

No. 37(4)/PF-II/2003  
Ministry of Finance  
Department of Expenditure  
PF-II Division

Office Memorandum

Dated: 19-06-2009

Subject: Revision in EFC format to address disaster management concerns

The EFC and DPR formats have been revised to include disaster management concerns. The additional questions that would need to be addressed while framing the EFC memo and the respective DPRs are enclosed at Annexure. The set of questions for the EFC format may be treated as para 3F of the EFC memo and those pertaining to the DPR may be treated as para xii(a) of the DPR format.

2. Ministry/ Department is advised to attach a self-certification regarding the correctness of the responses to these issues.



(Meena Agarwal)  
Joint Secretary (PF-II)

Copy to all Ministries/ Departments

GENERIC EFC/SFC/CNE

3F) Does the project involve any creation/modification of structural/ engineering assets including land reclamation or changes to existing land use plans? If yes, then the costs involved in prevention and mitigation of disaster(s) (natural and man-made) would need to be included fully in the project cost.

- a) What is the location of the project area? Reasons for selecting the site. Have possible alternatives sites been considered? Is the type of activity envisaged in the area compatible with the provisions of relevant NDMA Guidelines?
- b) Identify the possible risks and analyze the likelihood and impact from earthquakes, floods, cyclones and landslides due to the location of the project sites<sup>1 2</sup> as well as through secondary evidence.
- c) What are the landuse directives, regulations applicable? List preventive measures enshrined in regulations which are to be complied with and confirm compliance.
- d) Based on the prioritization of risks, the mitigation measures being contemplated, both structural and non-structural. Confirmation that the implementation of the selected mitigation measures will not create new risks.
- e) Confirmation that the design and engineering of the structure has taken into consideration the National Building Code 2005<sup>3</sup>, the appropriate BIS

<sup>1</sup> Please see the links natural disasters and manmade disasters on the NDMA web-site at <http://ndma.gov.in/wps/portal/NDMAPortal#> for details regarding risk zone maps, guidelines etc for each type of disaster. Please also see the questionnaires given for risk analysis for each type of natural disaster at the NDMA website.

<sup>2</sup> Please the web-site of Building Materials & Technology Promotion Council and specifically with respect to earthquakes at <http://www.bmtpc.org/eqtips/eqtips.htm>

<sup>3</sup> Regarding the National Building Code of India 2005. Please see <http://www.bis.org.in/sf/nbc.htm> for further details

Codes<sup>4</sup> and the NDMA guidelines. Other sources such as Indian Road Congress Manual, Ministry of Road Transport, Highways and Shipping manual, Railway Board manual, Central Public Health Engineering Organisation (Min. of Urban Development) manual, Central Electricity Authority manual and Central Water Commission manual etc may also be consulted where applicable.

- f) Has the cost of disaster treatment/mitigation measures been included in the overall project cost?
- g) Also indicate that the whole process of risk assessment has been done based on available information and secondary evidence and the mitigation measure(s) are in conformity with the statutory and other regulatory requirements and are the most viable ones in the present circumstances.

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<sup>4</sup> Please see <http://www.bis.org.in/> for various BIS codes applicable

## GENERIC DPR

### XII (a) Disaster Risk Reduction/Mitigation

This section focuses on natural disasters viz. floods, earthquakes, cyclones and landslides that may impact on the project and the physical and regulatory measures to be taken based on design and engineering/technology so as to prevent or mitigate the effect of such disasters including the possible impact the project may have on the population or the environs.

A risk assessment is to be conducted which includes: identification of different types of risks to which the project area is vulnerable, probable vulnerability of the project components, description of the risk; risk analysis based on likelihood and consequences; and evaluation of risk for prioritization. Identification will also be done of local land-use management directives, legislations, building codes and building-use regulations compliance to which will prevent/mitigate the identified risks. Risk treatments (engineering and non-engineering options) based on an objective criteria will be identified and prioritised and included within the budget.

Some specific items on which information will be furnished in all cases, are given below:

1. Siting of Project
2. Nature/ Type of Project
3. Hazard risk to the project
4. Mitigation/Reduction of Risk
5. Impact of the Project on the Environs and the People

A detailed checklist as enclosed will be attached with the Detailed Project Report.

