Major Project

On

EFFECT OF VARIOUS FACTORS ON CONCRETE MIX DESIGN

Submitted in Partial Fulfillment for the Award of the Degree of

Master of Engineering
in
Civil Engineering

With specialization in

STRUCTURAL ENGINEERING

by

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ACKNOWLEDGMENT

It is a moment of great pleasure and immense satisfaction for me to express my sense of gratitude and indebtedness towards my guides Mr. Alok Verma Associate Professor of Department of Civil Engineering, Delhi College of Engineering, for their eminent guidance, keen interest and constant encouragement during the course of project. I am indebted to them for their supervision and guidance at all stages of work.

Dated : **KUSHANT KUMAR**

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CERTIFICATE

This is to certify that the Thesis work entitled **"Effect of Various Factors on Concrete Mix Design "** being submitted by me, is a bonafide record of my own work carried by me under the guidance and supervision of Associate Professor Mr.Alok Verma in partial fulfillment of requirements for the award of the Degree of Master of Engineering (Structural Engineering) in Civil Engineering.

The matter embodied in this project has not been submitted for the award of any other degree.

KUSHANT KUMAR

Roll No: 10091

This is to certify that the above statement made by the candidate is correct to the best of our knowledge.

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1.0 ABSTRACT

Concrete Mix design is very important in the construction of structures made of concrete. Concrete is weak in tension So, It is normally reinforced with steel. Quantities of various constituents of concrete such as cement, water, coarse aggregate, fine aggregate, and admixtures are to be calculated. There are various factors which affect concrete mix design. Some of these are size of aggregate, exposure conditions, water cement ratio, aggregates shapes, requirement of pumping, type of fine aggregate, workability etc.

It is difficult to consider the effect of various factors on mix design experimentally. In this project theoretically efforts has been made to study the effect of various factors on concrete mix design. Effect of various factors has been considered on concrete mixes of different grades.

2.0 INTRODUCTION:

Design of concrete mixes involves determination of the proportions of the given constituents namely, cement, water, coarse aggregate and fine aggregate with admixtures if any.

Workability is specified as the important property of concrete in the fresh state. For hardened state compressive strength and durability will be considered.

3.0 OBJECTIVE

Following are objectives of in this projects :

1. To develop a procedure to design concrete mix for reinforced cement concrete.

2. To study the effect of various factors such as size of aggregate, exposure conditions, water cement ratio, aggregates shapes, requirement of pumping, type of fine aggregate, workability etc. on concrete mix design.

3. To showcase the variations of concrete mixes depending on variations in different factors in the form of suitable graphs.

4.0 LITERATURE REVIEW

4.1 Factors in the Choice of Mix Design –

Both IS : 456-1978 as well as IS : 1343-1980 envisage that design of concrete mix be based on the following factors:

a) Grade designation,

b) Type of cement,

c) Maximum nominal size of aggregates,

d) Minimum water-cement ratio,

e) Workability, and

f) Minimum cement content.

a) **GRADE DESIGNATION** :

The grade designation gives the characteristic strength requirement of concrete. Depending upon the level of quality control available at the site, the concrete mix has to be designed for a target mean strength somewhat higher than the characteristic strength.

b) **TYPE OF CEMENT** :

The type of cement is important mainly through its influence on the rate of development of compressive strength of concrete as well as durability under aggressive environments. Where very high compressive strength is required, for example, in prestressed concrete railway sleepers, high strength ordinary Portland cement conforming to IS : 8112-1976 will be found suitable. Where an early strength development is required, rapid hardening Portland cement conforming to IS : 8041- 19786 is preferable. On the other hand in situations where heat of hydration has to be limited, for example, in mass concrete constructions, low heat Portland cement conforming to IS : 269-1976' is preferable. Portland pozzolana cement and Portland slag cement are permitted for use in reinforced concrete constructions; while Portland slag cement is also permitted for prestressed concrete constructions. With such blended cements, the rate of development of early strength may be somewhat slower. On the other hand, these blended cements render greater durability to the concrete in sulphatic environment and sea water. The requirements of durability are achieved by limitations in terms of minimum cement content, the type of cement and the maximum water-cement ratio.

c) **MAXIMUM NORMAL SIZES OF AGGREGATES** :

The maximum nominal size of aggregates to be used in concrete is governed by the size of the section and spacing of the reinforcement. Both IS : 456-19783 and IS : 1343-19804, specify that the nominal maximum size of coarse aggregate should not be greater than one-fourth of the minimum thickness of the member, and it should be restricted to 5 mm less than the minimum clear distance between the main bars or, 5 mm less than the minimum cover to the reinforcement and 5 mm less' than the spacing between the cables, strands or sheathing in' case of prestressed concrete. Within these limits, the nominal maximum size of coarse aggregates may be as large as possible. In general, it is found that larger the maximum size of aggregate, smaller is the cement requirement for a particular water-cement ratio . This arises mainly from the fact that workability of concrete increases with increase in maximum size of aggregate. However, the maximum size of aggregates also influences the compressive strength of concrete in that, for a particular volume of aggregate, the compressive strength tends to increase with decrease in the size of coarse aggregate. This is due *to* the fact that smaller size aggregates present a larger surface

area for bonding with the mortar matrix; it also results from the fact that the stress concentration in the mortar-aggregate interfaces increase with increase in the maximum ‘size of aggregate*. here is thus an interaction of the maximum size of aggregate as well as the grade of concrete which determine the ‘strength efficiency’ of the cement and, therefore, the requirement of cement for a particular compressive strength is to be specified ,it is seen that for concrete with higher water-cement ratio, larger maximum size of aggregates may be beneficial whereas for high strength concretes 10 or 20 mm size of aggregates is preferable. It is because of such reasons that IS : 456-19783 and IS : 1343-198(r, while recommending that nominal size of coarse aggregates be as large as possible, also suggest that for reinforced and prestressed concrete works, aggregates having a maximum nominal size of 20 mm or smaller are generally considered satisfactory.

D) **MINIMUM WATER CEMENT RATIO** :

The compressive strength of concretes at a given age and under normal temperature, depends primarily on the water-cement ratio; lower the water-cement ratio, greater is the compressive strength and vice-versa. This was first enunciated by Abrams as:

$$S = \frac{K1}{K2}$$

where S is the compressive strength and w/c represents the water-cement ratio of a fully compacted concrete mix, and K; and K, are empirical constants. In day to day practice, the constants K, and K2 are not evaluated; instead the relationship between compressive strength and the water-cement ratio are adopted, which are supposed to be valid for a wide range of conditions.

e) **WORKABILITY** :

From the stage of mixing till it is transported, placed in the formwork and compacted, fresh concrete should satisfy a number of requirements which may be summarized as follows:

i) The pix should be stable, in that it should not segregate during transportation and placing. The tendency of bleeding should be minimized.

ii) The mix should be cohesive and mobile enough to be placed in the form around the reinforcement and should be able to cast into the required shape.

iii) The mix should be amenable to proper and thorough compaction as possible in the situation of placing and with the facilities of compaction.

iv) It should be possible to obtain a satisfactory surface finish.

The diverse requirements of -stability, mobility, compactability, placeability and finishability of fresh concrete mentioned above are collectively referred to as ‘workability’. The workability of fresh concrete is thus a composite property. It is difficult to precisely define all the aspects in a single definition. IS : 6461 (Part VII)-1973’ defines workability as ‘that property of freshly mixed concrete or mortar which determines the ease and homogeneity with which it can be mixed, placed, compacted and finished . It is also clear that the optimum workability of concrete varies from situation to situation and concrete which can be termed as workable for pouring into large sections with minimum reinforcement may not be equally workable for pouring in thin sections with heavier concentration of reinforcement. A concrete may not be workable when compacted by hand but may be satisfactory’ when mechanical vibration is used.

f) **MINIMUM CEMENT CONTENT** :

The maximum limit of cement content in the concrete may also have to be specified. This is because concrete mixes having high cement content may give rise to shrinkage, cracking and creep of concrete also increases with the cement paste content. In thick concrete sections restrained against movements, high cement content may give rise to excessive cracking caused by differential thermal stresses due to hydration of cement in young concretes. For high strength concretes, increasing cement content beyond a certain value, of the order of 550 kg/m3 or so, may not increase the compressive strength. From these considerations as well as those of overall economy, the maximum cement content in the concrete mixes was limited to 530 kg/m3 for prestressed concrete structures (see IS : 1343-1980) and for reinforced concrete liquid retaining structures [see IS : 3370 (Part I)].

4.2 COMMON MIX DESIGN METHODS :

(a) The ACI Mix Design Method,

(b) The USBR Mix Design Practice,

(c) The British Mix Design Method .and

(d) The Mix Design Method according to Indian Standard Recommended Guidelines for Concrete Mix Design.

(a) The ACI Mix Design Method:

The ACI method' gives mix design for normal and heavy weight concrete (air entrained and non-air-entrained) in the workability range of 25 to 100 mm slump, the maximum 28-day cylinder compressive strength being 450 kgf/cm2. There is a separate method* for mix design of 'no slump' (slump being zero to 25 mm) concrete (air-entrained and non-air-entrained) having maximum 28-day cylinder compressive strength of 475 kgf/cm2. In the ACI method', the volume of coarse aggregate in the concrete mix is first determined depending on the maximum size of aggregate and the grading of fine aggregate. The AC1 method also determines the proportions of dry-rodded coarse aggregate in the concrete mix, the rodding being done according to ASTM C 296 for unit weight of aggregate. It is based on the concept that in dry-rodded void content, the differences in the amount of mortar required for workability with different aggregates due to differences in particle shape and grading are automatically compensated for.

(b) The USBR Mix Design Practice :

In the USBR method5, mix proportioning is done only for air-entrained concrete, the maximum 28-day cylinder compressive strength being 455 kgf/cm*, when water reducing and set controlling admixtures are used. In **USBR method**, the proportion of dry rodded coarse aggregate is determined corresponding to the maximum size of aggregate, a fixed fineness modulus of sand and a fixed workability in terms of slump.

(c) The British Mix Design Method :

The latest British mix design method does not consider the combined aggregate grading curves like those used in Reference 4 (for maximum sizes of aggregate of 40 mm and 20 mm) and those developed for 10 mm maximum size of aggregate . This implies admission to the use of aggregates of any grading as long as they are within the grading limits specified by the appropriate Codes/Specifications. In the British method, the proportion of fine aggregate is determined first depending on the maximum size of aggregate, the degree of workability, the grading of fine aggregate and the water-cement ratio of the concrete mix.

(d) The Mix Design Method according to Indian Standard Recommended Guidelines for Concrete Mix Design:

The 'Indian Standard recommended guidelines for mix design includes design of normal concrete mixes '(non-air entrained), both for medium and high strength concrete. In this method of mix design, the water content and proportion of SP : 23-1982 fine aggregate corresponding to a maximum size of aggregate are first determined for reference values of workability, water cement ratio and grading of fine aggregate. The water content and the proportion of fine aggregate are then adjusted for any difference in workability, water-cement ratio and grading of fine aggregate in any particular case from the reference values. The batch weight of materials per unit volume of concrete is finally calculated by the absolute volume method. The specific relationships (Figures and Tables) that are given in this method of mix design, have been arrived at by exhaustive tests at the Cement Research Institute of India9~io as well as on the basis of data on concrete being designed and produced in the country". These guidelines, although based on data on concrete, majority of which were made with OPC, are also almost equally applicable to concretes made with PPC. The final mix proportions, selected after trial mixes, may entail some minor

changes in each case; such variations may also be necessary in case of cements of one type (either OPC or PPC) but from different sources, or aggregates varying in quality. In so far as selection of water-cement ratio for the target compressive strength at 28-day in concerned, Fig. 46 is applicable for both ordinary Portland and Portland pozzolana cements with comparable validity. However, if a more precise estimate is made with the help of Fig. 47 where cements are classified on the basis of their 28-day strengths, then use of OPC or PPC is not expected to make much difference. Experiences with fly-ash-cement concretes indicate that in such cases, for comparable workabilities, the water content can be reduced by about 3 to 5 percent and proportion of fine aggregates reduced by 2 to 4 percentage points. It is doubtful whether such generalization can be straightway extended in case of concretes made with PPC also, .but any difference that would be necessary can be easily established by trials with the materials at hand.

4.3 Mix Design in Accordance with Indian Standard Recommended Guidelines for Concrete Mix Designs –

The following basic data are required to be specified for design of a concrete mix:

a) Characteristic compressive strength (that is, below which only a specified proportion of test results are allowed to fall) at 28 days (fck)

b) Degree of workability desired ;

c) Limitations on the water-cement ratio and the minimum cement content to ensure Adequate durability for the type of exposure (see Tables 6 to 9);

d) Type and maximum size of aggregate to be used;

e) Standard deviation (s) for compressive strength of concrete: The standard deviation has to be calculated from the results of tests. When, the results of sufficient number of tests under site conditions and for the grade of concrete are not available, the values of standard deviation for different degree of control as given in Table below may be adopted.

TABLE : ASSUMED STANDARD DEVIATION

GRADE OF CONCRETE	ASSUMED STANDARD DEVIATION (N/mm 2)
M10 M15	3.5
M20 M25	4.0
M30 M35 M40 M45 M50	5.0

4.4 The step-by-step procedure of mix proportioning is as follows:

a) The target mean strength is first determined as follows:

$$f_{,}=f_{,,}+K.S. \quad (1)$$

where as

$f_{,}$ = target mean compressive strength at 28 days,

fck= characteristic compressive strength at 28 days,

S = standard deviation,

K = a statistical value depending upon the accepted proportion of low results and the number of tests (see Table below).

NOTE - As per IS : 456 &1978 the characteristic strength is defined as that value below which not more than 5 percent of the test results are expected to fall. In such case, K = 1.65 in equation (1).

TABLE : VALUES OF K

PERCENTAGE OF RESULTS BELOW THE CHARACTERISTICS STRENGTH	K
50	0
16	1.00
10	1.28
5	1.65
2.5	1.96
1.0	2.33
0.5	2.58
0.0	Infinity

(b) The water-cement ratio for the target mean strength is chosen from Fig. 1 .

The water-cement ratio so chosen is checked against the limiting water cement ratio for the requirements of durability (Tables 6 to 9) and the lower of the two values adopted.

Fig. 1 is based on a large number of results under Indian conditions, but on a given situation, may need slight modifications depending upon then characteristics of cement available". As such, it is used more as a guide and actual water-cement ratio is determined by means of trial mixes as described in Ref 8. A more precise estimate of the preliminary water-cement ratio corresponding to the target average strength may be made from the relationships shown in *Fig. 2 , using the curves corresponding to the 28-day compressive strength of cement. It is to be noted that cements have been characterised by its 28-day strength in Fig. 2 rather than upon its 7-day strength because 28-day strength of concrete is found to be better related to the 28-day strength of cement rather than at earlier ages, more so for blended cements. The relationship in Fig. 1 is really a mean curve through Fig. 2 . However, such trials will need 28 days for determining the strength characteristics of cement and atleast

another 28 days for the trial mixes. In order to cut down the time required for trials, an alternative method has been suggested in Ref .In this method,

the accelerated strength (boiling water method in accordance with IS : 9013 -1978 of a ‘reference’ concrete mix having water cement ratio 0.35 and workability of’ 0.80 compacting factor with the cement proposed to be used is determined on 15 cm cube specimens. The nominal maximum size of aggregate of the ‘reference’ concrete should be 10 mm and fine aggregate should conform to Zone II of Table 4 of IS : 383-1970. Corresponding to this accelerated strength, the water-cement ratio is determined for the target mean strength. These curves are based on the relation between 28-day compressive strength of concrete having water-cement ratio of 0.35, which is found to be, on an average, 0.934 times that of 28-day strength of cement tested as per IS : 4031-1968, and correlation of accelerated and normal 28-day strength of concrete .

(c) The **air content (amount of entrapped air)** is estimated from Table 2 for the maximum size of aggregate used.

(d)The **water content and percentage of sand in total aggregate by absolute volume** are next selected from Tables 3 and 4 for medium and

high strength concretes, respectively, for the following standard reference conditions:

i) Crushed (angular) coarse aggregate,

ii) Fine aggregate consisting of natural sand. conforming to grading zone II of Table 4, IS : 383-1970r3, in saturated surface dry condition,

iii) Water-cement ratio of 0.60 and 0.35 for medium and high strength concretes respectively, and

iv) Workability corresponding to compacting factor of 0.80.

e) For other conditions of workability, water-cement ratio, grading of fine aggregate and for rounded aggregates, adjustments in water content and percentage of sand in total aggregate are made as per 5.

f) The cement content is calculated from the water-cement ratio and the final water content arrived after adjustment. The cement content so calculated is checked against' the minimum cement content from the requirements of durability (Tables 6 to 9) and the greater of the two values adopted.

g) With the quantities of water and cement per unit volume of concrete and the percentage of sand in the total aggregate already determined, the coarse and fine aggregates content per unit volume of concrete are calculated from the following equations:

$$V = \left[W + \frac{C}{Sc} + \frac{1}{p} \cdot \frac{fa}{Sfa} \right] \times \frac{1}{1000} \qquad (2)$$

$$V = \left[W + \frac{C}{Sc} + \frac{1}{1 - p} \cdot \frac{Ca}{Sca} \right] \times \frac{1}{1000} \qquad (3) \text{ and}$$

Where as ,

V = absolute volume of fresh concrete
= gross volume (1 m3) minus the volume of entrapped air,
Sc = specific gravity of cement,

W = mass of water (kg) per m3 of concrete,

C = mass of cement (kg) per m3 of concrete,

p = ratio of fine aggregate to total aggregate by absolute volume,

fa ,Ca = total masses of fine aggregate and coarse aggregate, (kg) per m3 of concrete respectively, and

Sfa , Sca = specific gravities of saturated surface dry fine aggregate and coarse aggregate respectively.

TABLE 1 :DEGREE OF QUALITY CONTROL EXPECTED UNDER DIFFERENT SITE CONDITIONS

DEGREE OF CONTROL	CONDITIONS OF PRODUCTION
Very Good	Fresh cement from single source and regular tests, weighbatching of all materials, aggregates supplied in single sizes, control of aggregate grading and moisture content, control of water added, frequent supervision, regular workability and strength tests, field laboratory facilities.
Good	Carefully stored cement and periodic tests, weighbatching of all materials, controlled water, graded aggregate supplied, occasional grading and moisture tests, periodic check of workability and strength, intermittent supervision, experienced workers.
Fair	Proper storage of cement, volume batching of all aggregates allowing for bulking of sand, weighbatching of cement, water content controlled by inspection of mix, occasional supervision and tests.

TABLE 2 : APPROXIMATE ENTRAPPED AIR CONTENT

NOMINAL MAXIMUM SIZE OF AGGREGATE (mm)	ENTRAPPEDE AIR, AS PERCENT OF VOLUME OF CONCRETE
10	3.0
20	2.0
40	1.0

NOTE: Table 41 is from “hardened concrete: Mechanical Aspects: ACI Monograph No. 6(1971) by A.M Neville with the permission of the American Concrete Institute, USA

TABLE 3 : APPROXIMATE SAND AND WATER CONTENTS PER CUBIC METRE OF CONCRETE

(Clause 6.4)

W/C = 0.60

Workability =0.80 CF

(Applicable for concrete up to grade M 15)

MAXIMUM SIZE OF AGGREGATE (mm)	WATER CONTENT* PER CUBIC METER OF CONCRETE	SAND AS PERCENT OF TOTAL AGGREGATE BY ABSOLUTE VOLUME
10	208	40
20	186	35
40	165	30

***Water content corresponding to saturated surface dry aggregate.**

TABLE 4 : APPROXIMATE SAND AND WATER CONTENTS PER CUBIC METRE OF CONCRETE.

W/C =0.35

Workability = 0.80 CF

(Applicable for concrete above grade M 35)

MAXIMUM SIZE OF AGGREGATE (mm)	WATER CONTENT* PER CUBIC METRE OF CONCRETE	SAND AS PERCENT OF TOTAL AGGREGATE BY ABSOLUTE VOLUNE
10	200	28
20	180	25

***Water content corresponding to saturated surface dry aggregate.**

TABLE 5 : ADJUSTMENT OF VALUES IN WATER CONTENT AND SAND PERCENTAGE FOR OTHER CONDITION

CHANGE IN CONDITIONS STIPULATED FOR TABLES 2 AND 3	ADJUSTMENT REQUIRED IN WATER CONTENT	ADJUSTMENT REQUIRED IN PERCENT SAND IN TOTAL AGGREGATE
For sand conforming to grading Zone I , Zone III or Zone IV of table 4 of IS 383 : 1970	0	+1.5 percent for Zone I -1.5 percent for Zone III -3.0 percent for Zone IV
Increase or decrease in the value of compacting factor by 0.1	± 3 percent	0
Each 0.05 increase or decrease in water cement ratio	0	± 1 percent
For rounded aggregate	- 15 kg/m 3	- 7 percent

5.0 APPLICATION OF EXCEL WORKSHEET.

THIS IS FOR RCC WITHOUT FLY ASH

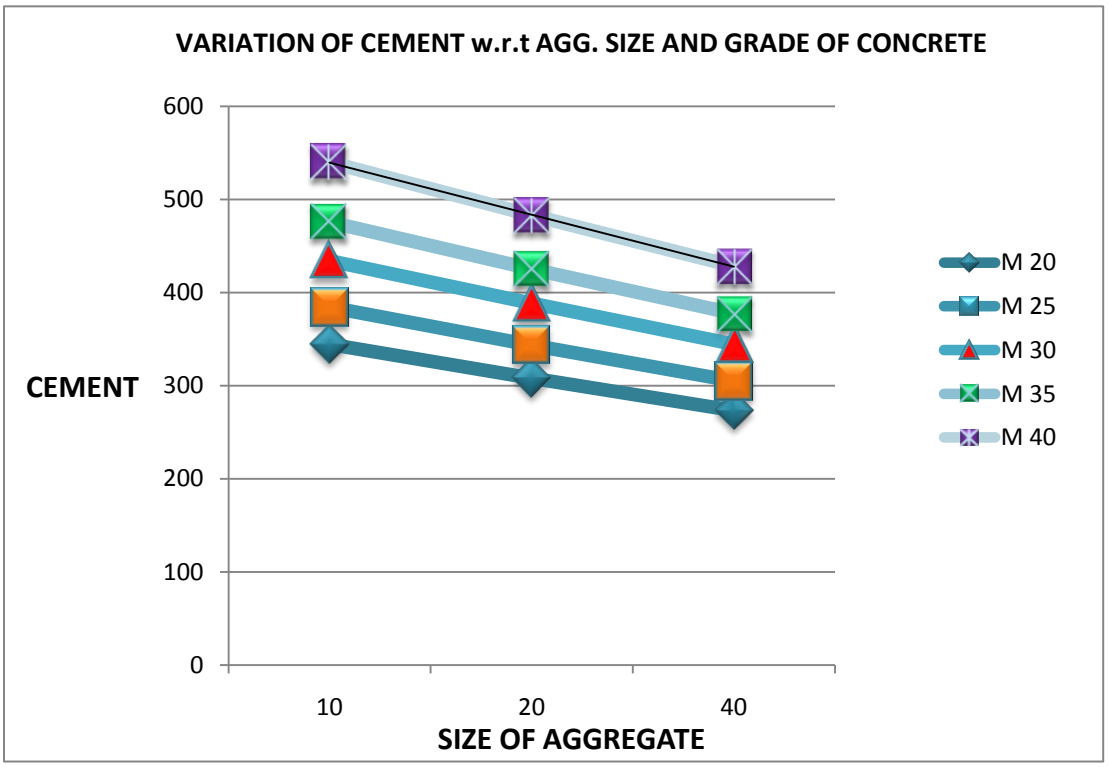
GRADE M	20	20	20
MAXIMUM SIZE AGG **10 / 20 / 40** MM	10	20	40
EXPOSURE M1 MOD2 SEV3 VERYSEV4 EXT5	1	1	1
MAX W/C RATIO	0.55	0.55	0.55
w/c ratio (to be less than max value above)	0.58	0.58	0.58
CHECKING OF W/C RATIO	CHECK	CHECK	CHECK
SLUMP 0-251 25-502 50-753 75-1004 100-1255 125-1506 150-1757 COLL8	1	1	1
PUMPING OR NOT ? 1 / 0	0	0	0
FOR VERY GOOD SUPERVISION PUT 1 ELSE LEAVE BLANK	1	1	1
FOR GOOD SUPERVISION PUT 2 ELSE LEAVE BLANK			
FOR FAIR SUPERVISION PUT 3 ELSE LEAVE BLANK			
AGG ANGULAR1 SUB-ANGU2 CRUSHED-ANGU3 ROUN4	1	1	1
CAPACITY OF WATER REDUCING ADM TO REDUCE WATER(%)	10	10	10
SPECIFIC GRAVITY OF CEMENT	3.15	3.15	3.15
SPECIFIC GRAVITY OF COARSE AGG	2.74	2.74	2.74
SPECIFIC GRAVITY OF FINE AGG	2.74	2.74	2.74
SPECIFIC GRAVITY OF SP	1.145	1.145	1.145
WATER ABSORPTION BY COARSE AGG (%)	0.5	0.5	0.5
WATER ABSORPTION BY FINE AGG (%)	1	1	1
FREE SURFACE MOISTURE COARSE AGGREGATE (%)	0	0	0
FREE SURFACE MOISTURE FINE AGGREGATE (%)	1	1	1
ZONE OF FINE AGGREGATE **1 / 2 / 3 /4**	1	1	1
INCREASE IN CEMENT CONTENT (%) FOR PUMPING	10	10	10
% OF SP BY MASS OF CEMENT	1	1	1
check cement content to be more than min. specified	OK	OK	CHECK
FINAL PROPORTIONS			
	344.383	307.958	273.188
CEMENT (KG/CUB M)	4	3	8
FLY ASH (KG/CUB M)	0	0	0
WATER (KG/CUB M)	181.584	162.378	144.045
	839.642	1199.78	1437.18
CA (KG/CUB M)	3	5	5
	1095.01		663.962
FA (KG/CUB M)	7	820.055	9
	3.44383	3.07958	2.73188
SP (KG/CUB M)	4	3	8
	0.52727	0.52727	0.52727
W/C RATIO	3	3	3

