# M40 with Without Graphene Solution

## TEST REPORT

**TEST REPORT NO.** : GLOBAL/25/BNR-1213-TR-810393/1
**TEST REFERENCE NO.** : BNR-1213-TR-810393
**TEST REPORT DATE** : 26-09-2025

**NAME OF CUSTOMER :** :
**CAPPATERY PRIVATE LIMITED**
**Plot No. 316/5846, Niladri Vihar,**
**Chandrasekharpur, Sailashree Vihar Road, Bhubaneswar**

**PROJECT / SITE ADD:**
**CAPPATERY PRIVATE LIMITED**
**Plot No. 316/5846, Niladri Vihar,**
**Chandrasekharpur, Sailashree Vihar Road, Bhubaneswar**

**QUANTITY** : 01 No.
**DATE OF RECIEPT** : 13-09-2025

### MORTAR MIX DESIGN

GRADE OF CONCRETE :M 40 TYPE OF CONCRETE : RCC
TARGET MEAN STRENGTH = ( 40 + 1.65 X 5 ) = 48.25 N/mm2

**DATA OF INGREDIENTS**

| Ingredients | Type of material | Source of materials | Average Specific Gravity | Water Absorption % | Material Percentage used |
|---|---|---|---|---|---|
| Cement | OPC 53G | Ultratech | 3.13 | | 82 |
| Flyash | Flyash | NA | 2.18 | - | 18 |
| Fine Aggregate | Natural Sand | Mahanadi | 2.62 | 0.73 | 100 |

**MORTAR MIX PROPORTION**

| Sr No | Ingredients | Material in kg/Cum | Material in Kg/Cement Bag | DLBD (Kg/Ltr) | Material in Vol (Ltrs) / Cement bag | Material by Farma of 35 Lit Cap./ Cement Bag |
|---|---|---|---|---|---|---|
| 1 | Cement | 450 | 1 | | | |
| 2 | Flyash | 100 | 11 | | | |
| 3 | Fine Aggregate | 1418 | 158 | 1.54 | 102 | 2.93 |
| 4 | Total Water | 245 | 27 | | | |

**CUBE COMPRESSIVE STRENGTH TEST RESULT**

| Sr No. | Cross sectional area (mm2) | Date of Casting | Date of Testing | Age in days | Weight (kg) | Load (kN) | Compressive Strength (N/mm$^2$) |
|---|---|---|---|---|---|---|---|
| 1 | 4995 | 18/09/2025 | 25-09-2025 | 7 | 0.801 | 192.8 | 38.6 |
| 2 | 4991 | 18/09/2025 | 25-09-2025 | 7 | 0.815 | 198.64 | 39.8 |
| 3 | 4993 | 18/09/2025 | 25-09-2025 | 7 | 0.811 | 195.72 | 39.2 |
| | | | | | **Average** | | 39.2 |

| Sr No. | Cross sectional area (mm2) | Date of Casting | Date of Testing | Age in days | Weight (kg) | Load (kN) | Compressive Strength (N/mm$^2$) |
|---|---|---|---|---|---|---|---|
| 1 | 4993 | 18/09/2025 | 16-10-2025 | 28 | 0.807 | 200.7 | 40.21 |
| 2 | 4992 | 18/09/2025 | 16-10-2025 | 28 | 0.809 | 206.16 | 41.30 |
| 3 | 4994 | 18/09/2025 | 16-10-2025 | 28 | 0.834 | 196.01 | 39.25 |
| | | | | | **Average** | | 40.25 |

Test Witnessed : Dr. Aneeya Kumar Samantara (Senior Scientist).
Remark : A Mortar mix was designed specifically for R&D, adhering to the customer's requirement of excluding chemical admixtures.
However Mix design submitted as requested by customer. Workability: Flow-Initial 120mm.
Note :

* Mix will require necessary Moisture correction of water at site depending condition of aggregate
* Mix will require necessary Bulkage correction for River Sand
* This Certificate valid only to the sample submitted for testing
* Any Correction or changes invalid this Certificate

