

# **DEVELOPING BUILDING CODES AND REGULATION IN ( DISASTER-PRONE AREA) OF PROVINCE OF NANGGROE ACEH DARUSSALAM, INDONESIA**

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## **ABSTRACT**

*A 9.4 Richter scale of earthquake followed by Tsunami waves had severely hit the Province of Nanggroe Aceh Darussalam, Indonesia, and parts of Thailand, Bangla Desh and Srilangka on December 26th 2004. Nine out of 22 cities/districts in Aceh, for example, were damaged. In facts, more than half of 4 x 15 sq. km of the city of Banda Aceh was totally wiped out by tsunami tide, with almost 500.000 people were killed and lost. To recover the areas affected by the disaster, not less than 150.000 houses, schools and office buildings should immediately be rebuilt by the government, international NGO's as well as private institutions.*

*After one year of emergency stage, and facing further rehabilitation and reconstruction stage, the Directorate of Buildings and Environment Management, Department of Public Works supports the Provincial Government of Nanggroe Aceh Darusalam to develop Building Codes to be used as a basic reference that guide the activities of buildings redevelopment and reconstruction in the disaster areas.*

## **A. BACKGROUND**

After one year of 9.4 Richter scale of earthquake and tsunami in the end of 2004, the emergency actions for the victims has over, but the duty of restoring the physical damages of the city infrastructures, buildings, communities and houses caused by the nature's changes need to be done immediately in order to make the community activities back into normal again.

Before the buildings rehabilitation and reconstruction activities phase is started, it is considered necessary to develop a reference that could be used as a development guideline for those who will give their contribution for the recovery development in every regency of NAD province and Nias island (as mandated by the Building Law No 28/2002). It is hoped that with the existence of Building Codes and Building Regulation will generate buildings that are structurally earthquake resistant, culturally harmonious and environmentally sound, makes all activities of the people can be safely accomodated.

Actually the development of Building Codes (BC) and Building Regulation (BR) derived from local planning regulations that are designed to accomodate the local specific conditions. Furthermore, this regulations need to be followed by capacity building of building management institutions and public campaign. However, since the NAD province government, at that time, is not fully function caused by the catastrophe, the Central Government through the Directorate of Buildings and Environment Management, Department of Public Works, has an initiative to provide technical assistance and advisory to the local buildings offices by developing Building Codes. The whole program will be conducted in three stages that involves related institutions and individuals.

## **B. DEVELOPMENT OF BUILDING CODES AND REGULATION**

The need for immediate actions to recover and refunction cities in the province of Aceh through the building facilities and infrastructures construction, motivated the Ministry of Public Works to develop Building Codes and Regulation.

The Building Codes is intended to be a reference for administrative and technical requirements to regulate and organize the building construction, in order that buildings development are functional, fulfill the administrative, technical and building arrangement requirements, reliable, and contextual with the surrounding environment. The aspects that are regulated by the building Codes comprise building and environment requirements, building reliability and management for the complex dwelling houses and other building with various functions.

Building Codes as a development directive in NAD province is mainly derived from local *Zoning Regulation and Environmental Code NAD province*, Public Works Ministry Decree (Kep Men PU), Government Regulation No.36/2005 and Indonesian Building Law No.28/2002, and other related buildings standards..

Basically, the content of the Building Codes are consisting of (1) General Conditions, (2) Buildings Arrangement (3) Building Reliability and (4) Development Management. General Condition describes the general and technical terminology of the contents, the objectives and the coverage of the BC. Buildings arrangement directs and guides the requirements of buildings and simple dwelling house arrangement, it covers among other things, location requirements and building intensity including zoning, architectural requirements and environmental Impact Management. Building Reliability section directs and guides building and dwelling house requirements in the context of safety, healthy, comfortability and accessibility. Development Management section directs and guides the execution process of building and simple dwelling house construction.

Important points which are also stated by the Building Codes are as follows:

### **1. Determination of disaster/ dangerous zone**

The allotment of the land use and the buildings intensity in the province of Aceh are based on the level of building damage condition and the distance from the tsunami/earthquake center, the earth elevation and geological condition. The zones are divided by the level of damage of the buildings in the area. Zone I is plotted for the area that the buildings were totally damaged, Zone II is plotted for the area that the buildings were highly damaged, zone III is plotted for the area that the buildings were lightly damaged and Zone IV is plotted for the area that were unaffected by the earthquake and tsunami.

### **2. Type of Buildings**

Following the zone divisions above, the building types that are allowed to be built in each zone should in accordance with the local condition. Zone I are used mainly for the fishermen's villages and urban villages with very low building density (<31 p/ha), Zone II are allocated for limited urban communities with low building density (31-50 p/ha), Zone III for the new communities with medium building density (51-75 p/ha) and zone IV are directed for the new settlements with high building density (75-100 p/ha).

The building functions and space limitation are regulated for every zones. In Zone 1 buildings for tourism, research facilities, harbor port, fishing industries and beach protection structures are permitted to build. The extension of the existing buildings are restricted, the rehabilitation of building are recommended.

