Smoothing and Filtering image data
- Edit image data to select traces
- Crop and rotate image data
- Print trace data for quality assurance
- Convert trace data to uncorrected accelerogram

The first step of data processing includes film developing. Then using the software, scanning and digitization of the film are carried out. The data are corrected and filtered by Origin. All the data are filtered using a band pass filter of 0.4 to 20 Hz and smoothed using a 15 points Adjacent-Averaging smoothing technique. The earthquake data is formatted using USGS format. The acceleration records have three components EW, UD and NS.

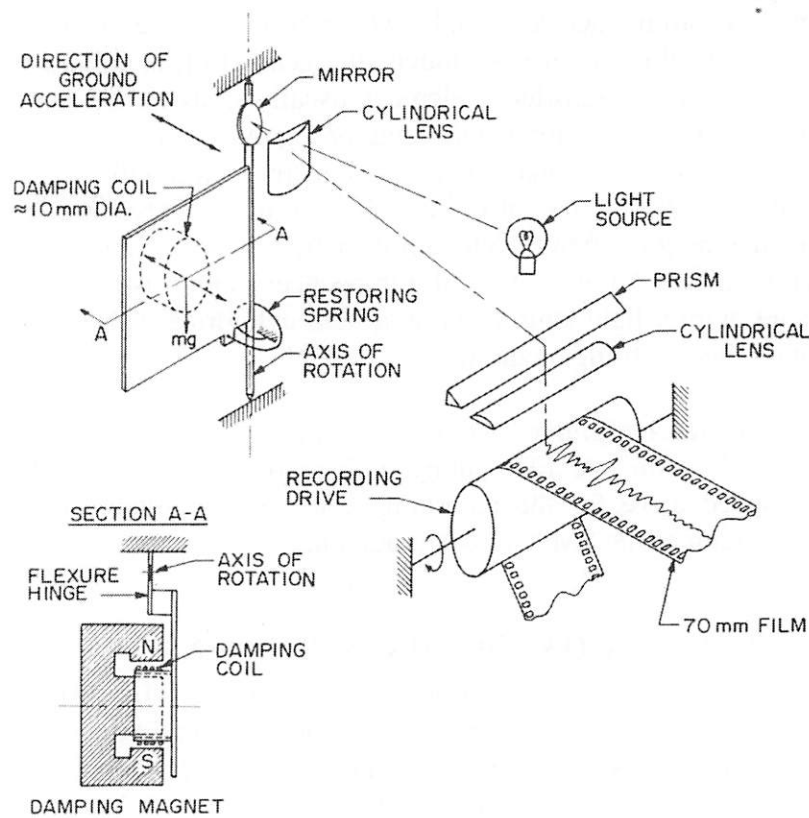


Figure 1 Schematic diagram of mechanical-optical photographic recording Strong Motion Accelerograph (parts not to scale) [after Hudson, 1979]



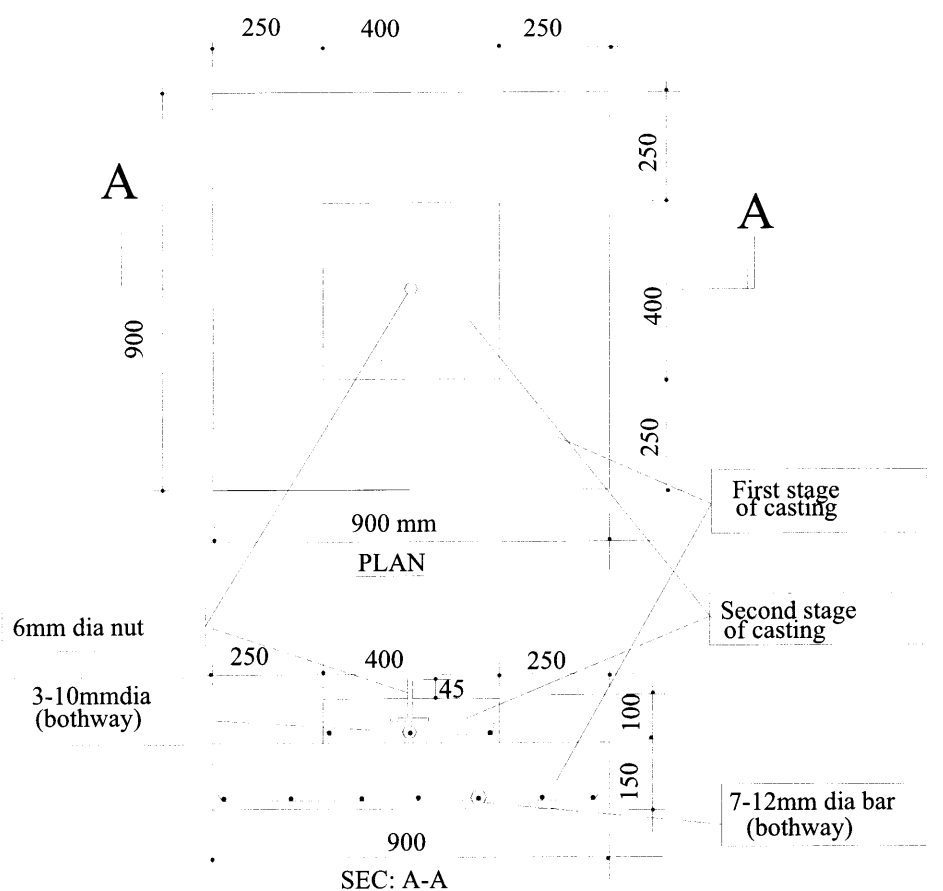
Figure 2 Photograph of SMA-1 Strong Motion Accelerograph