**Note:** Measures against blasts/terrorism related activities do not form part of this suggested activity.

## Check List for Natural Disaster Impact Assessment

Name of the Project:

State:

District:

Project Estimate Rs. \_\_\_\_\_ (Lakhs)

### 1. Siting of the Project

#### 1.1 Location of Project site

- Latitude
- Longitude
- Height above mean sea level

#### 1.2 Earthquake Zone (Any known geological fault near by may be listed)

#### 1.3 Flood Proneness & Vulnerability:

- Past history of floods in the area
- Observed Highest flood level
- Frequency of flooding
- Depth of flooding
- Duration of flooding
- Damage/loss (maximum, average, potential)

#### 1.4 Cyclone Proneness (If close to sea coast) & Vulnerability:

- Frequency and Intensity
- Wind speed zone - information on highest wind speed
- Distance of site from sea coast
- Record of past storm surge

#### 1.5 Landslide Proneness & Vulnerability:

- Location of Hill slope vis-a-vis the project's location
- Past history of landslides,
- Possibility of mud flows/rock falls/snow avalanches etc.

#### 1.6 Tsunami proneness (If close to sea coast) & Vulnerability:

- Past history

#### 1.7 Existence of Dams or Barrages upstream

- Distance from the project. Was dam breach effect considered on the project?
- If so, have the dam break analyses been carried out? Has their impact on safety of the project been evaluated?

## **2 Nature/Type of Project**

2.1 All the projects of the nature/type mentioned below are liable to damage by natural disasters and inadequacies of design or any of their components is likely to accentuate the vulnerability of the area to the disasters and/ or lead to rise in damage/loss to lives, property, livelihood systems environment,

- Communications: towers, lines, building
- Transportation: Roads, Railways, Bridges, Tunnels
- Power: Power houses, sub stations, power lines
- Water Resources: Dams, barrages, appurtenant structures, river training structures, Canals
- Habitations: townships- planning from the point of view of safety against hazards
- Water supply and sanitation projects including water supply and sewer lines
- Ports & Harbors
- Building projects
- Any other

## **3. Hazards Risk to the Project**

Have the following been evaluated:

- Probable maximum seismicity at site and site dependant seismic design parameters
- Probable Maximum storm surge,
- Probable Maximum wind speed
- Probable Maximum precipitation
- Probable maximum flood discharge and level
- Probability of occurrence of floods, earthquakes, land slides, mud flows, avalanches, cyclones, tsunamis
- Soil liquefaction proneness under probable earthquake intensities

## **4. Mitigation/ Reduction of Risk:**

4.1 There are specific codes, manuals, guidelines etc. developed by Bureau of Indian Standards, NDMA, and concerned organizations for sitting, design, construction and maintenance of various type of infrastructures. Indicative and not exhaustive list of some of them is at Annex-1.

4.2. Have the relevant BIS codes and guidelines been complied with?

4.3. Have adequate safeguards to meet the risks of natural hazards as evaluated at para 3 above, been adopted?

### **5. Impact of the Project on the Environs and the People**

Has the impact of the project on the environment and the people been studied with the respect to the following and what mitigation measures have been adopted? An illustrative but not exhaustive list of scenarios are given below:

- 5.1 The earthquakes and landslides may damage the pipelines to transport and storages to store harmful and inflammable materials and gases in the project area. Has any study been made to asses the danger to the environment and the people posed by those occurrences? And if so what measures have been proposed?
- 5.2 The railway lines and roads run across the drainage lines and if adequate waterways at appropriate locations are not provided, it may result in rise in water level and drainage congestion in up-stream areas. Has this aspect been studied and if so, what mitigation measures have been proposed?
- 5.3 Land- slides triggered by earthquakes as well as due to inherent instability of slopes accentuated by rains may lead to blockage of drainage channels and accumulation of water up-stream. These blockages may collapse due to their inherent instability or aided by rains. Men, machines and explosives can also be used to remove blockages and reduce flooding upstream. These lead to sudden release of water and flooding and erosion in down-stream areas. It may be stated whether any study has been carried out in this regard and what mitigation measures have been proposed?
- 5.4 As all the projects involve acquisition of land and influx of large number of people in the area to take up construction activities, it may result in deforestation and soil erosion. Measures for prevention of deforestation and arresting soil erosion are required to be taken. It may be stated whether any study has been carried out in this regard and what mitigation measures have been proposed?

5.5 If the project involves storage of water, failure of any component may cause flooding and large scale damage to lives, property and infrastructure etc. Please state whether any study has been made and if there is a possibility thereof, what measures have been proposed to meet the eventuality?