Public, economic and social building facilities to support urban village level can be built in Zone II, but the extension of the existing building are not permitted, the improvement of building materials and design are also recommended. Zone III similar with zone II but the facilities buildings are for subdistricts level, and the existing buildings can be extended, rebuilt and improved, The less limitation are applied for buildings in the zone IV.

### **3. Building Architecture**

Since the province of Aceh is known for its unique custom and religious living, the architecture of the building should consider social and religious customs in the local level. Architectural requirements includes specific building façade, interior design, building placement should consider balance, harmony and building appropriateness to environment. Housing interior is marked by Acehnese traditional concept, like patios at the front and back of the house, separation of male and female area, while space allocation for housing and other purposes will follow the functions and space hierarchy like : public, semi private, private and service area that comply with safety, health, amenity and difability (disable and elderly) requirements.

### **4. Building Forms**

The codes stipulate that building forms should be simple, symmetrical, and arranged in a regular form. An irregular building forms is only allowable as long as the total irregularity floor of the building is not more than 25% of total floor.

Uniformity in building forms is advisable mainly in the development of hospital buildings, emergency and escape buildings, and other types of public buildings. The axis of a rectangular building should be placed 90 degrees toward coastal line or should be arranged in accordance with potential tidal wave of the tsunami

### **5. Building Structures**

Based on the result of related studies, structural calculation should consider zonation which refer to:

1. **Earthquake zonation;** based on the class of earthquake intensity, the region of Aceh falls into zone 3, 4,5, 6. For example earthquake zone 6 means using earthquake coefficient of 0.3 g in structural calculation
2. **Elevation zonation:** by taking into account the aspect of tsunami disaster, the region is classified into 3 elevation zone of less than 5 m, 5-15 m and above 15 m.
3. **Distance from the coastal line zonation;** by taking into account the aspects of tsunami disaster and wind storm, the region is classified into 3 zone of distance from coastal line which are less than 200 m, 200- 5 km and farther from 5 km.

Considering all of those zoning condition, it is recommended that in all of coastal zone, the structure of the buildings is only 1 story building height with open ground floor. Furthermore, building structure planning must comply with safety, serviceability, durability, and fire resistance requirements.

It is required that in a situation in which maximum loading has caused building damage, the building structure itself may still be able to secure people and property. Building may still be repaired as its ductility bring the building into expected damage condition. Building structure should also capable of handling maximum loading and external factor such as earthquake for a period of time, pay attention to bulding connections especially for future expansion, space between buildings, structural material variation, detached buildings, and roof orientation againts windfall.

## **6. Escape route and safety measures**

To provide escape route and safety measures, in case of emergency, building in an neighbourhood should be arranged in such that the building should not hinder view of the public traffic, and construct in a manner that will hamper the tidal and river flow. Series of buildings in one block must not attach together longer than 60m length. There should be separation in a form of emergency lane for every 60m of attached building. Protection from tsunami for building located less than 2km away from coastal line, should be done through an area development program that includes planting of mangrove trees along the coastal line or installment of permanent barriers.

## **C. Social campaign and the development of Building Information System**

In an effort to campaign the building code to the public, serial activities such as exhibition, provision of published material and related job training mainly for local public building officer should be organized. To support capacity building of the public building local office, development of Building Codes Information System has to be arranged. Provision and instalation of workstation unit in 19 local public buildings office were completed. However, further development of MIS is needed.

## **D. Capacity Building**

Network development for institutions involved in building rehabilitation and reconstruction especially those dealing with the public service sectors and responsible in widespreading information and or maintenance of information base for Building Codes and Building Regulation is the target for next development process. It is expected that all regulations can be implemented by any district/city goverment in order to provide community with clear information about the ongoing rehabilitation and reconstruction process in the Province of Aceh.

The emphasise on intensification of institutional coordination and performance as a way to accelerate redevelopment of modest housings, city infrastructures and public/social facilities.

## **E. CONCLUSION**

Effort to provide supports for the development of housing and building in disaster prone area in Aceh province is organized in several activities below:

1. Provision of Building Codes and Regulation for 19 cities/ local municipalities in the Province of Aceh.
2. Organization of necessary public campaigns and development of Building Information System.

3. Development of network among local public office buildings in the Province of Aceh and North Sumatera

All activities for the development of Building Codes in ( disaster prone area) of Aceh Province is completed by the end of 2005. Further effort to continuously monitor this development should be organized.

After its completion, every housing and building project constructed by government agencies, international NGO's as well as private institutions should refer to these Codes and regulation.

**EXPECTATION FOR THE FORUM:**

**1. SUPPORTS AND ASSISTANCES;**

The GOI sincerely hope that this Forum will support the on-going development of human settlements and building construction in Aceh, by sharing knowledge and experiences among Asian countries on developing sustainable building, building regulation and standards, and policy specifically in areas of disaster prone area.

Establishment of networking among Asian countries is also needed to exchange latest construction technologies and providing references in construction know how.