EARTHQUAKE RECORDS

The installation of 34 SMAs at PWD offices all over Bangladesh and within BUET campus was completed in the end of March 2005. From April 2005 to November 2007, these SMAs recorded the following earthquakes:

- ❖ May 30, 2006: Bay of Bengal Earthquake (1)
- ❖ August 05, 2006: Jessore Earthquake
- ❖ November 03, 2006: Myanmar-India Earthquake
- ❖ November 10, 2006: Bangladesh-India (Assam) Earthquake
- ❖ July 28, 2007: India-Myanmar Earthquake
- ❖ November 07, 2007: Bangladesh-Myanmar Earthquake

Table 1 presents summary of all those events. Figure 5 shows SMA and earthquake locations.



NOTE: All dimensions are in mm.
Concrete to be used 1:2:4

Figure 3 Concrete Base Foundations for SMA-Instrument

Table 1. Summary of earthquake events

Name of the earthquake	Occurrence date	Latitude (deg.)	Longitude (deg.)	Magnitude	Depth (km)	Maximum recorded acceleration (cm/sec ²)	Recorded site
Bay of Bengal (1)	30.05.2006	20.60°N	91.94°E	4.7	29	23.5	Agrabad, Rahamatganj and Coxbazar
Jessore	05.08.2006	23.10°N	89.20°E	4.0	15	24.0	Meherpur and Sathkhira
Mynmar-India	03.11.2006	22°N	93.30°E	5.2	33	34.0	Rahamatganj, Coxbazar, Bandanban, Khagrachari and Rangamati
Bangladesh-India (Assam)	10.11.2006	24.60°N	92.20°E	5.0	33	34.0	Sylhet, Sunamganj, Moulvibazar and Hobiganj
India-Mynmar	28.07.2007	22.80°N	92.60°E	4.8	15	30.0	Rahamatganj, Bandarban, Khagrachari and Rangamati
Bangladesh-Myanmar	07.11.2007	22.10°N	92.50°E	5.3	15	96.0	Rahamatganj, Bandarban, Khagrachari, Cox'sbazar and Rangamati