## LIST OF CODES/GUIDELINES FOR SAFETY OF BUILDINGS/STRUCTURES FROM NATURAL HAZARDS

*As these codes and guidelines are being updated from time to time by different Institutions/organizations therefore the latest updated version shall be referred at the time of conceiving a project. List has been attempted which may not be complete.*

### I For General Structural Safety

1. BIS National Buildings Code 2005
2. IS: 456:2000 "Code of Practice for Plain and Reinforced Concrete.
3. IS: 800-1984 "Code of Practice for General Construction in Steel
4. IS: 801-1975 "Code of Practice for Use of Cold Formed Light Gauge Steel Structural Members in General Building Construction
5. IS 875 ( Part 2):1987Design loads ( other than earthquake ) for buildings and structures Part2 Imposed Loads
6. IS 875 ( Part 4):1987Design loads ( other than earthquake ) for buildings and structures Part 4 Snow Loads
7. IS 875 ( Part 5):1987Design loads ( other than earthquake ) for buildings and structures Part 5 special loads and load combination
8. IS: 883:1966 "Code of Practice for Design of Structural Timber in Buildings
9. IS: 1904:1987 "Code of Practice for Structural Safety of Buildings: Foundation's
10. IS1905:1987 "Code of Practice for Structural Safety of Buildings: Masonry Walls
11. IS 2911 (Part 1): Section 1: 1979 "Code of Practice for Design and Construction of Pile Foundation Section 1  
Part 1: Section 2 Based Cast-in-situ Piles  
Part 1: Section 3 Driven Precast Concrete Piles  
Part 1: Section 4 Based precast Concrete Piles  
Part 2: Timber Piles  
Part 3 Under Reamed Piles  
Part 4 Load Test on Piles

### II Protection from Cyclones/Wind Storms

12. IS 875 (3)-1987 "Code of Practice for Design Loads (other than Earthquake) for Buildings and Structures, Part 3, Wind Loads"
13. IS:2911 – 1973 "Guideline for construction of cyclone shelters".
14. IS: 15498 – 2004 "Guidelines for improving the cyclonic resistance of low rise houses & other building/structures.
15. Guidelines (Based on IS 875 (3)-1987) for improving the Cyclonic Resistance of Low rise houses and other building.

### III For Earthquake Protection

16. IS: 1893-2002 "Criteria for Earthquake Resistant Design of Structures (Fifth Revision)"
17. IS:13920-1993 "Ductile Detailing of Reinforced Concrete Structures subjected to Seismic Forces - Code of Practice"

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18. IS:4326-1993 "Earthquake Resistant Design and Construction of Buildings - Code of Practice (Second Revision)"
  19. IS:13828-1993 "Improving Earthquake Resistance of Low Strength Masonry Buildings - Guidelines"
  20. IS:13827-1993 "Improving Earthquake Resistance of Earthen Buildings - Guidelines",
  21. IS:13935-1993 "Repair and Seismic Strengthening of Buildings - Guidelines"

#### **IV Flood Management/ River Valley Projects**


22. IS: 4189 -1985 "Guide for preparation of project report for river valley projects".
23. IS: 4410 (Part 3): 1988 "Glossary of terms relating to river valley projects: Part 3 River and river training".
24. IS:4410 (Part 11): Sec 5 -1977 "Glossary of terms relation to river valley projects: Part 11 Hydrology Section 5 Floods".
25. IS:4410 (Part 21): 1987 "Glossary of terms relating to river valley projects :Part 21 Flood control".
26. IS:11532 - 1995 "Construction and maintenance of river embankments (levees)- Guidelines"
27. IS: 12094 – 2000 "Guidelines for Planning and Design of River Embankments (Levees)".
28. IS: 14262 - 1995 "Planning and design of revetments- Guidelines".
29. IS: 5477 (Part 4): 1971 "Methods for Fixing the capacities or reservoirs: Part 4 Flood storage".
30. IS: 7323 – 1994 "Operation of Reservoirs – Guidelines".
31. IS: 8408 -1994 "Planning and design of groynes in alluvial river – Guidelines".
32. IS: 14815 – 2000 "Design Flood for River Diversion Works- Guidelines".

#### **V Landslide Hazard**

33. IS:14458 (Part 1): 1998 Guidelines for retaining wall for hill area: Part 1 Selection of type of wall.
34. IS:14458 (Part 2): 1997 Guidelines for retaining wall for hill area: Part 2 Design of retaining/breast walls
35. IS:14458 (Part 3): 1998 Guidelines for retaining wall for hill area: Part 3 Construction of dry stone walls
36. IS:14496 (Part 2): 1998 Guidelines for preparation of landslide – Hazard Zonation maps in mountainous terrains: Part 2 Macro-Zonation.
37. IS: 14680: 1999 Guidelines for land slide control
38. IS: 14948: Code of practice for Reinforcement of Rock Slopes with plain edge of failure
39. BIS 12023: Code of Practice for Field Monitoring and Movement of Structures using Tape Extensometer
40. BIS: 14804: Guidelines for Siting, Design and selection of materials for Residential Building in Hilly Areas

#### **VI For Protection of Saline Embankments and Coastal Canals**

41. IS:8835 – 1978 "Feasibility study and preparation of preliminary project report".
42. IS: 10635 – 1993 (reaffirmed 2003) "Freeboard requirements in embankments and dams".
43. IS:12169 – 1987 – "Criteria for design of small embankment dams".
44. IS: 8835-1978: Feasibility study, preparation of