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## DETAIL CALCULATION FOR MIX DESIGN

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Target mean strength = | f ck + 1.65 x t | = | 40 | + | 1.65 | X | 5.00 | = | 48.25 | $N/mm^2$ |
| 1. Total free water content | | | | | | = | 235 | Lit | | |
| Free Water Cementitious Ratio | | | | | | = | 0.43 | | | |
| 2. Total Cementitious material content ( a) | | | | | | = | 550 | | kg | |
| (1) Mineral admixture 1 | Flyash | | [ 18 % | X | 550 ] | | = | 100 | kg | |
| (2) Cement content | OPC 53G | | { (a) - ( 1) - (2) - (3) } | | | | | 450 | kg | |

3. Absolute volume of

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cement | OPC 53G | [ 450 | / | 3.13 | ] X ( 1/1000) | = | 0.1438 | cum |
| Mineral admixture 1 | Flyash | [ 100 | / | 2.18 | ] X ( 1/1000) | = | 0.0459 | cum |
| Water | | [ 235 | / | 1.00 | ] X ( 1/1000) | = | 0.2350 | cum |
| Air content | | [ 3.00 | / | | | = | 0.0300 | cum |
| Absolute volume of cementitious material + water + air | | | | | | = | **0.4546** | cum |

Volume occupied by aggregate = 1 - 0.4546 0.5454 cum

Quantity of
Fine aggregate 1 Natural Sand = 0.545 X 2.620 X 100.00 % = 1429 kg /cum

**Adjustment for absorption by aggregates:**

1. Free water to be used in one cubic meter of concrete = 235

b) Absorption by Fine aggregates Natural Sand 1429 x 0.73 % = 10.43
Water required for absorption of aggregates 10.43

2. Total water to be used including absorbed water = 235.00 + 10.43 = 245.4
Say **245** Litres

Total density of fresh concrete = (Cementitious + Aggregates + Water) = 2214

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INWARD NO : **BNR-1213-TR-810393**

## ANALYSIS OF FINE AGGREGATE FOR MIX DESIGN PURPOSE

Material : Natural Sand
Total Wt. of sample : 80 kg
Date of testing : 16-09-2025

| IS SIEVE (mm) | Wt. Retained ( g) | % Wt. Retained | Cum % Retained | Cum % Passing | IS 383 Limits |
|---|---|---|---|---|---|
| 10.00 | 0 | 0.0 | 0.0 | 100.0 | 100 |
| 4.75 | 7 | 0.7 | 0.7 | 99.3 | 90-100 |
| 2.36 | 27 | 2.7 | 3.4 | 96.6 | 75-100 |
| 1.18 | 110 | 11.0 | 14.4 | 85.6 | 55-90 |
| 0.60 | 310 | 31.0 | 45.4 | 54.6 | 35-59 |
| 0.30 | 335 | 33.5 | 78.9 | 21.1 | 8-30 |
| 0.15 | 192 | 19.2 | 98.1 | 1.9 | 0-10 |
| Pan | 19 | 1.9 | 100.0 | 0.0 | |
| TOTAL | 1000 | | | ZONE | II |

| | | | |
|---|---|---|---|
| i) Fineness Modulus | 2.41 | vi) Water Absorption (%) | 0.73 |
| ii) D.L.B.D. ( kg/lit ) | 1.54 | | |
| iii) Specific Gravity | 2.62 | | |

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## MORTAR MIX BATCH DETERMINATION

1 LOCATION : GLOBAL/25/BNR-1213-TR-810393/BNR-1213-TR DATE : 18/09/2025
2 GRADE OF CONCRETE M-40
4 CEMENT TYPE : Ultratech-OPC 53G