Figure 4. SMA at Satkhira

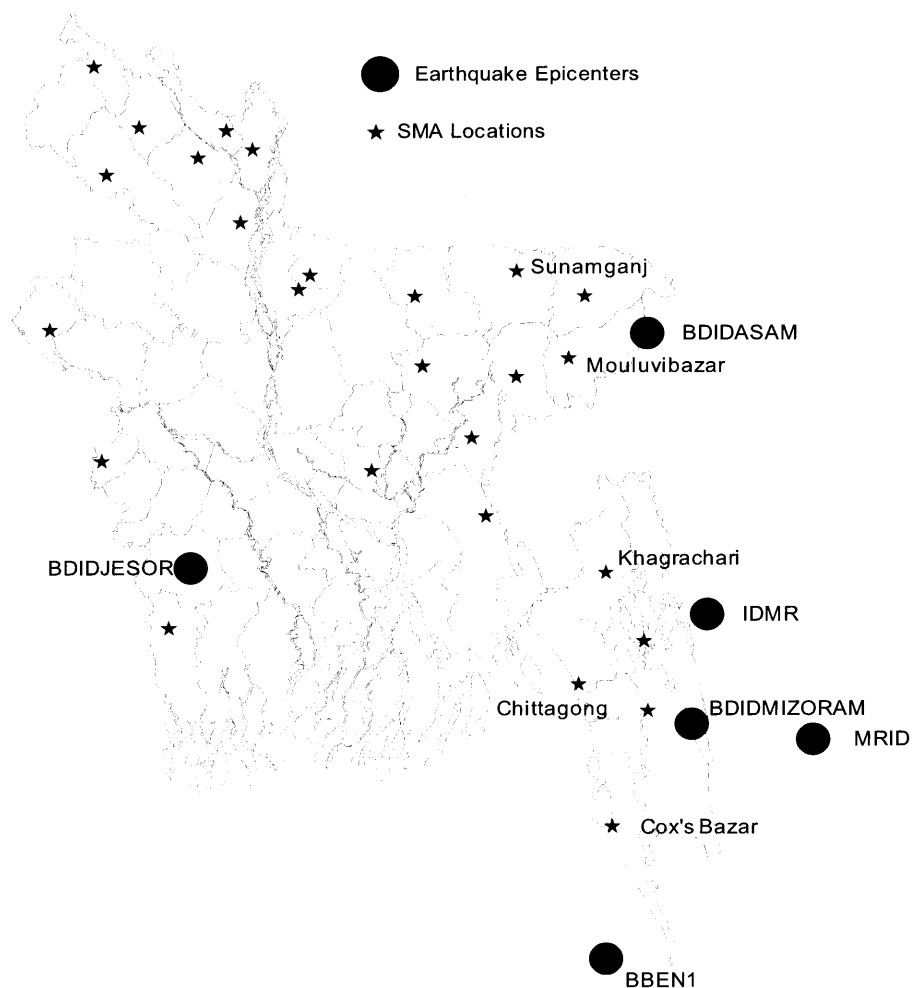


Figure 5. Earthquake and SMA Locations

PEAK GROUND MOTIONS

Whereas the peak acceleration values are not much influenced by technique of digital signal processing, on the other hand peak ground velocity and displacement are strongly influenced by the technique adopted. The results presented here are mainly based on CALTECH procedure with filter settings as described above. Intensity of acceleration decreases away from epicentre. Epicentre lies approximately 60 to 70 km away from the SMA site in the earthquake of 30/05/06. Table 2 presents summary of Ground Motions including response spectrum for 5% damping. Figures 6 to 8 presents acceleration time histories of three components and response spectra for 5% damping at Cox'Bazar, Rahamatganj and Agrabad SMAs, respectively.

Table 2. Summary of Ground Motion in Free Field Stations due to Bay of Bengal Earthquake

Station ID	Channel	Max. Peak Ground Acceleration (cm/s ²)	Derived Max. Peak Ground Velocity (cm/s)	Derived Max. Peak Ground Displacement (cm)	Acceleration Response Spectrum ($\xi=5\%$) (cm/s ²)
Cox's-bazar	EW	8.0	2.4	27.3	22.8
	UD	13.5	1.5	2.9	53.8
	NS	13.5	2.4	17.6	78.3
Chittagong Rahmatganj	EW	8.8	4.7	23.0	19.0
	UD	23.5	3.0	14.7	36.7
	NS	14.8	1.5	5.5	19.2
Chittagong Agrabad	EW	7.2	2.8	28.5	17.8
	UD	11.3	17.5	170.0	47.0
	NS	8.0	10.4	150.0	14.0

Note. EW represents East-West direction
UD represents Vertical direction
NS represents North-South direction

