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Appendices

Appendix A : ***Concrete mix design procedure (Using British method)***

Item	Reference & calculation	Values
1.1 Characteristic strength	Specified	…. …**25**… .N /mm^2 at …**28**…..Days
	Proportion defective … **2.5** …percent	
Standard deviation	fig.3	…**8**..... N /mm^2 or no data
Target Strength	Eq 1 (K = 1.96) ×8 + 25 = **40.68** N / mm^2	
1.2 Cement type	Specified	……**O.P.C**……
1.3 Aggregate type : coarse	Specified	……**uncrushed** ……
Aggregate type : Fine	Specified	……. **uncrushed** ……
1.4 Compressive strength	Table 19.3	……**40** N /mm^2…….
1.5 Condition of exposure	Table15.1	……**Moderate**……
1.6 Nominal cover	Specified	……**25**.mm
1.7 Free water / cement ratio	Fig.19.1	…**0.47**……..use the lower value
1.8 Max. Free water / cement ratio	Table14.5	…**0.50**……
2.1 Slump	Table5.1	slump …**10 – 30** …..mm
2.2 Max. aggregate size	Specified	..…**20**……..mm
2.3 Free water content	Table19.6	……**160**……..Kg /m^3
3.1 Cement content Kg /m^3	Eq2 C =	…**160**…. / …**0.47**… = **340.4**….
3.2 Max. cement content Kg /m^3	Code C =	……..…. ...…… = .**550**....
3.3 Min. cement content item 3.1	Specified	. …**290**…. Kg /m^3 Use if greater than

and calculate item3.4

3.4 Modified free water / cement ratio ……..

4.1 Bulk specific gravity of aggregate ……**2.60**……known / assumed

4.2 Wet density of concrete Fig19.3 ……**2400**…….Kg /mm^3

4.3 Total aggregate content Eq3 …**2400**… – …**160**.– **340**..=**1900**… Kg /m^3

5.1 Percentage of fines aggregate Fig19.4 ……**28%**……..
passing a600 μ m sieve

5.2 Fine aggregate content Eq4 …**0.28**….x …**1900**…. = ……**532**..… …. Kg /m^3

5.3 Coarse aggregate content Eq5 .. ……**1900**. – .**532**… = ……..**1368**…..… .Kg /m^3

	Cement	Water	Fin Agg.	Coarse Agg.
Quantities	(Kg)	(Kg)	(Kg)	(Kg)
Per $1m^3$	… **340**…	…**160**…	… **532**..	.. . **1368**…
Per trial mix of 0.02 m^3	…6.8…	…3.2…	… 10.64	…27.36…
Total	**2400**…. Kg			

Equation:

Eq1: Target strength = Characteristic strength + (Margin ×Standard deviation)

Eq2: C = $\frac{w}{\frac{w}{c}}$

Eq3: Total Agg. Content = wet density of concrete – free water content – cement content

Eq4: Fine Agg. Content = fines aggregate passing a600 μ m sieve x Total Agg. content

Eq5: Coarse Agg. Content = Total Agg. Content – Fine Agg. Content

Appendix B: ***Some pictures of Acacia tortilis Gum applications***

(1)

(2)

Appendix C: ***Some pictures show procedures in laboratory*** :

(1)

(2)

(3)

Appendix D: ***Results from tests in documents paper of laboratory***

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شركة دان فوديو للمقاولات والطرق والجسور المحدودة
قسم الخلاط المركزي
معمل الخرسانة

Results of Concrete Compressive Strength Test
(Concrete Cube Test)

Addressed To: ... designe .....
Section: ..... ACT .....
Date of Cast: .... 8/9/2013 ....
Date of Test: ... 6/10/2013 ....
Age: ... 28 days .....
Slump (mm): ..... 17 .....
Type of Cement: ... O.P..C ....
Method of Curing: ... ACT .....

Mix proportion:

Cement: ..... 8 .... Kg/m^3 Gravel: ... 28 ... Kg/m

Sand: ..... 11.75 ..... Kg/m^3 Water: ... 3.5 .... Kg/m^3

IN case of the Use of additives:-

Type additive : *Acacia tortilis* GUM Percentage additions used:0.25%

Specimen designation	Average Dimention	Weight (Kg)	Failure load (Kn)	Strength (N/mm^2)	Mean strength (N/mm^2)
Designe	150*150*150				
		8	532	23.6	
		8	500	22.2	23.1
		8	526	23.4	

- Any Special Remarks: ----------

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Laboratory In charge

.....

Engineer In charge

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Results of Concrete Compressive Strength Test
(Concrete Cube Test)

Addressed To: … designe …..
Section: …… ACT ……..
Date of Cast: …. 8/9/2013 ……
Date of Test: … 15/9/2013 …….

Age: ……7 days ……..……
Slump (mm): …… 12 ……..
Type of Cement: … O.P..C ….
Method of Curing: ……..

Mix proportion:

Cement: …… 7 …. Kg/m^3 Gravel: … 28 … Kg/m

Sand: …… 11.75 ……. Kg/m^3 Water: … 3.5 …. Kg/m^3

IN case of the Use of additives:-

Type additive :… non ….. Percentage additions used:…non ….

Specimen designation	Average Dimention	Weight (Kg)	Failure load (Kn)	Strength (N/mm^2)	Mean strength (N/mm^2)
Designe	150*150*150				
		8	386	17.1	
		8	371	16.4	16.7
		8	380	16.8	

- Any Special Remarks: ----------

…… ……

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Results of Concrete Compressive Strength Test
(Concrete Cube Test)

Addressed To: … designe …..
Section: …… ACT ……..
Date of Cast: …. 8/9/2013 ……
Date of Test: … 6/10/2013 …….