**MORTAR MIX INGREDIENT PER CUM OF CONCRETE**

| Sr. No. | Description | Flyash | Cement | River Sand | Admixture | Water | Remark |
|---|---|---|---|---|---|---|---|
| 1 | BATCH WEIGHT (kgs) | 100 | 450 | 1429 | 0.00 | 235 | - |
| 2 | MOISTURE CONTENT ( % ) | | | 0 | | | |
| 3 | ABSORPTION ( % ) | | | 0.73 | | | |
| 4 | NET WATER CORRECTION ( % ) | | | 0.73 | | | |
| 5 | NET WATER CORRECTION (kgs) | | | -10.43 | | 10.43 | |
| 6 | BATCH WEIGHT (Kgs) After Moisture Correction | 100 | 450 | 1418 | 0.00 | 245 | |
| 7 | FINAL BATCH WEIGHT ( Kgs ) | 100 | 450 | 1418 | 0.00 | 245 | |
| | | 0.14 | 0.63 | 1.99 | 0.000 | 0.34 | Batch Size: 0.0014 cum |

| | | | |
|---|---|---|---|
| Mixing time: 11:00AM | Water Balance | Initial Flow | 120mm |
| Casting Time: 11:15AM | Extra Water Added | | |

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# M40 with Graphene Solution

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GRADE OF CONCRETE :M 40 TYPE OF CONCRETE : RCC
TARGET MEAN STRENGTH = ( 40 + 1.65 X 5 ) = 48.25 $N/mm^2$

**DATA OF INGREDIENTS**

| Ingredients | Type of material | Source of materials | Average Specific Gravity | Water Absorption % | Material Percentage used |
|---|---|---|---|---|---|
| Cement | OPC 53G | Ultratech | 3.13 | | 82 |
| Flyash | Flyash | NA | 2.18 | - | 18 |
| Fine Aggregate | Natural Sand | Mahanadi | 2.62 | 0.73 | 100 |
| Chemical Admixture | Plasticizer | Graphene Concrete Admixture | 1.08 | | 0.90 |

**MORTAR MIX PROPORTION**

| Sr No | Ingredients | Material in kg/Cum | Material in Kg/Cement Bag | DLBD (Kg/Ltr) | Material in Vol (Ltrs) / Cement bag | Material by Farma of 35 Lit Cap./ Cement Bag |
|---|---|---|---|---|---|---|
| 1 | Cement | 450 | 1 | | | |
| 2 | Flyash | 100 | 11 | | | |
| 3 | Fine Aggregate | 1418 | 158 | 1.54 | 102 | 2.93 |
| 4 | Total Water | 245 | 27 | | | |
| 5 | Admixture | 4.95 | 0.55 | | 0.51 | |

**CUBE COMPRESSIVE STRENGTH TEST RESULT**

| Sr No. | Cross sectional area (mm2) | Date of Casting | Date of Testing | Age in days | Weight (kg) | Load (kN) | Compressive Strength ($N/mm^2$) |
|---|---|---|---|---|---|---|---|
| 1 | 4995 | 19/09/2025 | 26-09-2025 | 7 | 0.813 | 247.2 | 49.5 |
| 2 | 4991 | 19/09/2025 | 26-09-2025 | 7 | 0.827 | 244.06 | 48.9 |
| 3 | 4993 | 19/09/2025 | 26-09-2025 | 7 | 0.812 | 250.64 | 50.2 |
| | | | | | **Average** | | 49.53 |

Test Witnessed : Dr. Aneeya Kumar Samantara (Senior Scientist).
Remark : A Mortar mix was designed specifically for R&D, adhering to the customer's requirement of including chemical admixtures. Compression tests showed that the mix did not meet the target mean strength for the specified design grade, However Mix design submitted as requested by customer. Workability: Flow-Initial 120mm.

Note :

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| Water | | [ 235 | / | 1.00 | ] X ( 1/1000) | = | 0.2350 | cum |
| Air content | | [ 3.00 | / | | | = | 0.0300 | cum |
| Absolute volume of cementitious material + water + air | | | | | | = | **0.4546** | cum |

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