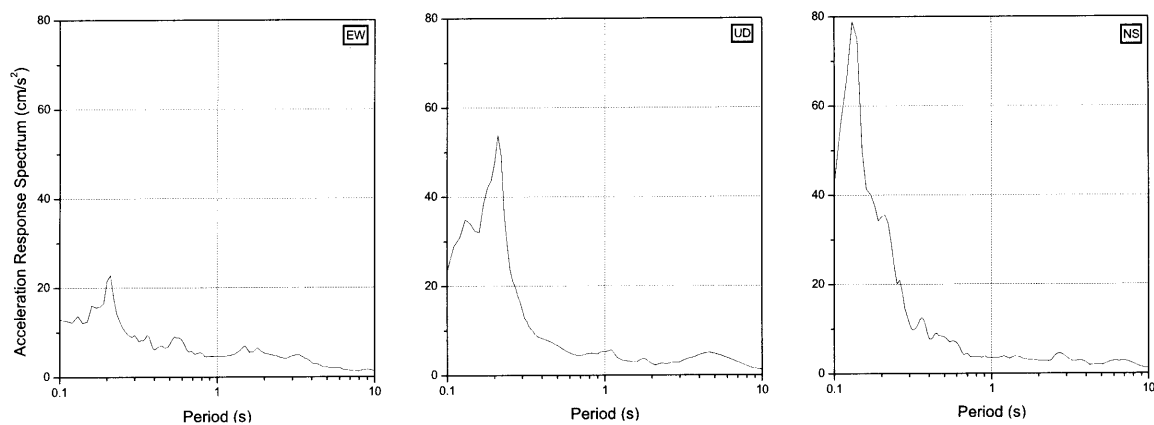


Figure 6. Acceleration and Response Spectra for 5% Damping at Cox'Bazar

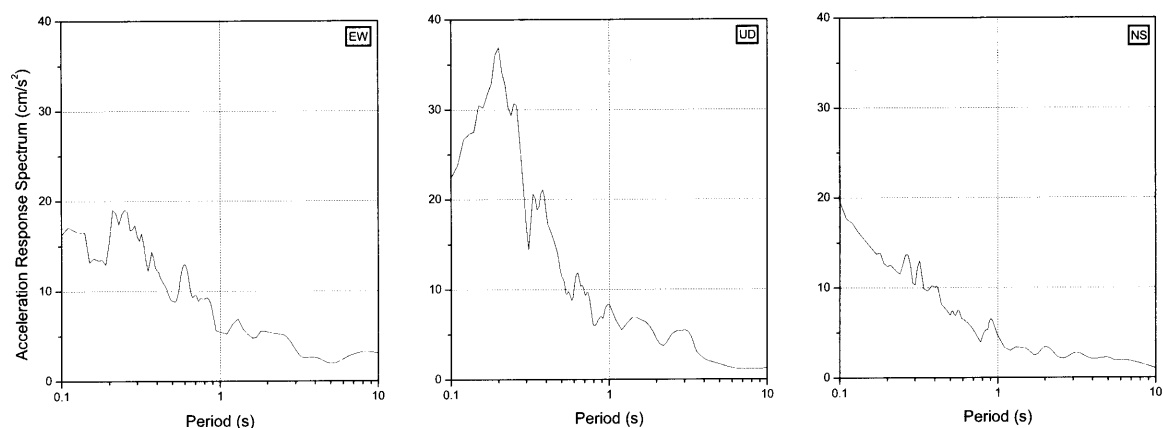


Figure 7. Acceleration and Response Spectra for 5% Damping at Rahmatganj

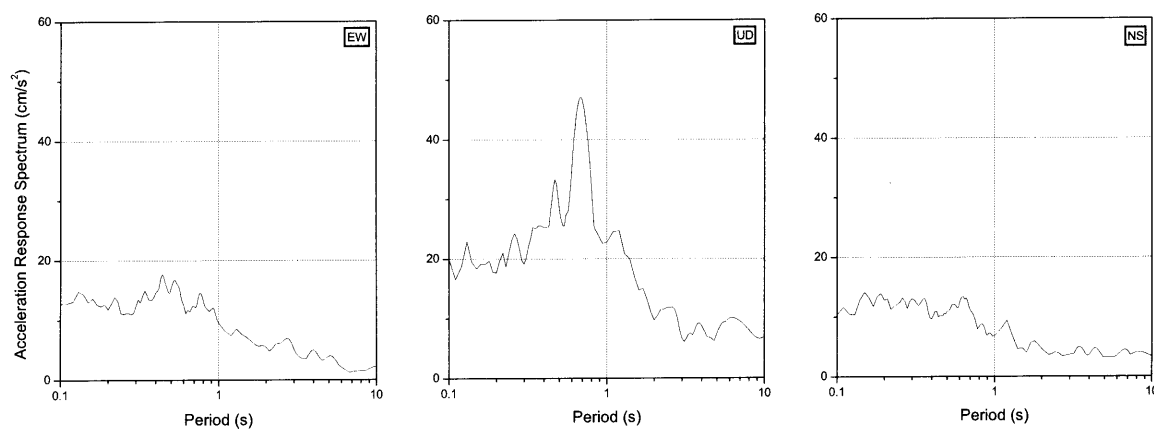


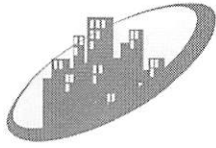
Figure 8. Acceleration and Response Spectra for 5% Damping at Agrabad