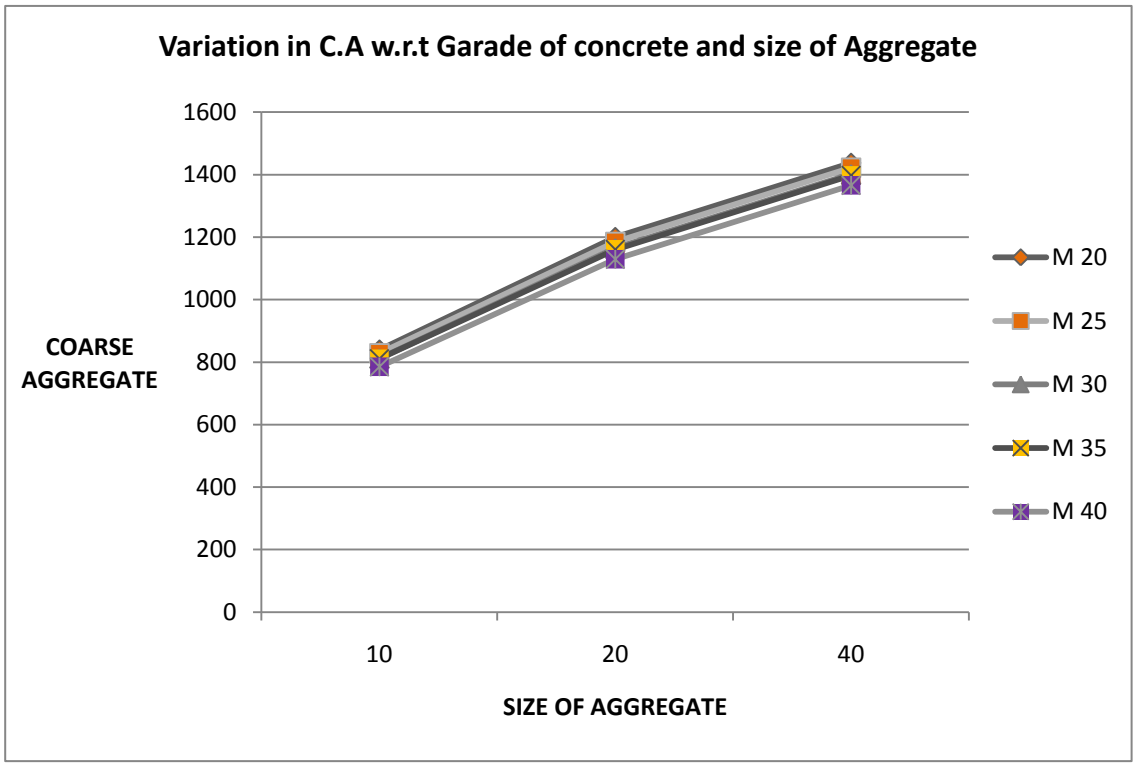
25	25	25	30	30	30	35	35	35
10	20	40	10	20	40	10	20	40
2	2	2	3	3	3	4	4	4
0.5	0.5	0.5	0.45	0.45	0.45	0.45	0.45	0.45
0.52	0.52	0.52	0.46	0.46	0.46	0.42	0.42	0.42
CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	OK	OK	OK
1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1
OK	OK	OK	OK	OK	OK	OK	OK	OK

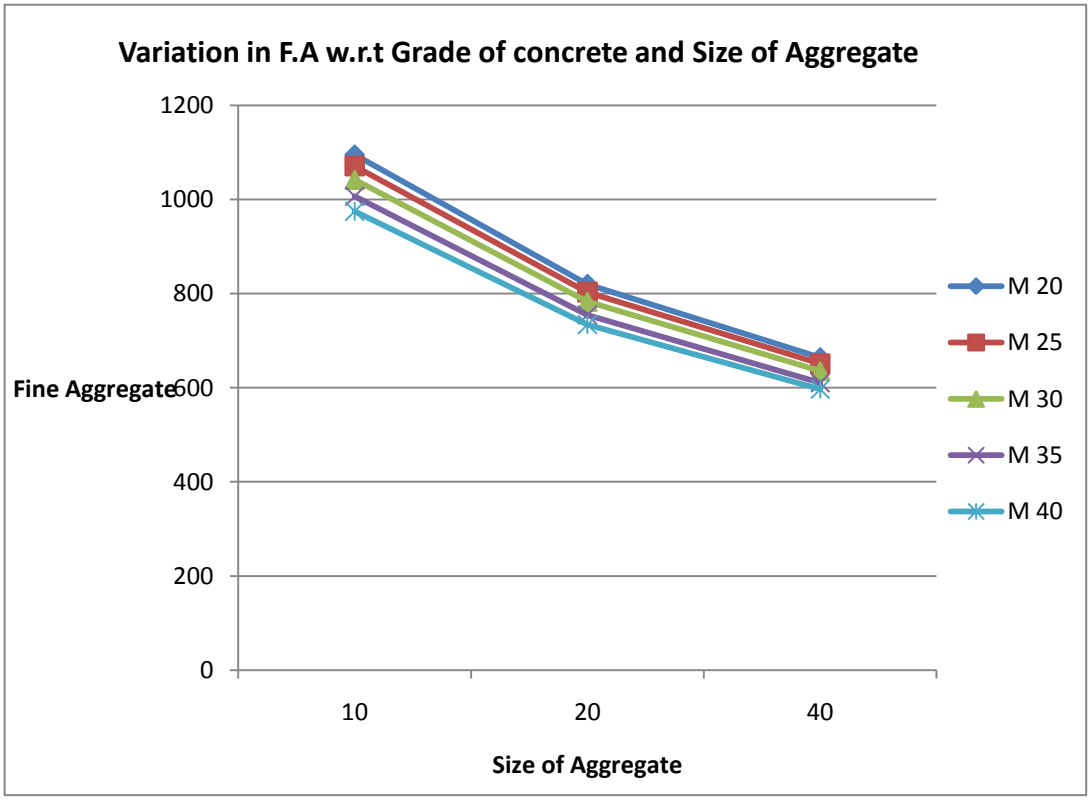
	343.491	304.710	434.222	388.295	344.455	475.577	425.275	377.260
384.12	9	6	6	2	4	1	7	7
0	0	0	0	0	0	0	0	0
181.584	162.378	144.045	181.584	162.378	144.045	181.584	162.378	144.045
828.026	1184.89	1422.06	812.211	1164.92	1401.76	810.561	1160.48	
9	6	1	5	6	7	6	1	1397.66
1071.11	803.184	650.914	1042.15	783.110	635.685	1006.84	754.504	610.472
7	7	2	3	9	1	1	1	1
	3.43491	3.04710	4.34222	3.88295	3.44455	4.75577	4.25275	3.77260
3.8412	9	6	6	2	4	1	7	7
0.47272	0.47272	0.47272	0.41818	0.41818	0.41818	0.38181	0.38181	0.38181
7	7	7	2	2	2	8	8	8

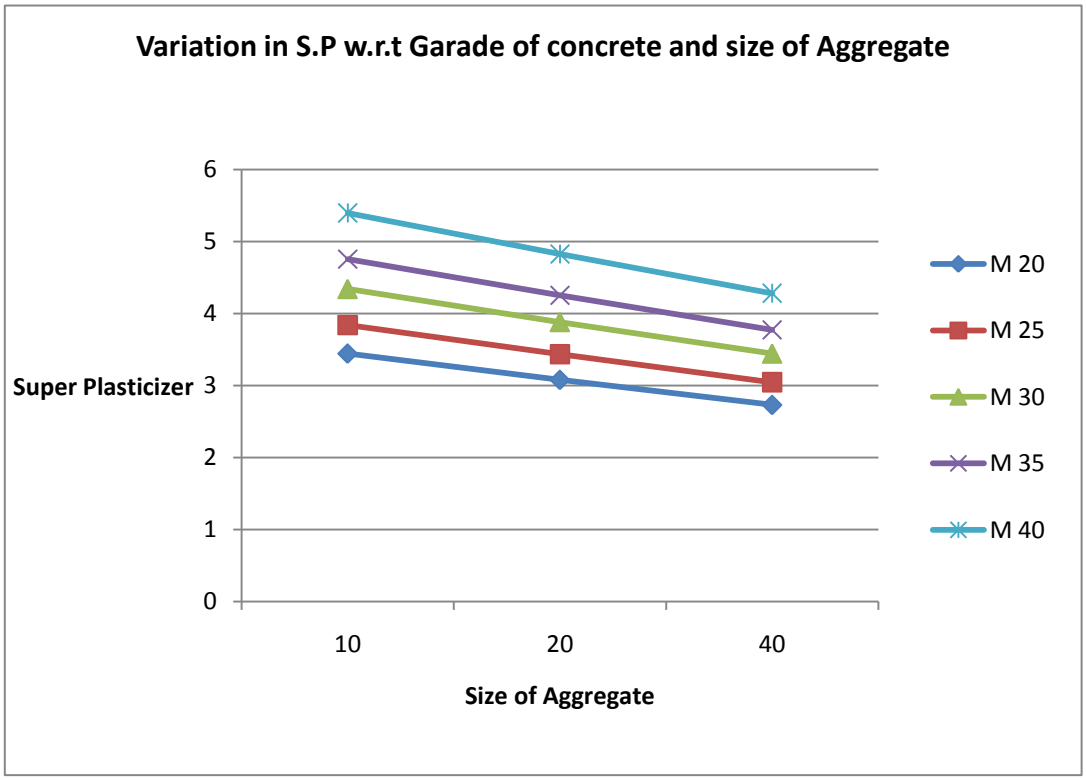
40	40	40
10	20	40
5	5	5
0.4	0.4	0.4
0.37	0.37	0.37
OK	OK	OK
1	1	1
0	0	0
1	1	1
1	1	1
10	10	10
3.15	3.15	3.15
2.74	2.74	2.74
2.74	2.74	2.74
1.145	1.145	1.145
0.5	0.5	0.5
1	1	1
0	0	0
1	1	1
1	1	1
10	10	10
1	1	1
OK	OK	OK

539.8443	482.7454	428.2419
0	0	0
181.584	162.378	144.045
784.9432	1129.354	1365.946
975.0192	734.2664	596.6202
5.398443	4.827454	4.282419
0.336364	0.336364	0.336364


VARIATION OF CEMENT w.r.t AGG. SIZE AND GRADE OF CONCRETE
600
500
400
300
200
100
0
CEMENT
10
20
40
SIZE OF AGGREGATE
M 20
M 25
M 30
M 35
M 40


Variation in C.A w.r.t Garade of concrete and size of Aggregate
COARSE AGGREGATE
1600
1400
1200
1000
800
600
400
200
0
10
20
40
SIZE OF AGGREGATE
M 20
M 25
M 30
M 35
M 40


Variation in F.A w.r.t Grade of concrete and Size of Aggregate
1200
1000
800
600
400
200
0
Fine Aggregate
10
20
40
Size of Aggregate
M 20
M 25
M 30
M 35
M 40


Variation in S.P w.r.t Garade of concrete and size of Aggregate
Super Plasticizer
6
5
4
3
2
1
0
10
20
40
Size of Aggregate
M 20
M 25
M 30
M 35
M 40

THIS IS FOR RCC WITHOUT FLY ASH

GRADE	M	20	20	20
MAXIMUM SIZE AGG **10 / 20 / 40** MM		10	20	40
EXPOSURE M1 MOD2 SEV3 VERYSEV4 EXT5		1	1	1
MAX W/C RATIO		0.55	0.55	0.55
w/c ratio (to be less than max value above)		0.58	0.58	0.58
	CHECKING OF W/C RATIO	CHECK	CHECK	CHECK
SLUMP 0-251 25-502 50-753 75-1004 100-1255 125-1506 150-1757 COLL8		1	1	1
PUMPING OR NOT ?	**1 / 0**	0	0	0
FOR VERY GOOD SUPERVISION PUT 1 ELSE LEAVE BLANK		1	1	1
FOR GOOD SUPERVISION PUT 2 ELSE LEAVE BLANK				
FOR FAIR SUPERVISION PUT 3 ELSE LEAVE BLANK				
AGG ANGULAR1 SUB-ANGU2 CRUSHED-ANGU3 ROUN4		1	1	1
CAPACITY OF WATER REDUCING ADM TO REDUCE WATER(%)		10	10	10
SPECIFIC GRAVITY OF CEMENT		3.15	3.15	3.15
SPECIFIC GRAVITY OF COARSE AGG		2.74	2.74	2.74
SPECIFIC GRAVITY OF FINE AGG		2.74	2.74	2.74
SPECIFIC GRAVITY OF SP		1.145	1.145	1.145
WATER ABSORPTION BY COARSE AGG (%)		0.5	0.5	0.5
WATER ABSORPTION BY FINE AGG (%)		1	1	1
FREE SURFACE MOISTURE COARSE AGGREGATE (%)		0	0	0
FREE SURFACE MOISTURE FINE AGGREGATE (%)		1	1	1
ZONE OF FINE AGGREGATE **1 / 2 / 3 /4**		1	1	1
INCREASE IN CEMENT CONTENT (%) FOR PUMPING		10	10	10
% OF SP BY MASS OF CEMENT		1	1	1
check cement content to be more than min. specified		OK	OK	CHECK
FINAL PROPORTIONS				
CEMENT (KG/CUB M)		344.3834	307.9583	273.1888
FLY ASH (KG/CUB M)		0	0	0
WATER (KG/CUB M)		181.584	162.378	144.045
CA (KG/CUB M)		839.6423	1199.785	1437.185
FA (KG/CUB M)		1095.017	820.055	663.9629
SP (KG/CUB M)		3.443834	3.079583	2.731888
W/C RATIO		0.527273	0.527273	0.527273

25	25	25	30	30	30	35	35	35	40
10	20	40	10	20	40	10	20	40	10
2	2	2	3	3	3	4	4	4	5
0.5	0.5	0.5	0.45	0.45	0.45	0.45	0.45	0.45	0.4
0.52	0.52	0.52	0.46	0.46	0.46	0.42	0.42	0.42	0.37
CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	OK	OK	OK	OK
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1	1
OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
384.12	343.4919	304.7106	434.2226	388.2952	344.4554	475.5771	425.2757	377.2607	539.8443
0	0	0	0	0	0	0	0	0	0
181.584	162.378	144.045	181.584	162.378	144.045	181.584	162.378	144.045	181.584
828.0269	1184.896	1422.061	812.2115	1164.926	1401.767	810.5616	1160.481	1397.66	784.9432
1071.117	803.1847	650.9142	1042.153	783.1109	635.6851	1006.841	754.5041	610.4721	975.0192
3.8412	3.434919	3.047106	4.342226	3.882952	3.444554	4.755771	4.252757	3.772607	5.398443
0.472727	0.472727	0.472727	0.418182	0.418182	0.418182	0.381818	0.381818	0.381818	0.336364

40	40	20	20	20	25	25	25	30
20	40	10	20	40	10	20	40	10
5	5	1	1	1	2	2	2	3
0.4	0.4	0.55	0.55	0.55	0.5	0.5	0.5	0.45
0.37	0.37	0.58	0.58	0.58	0.52	0.52	0.52	0.46
OK	OK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK
1	1	2	2	2	2	2	2	2
0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1
OK	OK	OK	OK	CHECK	OK	OK	OK	OK

482.7454	428.2419	355.0345	317.4828	281.6379	396	354.1154	314.1346	447.6522
0	0	0	0	0	0	0	0	0
162.378	144.045	187.2	167.4	148.5	187.2	167.4	148.5	187.2
1129.354	1365.946	828.8325	1186.555	1423.671	816.6884	1171.036	1407.909	800.2143
734.2664	596.6202	1080.92	811.0122	657.7193	1056.45	793.7896	644.4365	1026.759
4.827454	4.282419	3.550345	3.174828	2.816379	3.96	3.541154	3.141346	4.476522
0.336364	0.336364	0.527273	0.527273	0.527273	0.472727	0.472727	0.472727	0.418182

30	30	35	35	35	40	40	40	20	20
20	40	10	20	40	10	20	40	10	20
3	3	4	4	4	5	5	5	1	1
0.45	0.45	0.45	0.45	0.45	0.4	0.4	0.4	0.55	0.55
0.46	0.46	0.42	0.42	0.42	0.37	0.37	0.37	0.58	0.58
CHECK	CHECK	OK	OK	OK	OK	OK	OK	CHECK	CHECK
2	2	2	2	2	2	2	2	3	3
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1	1
OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

400.3043	355.1087	490.2857	438.4286	388.9286	556.5405	497.6757	441.4865	365.6855	327.0072
0	0	0	0	0	0	0	0	0	0
167.4	148.5	187.2	167.4	148.5	187.2	167.4	148.5	192.816	172.422
1150.279	1386.818	797.8354	1145.018	1381.906	771.4248	1112.929	1349.211	818.0227	1173.325
773.2645	628.9059	991.0332	744.4508	603.591	958.2272	723.5872	589.3107	1066.822	801.9694
4.003043	3.551087	4.902857	4.384286	3.889286	5.565405	4.976757	4.414865	3.656855	3.270072
0.418182	0.418182	0.381818	0.381818	0.381818	0.336364	0.336364	0.336364	0.527273	0.527273

20	25	25	25	30	30	30	35	35	35
40	10	20	40	10	20	40	10	20	40
1	2	2	2	3	3	3	4	4	4
0.55	0.5	0.5	0.5	0.45	0.45	0.45	0.45	0.45	0.45
0.58	0.52	0.52	0.52	0.46	0.46	0.46	0.42	0.42	0.42
CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	OK	OK	OK
3	3	3	3	3	3	3	3	3	3
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1	1
CHECK	OK	OK	OK	OK	OK	OK	OK	OK	OK

290.0871	407.88	364.7388	323.5587	461.0817	412.3135	365.762	504.9943	451.5814	400.5964
0	0	0	0	0	0	0	0	0	0
152.955	192.816	172.422	152.955	192.816	172.422	152.955	192.816	172.422	152.955
1410.156	805.3498	1157.176	1393.757	788.2171	1135.632	1371.869	785.1093	1129.556	1366.152
651.4756	1041.783	784.3945	637.9588	1011.365	763.418	622.1267	975.2254	734.3975	596.7099
2.900871	4.0788	3.647388	3.235587	4.610817	4.123135	3.65762	5.049943	4.515814	4.005964
0.527273	0.472727	0.472727	0.472727	0.418182	0.418182	0.418182	0.381818	0.381818	0.381818

40	40	40	20	20	20	25	25	25	30
10	20	40	10	20	40	10	20	40	10
5	5	5	1	1	1	2	2	2	3
0.4	0.4	0.4	0.55	0.55	0.55	0.5	0.5	0.5	0.45
0.37	0.37	0.37	0.58	0.58	0.58	0.52	0.52	0.52	0.46
OK	OK	OK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK
3	3	3	4	4	4	4	4	4	4
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1	1
OK	OK	OK	OK	OK	CHECK	OK	OK	OK	OK
573.2368	512.6059	454.7311	376.3366	336.5317	298.5362	419.76	375.3623	332.9827	474.5113
0	0	0	0	0	0	0	0	0	0
192.816	172.422	152.955	198.432	177.444	157.41	198.432	177.444	157.41	198.432
757.9063	1096.503	1332.476	807.2129	1160.094	1396.641	794.0113	1143.316	1379.605	776.22
941.4352	712.908	582.0012	1052.725	792.9265	645.232	1027.116	774.9994	631.4811	995.9717
5.732368	5.126059	4.547311	3.763366	3.365317	2.985362	4.1976	3.753623	3.329827	4.745113
0.336364	0.336364	0.336364	0.527273	0.527273	0.527273	0.472727	0.472727	0.472727	0.418182

30	30	35	35	35	40	40	40	20	20
20	40	10	20	40	10	20	40	10	20
3	3	4	4	4	5	5	5	1	1
0.45	0.45	0.45	0.45	0.45	0.4	0.4	0.4	0.55	0.55
0.46	0.46	0.42	0.42	0.42	0.37	0.37	0.37	0.58	0.58
CHECK	CHECK	OK	OK	OK	OK	OK	OK	CHECK	CHECK
4	4	4	4	4	4	4	4	5	5
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1	1
OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
424.3226	376.4152	519.7029	464.7343	412.2643	589.933	527.5362	467.9757	386.9876	346.0562
0	0	0	0	0	0	0	0	0	0
177.444	157.41	198.432	177.444	157.41	198.432	177.444	157.41	204.048	182.466
1120.985	1356.92	772.3831	1114.093	1350.398	744.3879	1080.078	1315.742	796.403	1146.864
753.5715	615.3474	959.4176	724.3443	589.8289	924.6432	702.2288	574.6917	1038.627	783.8837
4.243226	3.764152	5.197029	4.647343	4.122643	5.89933	5.275362	4.679757	3.869876	3.460562
0.418182	0.418182	0.381818	0.381818	0.381818	0.336364	0.336364	0.336364	0.527273	0.527273

20	25	25	25	30	30	30	35	35	35
40	10	20	40	10	20	40	10	20	40
1	2	2	2	3	3	3	4	4	4
0.55	0.5	0.5	0.5	0.45	0.45	0.45	0.45	0.45	0.45
0.58	0.52	0.52	0.52	0.46	0.46	0.46	0.42	0.42	0.42
CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	OK	OK	OK
5	5	5	5	5	5	5	5	5	5
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1	1
OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

306.9853	431.64	385.9858	342.4067	487.9409	436.3317	387.0685	534.4114	477.8871	423.9321
0	0	0	0	0	0	0	0	0	0
161.865	204.048	182.466	161.865	204.048	182.466	161.865	204.048	182.466	161.865
1383.127	782.6728	1129.456	1365.453	764.2228	1106.337	1341.971	759.657	1098.63	1334.644
638.9884	1012.448	765.6043	625.0034	980.5781	743.7251	608.5682	943.6098	714.291	582.9478
3.069853	4.3164	3.859858	3.424067	4.879409	4.363317	3.870685	5.344114	4.778871	4.239321
0.527273	0.472727	0.472727	0.472727	0.418182	0.418182	0.418182	0.381818	0.381818	0.381818