Age: ……28 days ……..……
Slump (mm): …… 12 ……...
Type of Cement: … O.P..C ….
Method of Curing: … ACT ……

Mix proportion:

Cement: …… 8 …. Kg/m^3 Gravel: … 28 … Kg/m

Sand: …… 11.75 ……. Kg/m^3 Water: … 3.5 …. Kg/m^3

IN case of the Use of additives:-

Type additive :… non ….. Percentage additions used:…non ….

Specimen designation	Average Dimention	Weight (Kg)	Failure load (Kn)	Strength (N/mm^2)	Mean strength (N/mm^2)
Designe	150*150*150				
		8	583	25.9	
		8	623	27.7	26.2
		8	565	25.1	

- Any Special Remarks: ----------

…… ……

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Results of Concrete Compressive Strength Test
(Concrete Cube Test)

Addressed To: ... designe .....
Section: ..... ACT .....
Date of Cast: .... 9/9/2013 ....
Date of Test: ... 16/9/2013 ....

Age: ... 7 days .....
Slump (mm): ..... 20 .....
Type of Cement: ... O.P..C ....
Method of Curing: ... ACT .....

Mix proportion:

Cement: ..... 8 .... Kg/m^3 Gravel: ... 28 ... Kg/m

Sand: ..... 11.75 ..... Kg/m^3 Water: ... 3.5 .... Kg/m^3

IN case of the Use of additives:-

Type additive : *Acacia tortilis* GUM Percentage additions used:0.5%

Specimen designation	Average Dimention	Weight (Kg)	Failure load (Kn)	Strength (N/mm^2)	Mean strength (N/mm^2)
Designe	150*150*150				
		8	453	20.1	
		8	444	19.7	20.2
		8	480	21.3	

- Any Special Remarks: ----------

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Results of Concrete Compressive Strength Test
(Concrete Cube Test)

Addressed To: … designe …..
Section: …… ACT ……..
Date of Cast: …. 9/9/2013 ….
Date of Test: … 7/10/2013 ….
Age: … 28 days ……..……
Slump (mm): …… 20 ……..
Type of Cement: … O.P..C ….
Method of Curing: … ACT ……

Mix proportion:

Cement: …… 8 …. Kg/m^3 Gravel: … 28 … Kg/m

Sand: …… 11.75 ……. Kg/m^3 Water: … 3.5 …. Kg/m^3

IN case of the Use of additives:-

Type additive : *Acacia tortilis* GUM Percentage additions used:0.5%

Specimen designation	Average Dimention	Weight (Kg)	Failure load (Kn)	Strength (N/mm^2)	Mean strength (N/mm^2)
Designe	150*150*150				
		8	587	26.1	
		8	600	26.7	26.4
		8	594	26.4	

- Any Special Remarks: ----------

…… ……

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Results of Concrete Compressive Strength Test
(Concrete Cube Test)

Addressed To: ... designe .....
Section: ..... ACT .....
Date of Cast: .... 11/9/2013 ....
Date of Test: ... 18/9/2013 ....
Mix proportion:

Age: ... 7 days .....
Slump (mm): ..... 23 .....
Type of Cement: ... O.P..C ....
Method of Curing: ... ACT .....

Cement: ..... 8 .... Kg/m^3 Gravel: ... 28 ... Kg/m

Sand: ..... 11.75 ..... Kg/m^3 Water: ... 3.5 .... Kg/m^3

IN case of the Use of additives:-

Type additive : *Acacia tortilis* GUM Percentage additions used:1.0%

Specimen designation	Average Dimention	Weight (Kg)	Failure load (Kn)	Strength (N/mm^2)	Mean strength (N/mm^2)
Designe	150*150*150				
		8	361	16.0	
		8	355	15.8	16.2
		8	376	16.7	

- Any Special Remarks: ----------

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Results of Concrete Compressive Strength Test
(Concrete Cube Test)

Addressed To: ... designe .....
Section: ..... ACT .....
Date of Cast: .... 11/9/2013 ....
Date of Test: ... 9/10/2013 ....
Age: ... 28 days .....
Slump (mm): ..... 23 .....
Type of Cement: ... O.P..C ....
Method of Curing: ... ACT .....

Mix proportion:

Cement: ..... 8 .... Kg/m^3 Gravel: ... 28 ... Kg/m

Sand: ..... 11.75 ..... Kg/m^3 Water: ... 3.5 .... Kg/m^3

IN case of the Use of additives:-

Type additive : *Acacia tartilis* GUM Percentage additions used:1.0%

Specimen designation	Average Dimention	Weight (Kg)	Failure load (Kn)	Strength (N/mm^2)	Mean strength (N/mm^2)
Designe	150*150*150				
		8	515	22.9	
		8	520	23.1	23.3
		8	536	23.8	

- Any Special Remarks: ----------

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Results of Concrete Compressive Strength Test
(Concrete Cube Test)

Addressed To: … designe …..
Section: …… ACT ……..
Date of Cast: …. 8/9/2013 ……
Date of Test: … 15/9/2013 …….
Age: ……7 days ……..……
Slump (mm): …… 17 ……..
Type of Cement: … O.P..C ….
Method of Curing: … ACT ……

Mix proportion:

Cement: …… 8 …. Kg/m^3 Gravel: … 28 … Kg/m

Sand: …… 11.75 ……. Kg/m^3 Water: … 3.5 …. Kg/m^3

IN case of the Use of additives:-

Type additive : *Acacia tortilis* GUM Percentage additions used:0.25%

Specimen designation	Average Dimention	Weight (Kg)	Failure load (Kn)	Strength (N/mm^2)	Mean strength (N/mm^2)
Designe	150*150*150				
		8	389	17.3	
		8	397	17.6	17.1
		8	370	16.4	

- Any Special Remarks: ----------

Laboratory In charge

Engineer In charge