CONCLUSIONS

The first earthquake recorded by SMAs was the Bay of Bengal Earthquake (1) on May 30, 2006. By recording this earthquake event, the installation of the earthquake monitoring system for Bangladesh entered in to an interesting stage. The earthquake, which was a minor one, is estimated to be located close to the SMA site. This paper presents analysis results of that particular earthquake data recorded by three free-field stations namely, Cox'Bazar, Rahamatganj and Agrabad. After installation the system so far recorded six earthquakes. It is hoped that the system will yield valuable data to the local researchers to have better ideas on the performance of the SMA sites as well as seismic activities of the whole region. For the next few years compilation of such earthquake data is needed to develop the attenuation law for Bangladesh. This attenuation law will help us to develop the seismic zonation map for Bangladesh.

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**BANGLADESH NETWORK
OFFICE FOR URBAN SAFETY**



PART-IV

SYMPOSIUM AND SEMINARS ORGANIZED BY BNUS

**BANGLADESH NETWORK OFFICE FOR URBAN SAFETY
(BNUS),
BUET, DHAKA**

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WORKSHOP

‘Sharing Knowledge on Disaster Warning: Community-based Last-Mile Warning Systems’

The workshop held in ITN Center, Bangladesh University of Engineering and technology (BUET), Dhaka on October 25, 2007, hosted by Bangladesh Network Office for Urban Safety (BNUS), BUET in co-ordination with LIRNEasia. The chief guest was Dr. Prof. Dr. A.M.M. Safiullah, Vice Chancellor of BUET and Special Guest was K. H. Masud Siddique, DG, Disaster Management Bureau (DMB).

The sharing of the workshop was focused on

- Discussion on findings of “Evaluating Last-Mile hazard Warning Dissemination : A Research project”
- Exchange of experiences and lessons learned from hazard detection and early warning systems as well as early warning dissemination measures
- Analysis of methodologies for measuring the performance of Community-based Early Warning Systems
- Exchange of information and views on the performance and response of local community to the Early Warning Systems
- Introduction of a technology for Warning Dissemination
- Dialogue on the development of regional last mile hazard determination and warning system

Inauguration Session

- Mr. K. M. Massud Siddiqui, Director General, Disaster Management Bureau (DMB) delivered the inaugurating speech.
 - Making early warning is a difficult decision for the government. Prior to any warning technical adequacy is a must
 - Government policy makers as well as the Non government communities and Civil Society need to take lessons for each event
- Prof. Rohan Samarajiva, Executive Director, LIRNEasia introduced their approach on Community based warning
 - ICTs play a key role in associating media and first responders to alert the community in emergency situations
 - The elements involved are national early warning center, government, first-responders, media, community

Debate on issuing early warning on 12 Sep 2007 Tsunami event:

- Director, Cyclone Preparedness Program Bangladesh, narrated his team's experience on Disseminating tsunami Warning in Coastal region of Bangladesh, Volunteer Activities and response of the local communities
 - They found the response of the community very positive and quick even more than that of on any other past events
 - Most of the people responded to the evacuation action and went to the cyclone shelters.
 - But as the warning proved to be “false” and tsunami did not take place, there is a probability in future; response will not be so good in similar events.
 - He recommended that in Community-based activities the first priority should be mobilization of volunteers