40	40	40	20	20	20	25	25	25	30
10	20	40	10	20	40	10	20	40	10
5	5	5	1	1	1	2	2	2	3
0.4	0.4	0.4	0.55	0.55	0.55	0.5	0.5	0.5	0.45
0.37	0.37	0.37	0.58	0.58	0.58	0.52	0.52	0.52	0.46
OK	OK	OK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK
5	5	5	6	6	6	6	6	6	6
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1	1
OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
606.6292	542.4665	481.2203	397.6386	355.5807	315.4345	443.52	396.6092	351.8308	501.3704
0	0	0	0	0	0	0	0	0	0
204.048	182.466	161.865	209.664	187.488	166.32	209.664	187.488	166.32	209.664
730.8694	1063.652	1299.007	785.5932	1133.634	1369.612	771.3342	1115.596	1351.301	752.2256
907.8512	691.5496	567.3823	1024.529	774.8409	632.7448	997.7809	756.2092	618.5257	965.1845
6.066292	5.424665	4.812203	3.976386	3.555807	3.154345	4.4352	3.966092	3.518308	5.013704
0.336364	0.336364	0.336364	0.527273	0.527273	0.527273	0.472727	0.472727	0.472727	0.418182

30	30	35	35	35	40	40	40	20	20
20	40	10	20	40	10	20	40	10	20
3	3	4	4	4	5	5	5	1	1
0.45	0.45	0.45	0.45	0.45	0.4	0.4	0.4	0.55	0.55
0.46	0.46	0.42	0.42	0.42	0.37	0.37	0.37	0.58	0.58
CHECK	CHECK	OK	OK	OK	OK	OK	OK	CHECK	CHECK
6	6	6	6	6	6	6	6	7	7
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1	1
OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
448.3409	397.7217	549.12	491.04	435.6	623.3254	557.3968	494.4649	408.2897	365.1052
0	0	0	0	0	0	0	0	0	0
187.488	166.32	209.664	187.488	166.32	209.664	187.488	166.32	215.28	192.51
1091.69	1327.022	746.9309	1083.168	1318.89	717.351	1047.227	1282.272	774.7834	1120.404
733.8786	601.789	927.802	704.2377	576.0667	891.0593	680.8705	560.0728	1010.432	765.798
4.483409	3.977217	5.4912	4.9104	4.356	6.233254	5.573968	4.944649	4.082897	3.651052
0.418182	0.418182	0.381818	0.381818	0.381818	0.336364	0.336364	0.336364	0.527273	0.527273

20	25	25	25	30	30	30	35	35	35
40	10	20	40	10	20	40	10	20	40
1	2	2	2	3	3	3	4	4	4
0.55	0.5	0.5	0.5	0.45	0.45	0.45	0.45	0.45	0.45
0.58	0.52	0.52	0.52	0.46	0.46	0.46	0.42	0.42	0.42
CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	OK	OK	OK
7	7	7	7	7	7	7	7	7	7
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1	1
OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

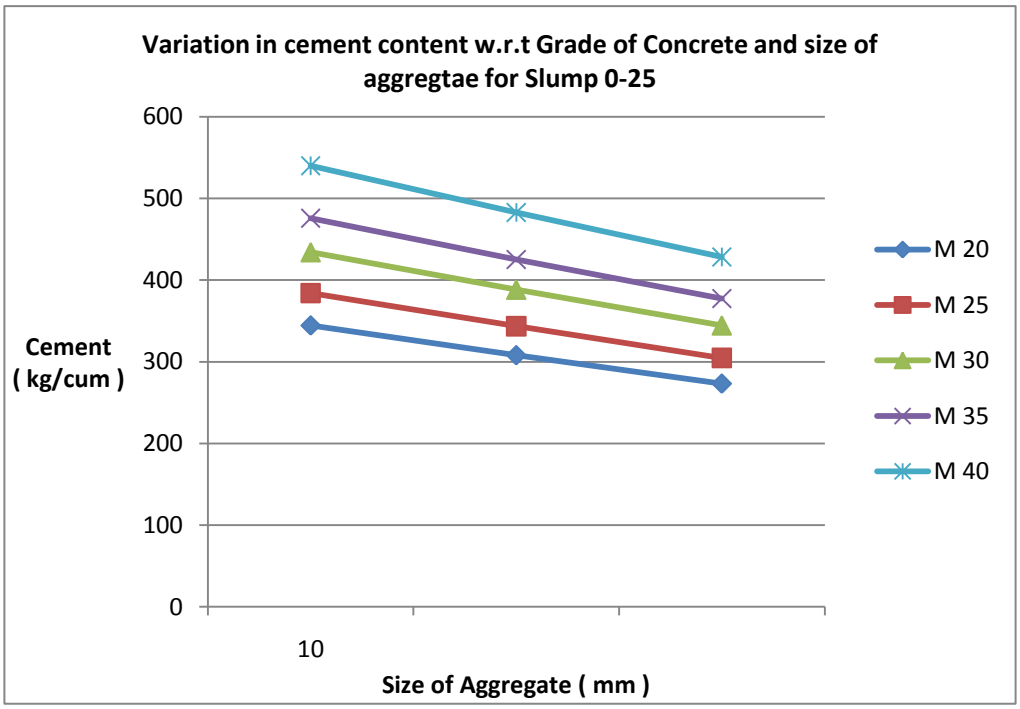
323.8836	455.4	407.2327	361.2548	514.8	460.35	408.375	563.8286	504.1929	447.2679
0	0	0	0	0	0	0	0	0	0
170.775	215.28	192.51	170.775	215.28	192.51	170.775	215.28	192.51	170.775
1356.097	759.9957	1101.736	1337.149	740.2284	1077.043	1312.073	734.2047	1067.705	1303.136
626.5012	983.1136	746.8141	612.0479	949.7908	724.0321	595.0098	911.9942	694.1844	569.1857
3.238836	4.554	4.072327	3.612548	5.148	4.6035	4.08375	5.638286	5.041929	4.472679
0.527273	0.472727	0.472727	0.472727	0.418182	0.418182	0.418182	0.381818	0.381818	0.381818

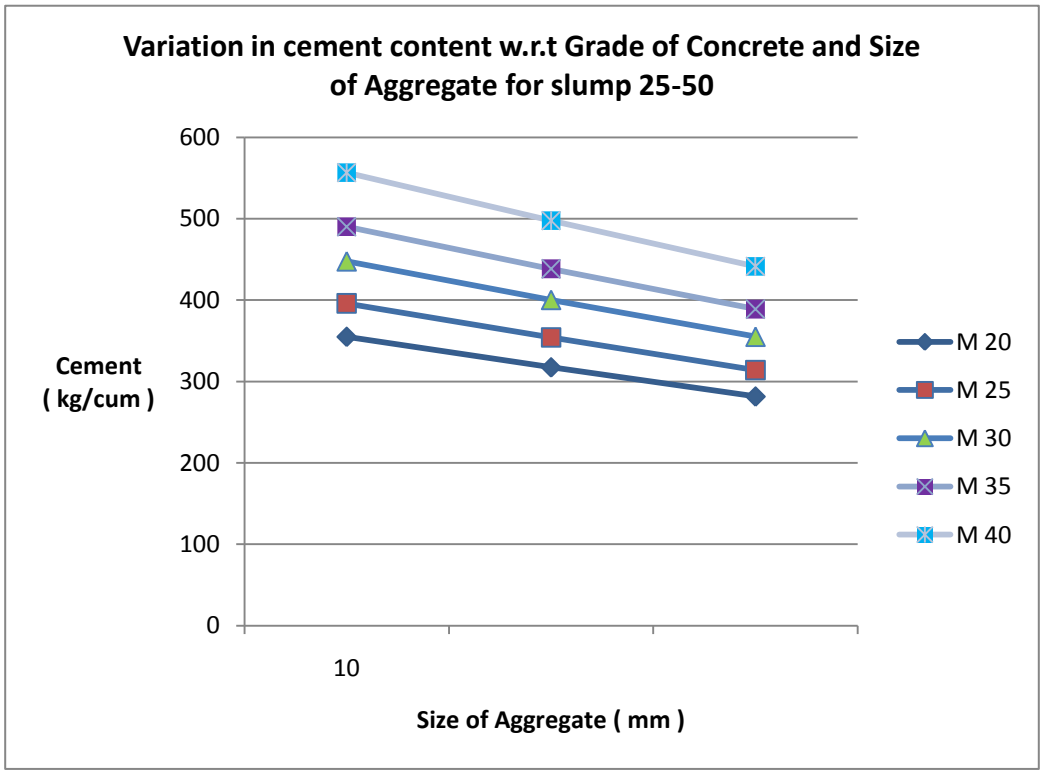
40	40	40	20	20	20	25	25	25	30
10	20	40	10	20	40	10	20	40	10
5	5	5	1	1	1	2	2	2	3
0.4	0.4	0.4	0.55	0.55	0.55	0.5	0.5	0.5	0.45
0.37	0.37	0.37	0.58	0.58	0.58	0.52	0.52	0.52	0.46
OK	OK	OK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK
7	7	7	8	8	8	8	8	8	8
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1	1
OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

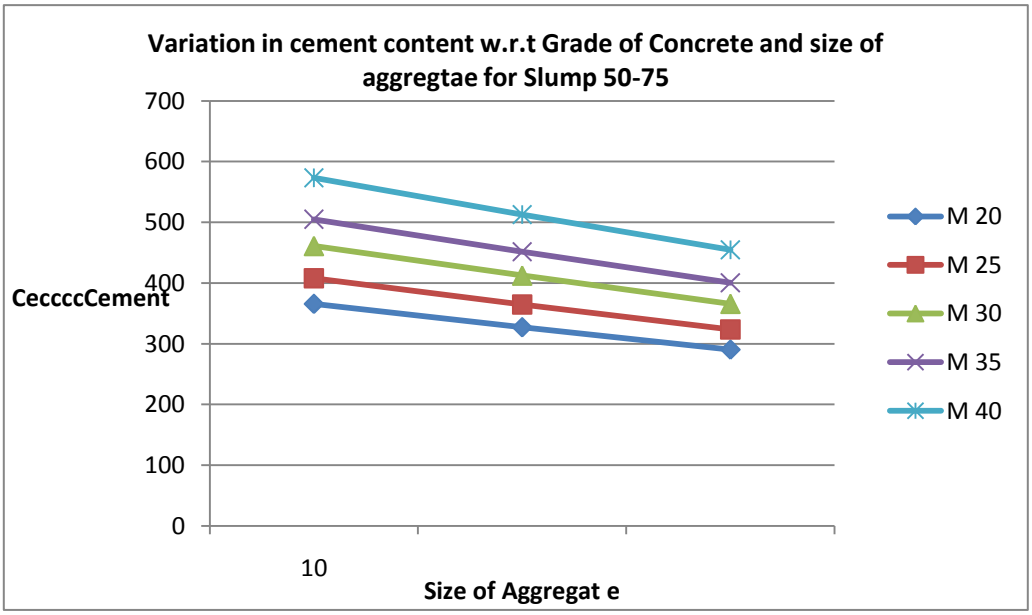
640.0216	572.327	507.7095	418.9407	374.6297	332.3328	467.28	417.8562	370.6788	528.2296
0	0	0	0	0	0	0	0	0	0
215.28	192.51	170.775	220.896	197.532	175.23	220.896	197.532	175.23	220.896
703.8325	1030.802	1265.537	763.9736	1107.174	1342.583	748.6571	1087.875	1322.997	728.2313
874.2673	670.1913	552.7633	996.3342	756.7552	620.2575	968.4464	737.419	605.5702	934.3972
6.400216	5.72327	5.077095	4.189407	3.746297	3.323328	4.6728	4.178562	3.706788	5.282296
0.336364	0.336364	0.336364	0.527273	0.527273	0.527273	0.472727	0.472727	0.472727	0.418182

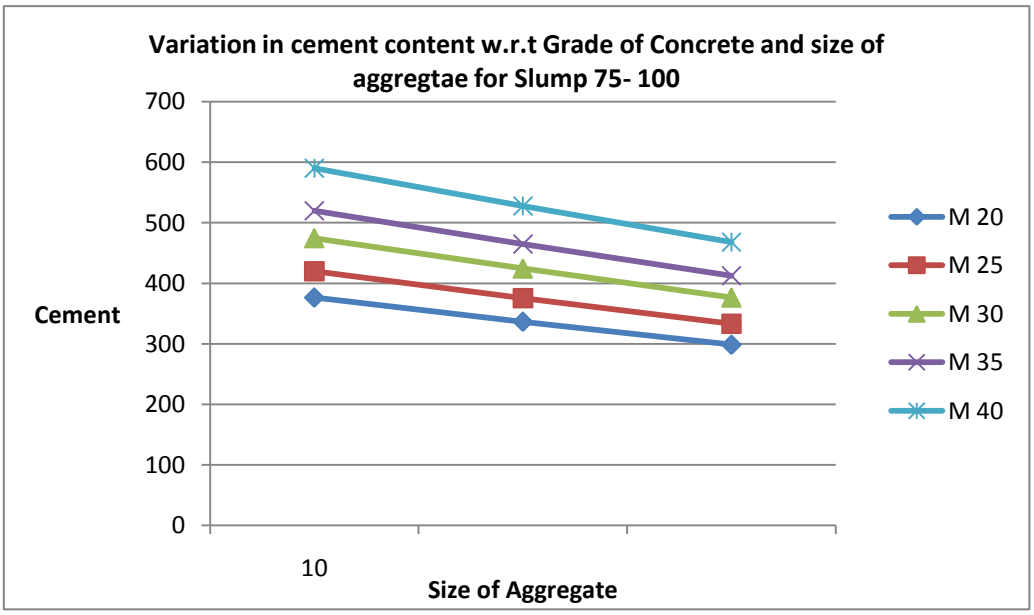
30	30	35	35	35	40	40	40
20	40	10	20	40	10	20	40
3	3	4	4	4	5	5	5
0.45	0.45	0.45	0.45	0.45	0.4	0.4	0.4
0.46	0.46	0.42	0.42	0.42	0.37	0.37	0.37
CHECK	CHECK	OK	OK	OK	OK	OK	OK
8	8	8	8	8	8	8	8
0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1
OK	OK	OK	OK	OK	OK	OK	OK

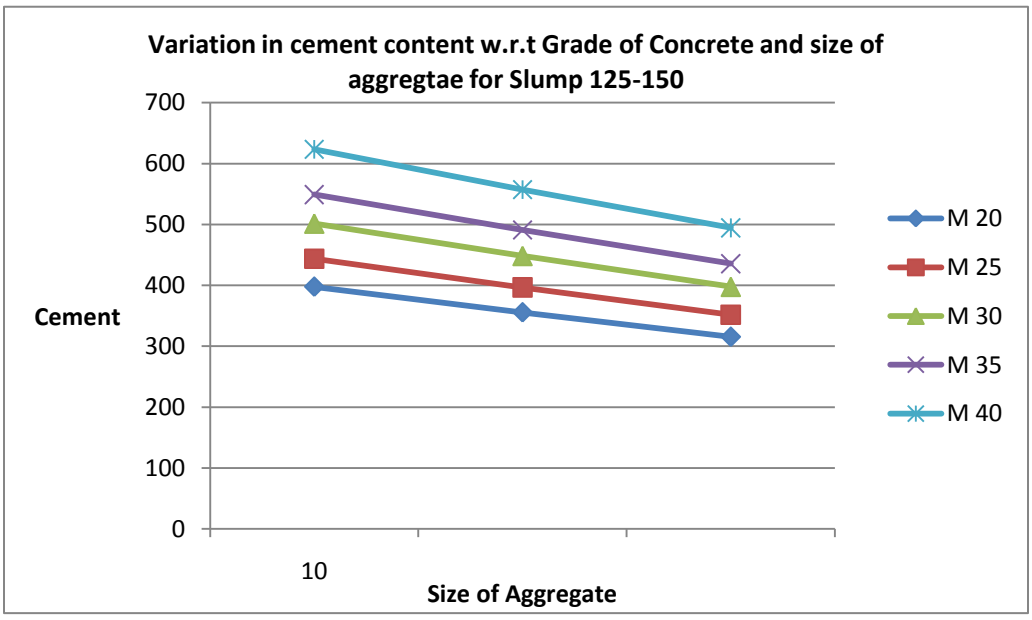
472.3591	419.0283	578.5371	517.3457	458.9357	656.7178	587.2573	520.9541
0	0	0	0	0	0	0	0
197.532	175.23	220.896	197.532	175.23	220.896	197.532	175.23
1062.396	1297.124	721.4786	1052.242	1287.382	690.314	1014.376	1248.802
714.1857	588.2305	896.1864	684.1312	562.3046	857.4753	659.5121	545.4538
4.723591	4.190283	5.785371	5.173457	4.589357	6.567178	5.872573	5.209541
0.418182	0.418182	0.381818	0.381818	0.381818	0.336364	0.336364	0.336364

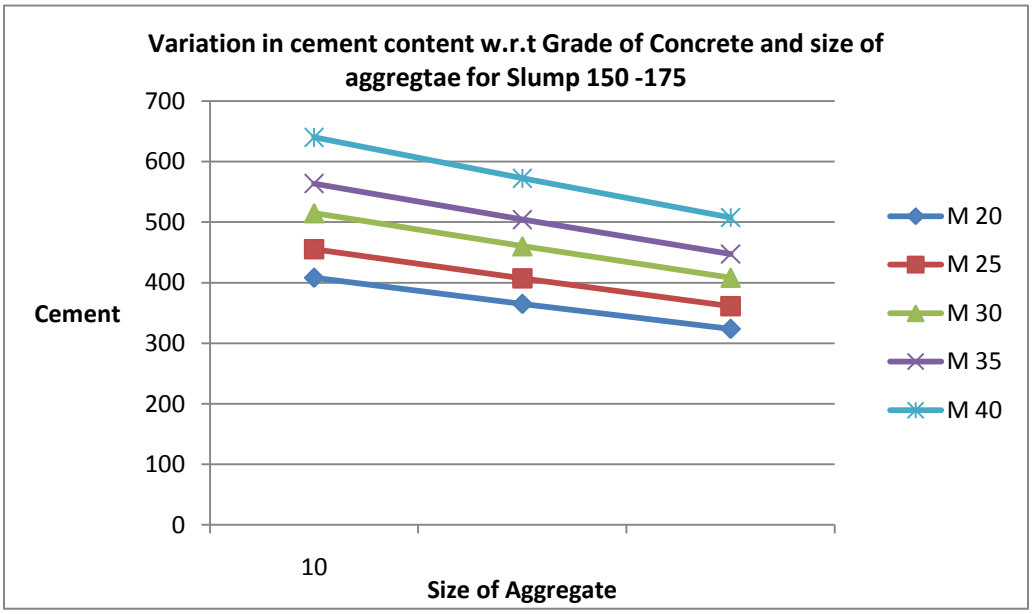

Variation in cement content w.r.t Grade of Concrete and size of aggregtae for Slump 0-25
600
500
400
300
200
100
0
Cement (kg/cum)
10
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40

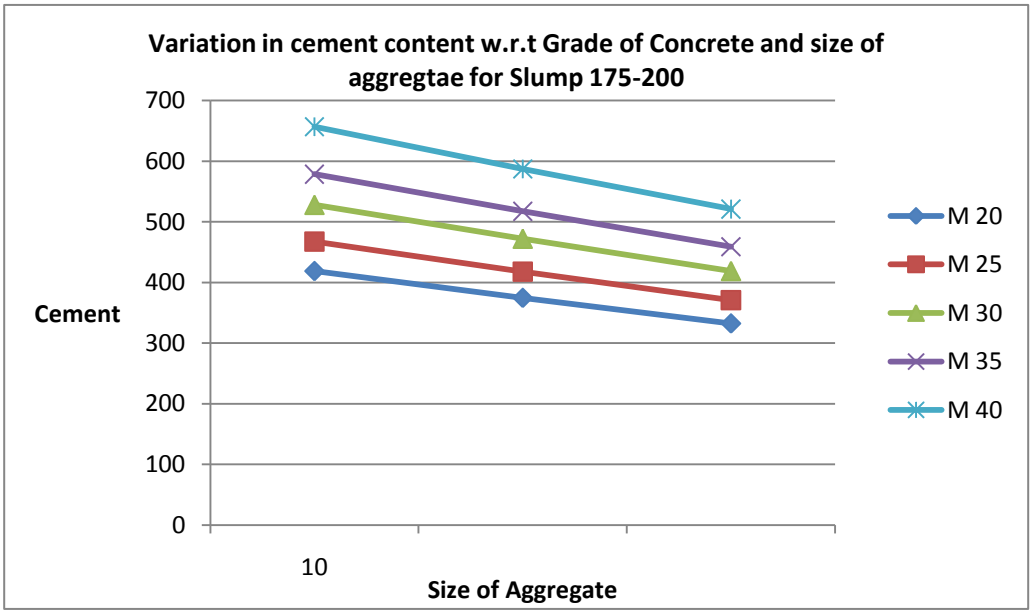

Variation in cement content w.r.t Grade of Concrete and Size of Aggregate for slump 25-50
600
500
400
300
200
100
0
Cement (kg/cum)
10
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40

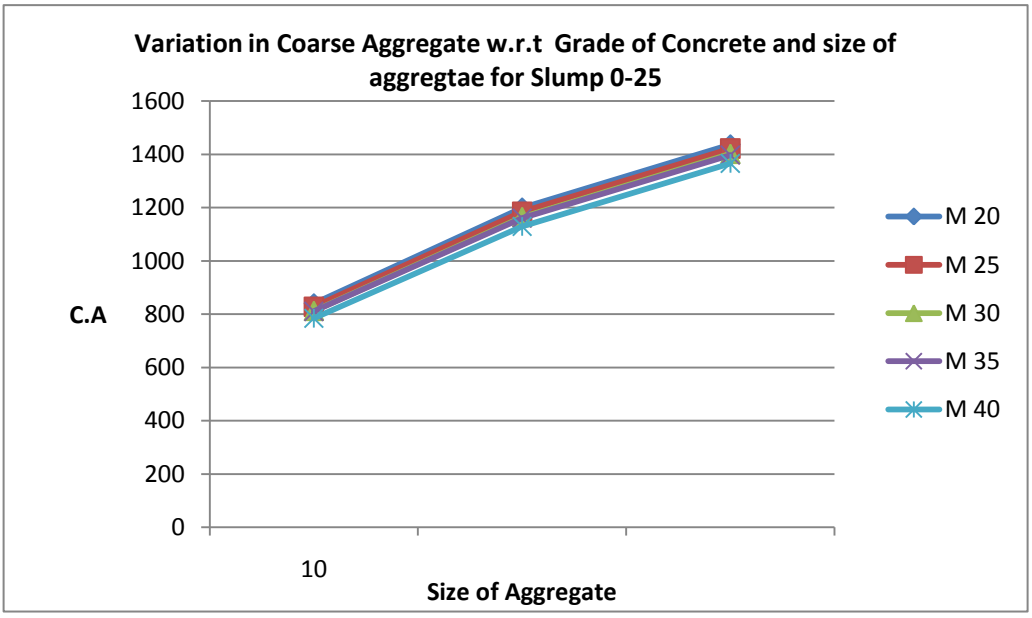

Variation in cement content w.r.t Grade of Concrete and size of aggregtae for Slump 50-75
700
600
500
400
300
200
100
0
CeccccCement
10
Size of Aggregat e
M 20
M 25
M 30
M 35
M 40

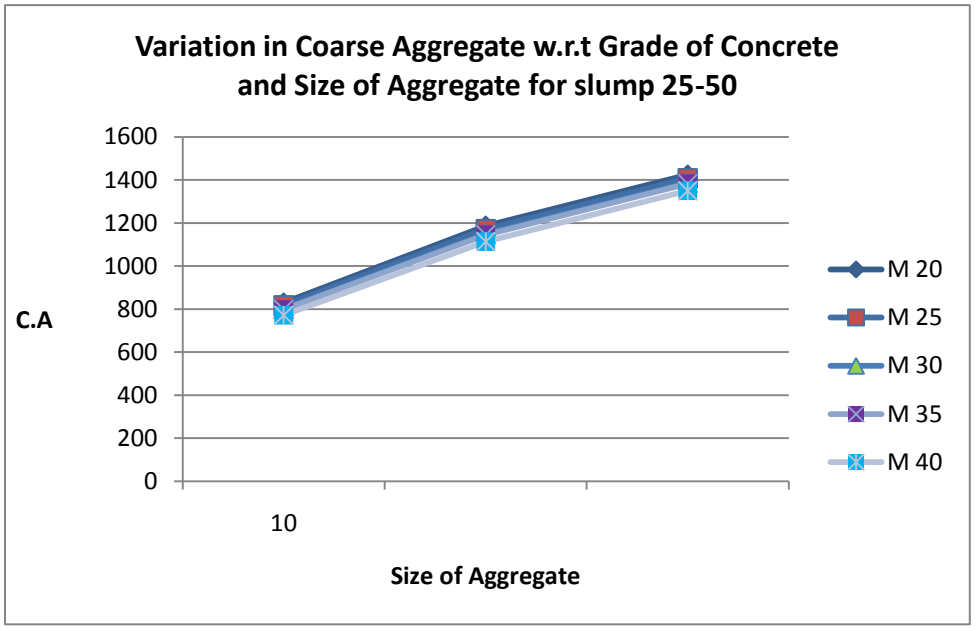

Variation in cement content w.r.t Grade of Concrete and size of aggregtae for Slump 75- 100
700
600
500
400
300
200
100
0
Cement
10
Size of Aggregate
M 20
M 25
M 30
M 35
M 40