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45. IS:12094-1978: Preliminary Project Report
  46. IS: 10635-1993 (reaffirmed 2003): Freeboard requirements in embankments and dams
  47. IS: 11532-1995 (reaffirmed 2005): Construction and maintenance of river embankments
  48. IS: 12094-2000 (reaffirmed 2005): Planning and design of river embankment
  49. IS: 12169-1987: Criteria for design of small embankments dams

## LIST OF INDIAN ROAD CONGRESS (IRC) CODES/MANUALS

1. IRC: 5-1998 (Seventh Revision) - "Standard specifications and Code of practice for Road Bridges, Section I- General features of Design".
2. IRC: 10-1961 - "Recommended Practice for Borrow pits for Road Embankments Constructed by Manual Operation".
3. IRC: 34-1970 - "Recommendations for Road Construction in Waterlogged Area".
4. IRC: 36-1970 - "Recommended Practice for the Construction of Earth Embankments for Road Works".
5. IRC: 45-1972 - "Recommendations for Estimating the Resistance of Soil Below the Maximum Scour Level in the Design of Well Foundations of Bridges".
6. IRC: 52-2001 (Second revision) - "Recommendations about the Alignment Survey and Geometric Design of Hill Roads".
7. IRC: 56-1974 - "Recommended Practice for Treatment of Embankment Slopes for Erosion Control".
8. IRC: 75-1979 - "Guidelines for the Design of High Embankments".
9. IRC: 78-2000 (Second Revision) - "Standard specifications and Code of practice for road, bridges, Section VII - Foundations and substructure.
10. IRC: 89-1997 (First Revision) - "Guidelines for Design and Construction of River Training and Control Works for Road Bridges".
11. IRC: 104-1988 - "Guidelines for Environmental Impact Assessment of Highway Projects".
12. IRC: SP: 13-2004 (First Revision) - "Guidelines for the Design of Small Bridges and Culverts".
13. IRC: SP: 35-1990 - "Guidelines for Inspection and Maintenance of Bridges".
14. IRC: SP: 42-1994 - "Guidelines on Road Drainage".
15. IRC: SP: 50-1999 - "Guidelines of Urban Drainage".
16. IRC: SP: 54-2000 - "Project preparation Manual for Bridges".
17. IRC: 6 - 2000 - "Standard specifications and code of practice for road bridges - section: II Loads & stresses".
18. IRC: SP: 57-2001 - "Guidelines for quality systems for road construction".
19. IRC: 28-1967 - "Recommendation of road construction in water logged areas".
20. IRC: SP: 26-1984 - "Project preparation manual for bridges".
21. IRC: 87-1984 - "Guidelines for design and erection".
22. IRC: 21-2000 - "Standard specification and codes for roads and bridges".
23. IRC: SP: 20-2002 - "Rural roads".
24. MORT & H Pocket Book for Highway Engineers, 2002 (Second Revision)
25. IRC: SP33:1989 Guidelines on Supplemental Measures for Design, Detailing & Durability of Important Bridge Structures.

**RAILWAY CODES & MANUALS - RDSO PUBLICATIONS**

1. RBF-20: "Estimation of design discharge based on regional flood frequency approach for sub-zones 3(a), 3 (b), 3 (c) & 3 (e)".
2. RBF-22: "50 year 24 hour set of isopluvial maps of India maps of short duration ratios".
3. RBF- 23: "Validation of flood estimation report No. UNT-7-1983 for sub-zone- 3 (f)".
4. RBF-24: "Validation of flood estimation report No. 3/1980 for sub-zone-3 (f)".
5. RBF-25: "Estimation of design discharge based on regional flood frequency approach for sub- zone -3 (f)".
6. RBF-26: "Validation of flood estimation report No. UGP -9-1984 for sub-zone-1 (e)".
7. RBF-27: "Validation of design discharge based on regional flood frequency approach for sub-zone- 3 (e)".
8. RBF -28: "Estimation of design discharge based on regional flood frequency approach for sub-zone-3 (i)".
9. RBF-29: "Estimation of design discharge based on regional flood frequency approach of sub-zone-3 (b)".
10. RBF-32: "Validation of flood estimation report no.c/16/1988 Subzone -1 (b) (chambal basin)".
11. RBF-33: "Estimation of design discharge based on regional flood frequency approach for sub- zone-1 (d) (sone basin)".
12. RBF-34: "Validation of flood estimation report no.S/15/1987 sub-zone-1 (d) (sone basin)".
13. GE-1: "Guidelines- Erosion control on slopes of banks and cuttings".
14. GE-6: "Guidelines for earthwork in conversion projects".