- The Director, Bangladesh Meteorological Department, appreciated the effort of CPP team and also mentioned that the disaster warning system as well as the dissemination system is well enough in Bangladesh since the number of destruction and casualties have been reduced as compared to any other past events. He also regarded the present simulation model used in the department as reliable enough, though having bathymetric data insufficiency, as it delivers almost similar result as that of PTWC or NOAA models.
 - In reply to the allege, raised by the scientists and experts, that the Government Authority has not taken any suggestion or recommendation on the event prior to issuing warning and it will significantly act negatively on peoples' response in case of false warnings, the Director explained the situation which led them to issue warning and evacuation order on 12 September.
 - The Meteorological Department received bulletin from Japan Meteorological Department and PTWC on 5:30 pm. The message cited that a Tsunami had been generated in Indian Ocean and though there are limitations in analysis it is anticipated to striking Bangladesh Coast within 6-9 hours. Being concerned to this alert, the Bangladesh Meteorological Department issued the warning and evacuation order and drove volunteer activities in support of the community in coastal area. At the same time 'they ran their tsunami simulation model which took take 3 to 4 hours to analyze the data and got that the appearing tsunami wave will rise upto 1-2 ft only on Bangladesh Coast, in the mean time they were informed that the tsunami wave was only 9 ft high even in Srilanka. At the end, be assured perfectly, the warning had been withdrawn on 1:20 am.
- The scientist, Dr. Aftab Alam Khan from Bangladesh recommended that before issuing any warning, the decision making authority should define clearly how much area is vulnerable to which intensity so that the warning becomes reliable to the community at risk. He commented that the existing cyclone warning system in Bangladesh is not applicable for other hazards and it cannot address vulnerable area specifically or clarify the meaning of warning
- The Chief Guest pointed out some lessons and recommendations also in this regard. According to him, the local community is receptive to the early warning and the communication as well as warning dissemination system is also efficient, but everything will go in vein if the warning does not becomes true and in the long run the community-response will decline which can cause a further ineffectiveness of the disaster preparedness situation. Therefore the simulation models should be more trustable, specific and updated. At the same time since the limitations in observations and analysis are unavoidable in Bangladesh, the message to the community at risk should be such that, "the present situation is critical according to our available investigations and the warnings have been delivered based on this conditions in accordance with all the limitations in our efforts. The warnings are not full-proof and certain but it is better for the community's well being that they should respond immediately", so that the community itself can take its decision. The community must be trained and informed to make them able to take their decisions in emergency alerts.
- Representative from the press, the Daily Nayadiganta, raised an objection that the "Communication" appreciated by the CPP director, in fact was not good enough because on 12th September, according to the press representatives in coastal area,

people were very much confused about what they should do due to lack of proper information and volunteer help.

- The moderator of the workshop, Dr. Mehedi Ahmed Ansary commented that to overcome the problems associated with proper knowledge and information, there should be an Advisory committee of technical experts and scientists who should guide in the emergency situation.

Session I: Local Transmission of Warning

- Mr. Md. Nasir Ullah, Director, Cyclone Preparedness Program, gave a presentation on An Overview of the Bangladesh Cyclone Preparedness Program (CPP)
 - The well trained and dedicated volunteers of CPP and Bangladesh red Crescent Society act in helping and informing local communities about disaster preparedness
 - He also explained the current warning system and dissemination technologies
 - The multipurpose function of current cyclone shelters lead their better utilization and maintenance
- Nuwan Waidyanatha Project Manager, LIRNEasia Presented data on transmission of warning to communities through the experience of the HazInfo project.
 - VSAT connection is used for the main receiver of warning system so that they do not get disconnected in case of unavailability of internet
 - Multiple input-output system is used where alert is disseminated in three different languages
 - The messaging system is based on level of priority
 - The warning system is depended on 1st responders action rather than direct public alerting
 - Reliability of the system can be measured in terms of certainty and efficiency
 - The system has addressability that is translatable by operators, GPS location or geographical area can be specified
 - The other participants commented on the system used in Srilanka. They said that the system can be adoptable for Bangladesh also, but the message delivered should be consisted of local terminologies used for the convenience of the particular locality. In case of cyclone warning long lead time can be taken for warning but available time to warn is short in case of tsunami, 24 hour observation approach should be adopted

Session II: Determination of Hazard from National Level

- Natasha Udu-gama, Project Dissemination Manager, LIRNEasia presented a picture on comparisons between government action in Sri Lanka during the Indian Ocean tsunami of 26 December 2004 and the tsunami warning of 12 September 2007
 - She commented that national level can use the system and elements of the HazInfo project alerting structure to monitor and transmit warning.
- Prof. Aftab Alam Khan, Department of Geology, Dhaka University on experience of Bangladesh for Determination of Hazard from National Level.
 - DART system can cause false information as the bottom pressure sensor and surface buoy can be activated by other phenomenon; hence, it cannot sensor earthquake or tsunami wave accurately
 - Gaussian equations cannot be applied in Laplace equation for Tsunami modeling So the modeling approach should be corrected in Bangladesh
 - Andaman and Red Sea are opening at a rate of 2-3 cm/sec each year Any earthquake of Magnitude 8 cannot cause high offset from Bangladesh Coast upto Andaman
 - So almost entire Bangladesh coastal region is free from any potential tsunami threat.
 - Proper education and technical knowledge is recommended for warning system related bodies
- Mr. Sujit Kumar Debsarma, Pr. Meteorologist and System Manager, Bangladesh Meteorological Department explained simulation of tsunami model used in BMD.
 - They use satellite synthetic data from NOAA But higher resolution bathymetric and topographic data is needed for more accurate analysis.
 - Warning information is received from PTWC through GTS, Fax, Internet Continuous monitoring is held. When any warning message is received emergency light blinks and audio alarm becomes on in BMD
 - It is recommended that this alert system must be incorporate in CPP and other authorities