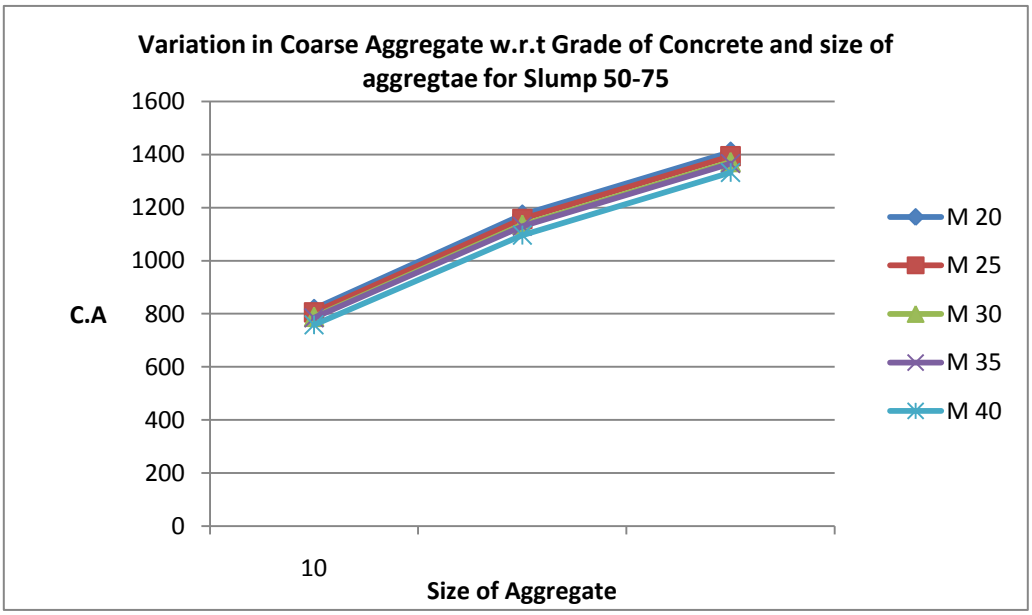

Variation in cement content w.r.t Grade of Concrete and size of aggregtae for Slump 125-150
700
600
500
400
300
200
100
0
Cement
10
Size of Aggregate
M 20
M 25
M 30
M 35
M 40

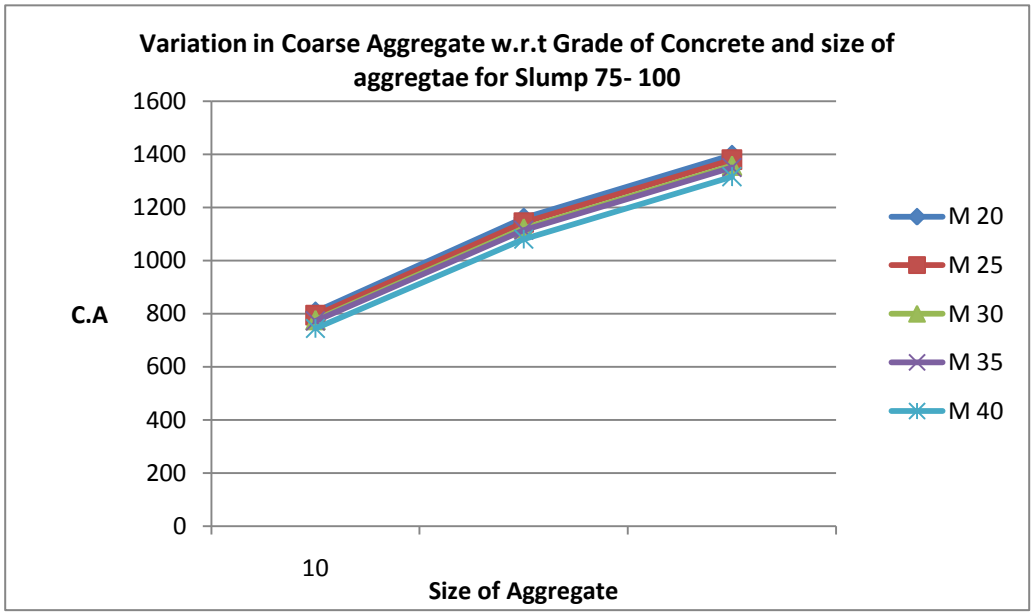

Variation in cement content w.r.t Grade of Concrete and size of aggregtae for Slump 150 -175
700
600
500
400
300
200
100
0
Cement
10
Size of Aggregate
M 20
M 25
M 30
M 35
M 40

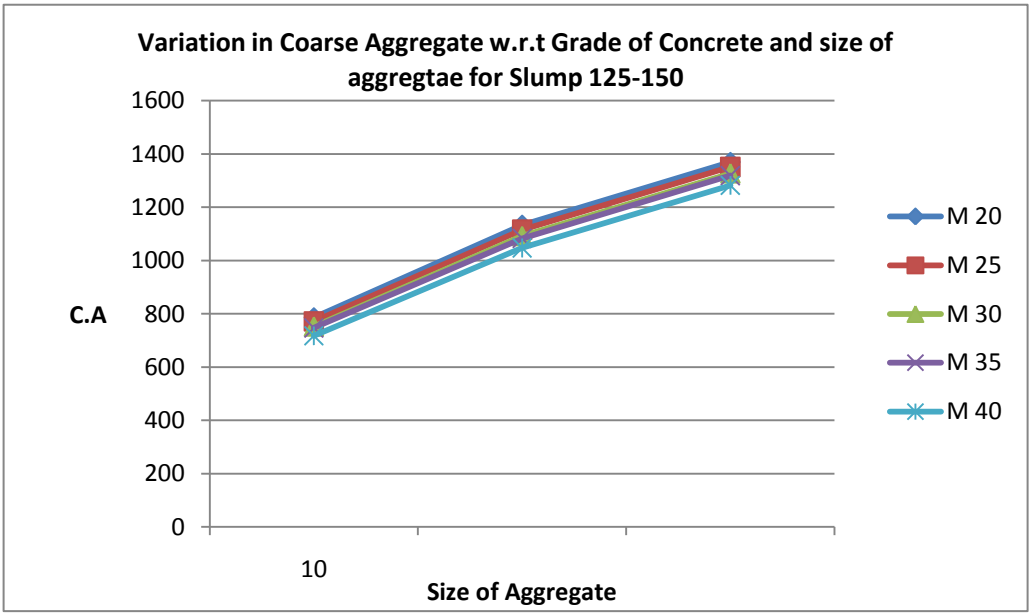

Variation in cement content w.r.t Grade of Concrete and size of aggregtae for Slump 175-200
700
600
500
400
300
200
100
0
Cement
10
Size of Aggregate
M 20
M 25
M 30
M 35
M 40

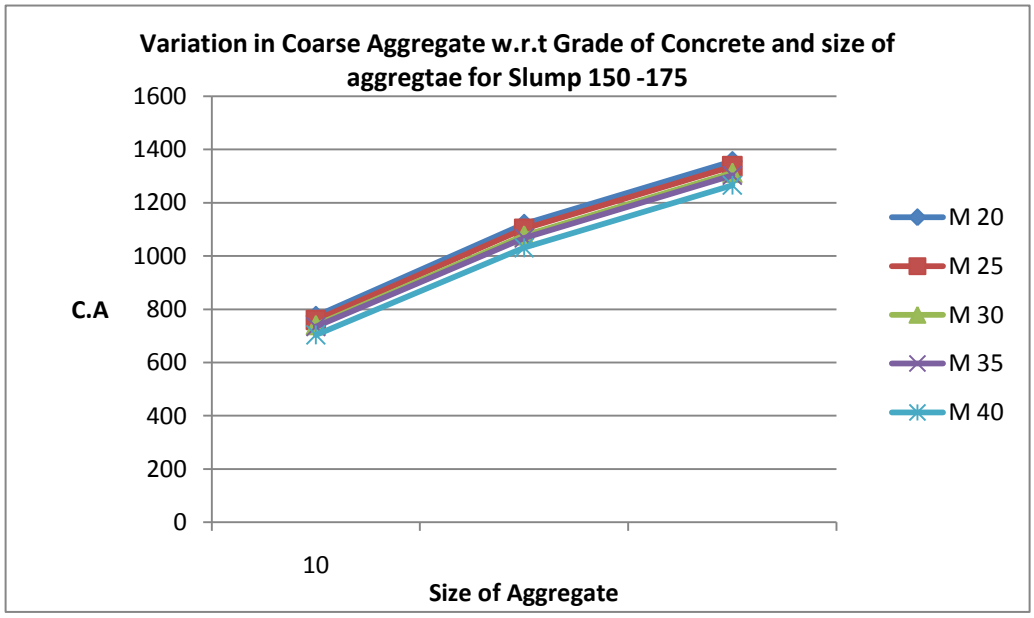

Variation in Coarse Aggregate w.r.t Grade of Concrete and size of aggregtae for Slump 0-25
1600
1400
1200
1000
800
600
400
200
0
C.A
10
Size of Aggregate
M 20
M 25
M 30
M 35
M 40

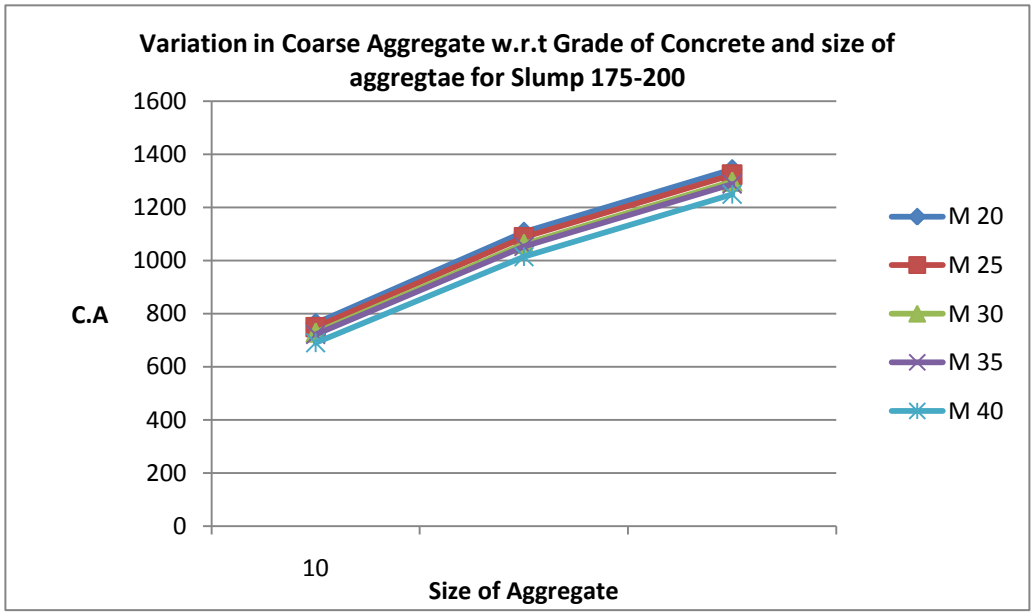

Variation in Coarse Aggregate w.r.t Grade of Concrete and Size of Aggregate for slump 25-50
C.A
1600
1400
1200
1000
800
600
400
200
0
10
Size of Aggregate
M 20
M 25
M 30
M 35
M 40

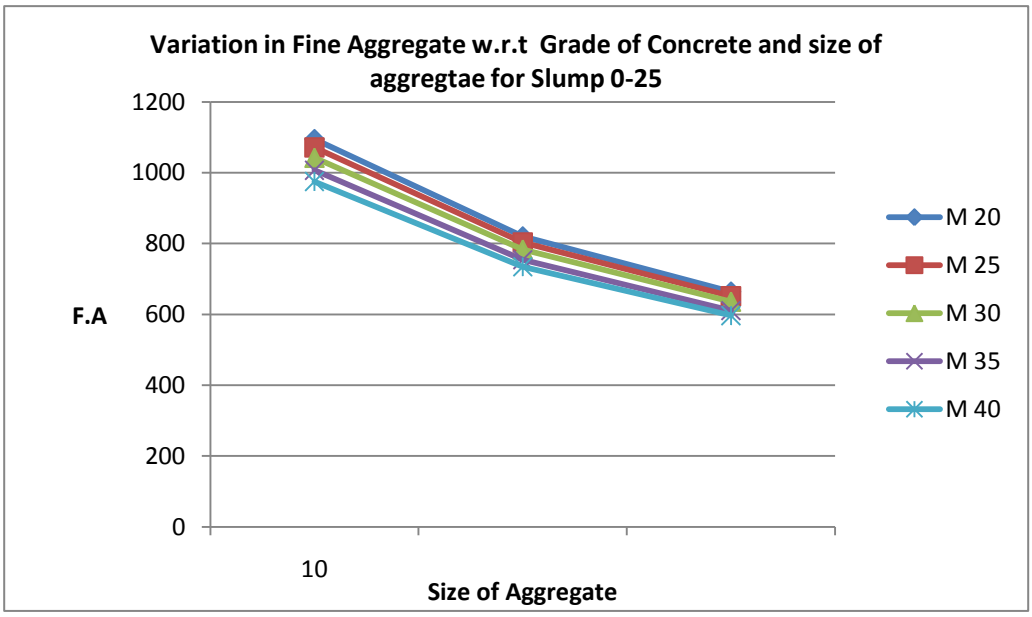

Variation in Coarse Aggregate w.r.t Grade of Concrete and size of aggregtae for Slump 50-75
1600
1400
1200
1000
800
600
400
200
0
C.A
10
Size of Aggregate
M 20
M 25
M 30
M 35
M 40

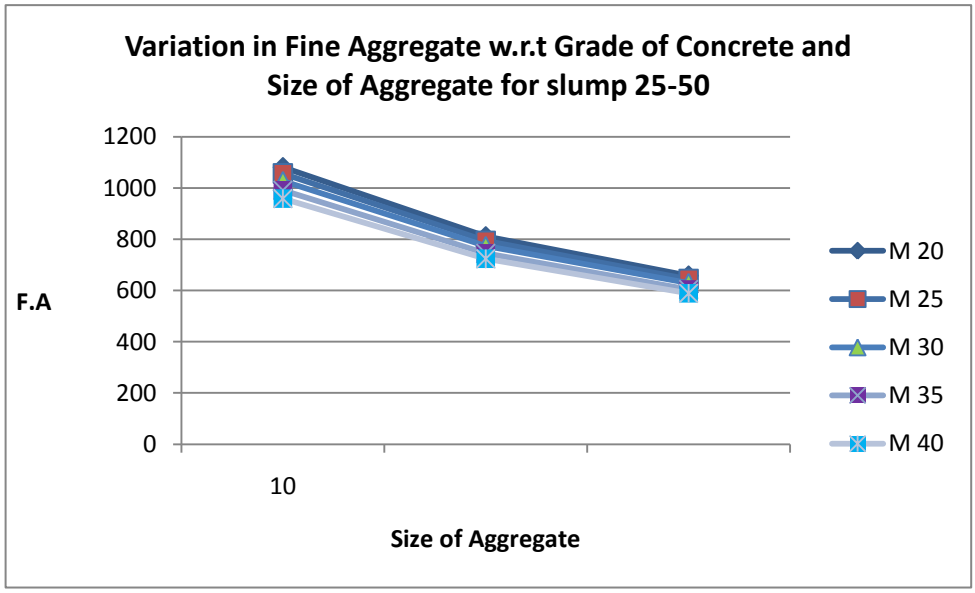

Variation in Coarse Aggregate w.r.t Grade of Concrete and size of aggregtae for Slump 75- 100
1600
1400
1200
1000
800
600
400
200
0
C.A
10
Size of Aggregate
M 20
M 25
M 30
M 35
M 40

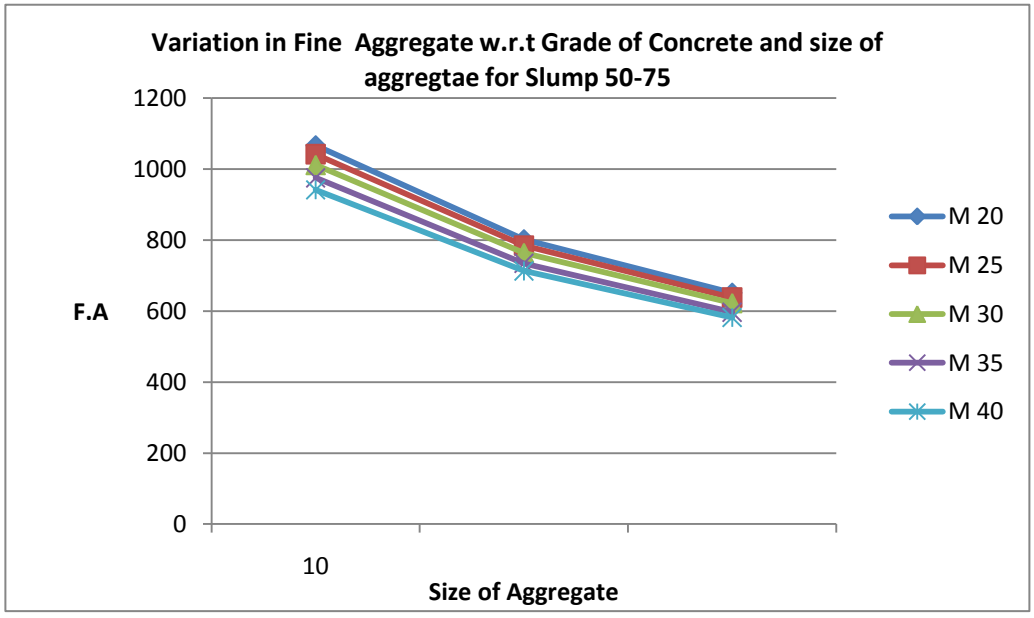

Variation in Coarse Aggregate w.r.t Grade of Concrete and size of aggregtae for Slump 125-150
1600
1400
1200
1000
800
600
400
200
0
C.A
10
Size of Aggregate
M 20
M 25
M 30
M 35
M 40

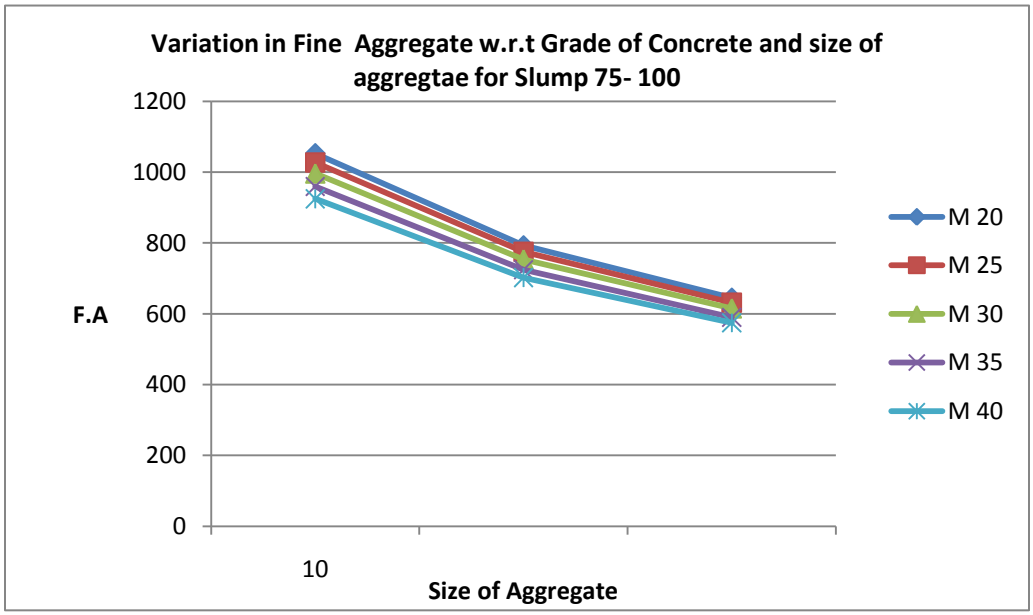

Variation in Coarse Aggregate w.r.t Grade of Concrete and size of aggregtae for Slump 150 -175
1600
1400
1200
1000
800
600
400
200
0
C.A
10
Size of Aggregate
M 20
M 25
M 30
M 35
M 40

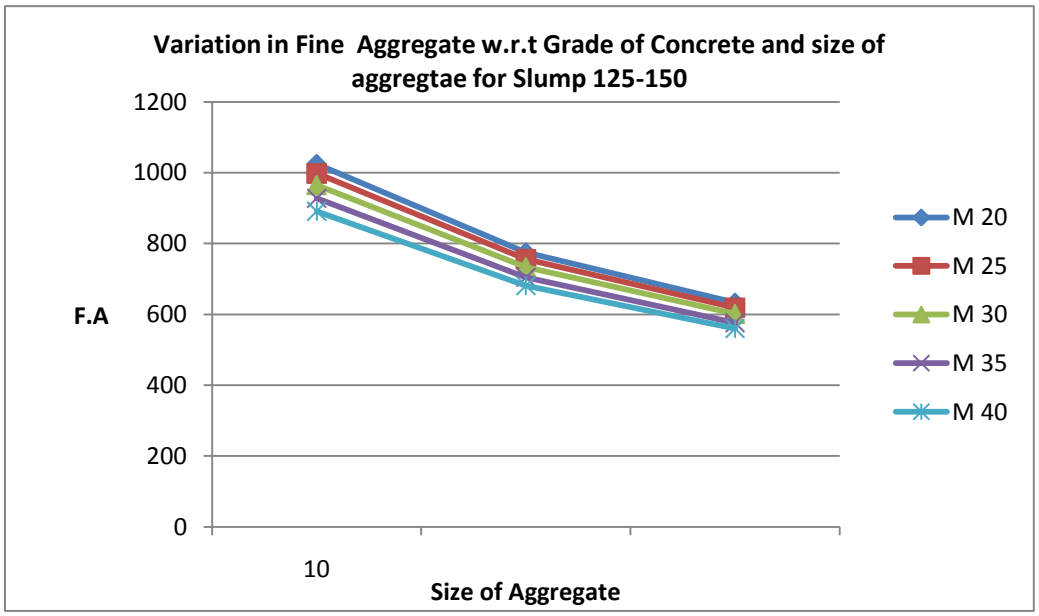

Variation in Coarse Aggregate w.r.t Grade of Concrete and size of aggregtae for Slump 175-200
1600
1400
1200
1000
800
600
400
200
0
C.A
10
Size of Aggregate
M 20
M 25
M 30
M 35
M 40

