CHAPTER 8
NON ENGINEERING REINFORCED CONCRETE BUILDINGS

8.9
typical damage and collapse of R.C. building

8.10
sliding of roofs off supports

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falling of infill walls

71
(a) Crushing of Column Ends & Virtual Hinge

(b) Short Column Effect

(c) Diagonal Cracking on Column

(d) Diagonal Cracking of Column-Beam Joint

(e) Pulling out of Reinforcing Bars

(f) Collapse of Gable Bridge

(g) Foundation Sinking & Tilting

(h) Care to be taken in Concrete Construction
3) Measuring Materials

4) Mixing Materials

5) Frame

6) Placing of Reinforcement

7) Stirrup
Casting & Compacting Concrete

Concrete, being a composite material, is critical in construction. It requires proper compacting and curing to ensure its strength and durability. Here are some guidelines:

1. Curing of Concrete

Concrete curing is crucial. It should be covered and left undisturbed for a minimum of 24 hours. During this period, it should not be exposed to wind, rain, or direct sunlight. Proper curing ensures the concrete reaches its full strength.

2. Construction Joint

Construction joints are necessary in concrete structures. They help in the proper transfer of loads and prevent cracking. These joints should be properly sealed to ensure water resistance.

Typical Material Properties

Concrete material properties vary depending on the type of concrete. For example, the compressive strength of concrete is typically measured in MPa. The durability of concrete is also a crucial factor, affecting its lifespan in various environments.

Diagrams are used to illustrate the construction process, showing the layout and accurate placement of concrete components.
<table>
<thead>
<tr>
<th>Details</th>
<th>Details</th>
<th>$P_{\text{max}}$</th>
<th>$P_{\text{min}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0.94:1 \enspace (F_c = 15\text{MPa})$</td>
<td>$F_{\text{c}} = 250\text{MPa}$</td>
<td>0.0001</td>
<td>0.000001</td>
</tr>
<tr>
<td></td>
<td>$F_{\text{y}} = 415\text{MPa}$</td>
<td>0.00099</td>
<td></td>
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<tr>
<td>$2.2:3:1 \enspace (F_c = 15\text{MPa})$</td>
<td>$F_{\text{c}} = 250\text{MPa}$</td>
<td>0.0054</td>
<td>0.00047</td>
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<tr>
<td></td>
<td>$F_{\text{y}} = 415\text{MPa}$</td>
<td>0.0039</td>
<td>0.0099</td>
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**Notes:**
- $F_{\text{c}}$ = Air / Moisture / Density
- $F_{\text{y}}$ = Yield Stress

$$P = \frac{A_s}{bh}$$

$a_{\text{max}} = bhP_{\text{max}}$

$a_{\text{min}} = bhP_{\text{min}}$

### Calculations

The density of concrete ($\rho_{\text{c}}$) in kg/m$^3$ can be calculated using the formula:

$$\rho_{\text{c}} = \frac{m}{V}$$

Where:
- $m$ = Mass of concrete in kg
- $V$ = Volume of concrete in m$^3$

### Example Calculation

1. Determine the critical zone ($Z_{\text{cr}}$) and confinement ($C_{\text{con}}$) based on the load factor ($F_{\text{load}}$) and the ratio of inner to outer diameter ($R_{\text{i}}/R_{\text{o}}$).

2. Calculate the critical depth ($d_{\text{cr}}$) and the critical radius ($r_{\text{cr}}$) using the critical zone ($Z_{\text{cr}}$) and confinement ($C_{\text{con}}$).

3. Determine the minimum and maximum values for the critical zone ($Z_{\text{min}}$, $Z_{\text{max}}$) and confinement ($C_{\text{con,min}}$, $C_{\text{con,max}}$) based on the load factor ($F_{\text{load}}$).

4. Use the calculated values to design the critical section ($S_{\text{cr}}$) and the confinement ($C_{\text{con}}$) for the given load factor ($F_{\text{load}}$).

5. Verify the design by comparing the critical zone ($Z_{\text{cr}}$) and confinement ($C_{\text{con}}$) with the calculated values.

### Units
- Mass: kg
- Volume: m$^3$
- Density: kg/m$^3$
1. ଏହରେ ବେରିଆ ପରାସନା 
(ପ୍ରମାଣ) କରାଇବାର ଲିଖିତ
2. ଲାତେରେ ପରାସନା
3. ବିଶେବରେ ପରାସନା

 |_\[S_1 \leq h/4, S_2 \leq h/2\] |

1. \[A_{51}, A_{52}, A_{54} \leq P_{\text{min}} \cdot bh\]
2. \[A_{52} \geq P_{\text{max}} \cdot bh + A_{51}/3\]
3. \[A_{55}, A_{59} \geq P_{\text{min}} \cdot bh\]
4. \[A_{56} \geq 2 \text{ bars of } \phi 12\]

\[S = 50 \text{ mm}\]

\[L/4 \leq L_{\text{cr}} \leq 1\]

\[L/5 \leq L_{\text{cr}} \leq 1\]

\[b \geq 450, h_k/6\]

\[b_k \geq 450, H_k/6\]

\[S \leq h_k/2\]
1. ଦହଳା ଜିକ୍ର
2. ଶ୍ରେଷ୍ଠ ମୃଣ
3. ପୂର୍ବ ବିଭାଗ ରାପୁତ୍ରରୁ ପରିମୂଖ ଉପରୀଁ ଧରାରୁ କରାଇଛନ୍ତି
4. ଏହା ତାଲା ବିଭାଗ ଦ୍ୱୀକ୍ତ ଭୂଗୋଳ ଧରାରୁ କରାଇଛନ୍ତି କେଉଳଙ୍କୁ ଗର୍ତ୍ତି କରାଇଛନ୍ତି

ନିଶ୍ଚନ ્୧ ହେକେ ପୂର୍ବରେ ଦହଳା ଜିକ୍ର କରାଇବେ

1. ଦହଳା ଜିକ୍ର
2. ଶ୍ରେଷ୍ଠ ମୃଣ
3. ପୂର୍ବ ବିଭାଗ ରାପୁତ୍ରରୁ ପରିମୂଖ ଉପରୀଁ ଧରାରୁ କରାଇଛନ୍ତି

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ନିଶ୍ଚନ ્୧ (ii) Hunched ନିଶ୍ଚନ କରାଇବେ
1. ଜଳାର ଗାଢା
2. ଜଳାର ଗାଢା
3. ଜଳାର ଗାଢା କମରା ଦେବାରି ହିଲି ଗୁଡି ଗଜାଲ

1. ଜଳାର ଗାଢା / ଜଳାର ଗାଢା
2. ଜଳାର ଗାଢା
3. ଜଳାର ଗାଢା କମରା ଦେବାରି ହିଲି ହିଲି
4. ଜଳାର ଗାଢା / ଜଳାର ଗାଢା


G.9 Details of Beam

1) Longitudinal Steel

Longitudinal Steel

2) Lateral Reinforcement

Lateral Reinforcement

3) Splicing of Steels

Splicing of Steels

4) Transverse Steel Stirrup

Transverse steel Stirrup

5) Column Section

Column Section