Session III: First Responder Action

- First Responder Action (Bangladesh Experience) was presented by Dr. Ashutosh Sutra Dhar, Dept. of Civil Engineering, BUET
 - He presented some comparative pictures showing the applicability and effectiveness of existing cyclone warning system in the coastal area of Bangladesh based on a Community Survey study of Cox's Bazar District from CDMP-BUET partnership project.
 - Though the warning reaches to almost all the people in recent times but the warnings are not specific, reliable and understandable to the people which causes decline in community response
- Nuwan Waidyanatha Project Manager, LIRNEasia presented the process of first responder action from the Hazard Information Hub through to the Emergency Response Plan Coordinators

- In this system they give full information to the first responders who decide the plan of action to be taken for disseminating warning to the community

Session IV: Methodology, Preparedness, Community Organization and Training

- Dr. S. Rangarajan, Senior Vice President, World Space (Satellite Radio) presented an Overview of the various satellite radio systems available from World Space Corporation for use in warning systems.
 - He described the configurations, operation and maintenance procedure, message relaying system, usability, effectiveness in community applications and other technical perspectives of the various warning radio transmission systems
- Natasha Udu-gama, Project Dissemination Manager, LIRNEasia showed the HazInfo vedio “The Long Last Mile”. The video gave a comprehensive overview of the background of the project, its inception and implementation in Sri Lanka. It also summarized the best practices in training, community organization, methodology and preparedness demonstrated within HazInfo project.

Session V: Next Steps

- Prof. Rohan Samarajiva, Executive Director, LIRNEasia discussed the Roles of policymakers, regulators, private sector and civil society
 - Early warning should give priority to “rapid onset”
 - So far 8/9 significant historical earthquakes have been recorded in Srilanka. So lack of significant past events cannot be an indicator for lessening the probability of future hazards. Probabilistic approaches in determining hazards should consider these notes
 - Political issues and authorities are also matters of concerns in the success of Total Disaster Preparedness and Management System



Some pictures of the workshop

SYMPOSIUM
‘New Technologies for Urban Safety of Mega Cities in Asia’
‘USMCA-2007’

Bangladesh Network Office for Urban Safety (BNUS), BUET, Bangladesh and The International Center for Urban Safety Engineering (ICUS), Institute of Industrial Science (IIS), the University of Tokyo, Japan, organized the Sixth International Symposium on New Technologies for Urban Safety of Mega cities in Asia USMCA 2007 at Dhaka on 09-10 December, 2007. The co-organizers of this symposium were The Foundation for the Promotion of Industrial Science, Japan; Center of Excellence (COE), The University of Tokyo, Japan and Center for Environment and Geographic information Services (CEGIS), Bangladesh.

The two-day long program of the symposium was arranged in two keynotes and plenary Sessions and ten technical sessions, in which two keynote speeches and five plenary lectures were delivered by invited distinguished academicians and researchers from several Asian countries. The Symposium was inaugurated by Mr. Tapan Choudhury, Advisor of Food, Energy and Disaster Management Ministry of the Govt. of Bangladesh. Prof. Mehedi Ahmed Ansary, Project Director of Bangladesh Network Office for Urban Safety (BNUS) and organizing committee chairman of USMCA 2007 delivered the welcome speech followed by the opening speeches of HE Masaki Inoue Ambassador of Japan in Bangladesh, Professor Tsuneo Katayama, President of International Earthquake Society, Prof. Jamilur Reza Choudhury, President of Bangladesh Earthquake Society and prof. A.M.M. Safiullah Vice-chancellor, Bangladesh University of Engineering and Technology.