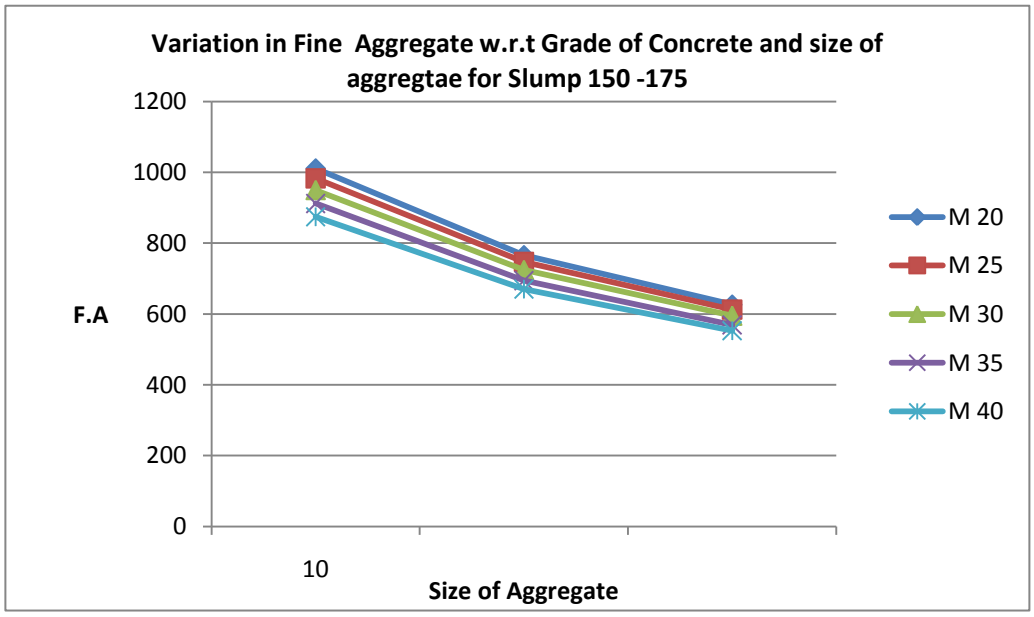

Variation in Fine Aggregate w.r.t Grade of Concrete and size of aggregtae for Slump 0-25
1200
1000
800
600
400
200
0
F.A
10
Size of Aggregate
M 20
M 25
M 30
M 35
M 40

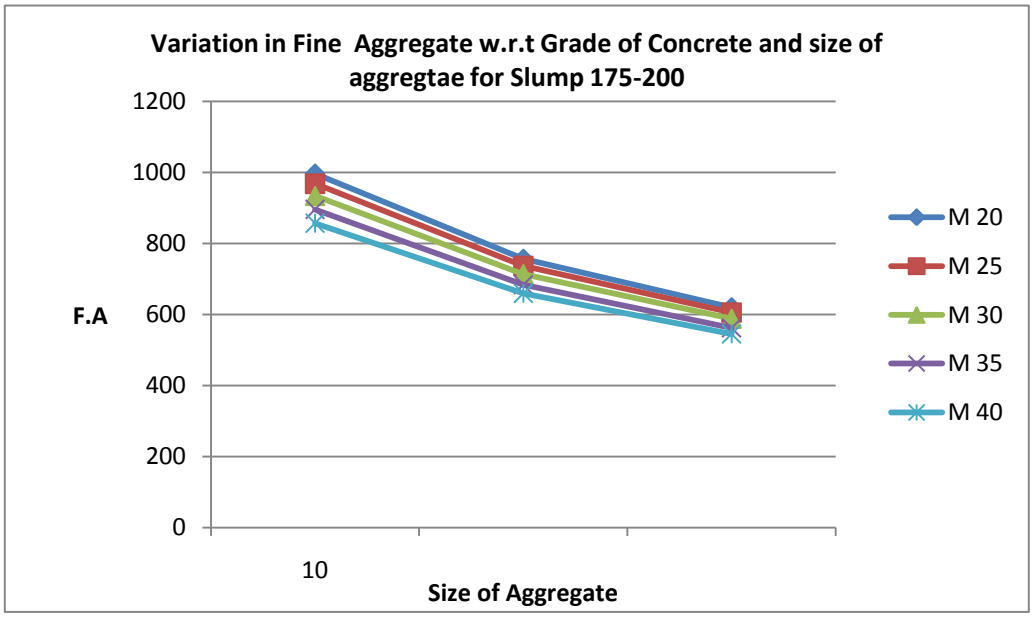

Variation in Fine Aggregate w.r.t Grade of Concrete and Size of Aggregate for slump 25-50
F.A
1200
1000
800
600
400
200
0
10
Size of Aggregate
M 20
M 25
M 30
M 35
M 40

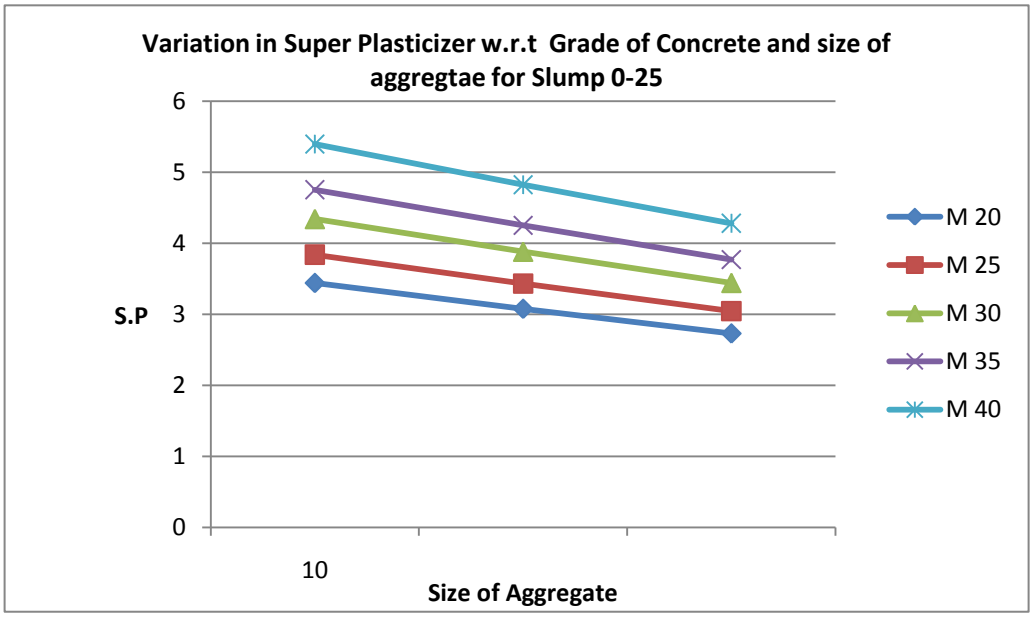

Variation in Fine Aggregate w.r.t Grade of Concrete and size of aggregtae for Slump 50-75
1200
1000
800
600
400
200
0
F.A
10
Size of Aggregate
M 20
M 25
M 30
M 35
M 40

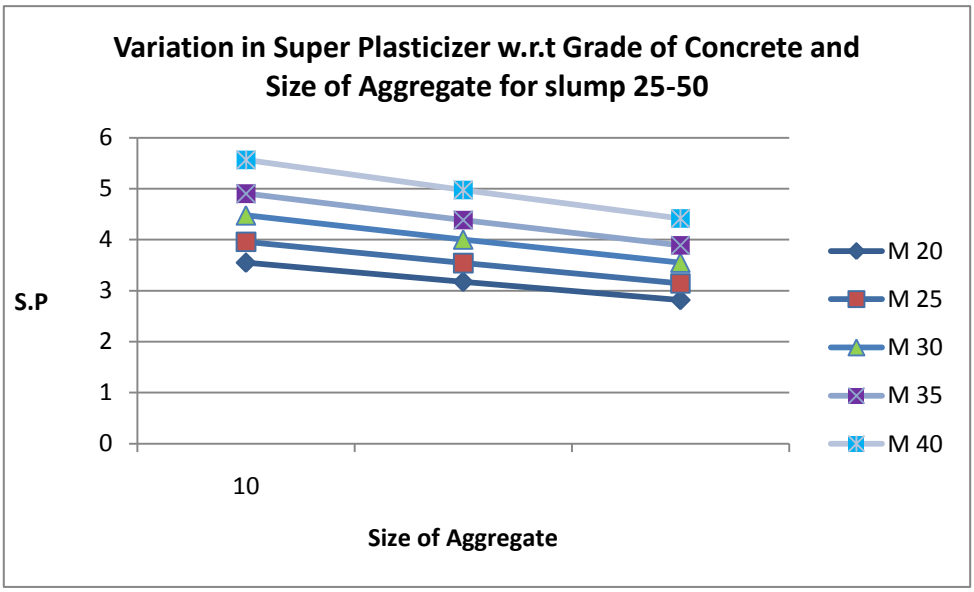

Variation in Fine Aggregate w.r.t Grade of Concrete and size of aggregtae for Slump 75- 100
1200
1000
800
600
400
200
0
F.A
10
Size of Aggregate
M 20
M 25
M 30
M 35
M 40

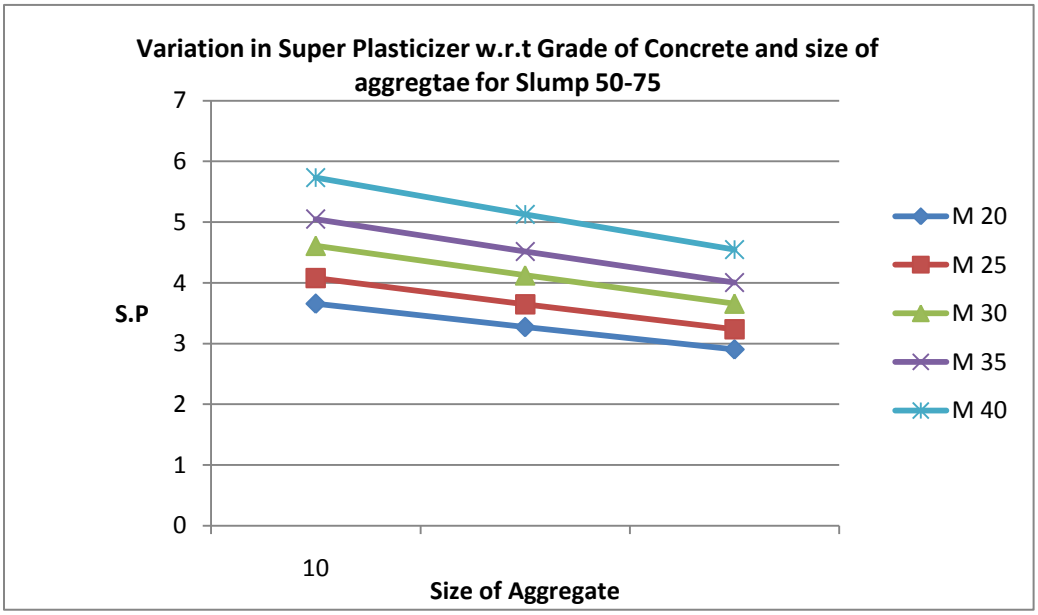

Variation in Fine Aggregate w.r.t Grade of Concrete and size of aggregtae for Slump 125-150
1200
1000
800
600
400
200
0
F.A
10
Size of Aggregate
M 20
M 25
M 30
M 35
M 40

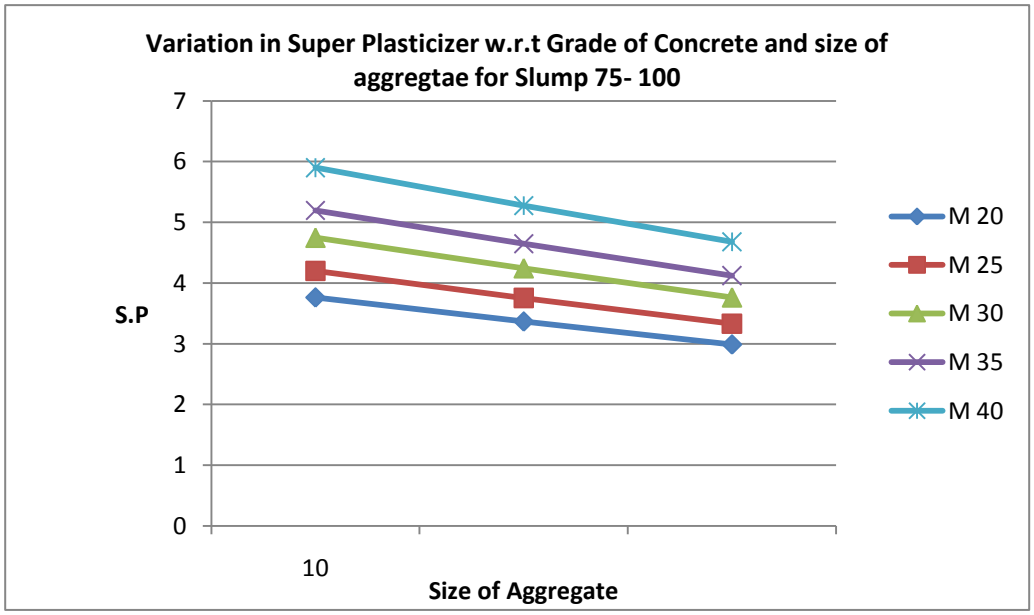

Variation in Fine Aggregate w.r.t Grade of Concrete and size of aggregtae for Slump 150 -175
1200
1000
800
600
400
200
0
F.A
10
Size of Aggregate
M 20
M 25
M 30
M 35
M 40

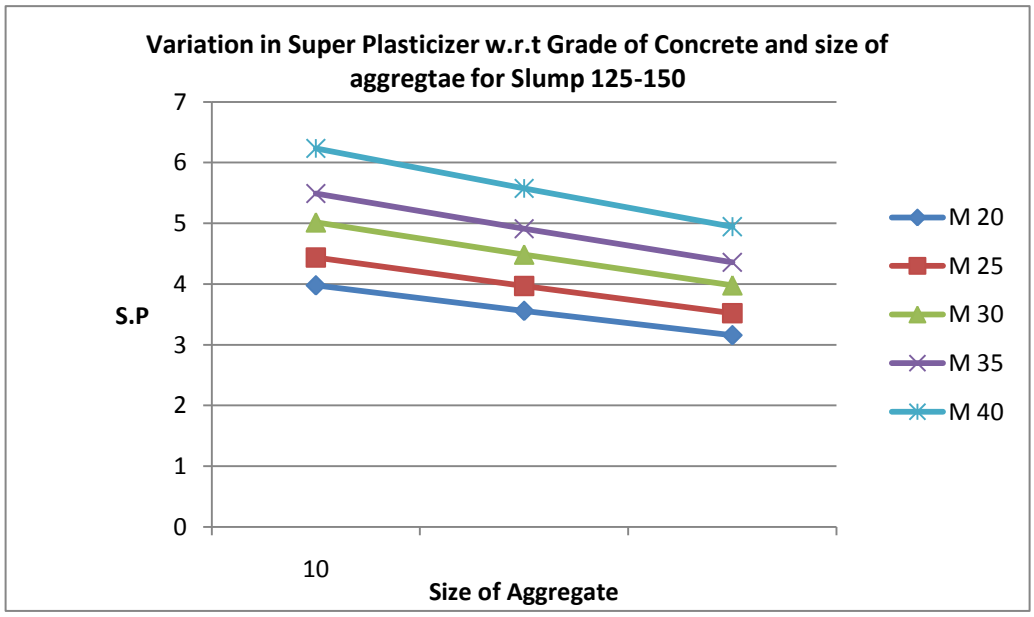

Variation in Fine Aggregate w.r.t Grade of Concrete and size of aggregtae for Slump 175-200
1200
1000
800
600
400
200
0
F.A
10
Size of Aggregate
M 20
M 25
M 30
M 35
M 40

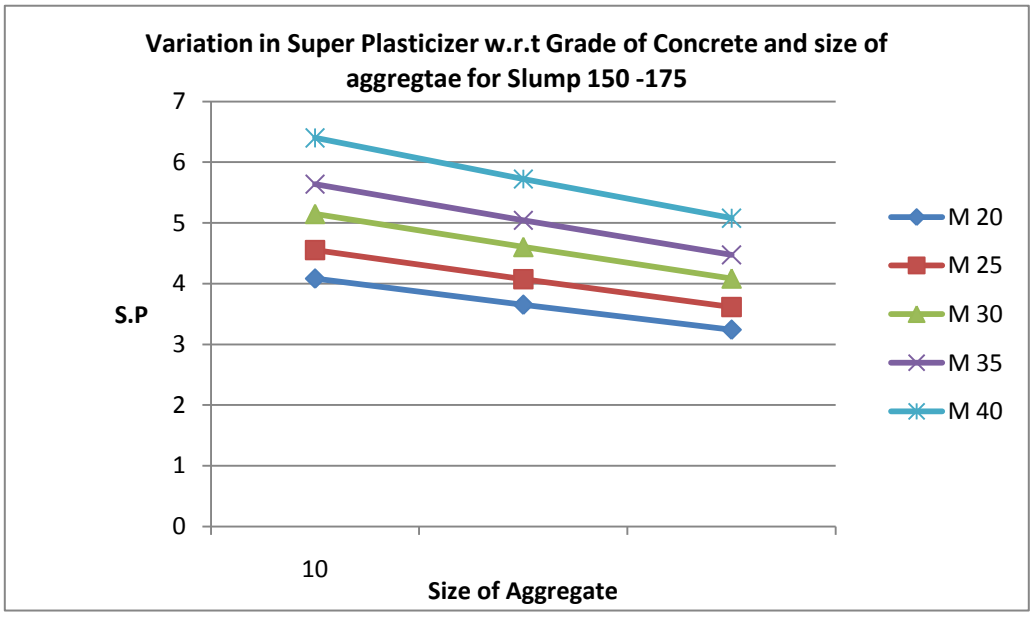

Variation in Super Plasticizer w.r.t Grade of Concrete and size of aggregtae for Slump 0-25
6
5
4
3
2
1
0
S.P
10
Size of Aggregate
M 20
M 25
M 30
M 35
M 40

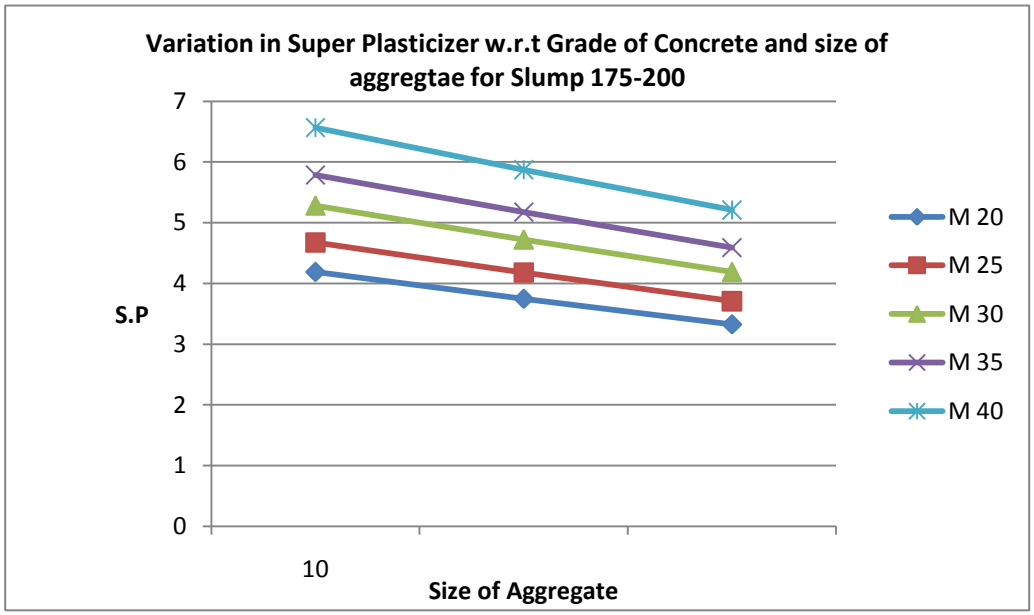

Variation in Super Plasticizer w.r.t Grade of Concrete and Size of Aggregate for slump 25-50
S.P
6
5
4
3
2
1
0
10
Size of Aggregate
M 20
M 25
M 30
M 35
M 40


Variation in Super Plasticizer w.r.t Grade of Concrete and size of aggregtae for Slump 50-75
S.P
7
6
5
4
3
2
1
0
10
Size of Aggregate
M 20
M 25
M 30
M 35
M 40


Variation in Super Plasticizer w.r.t Grade of Concrete and size of aggregtae for Slump 75- 100
S.P
7
6
5
4
3
2
1
0
10
Size of Aggregate
M 20
M 25
M 30
M 35
M 40


Variation in Super Plasticizer w.r.t Grade of Concrete and size of aggregtae for Slump 125-150
S.P
7
6
5
4
3
2
1
0
10
Size of Aggregate
M 20
M 25
M 30
M 35
M 40


Variation in Super Plasticizer w.r.t Grade of Concrete and size of aggregtae for Slump 150 -175
7
6
5
4
3
2
1
0
S.P
10
Size of Aggregate
M 20
M 25
M 30
M 35
M 40


Variation in Super Plasticizer w.r.t Grade of Concrete and size of aggregtae for Slump 175-200
7
6
5
4
3
2
1
0
S.P
10
Size of Aggregate
M 20
M 25
M 30
M 35
M 40

THIS IS FOR RCC WITHOUT FLY ASH

GRADE M	20	20	20
MAXIMUM SIZE AGG **10 / 20 / 40** MM	10	20	40
EXPOSURE M1 MOD2 SEV3 VERYSEV4 EXT5	1	1	1
MAX W/C RATIO	0.55	0.55	0.55
w/c ratio (to be less than max value above)	0.58	0.58	0.58
CHECKING OF W/C RATIO	CHECK	CHECK	CHECK
SLUMP 0-251 25-502 50-753 75-1004 100-1255 125-1506 150-1757 COLL8	1	1	1
PUMPING OR NOT ? 1 / 0	0	0	0
FOR VERY GOOD SUPERVISION PUT 1 ELSE LEAVE BLANK	1	1	1
FOR GOOD SUPERVISION PUT 2 ELSE LEAVE BLANK			
FOR FAIR SUPERVISION PUT 3 ELSE LEAVE BLANK			
AGG ANGULAR1 SUB-ANGU2 CRUSHED-ANGU3 ROUN4	1	1	1
CAPACITY OF WATER REDUCING ADM TO REDUCE WATER(%)	10	10	10
SPECIFIC GRAVITY OF CEMENT	3.15	3.15	3.15
SPECIFIC GRAVITY OF COARSE AGG	2.74	2.74	2.74
SPECIFIC GRAVITY OF FINE AGG	2.74	2.74	2.74
SPECIFIC GRAVITY OF SP	1.145	1.145	1.145
WATER ABSORPTION BY COARSE AGG (%)	0.5	0.5	0.5
WATER ABSORPTION BY FINE AGG (%)	1	1	1
FREE SURFACE MOISTURE COARSE AGGREGATE (%)	0	0	0
FREE SURFACE MOISTURE FINE AGGREGATE (%)	1	1	1
ZONE OF FINE AGGREGATE **1 / 2 / 3 /4**	1	1	1
INCREASE IN CEMENT CONTENT (%) FOR PUMPING	10	10	10
% OF SP BY MASS OF CEMENT	1	1	1
check cement content to be more than min. specified	OK	OK	CHECK
FINAL PROPORTIONS			
CEMENT (KG/CUB M)	344.3834	307.9583	273.1888
FLY ASH (KG/CUB M)	0	0	0
WATER (KG/CUB M)	181.584	162.378	144.045
CA (KG/CUB M)	839.6423	1199.785	1437.185
FA (KG/CUB M)	1095.017	820.055	663.9629
SP (KG/CUB M)	3.443834	3.079583	2.731888
W/C RATIO	0.527273	0.527273	0.527273

25	25	25	30	30	30	35	35	35	40
10	20	40	10	20	40	10	20	40	10
2	2	2	3	3	3	4	4	4	5
0.5	0.5	0.5	0.45	0.45	0.45	0.45	0.45	0.45	0.4
0.52	0.52	0.52	0.46	0.46	0.46	0.42	0.42	0.42	0.37
CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	OK	OK	OK	OK
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1	1
OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
384.12	343.4919	304.7106	434.2226	388.2952	344.4554	475.5771	425.2757	377.2607	539.8443
0	0	0	0	0	0	0	0	0	0
181.584	162.378	144.045	181.584	162.378	144.045	181.584	162.378	144.045	181.584
828.0269	1184.896	1422.061	812.2115	1164.926	1401.767	810.5616	1160.481	1397.66	784.9432
1071.117	803.1847	650.9142	1042.153	783.1109	635.6851	1006.841	754.5041	610.4721	975.0192
3.8412	3.434919	3.047106	4.342226	3.882952	3.444554	4.755771	4.252757	3.772607	5.398443
0.472727	0.472727	0.472727	0.418182	0.418182	0.418182	0.381818	0.381818	0.381818	0.336364

40	40	20	20	20	25	25	25	30
20	40	10	20	40	10	20	40	10
5	5	1	1	1	2	2	2	3
0.4	0.4	0.55	0.55	0.55	0.5	0.5	0.5	0.45
0.37	0.37	0.58	0.58	0.58	0.52	0.52	0.52	0.46
OK	OK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK
1	1	2	2	2	2	2	2	2
0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1
OK	OK	OK	OK	CHECK	OK	OK	OK	OK

482.7454	428.2419	355.0345	317.4828	281.6379	396	354.1154	314.1346	447.6522
0	0	0	0	0	0	0	0	0
162.378	144.045	187.2	167.4	148.5	187.2	167.4	148.5	187.2
1129.354	1365.946	828.8325	1186.555	1423.671	816.6884	1171.036	1407.909	800.2143
734.2664	596.6202	1080.92	811.0122	657.7193	1056.45	793.7896	644.4365	1026.759
4.827454	4.282419	3.550345	3.174828	2.816379	3.96	3.541154	3.141346	4.476522
0.336364	0.336364	0.527273	0.527273	0.527273	0.472727	0.472727	0.472727	0.418182

30	30	35	35	35	40	40	40	20	20
20	40	10	20	40	10	20	40	10	20
3	3	4	4	4	5	5	5	1	1
0.45	0.45	0.45	0.45	0.45	0.4	0.4	0.4	0.55	0.55
0.46	0.46	0.42	0.42	0.42	0.37	0.37	0.37	0.58	0.58
CHECK	CHECK	OK	OK	OK	OK	OK	OK	CHECK	CHECK
2	2	2	2	2	2	2	2	3	3
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1	1
OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

400.3043	355.1087	490.2857	438.4286	388.9286	556.5405	497.6757	441.4865	365.6855	327.0072
0	0	0	0	0	0	0	0	0	0
167.4	148.5	187.2	167.4	148.5	187.2	167.4	148.5	192.816	172.422
1150.279	1386.818	797.8354	1145.018	1381.906	771.4248	1112.929	1349.211	818.0227	1173.325
773.2645	628.9059	991.0332	744.4508	603.591	958.2272	723.5872	589.3107	1066.822	801.9694
4.003043	3.551087	4.902857	4.384286	3.889286	5.565405	4.976757	4.414865	3.656855	3.270072
0.418182	0.418182	0.381818	0.381818	0.381818	0.336364	0.336364	0.336364	0.527273	0.527273

20	25	25	25	30	30	30	35	35	35
40	10	20	40	10	20	40	10	20	40
1	2	2	2	3	3	3	4	4	4
0.55	0.5	0.5	0.5	0.45	0.45	0.45	0.45	0.45	0.45
0.58	0.52	0.52	0.52	0.46	0.46	0.46	0.42	0.42	0.42
CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	OK	OK	OK
3	3	3	3	3	3	3	3	3	3
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1	1
CHECK	OK	OK	OK	OK	OK	OK	OK	OK	OK

290.0871	407.88	364.7388	323.5587	461.0817	412.3135	365.762	504.9943	451.5814	400.5964
0	0	0	0	0	0	0	0	0	0
152.955	192.816	172.422	152.955	192.816	172.422	152.955	192.816	172.422	152.955
1410.156	805.3498	1157.176	1393.757	788.2171	1135.632	1371.869	785.1093	1129.556	1366.152
651.4756	1041.783	784.3945	637.9588	1011.365	763.418	622.1267	975.2254	734.3975	596.7099
2.900871	4.0788	3.647388	3.235587	4.610817	4.123135	3.65762	5.049943	4.515814	4.005964
0.527273	0.472727	0.472727	0.472727	0.418182	0.418182	0.418182	0.381818	0.381818	0.381818

40	40	40	20	20	20	25	25	25	30
10	20	40	10	20	40	10	20	40	10
5	5	5	1	1	1	2	2	2	3
0.4	0.4	0.4	0.55	0.55	0.55	0.5	0.5	0.5	0.45
0.37	0.37	0.37	0.58	0.58	0.58	0.52	0.52	0.52	0.46
OK	OK	OK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK
3	3	3	4	4	4	4	4	4	4
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1	1
OK	OK	OK	OK	OK	CHECK	OK	OK	OK	OK
573.2368	512.6059	454.7311	376.3366	336.5317	298.5362	419.76	375.3623	332.9827	474.5113
0	0	0	0	0	0	0	0	0	0
192.816	172.422	152.955	198.432	177.444	157.41	198.432	177.444	157.41	198.432
757.9063	1096.503	1332.476	807.2129	1160.094	1396.641	794.0113	1143.316	1379.605	776.22
941.4352	712.908	582.0012	1052.725	792.9265	645.232	1027.116	774.9994	631.4811	995.9717
5.732368	5.126059	4.547311	3.763366	3.365317	2.985362	4.1976	3.753623	3.329827	4.745113
0.336364	0.336364	0.336364	0.527273	0.527273	0.527273	0.472727	0.472727	0.472727	0.418182

30	30	35	35	35	40	40	40	20	20
20	40	10	20	40	10	20	40	10	20
3	3	4	4	4	5	5	5	1	1
0.45	0.45	0.45	0.45	0.45	0.4	0.4	0.4	0.55	0.55
0.46	0.46	0.42	0.42	0.42	0.37	0.37	0.37	0.58	0.58
CHECK	CHECK	OK	OK	OK	OK	OK	OK	CHECK	CHECK
4	4	4	4	4	4	4	4	5	5
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1	1
OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
424.3226	376.4152	519.7029	464.7343	412.2643	589.933	527.5362	467.9757	386.9876	346.0562
0	0	0	0	0	0	0	0	0	0
177.444	157.41	198.432	177.444	157.41	198.432	177.444	157.41	204.048	182.466
1120.985	1356.92	772.3831	1114.093	1350.398	744.3879	1080.078	1315.742	796.403	1146.864
753.5715	615.3474	959.4176	724.3443	589.8289	924.6432	702.2288	574.6917	1038.627	783.8837
4.243226	3.764152	5.197029	4.647343	4.122643	5.89933	5.275362	4.679757	3.869876	3.460562
0.418182	0.418182	0.381818	0.381818	0.381818	0.336364	0.336364	0.336364	0.527273	0.527273

20	25	25	25	30	30	30	35	35	35
40	10	20	40	10	20	40	10	20	40
1	2	2	2	3	3	3	4	4	4
0.55	0.5	0.5	0.5	0.45	0.45	0.45	0.45	0.45	0.45
0.58	0.52	0.52	0.52	0.46	0.46	0.46	0.42	0.42	0.42
CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	OK	OK	OK
5	5	5	5	5	5	5	5	5	5
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1	1
OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

306.9853	431.64	385.9858	342.4067	487.9409	436.3317	387.0685	534.4114	477.8871	423.9321
0	0	0	0	0	0	0	0	0	0
161.865	204.048	182.466	161.865	204.048	182.466	161.865	204.048	182.466	161.865
1383.127	782.6728	1129.456	1365.453	764.2228	1106.337	1341.971	759.657	1098.63	1334.644
638.9884	1012.448	765.6043	625.0034	980.5781	743.7251	608.5682	943.6098	714.291	582.9478
3.069853	4.3164	3.859858	3.424067	4.879409	4.363317	3.870685	5.344114	4.778871	4.239321
0.527273	0.472727	0.472727	0.472727	0.418182	0.418182	0.418182	0.381818	0.381818	0.381818

40	40	40	20	20	20	25	25	25	30
10	20	40	10	20	40	10	20	40	10
5	5	5	1	1	1	2	2	2	3
0.4	0.4	0.4	0.55	0.55	0.55	0.5	0.5	0.5	0.45
0.37	0.37	0.37	0.58	0.58	0.58	0.52	0.52	0.52	0.46
OK	OK	OK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK
5	5	5	6	6	6	6	6	6	6
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1	1
OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
606.6292	542.4665	481.2203	397.6386	355.5807	315.4345	443.52	396.6092	351.8308	501.3704
0	0	0	0	0	0	0	0	0	0
204.048	182.466	161.865	209.664	187.488	166.32	209.664	187.488	166.32	209.664
730.8694	1063.652	1299.007	785.5932	1133.634	1369.612	771.3342	1115.596	1351.301	752.2256
907.8512	691.5496	567.3823	1024.529	774.8409	632.7448	997.7809	756.2092	618.5257	965.1845
6.066292	5.424665	4.812203	3.976386	3.555807	3.154345	4.4352	3.966092	3.518308	5.013704
0.336364	0.336364	0.336364	0.527273	0.527273	0.527273	0.472727	0.472727	0.472727	0.418182

30	30	35	35	35	40	40	40	20	20
20	40	10	20	40	10	20	40	10	20
3	3	4	4	4	5	5	5	1	1
0.45	0.45	0.45	0.45	0.45	0.4	0.4	0.4	0.55	0.55
0.46	0.46	0.42	0.42	0.42	0.37	0.37	0.37	0.58	0.58
CHECK	CHECK	OK	OK	OK	OK	OK	OK	CHECK	CHECK
6	6	6	6	6	6	6	6	7	7
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1	1
OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

448.3409	397.7217	549.12	491.04	435.6	623.3254	557.3968	494.4649	408.2897	365.1052
0	0	0	0	0	0	0	0	0	0
187.488	166.32	209.664	187.488	166.32	209.664	187.488	166.32	215.28	192.51
1091.69	1327.022	746.9309	1083.168	1318.89	717.351	1047.227	1282.272	774.7834	1120.404
733.8786	601.789	927.802	704.2377	576.0667	891.0593	680.8705	560.0728	1010.432	765.798
4.483409	3.977217	5.4912	4.9104	4.356	6.233254	5.573968	4.944649	4.082897	3.651052
0.418182	0.418182	0.381818	0.381818	0.381818	0.336364	0.336364	0.336364	0.527273	0.527273

20	25	25	25	30	30	30	35	35	35
40	10	20	40	10	20	40	10	20	40
1	2	2	2	3	3	3	4	4	4
0.55	0.5	0.5	0.5	0.45	0.45	0.45	0.45	0.45	0.45
0.58	0.52	0.52	0.52	0.46	0.46	0.46	0.42	0.42	0.42
CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	OK	OK	OK
7	7	7	7	7	7	7	7	7	7
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1	1
OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

323.8836	455.4	407.2327	361.2548	514.8	460.35	408.375	563.8286	504.1929	447.2679
0	0	0	0	0	0	0	0	0	0
170.775	215.28	192.51	170.775	215.28	192.51	170.775	215.28	192.51	170.775
1356.097	759.9957	1101.736	1337.149	740.2284	1077.043	1312.073	734.2047	1067.705	1303.136
626.5012	983.1136	746.8141	612.0479	949.7908	724.0321	595.0098	911.9942	694.1844	569.1857
3.238836	4.554	4.072327	3.612548	5.148	4.6035	4.08375	5.638286	5.041929	4.472679
0.527273	0.472727	0.472727	0.472727	0.418182	0.418182	0.418182	0.381818	0.381818	0.381818

40	40	40	20	20	20	25	25	25	30
10	20	40	10	20	40	10	20	40	10
5	5	5	1	1	1	2	2	2	3
0.4	0.4	0.4	0.55	0.55	0.55	0.5	0.5	0.5	0.45
0.37	0.37	0.37	0.58	0.58	0.58	0.52	0.52	0.52	0.46
OK	OK	OK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK
7	7	7	8	8	8	8	8	8	8
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1	1
OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
640.0216	572.327	507.7095	418.9407	374.6297	332.3328	467.28	417.8562	370.6788	528.2296
0	0	0	0	0	0	0	0	0	0
215.28	192.51	170.775	220.896	197.532	175.23	220.896	197.532	175.23	220.896
703.8325	1030.802	1265.537	763.9736	1107.174	1342.583	748.6571	1087.875	1322.997	728.2313
874.2673	670.1913	552.7633	996.3342	756.7552	620.2575	968.4464	737.419	605.5702	934.3972
6.400216	5.72327	5.077095	4.189407	3.746297	3.323328	4.6728	4.178562	3.706788	5.282296
0.336364	0.336364	0.336364	0.527273	0.527273	0.527273	0.472727	0.472727	0.472727	0.418182

30	30	35	35	35	40	40	40	20	20
20	40	10	20	40	10	20	40	10	20
3	3	4	4	4	5	5	5	1	1
0.45	0.45	0.45	0.45	0.45	0.4	0.4	0.4	0.55	0.55
0.46	0.46	0.42	0.42	0.42	0.37	0.37	0.37	0.58	0.58
CHECK	CHECK	OK	OK	OK	OK	OK	OK	CHECK	CHECK
8	8	8	8	8	8	8	8	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	4	4
10	10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1	1
OK	OK	OK	OK	OK	OK	OK	OK	OK	CHECK

472.3591	419.0283	578.5371	517.3457	458.9357	656.7178	587.2573	520.9541	310.2455	273.8203
0	0	0	0	0	0	0	0	0	0
197.532	175.23	220.896	197.532	175.23	220.896	197.532	175.23	163.584	144.378
1062.396	1297.124	721.4786	1052.242	1287.382	690.314	1014.376	1248.802	874.2892	1247.205
714.1857	588.2305	896.1864	684.1312	562.3046	857.4753	659.5121	545.4538	1140.202	852.4666
4.723591	4.190283	5.785371	5.173457	4.589357	6.567178	5.872573	5.209541	3.102455	2.738203
0.418182	0.418182	0.381818	0.381818	0.381818	0.336364	0.336364	0.336364	0.527273	0.527273

20	25	25	25	30	30	30	35	35	35
40	10	20	40	10	20	40	10	20	40
1	2	2	2	3	3	3	4	4	4
0.55	0.5	0.5	0.5	0.45	0.45	0.45	0.45	0.45	0.45
0.58	0.52	0.52	0.52	0.46	0.46	0.46	0.42	0.42	0.42
CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	OK	OK	OK
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
4	4	4	4	4	4	4	4	4	4
10	10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1	1
CHECK	OK	OK	CHECK	OK	OK	CHECK	OK	OK	CHECK
239.0509	346.0431	305.415	266.6337	391.1791	345.2517	301.412	428.4343	378.1329	330.1179
0	0	0	0	0	0	0	0	0	0
126.045	163.584	144.378	126.045	163.584	144.378	126.045	163.584	144.378	126.045
1491.79	864.3684	1234.574	1479.24	850.6639	1217.425	1462.167	851.3505	1215.903	1461.312
689.1896	1118.128	836.859	677.0867	1091.491	818.4029	663.0759	1057.507	790.5373	638.2744
2.390509	3.460431	3.05415	2.666337	3.911791	3.452517	3.01412	4.284343	3.781329	3.301179
0.527273	0.472727	0.472727	0.472727	0.418182	0.418182	0.418182	0.381818	0.381818	0.381818

40	40	40	20	20	20	25	25	25
10	20	40	10	20	40	10	20	40
5	5	5	1	1	1	2	2	2
0.4	0.4	0.4	0.55	0.55	0.55	0.5	0.5	0.5
0.37	0.37	0.37	0.58	0.58	0.58	0.52	0.52	0.52
OK	OK	OK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK
1	1	1	2	2	2	2	2	2
0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1
4	4	4	4	4	4	4	4	4
10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1
OK	OK	OK	OK	CHECK	CHECK	OK	OK	CHECK
486.330	429.231	374.728	320.896	283.344		357.923	316.038	276.057
8	9	4	6	8	247.5	1	5	7
0	0	0	0	0	0	0	0	0
163.584	144.378	126.045	169.2	149.4	130.5	169.2	149.4	130.5
828.271	1188.22	1433.56	863.479	1233.97	1478.27	853.029	1220.71	1465.08
6	6	2	4	5	6	9	4	9
		626.153	1126.10	843.423		1103.46	827.463	
1028.84	772.543	4	4	8	682.946	1	9	670.609
4.86330	4.29231	3.74728	3.20896	2.83344		3.57923	3.16038	2.76057
8	9	4	6	8	2.475	1	5	7
0.33636	0.33636	0.33636	0.52727	0.52727	0.52727	0.47272	0.47272	0.47272
4	4	4	3	3	3	7	7	7

30	30	30	35	35	35	40	40	40	20
10	20	40	10	20	40	10	20	40	10
3	3	3	4	4	4	5	5	5	1
0.45	0.45	0.45	0.45	0.45	0.45	0.4	0.4	0.4	0.55
0.46	0.46	0.46	0.42	0.42	0.42	0.37	0.37	0.37	0.58
CHECK	CHECK	CHECK	OK	OK	OK	OK	OK	OK	CHECK
2	2	2	2	2	2	2	2	2	3
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
4	4	4	4	4	4	4	4	4	4
10	10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1	1
OK	OK	CHECK	OK	OK	OK	OK	OK	OK	OK
404.6087	357.2609	312.0652	443.1429	391.2857	341.7857	503.027	444.1622	387.973	331.5476
0	0	0	0	0	0	0	0	0	0
169.2	149.4	130.5	169.2	149.4	130.5	169.2	149.4	130.5	174.816
838.6668	1202.778	1447.218	838.6243	1200.44	1445.558	814.7532	1171.801	1416.827	852.6696
1076.098	808.5564	656.2967	1041.699	780.4841	631.3933	1012.048	761.8638	618.8439	1112.007
4.046087	3.572609	3.120652	4.431429	3.912857	3.417857	5.03027	4.441622	3.87973	3.315476
0.418182	0.418182	0.418182	0.381818	0.381818	0.381818	0.336364	0.336364	0.336364	0.527273

20	20	25	25	25	30	30	30	35	35
20	40	10	20	40	10	20	40	10	20
1	1	2	2	2	3	3	3	4	4
0.55	0.55	0.5	0.5	0.5	0.45	0.45	0.45	0.45	0.45
0.58	0.58	0.52	0.52	0.52	0.46	0.46	0.46	0.42	0.42
CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	OK	OK
3	3	3	3	3	3	3	3	3	3
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
4	4	4	4	4	4	4	4	4	4
10	10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1	1
CHECK	CHECK	OK	OK	CHECK	OK	OK	OK	OK	OK

292.8693	255.9491	369.8031	326.6619	285.4817	418.0383	369.27	322.7185	457.8514	404.4386
0	0	0	0	0	0	0	0	0	0
154.422	134.955	174.816	154.422	134.955	174.816	154.422	134.955	174.816	154.422
1220.745	1464.761	841.6913	1206.854	1450.937	826.6696	1188.131	1432.269	825.8982	1184.977
834.381	676.7024	1088.793	818.0687	664.1313	1060.704	798.71	649.5175	1025.891	770.4308
2.928693	2.559491	3.698031	3.266619	2.854817	4.180383	3.6927	3.227185	4.578514	4.044386
0.527273	0.527273	0.472727	0.472727	0.472727	0.418182	0.418182	0.418182	0.381818	0.381818

35	40	40	40	20	20	20	25	25	25
40	10	20	40	10	20	40	10	20	40
4	5	5	5	1	1	1	2	2	2
0.45	0.4	0.4	0.4	0.55	0.55	0.55	0.5	0.5	0.5
0.42	0.37	0.37	0.37	0.58	0.58	0.58	0.52	0.52	0.52
OK	OK	OK	OK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK
3	3	3	3	4	4	4	4	4	4
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
4	4	4	4	4	4	4	4	4	4
10	10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1	1
OK	OK	OK	OK	OK	OK	CHECK	OK	OK	CHECK
353.4536	519.7232	459.0924	401.2176	342.1986	302.3938	264.3983	381.6831	337.2854	294.9058
0	0	0	0	0	0	0	0	0	0
134.955	174.816	154.422	134.955	180.432	159.444	139.41	180.432	159.444	139.41
1429.804	801.2347	1155.375	1400.092	841.8597	1207.514	1451.246	830.3528	1192.994	1436.785
624.5122	995.2557	751.1847	611.5345	1097.909	825.3381	670.4588	1074.126	808.6736	657.6536
3.534536	5.197232	4.590924	4.012176	3.421986	3.023938	2.643983	3.816831	3.372854	2.949058
0.381818	0.336364	0.336364	0.336364	0.527273	0.527273	0.527273	0.472727	0.472727	0.472727

30	30	30	35	35	35	40	40	40	20
10	20	40	10	20	40	10	20	40	10
3	3	3	4	4	4	5	5	5	1
0.45	0.45	0.45	0.45	0.45	0.45	0.4	0.4	0.4	0.55
0.46	0.46	0.46	0.42	0.42	0.42	0.37	0.37	0.37	0.58
CHECK	CHECK	CHECK	OK	OK	OK	OK	OK	OK	CHECK
4	4	4	4	4	4	4	4	4	5
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
4	4	4	4	4	4	4	4	4	4
10	10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1	1
OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

431.4678	381.2791	333.3717	472.56	417.5914	365.1214	536.4195	474.0227	414.4622	352.8497
0	0	0	0	0	0	0	0	0	0
180.432	159.444	139.41	180.432	159.444	139.41	180.432	159.444	139.41	186.048
814.6724	1173.484	1417.32	813.172	1169.515	1414.05	787.7163	1138.95	1383.357	831.0499
1045.31	788.8635	642.7382	1010.084	760.3775	617.6312	978.4637	740.5055	604.225	1083.812
4.314678	3.812791	3.333717	4.7256	4.175914	3.651214	5.364195	4.740227	4.144622	3.528497
0.418182	0.418182	0.418182	0.381818	0.381818	0.381818	0.336364	0.336364	0.336364	0.527273

20	20	25	25	25	30	30	30	35	35
20	40	10	20	40	10	20	40	10	20
1	1	2	2	2	3	3	3	4	4
0.55	0.55	0.5	0.5	0.5	0.45	0.45	0.45	0.45	0.45
0.58	0.58	0.52	0.52	0.52	0.46	0.46	0.46	0.42	0.42
CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	OK	OK
5	5	5	5	5	5	5	5	5	5
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
4	4	4	4	4	4	4	4	4	4
10	10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1	1
OK	CHECK	OK	OK	OK	OK	OK	OK	OK	OK

311.9183	272.8474	393.5631	347.9088	304.3298	444.8974	393.2883	344.025	487.2686	430.7443
0	0	0	0	0	0	0	0	0	0
164.466	143.865	186.048	164.466	143.865	186.048	164.466	143.865	186.048	164.466
1194.284	1437.732	819.0143	1179.134	1422.633	802.6753	1158.836	1402.371	800.4459	1154.052
816.2953	664.2152	1059.459	799.2785	651.1759	1029.917	779.0171	635.959	994.2759	750.3242
3.119183	2.728474	3.935631	3.479088	3.043298	4.448974	3.932883	3.44025	4.872686	4.307443
0.527273	0.527273	0.472727	0.472727	0.472727	0.418182	0.418182	0.418182	0.381818	0.381818

35	40	40	40	20	20	20	25	25	25
40	10	20	40	10	20	40	10	20	40
4	5	5	5	1	1	1	2	2	2
0.45	0.4	0.4	0.4	0.55	0.55	0.55	0.5	0.5	0.5
0.42	0.37	0.37	0.37	0.58	0.58	0.58	0.52	0.52	0.52
OK	OK	OK	OK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK
5	5	5	5	6	6	6	6	6	6
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
4	4	4	4	4	4	4	4	4	4
10	10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1	1
OK	OK	OK	OK	OK	OK	CHECK	OK	OK	OK

376.7893	553.1157	488.953	427.7068	363.5007	321.4428	281.2966	405.4431	358.5323	313.7538
0	0	0	0	0	0	0	0	0	0
143.865	186.048	164.466	143.865	191.664	169.488	148.32	191.664	169.488	148.32
1398.296	774.1978	1122.525	1366.622	820.2401	1181.054	1424.217	807.6757	1165.274	1408.481
610.7501	961.6717	729.8263	596.9155	1069.714	807.2525	657.9715	1044.792	789.8834	644.6982
3.767893	5.531157	4.88953	4.277068	3.635007	3.214428	2.812966	4.054431	3.585323	3.137538
0.381818	0.336364	0.336364	0.336364	0.527273	0.527273	0.527273	0.472727	0.472727	0.472727

30	30	30	35	35	35	40	40	40	20
10	20	40	10	20	40	10	20	40	10
3	3	3	4	4	4	5	5	5	1
0.45	0.45	0.45	0.45	0.45	0.45	0.4	0.4	0.4	0.55
0.46	0.46	0.46	0.42	0.42	0.42	0.37	0.37	0.37	0.58
CHECK	CHECK	CHECK	OK	OK	OK	OK	OK	OK	CHECK
6	6	6	6	6	6	6	6	6	7
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
4	4	4	4	4	4	4	4	4	4
10	10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1	1
OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