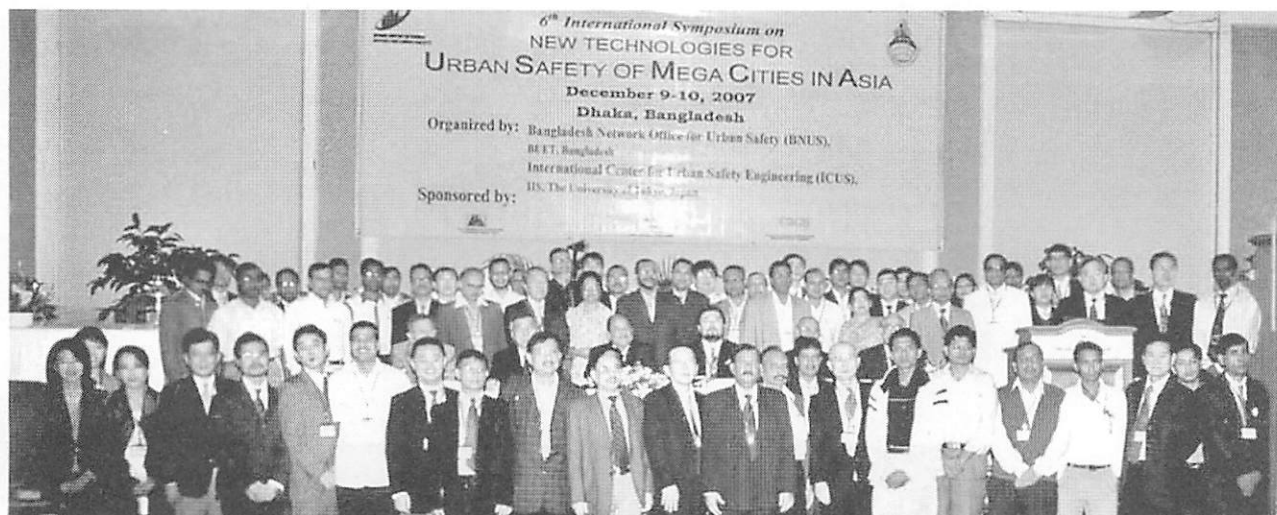
In first Keynote session, The keynote speaker were Professor Tsuneo Katayama and the plenary speakers were Professor Kenji Ishihara, Professor, Chuo University, Japan, Professor Worsak Kanok-Nukulchai, Professor, Dean of the School of Engineering & Technology, Asian Institute of Technology.

Again in second keynote session, Professor Jamilur Reza Choudhury presented his paper as keynote lecture. In this session the plenary lectures were presented by Professor Taketo Uomoto, Professor Yoshifumi Yasuoka, Professor Kimiro Meguro.

A total of 68 papers were presented in technical sessions covering a wide range of issues in the areas of urban safety including Safety Assessment and Monitoring of Existing Infrastructure 1, Advanced Technologies for Assessment of Urban Safety 1, Maintenance, Retrofitting and Rehabilitation of Structures, Disaster Management, Tsunamis, Flood, and Environmental Risk Assessment, Advanced Technologies for Assessment of Urban Safety, Safety Assessment and Monitoring of Existing Infrastructure, Urban Road Safety. Several presentations were made on newly developed advanced tools and methodologies for addressing these issues.

ICUS prepared the Excellent Young Researcher Award to encourage activities of young researchers in the field of urban safety engineering. The winners of this award were Afifa Imtiaz (Bangladesh University of Engineering and Technology) and Ema kato, Port and Harbour Rresearch Institute. The next symposium will be held at Beijing, China on October, 2008. Further information will be announced in ICUS web site soon.

USMCA'07 in a photo look



Participants in the USMCA, 2007



Delivering Speech of Chief guest



Presenting Keynote Lecture



Presenting Keynote Lecture



Two young researchers with Prof. Meguro and Prof. Ansary



Photograph: ICUS secretary with BNUS staff

60 years celebration of engineering education in Bangladesh

July 2007 marks the 60th anniversary of the establishment of the erstwhile Ahsanullah Engineering College, the first institution for producing graduate engineers in Bangladesh; which then followed a glorious path to become a premier institution of excellence in engineering education in Bangladesh known as the Bangladesh University of Engineering and Technology (BUET).



A series of events were arranged to celebrate this memorable events such as Seminar, fair etc. The fair was inaugurated at 28th December 2007. It was continued until 31st December 2007. BNUS had participated actively in this fair. The stall number of BNUS was 21. Some activities of BNUS were shown through projector. The publications of BNUS and International Center for Urban Safety Engineering (ICUS), the University of Tokyo were publicized through this fair. A number of visitors were interested about the mock drill, shown through projector, which was organized Bangladesh Network Office for Urban Safety (BNUS) with the help of Bangladesh Red-crescent society. Some posters made by BNUS were also distributed among the visitors to build up awareness against natural disaster. BNUS staffs were always present in this stall to answer the questions of visitors. It was found that in Bangladesh it is imperative to arrange fair or mock drill to remove some confusion about earthquake.

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