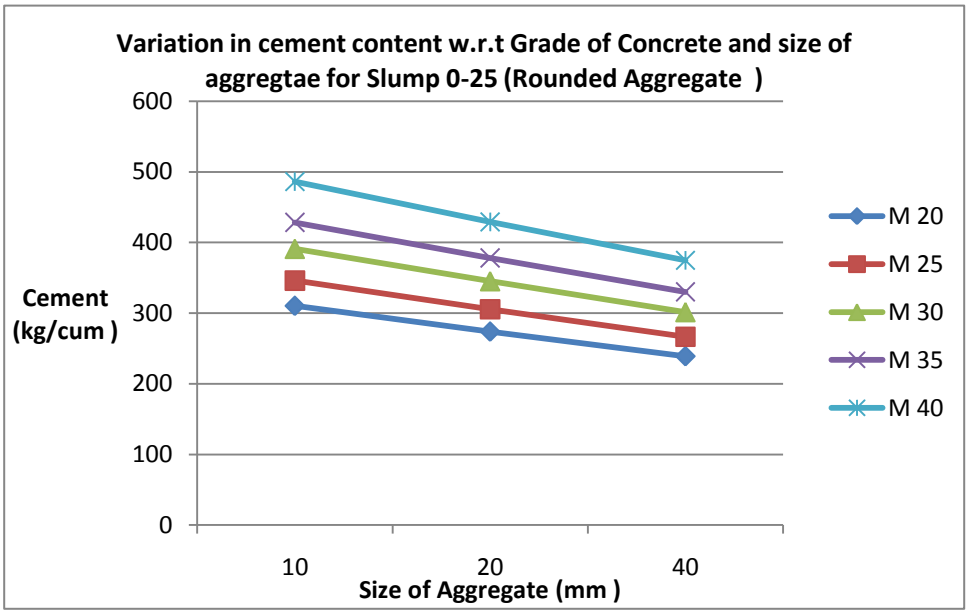
458.327	405.2974	354.6783	501.9771	443.8971	388.4571	569.8119	503.8832	440.9514	374.1517
0	0	0	0	0	0	0	0	0	0
191.664	169.488	148.32	191.664	169.488	148.32	191.664	169.488	148.32	197.28
790.6781	1144.189	1387.422	787.7198	1138.589	1382.542	760.6793	1106.099	1349.887	809.4303
1014.523	769.1706	629.1798	978.4681	740.271	603.869	944.8797	719.1471	589.606	1055.616
4.58327	4.052974	3.546783	5.019771	4.438971	3.884571	5.698119	5.038832	4.409514	3.741517
0.418182	0.418182	0.418182	0.381818	0.381818	0.381818	0.336364	0.336364	0.336364	0.527273

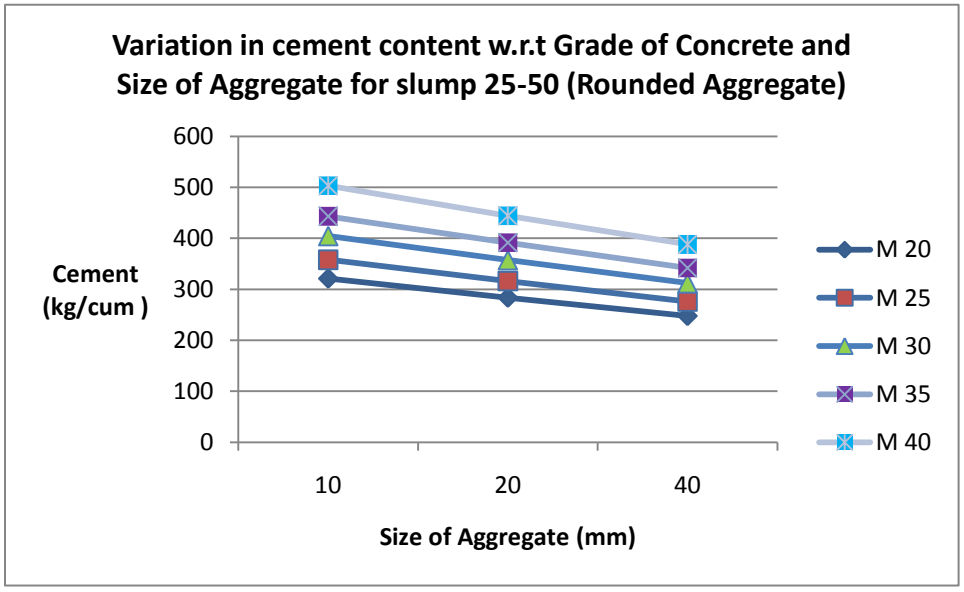
20	20	25	25	25	30	30	30	35	35
20	40	10	20	40	10	20	40	10	20
1	1	2	2	2	3	3	3	4	4
0.55	0.55	0.5	0.5	0.5	0.45	0.45	0.45	0.45	0.45
0.58	0.58	0.52	0.52	0.52	0.46	0.46	0.46	0.42	0.42
CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK	OK	OK
7	7	7	7	7	7	7	7	7	7
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
4	4	4	4	4	4	4	4	4	4
10	10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1	1
OK	CHECK	OK	OK	OK	OK	OK	OK	OK	OK
330.9672	289.7457	417.3231	369.1558	323.1779	471.7565	417.3065	365.3315	516.6857	457.05
0	0	0	0	0	0	0	0	0	0
174.51	152.775	197.28	174.51	152.775	197.28	174.51	152.775	197.28	174.51
1167.824	1410.702	796.3372	1151.413	1394.329	778.6809	1129.542	1372.473	774.9936	1123.127
798.2096	651.7279	1030.124	780.4883	638.2205	999.1294	759.3241	622.4006	962.6603	730.2177
3.309672	2.897457	4.173231	3.691558	3.231779	4.717565	4.173065	3.653315	5.166857	4.5705
0.527273	0.527273	0.472727	0.472727	0.472727	0.418182	0.418182	0.418182	0.381818	0.381818

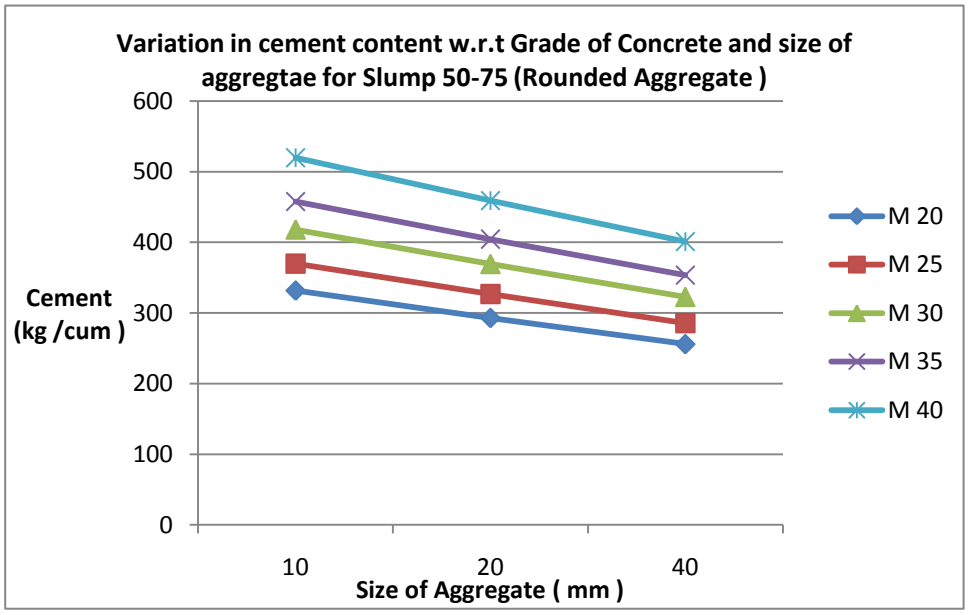
35	40	40	40	20	20	20	25	25	25
40	10	20	40	10	20	40	10	20	40
4	5	5	5	1	1	1	2	2	2
0.45	0.4	0.4	0.4	0.55	0.55	0.55	0.5	0.5	0.5
0.42	0.37	0.37	0.37	0.58	0.58	0.58	0.52	0.52	0.52
OK	OK	OK	OK	CHECK	CHECK	CHECK	CHECK	CHECK	CHECK
7	7	7	7	8	8	8	8	8	8
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
4	4	4	4	4	4	4	4	4	4
10	10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1	1
OK	OK	OK	OK	OK	OK	CHECK	OK	OK	OK

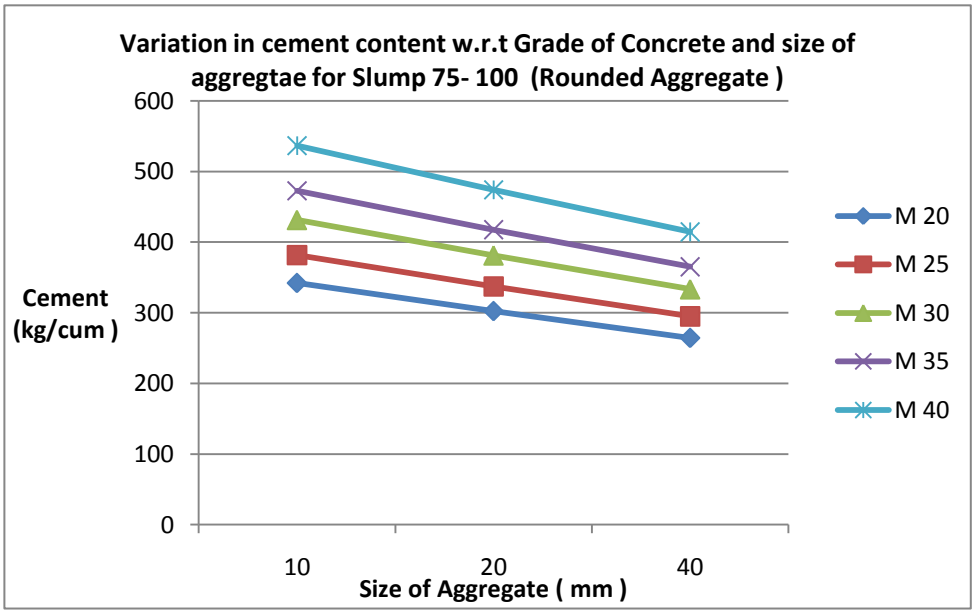
400.125	586.5081	518.8135	454.1959	384.8028	340.4917	298.1948	429.2031	379.7792	332.6019
0	0	0	0	0	0	0	0	0	0
152.775	197.28	174.51	152.775	202.896	179.532	157.23	202.896	179.532	157.23
1366.788	747.1609	1089.674	1333.153	798.6204	1154.594	1397.188	784.9986	1137.553	1380.177
596.988	928.0877	708.4679	582.2965	1041.519	789.1668	645.4843	1015.457	771.0932	631.7428
4.00125	5.865081	5.188135	4.541959	3.848028	3.404917	2.981948	4.292031	3.797792	3.326019
0.381818	0.336364	0.336364	0.336364	0.527273	0.527273	0.527273	0.472727	0.472727	0.472727

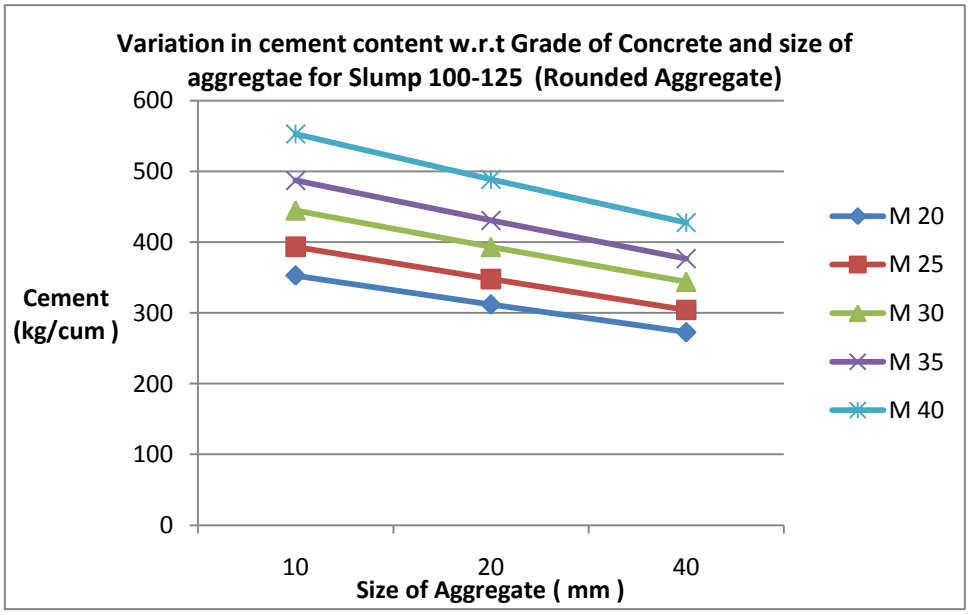
30	30	30	35	35	35	40	40	40
10	20	40	10	20	40	10	20	40
3	3	3	4	4	4	5	5	5
0.45	0.45	0.45	0.45	0.45	0.45	0.4	0.4	0.4
0.46	0.46	0.46	0.42	0.42	0.42	0.37	0.37	0.37
CHECK	CHECK	CHECK	OK	OK	OK	OK	OK	OK
8	8	8	8	8	8	8	8	8
0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1
4	4	4	4	4	4	4	4	4
10	10	10	10	10	10	10	10	10
3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74
1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145	1.145
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1
OK	OK	OK	OK	OK	OK	OK	OK	OK
485.186	429.315	375.984	531.394	470.202	411.792	603.204	533.743	467.440
1	7	8	3	9	9	3	8	5
0	0	0	0	0	0	0	0	0
202.896	179.532	157.23	202.896	179.532	157.23	202.896	179.532	157.23
766.683	1114.89	1357.52	762.267	1107.66	1351.03	733.642	1073.24	1316.41
7	5	4	5	4	4	4	9	8
983.735	749.477	615.621	946.852	720.164	590.106	911.295	697.788	574.987
8	7	4	4	4	9	8	7	1
4.85186	4.29315	3.75984	5.31394	4.70202	4.11792	6.03204	5.33743	4.67440
1	7	8	3	9	9	3	8	5
0.41818	0.41818	0.41818	0.38181	0.38181	0.38181	0.33636	0.33636	0.33636
2	2	2	8	8	8	4	4	4

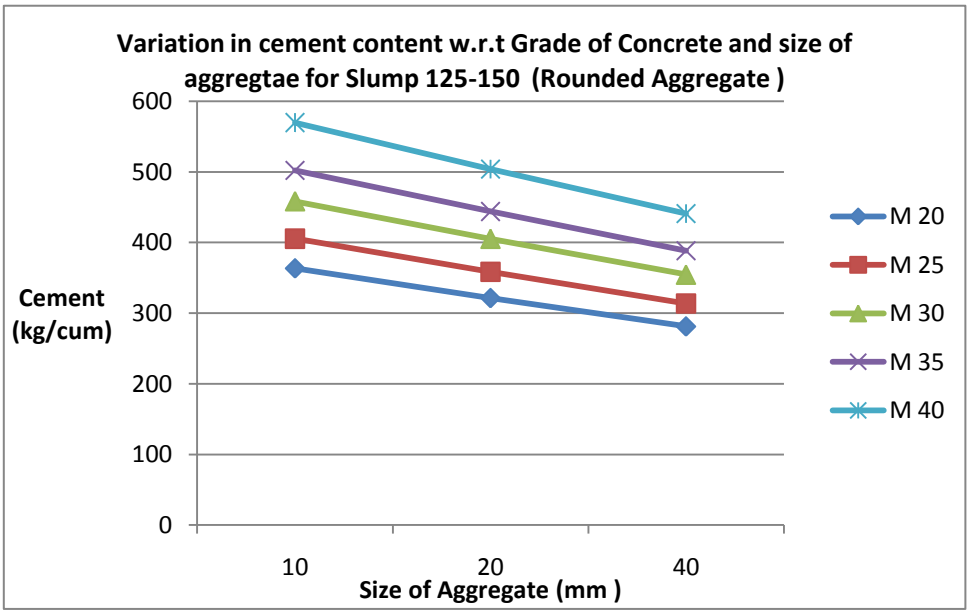

Variation in cement content w.r.t Grade of Concrete and size of aggregtae for Slump 0-25 (Rounded Aggregate)
Cement (kg/cum)
600
500
400
300
200
100
0
10
20
40
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40

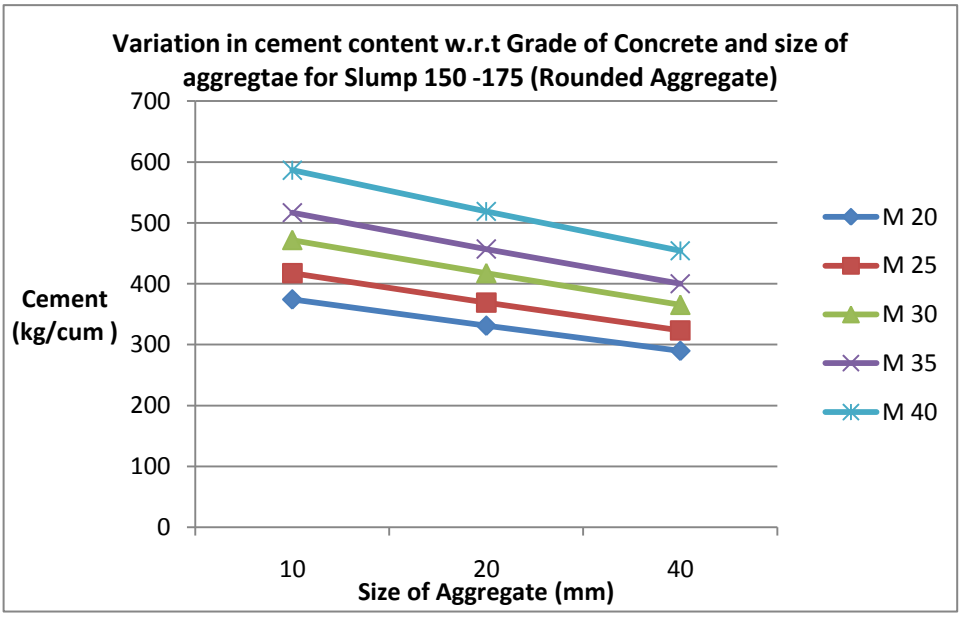

Variation in cement content w.r.t Grade of Concrete and Size of Aggregate for slump 25-50 (Rounded Aggregate)
Cement (kg/cum)
600
500
400
300
200
100
0
10
20
40
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40

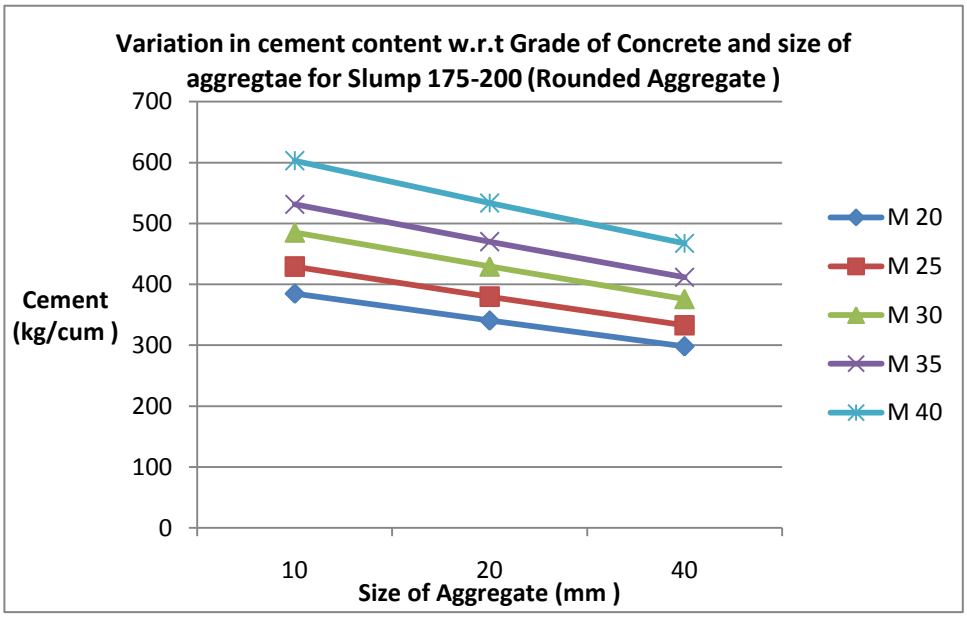

Variation in cement content w.r.t Grade of Concrete and size of aggregtae for Slump 50-75 (Rounded Aggregate)
600
500
400
300
200
100
0
Cement (kg /cum)
10
20
40
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40

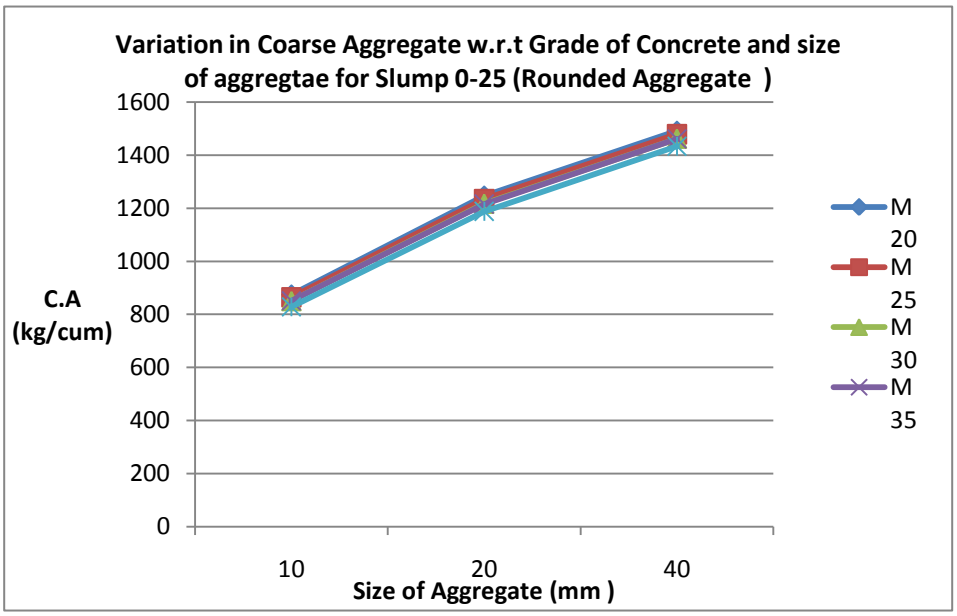

Variation in cement content w.r.t Grade of Concrete and size of aggregtae for Slump 75- 100 (Rounded Aggregate)
Cement (kg/cum)
600
500
400
300
200
100
0
10
20
40
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40

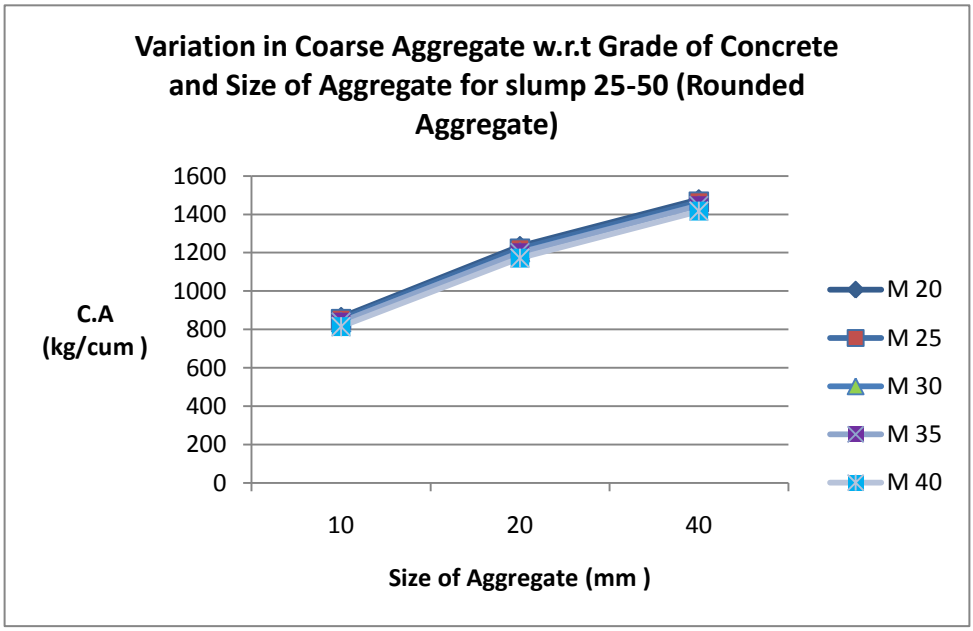

Variation in cement content w.r.t Grade of Concrete and size of aggregtae for Slump 100-125 (Rounded Aggregate)
Cement (kg/cum)
600
500
400
300
200
100
0
10
20
40
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40

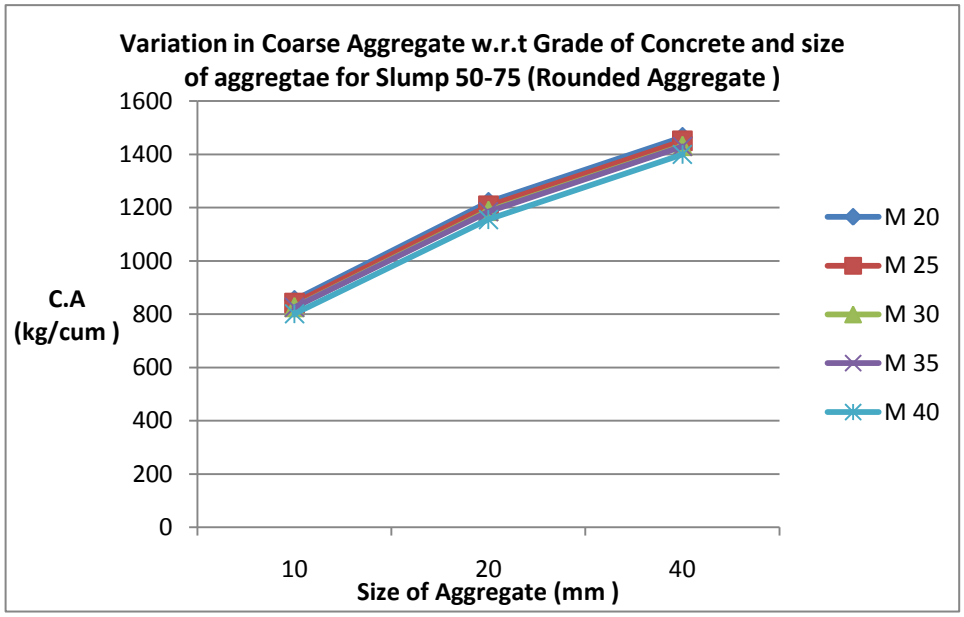

Variation in cement content w.r.t Grade of Concrete and size of aggregtae for Slump 125-150 (Rounded Aggregate)
Cement (kg/cum)
600
500
400
300
200
100
0
10
20
40
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40

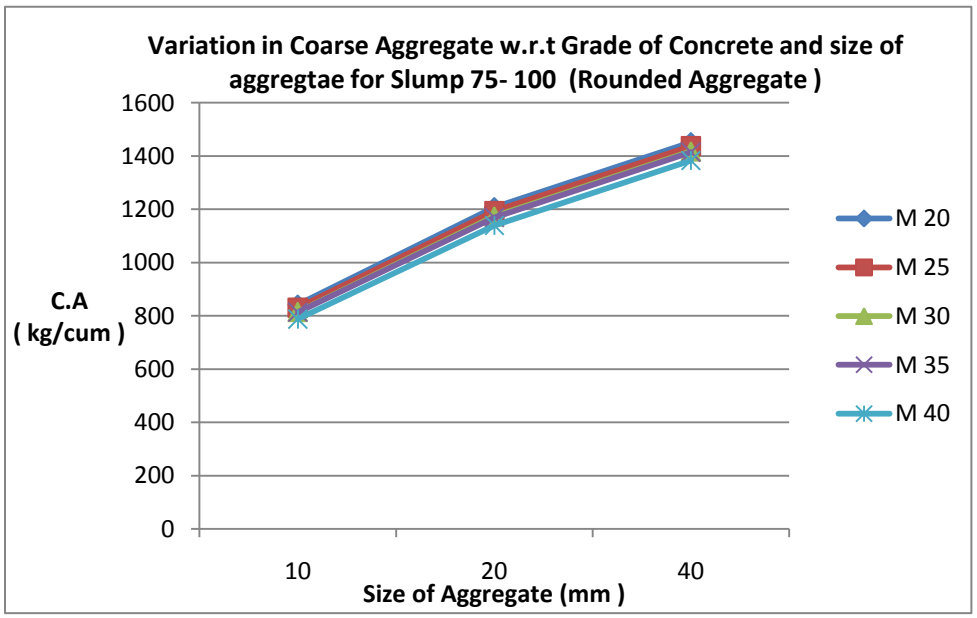

Variation in cement content w.r.t Grade of Concrete and size of aggregtae for Slump 150 -175 (Rounded Aggregate)
Cement (kg/cum)
700
600
500
400
300
200
100
0
10
20
40
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40

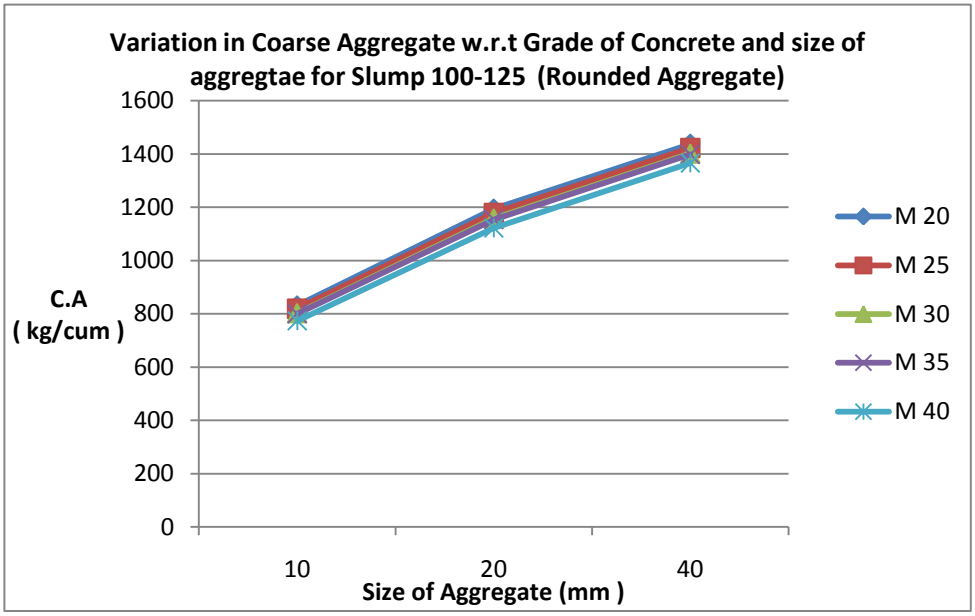

Variation in cement content w.r.t Grade of Concrete and size of aggregtae for Slump 175-200 (Rounded Aggregate)
Cement (kg/cum)
700
600
500
400
300
200
100
0
10
20
40
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40

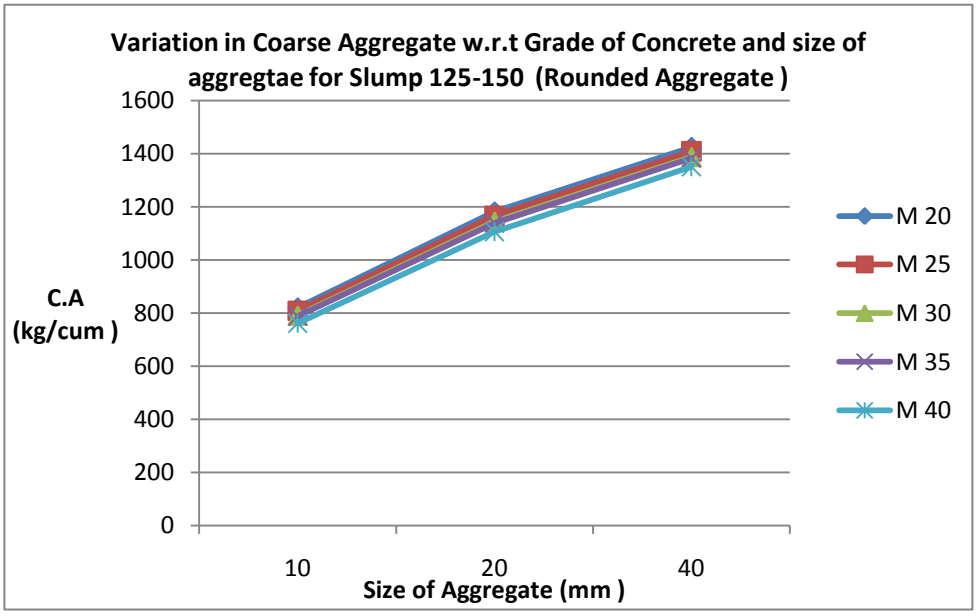

Variation in Coarse Aggregate w.r.t Grade of Concrete and size of aggregtae for Slump 0-25 (Rounded Aggregate)
C.A (kg/cum)
1600
1400
1200
1000
800
600
400
200
0
10
20
40
Size of Aggregate (mm)
M 20
M 25
M 30
M 35

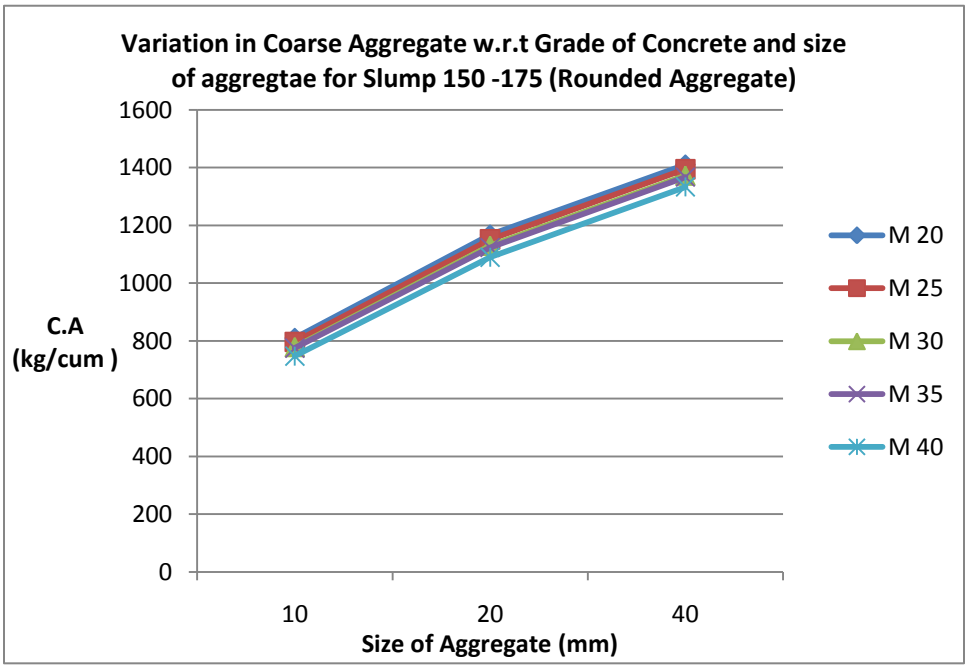

Variation in Coarse Aggregate w.r.t Grade of Concrete and Size of Aggregate for slump 25-50 (Rounded Aggregate)
C.A (kg/cum)
1600
1400
1200
1000
800
600
400
200
0
10
20
40
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40

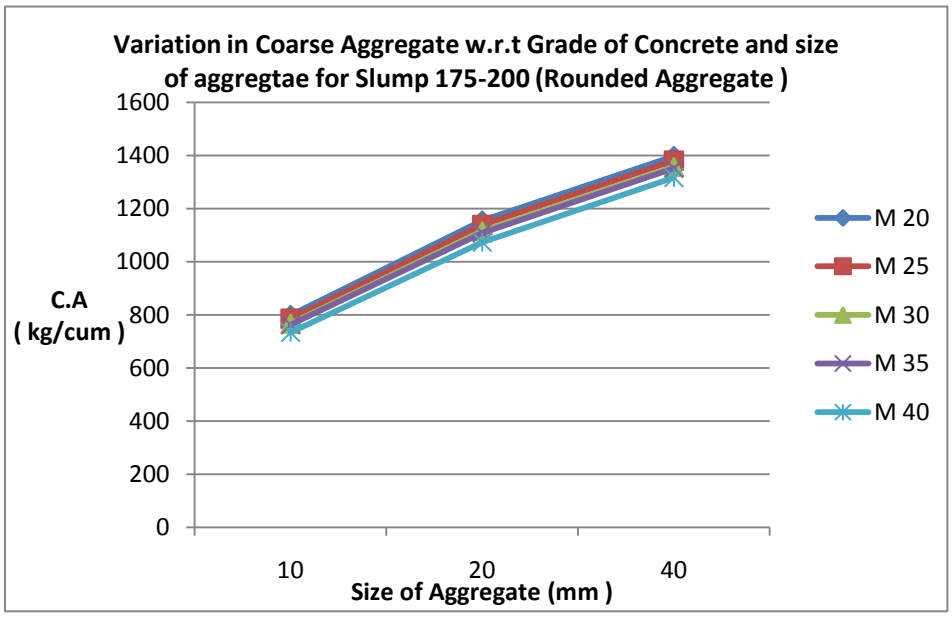

Variation in Coarse Aggregate w.r.t Grade of Concrete and size of aggregtae for Slump 50-75 (Rounded Aggregate)
C.A (kg/cum)
1600
1400
1200
1000
800
600
400
200
0
10
20
40
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40

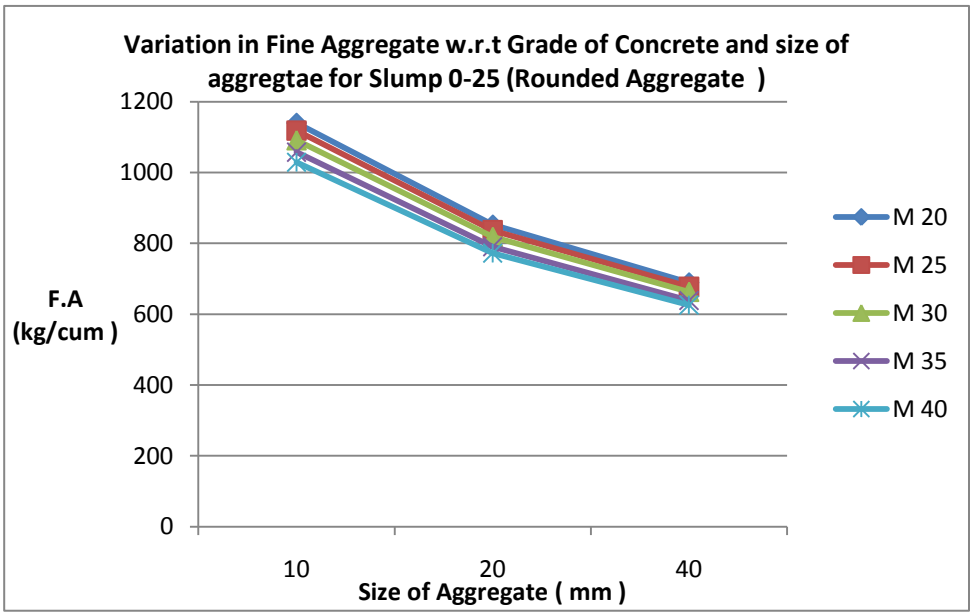

Variation in Coarse Aggregate w.r.t Grade of Concrete and size of aggregtae for Slump 75- 100 (Rounded Aggregate)
C.A (kg/cum)
1600
1400
1200
1000
800
600
400
200
0
10
20
40
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40

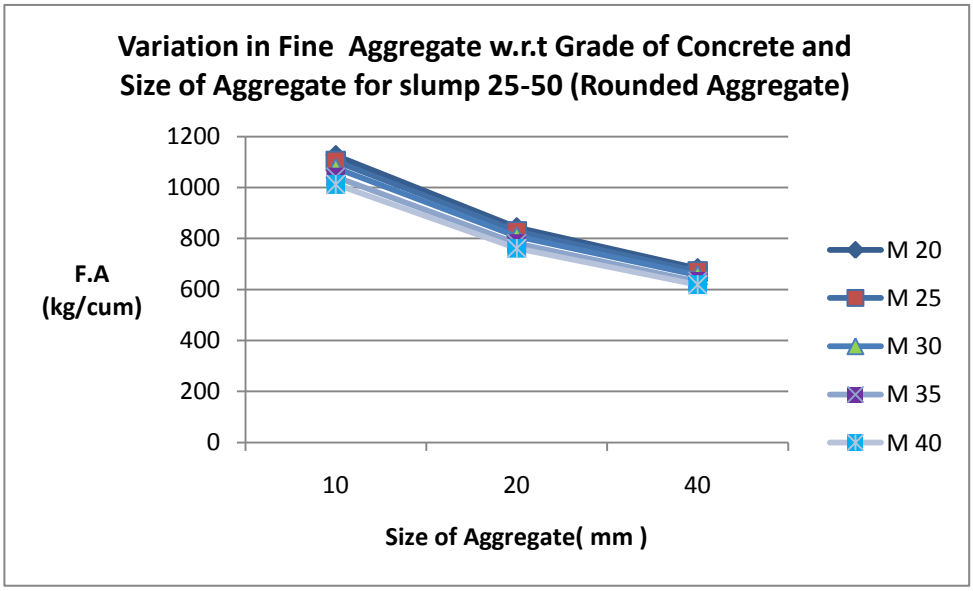

Variation in Coarse Aggregate w.r.t Grade of Concrete and size of aggregtae for Slump 100-125 (Rounded Aggregate)
C.A (kg/cum)
1600
1400
1200
1000
800
600
400
200
0
10
20
40
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40

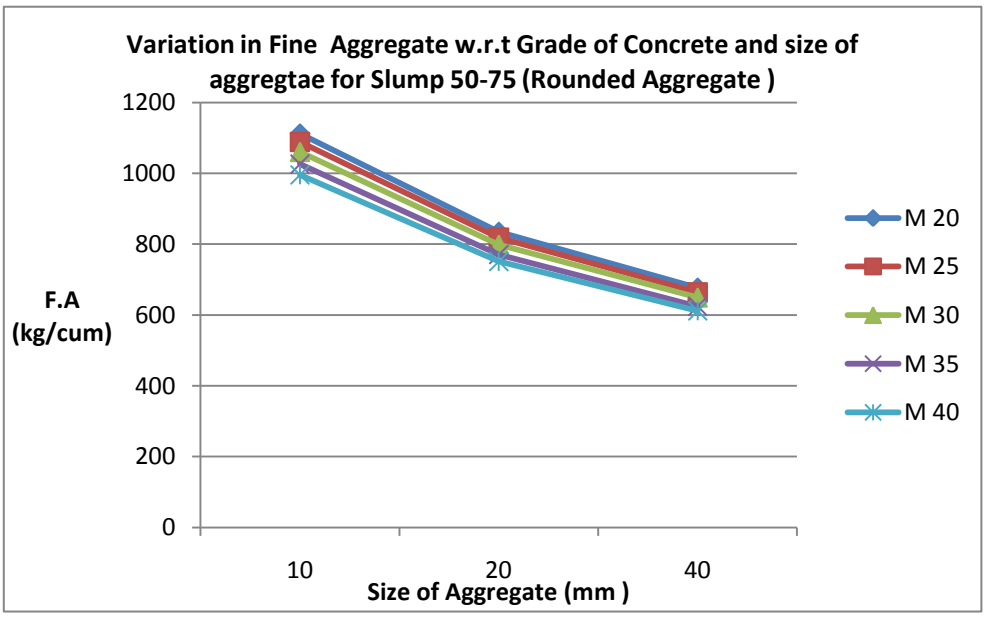

Variation in Coarse Aggregate w.r.t Grade of Concrete and size of aggregtae for Slump 125-150 (Rounded Aggregate)
C.A (kg/cum)
1600
1400
1200
1000
800
600
400
200
0
10
20
40
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40

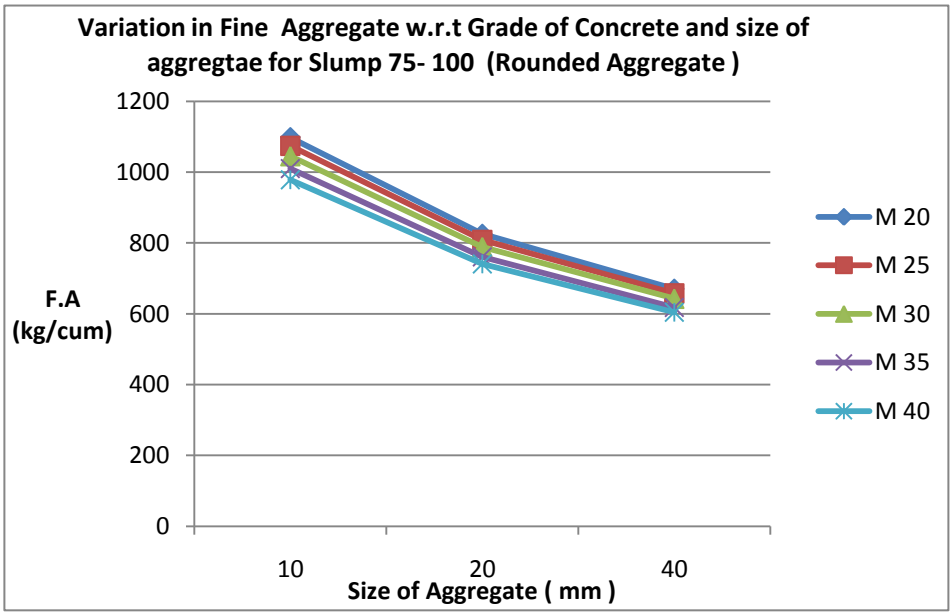

Variation in Coarse Aggregate w.r.t Grade of Concrete and size of aggregtae for Slump 150 -175 (Rounded Aggregate)
C.A (kg/cum)
1600
1400
1200
1000
800
600
400
200
0
10
20
40
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40

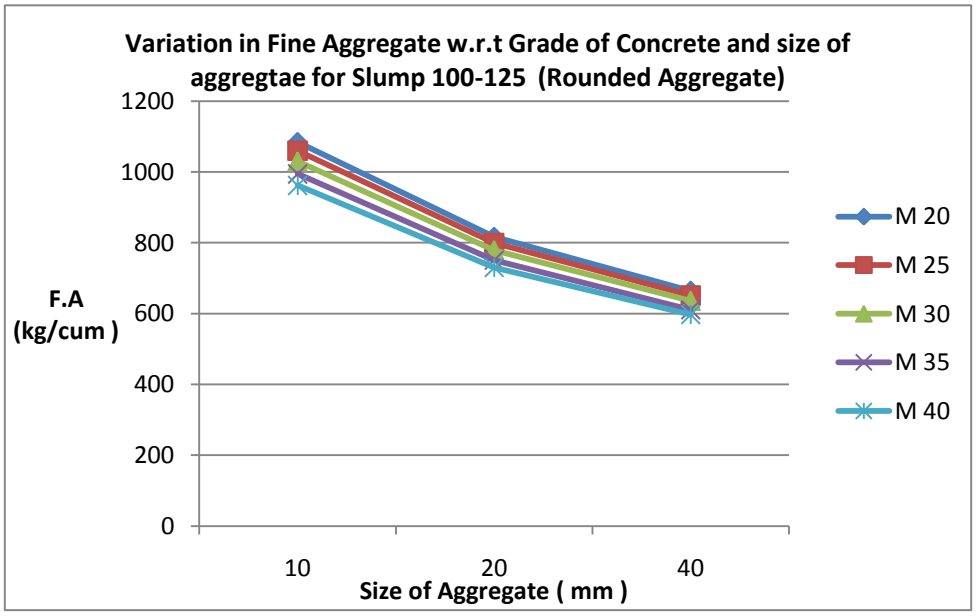

Variation in Coarse Aggregate w.r.t Grade of Concrete and size of aggregtae for Slump 175-200 (Rounded Aggregate)
C.A (kg/cum)
1600
1400
1200
1000
800
600
400
200
0
10
20
40
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40

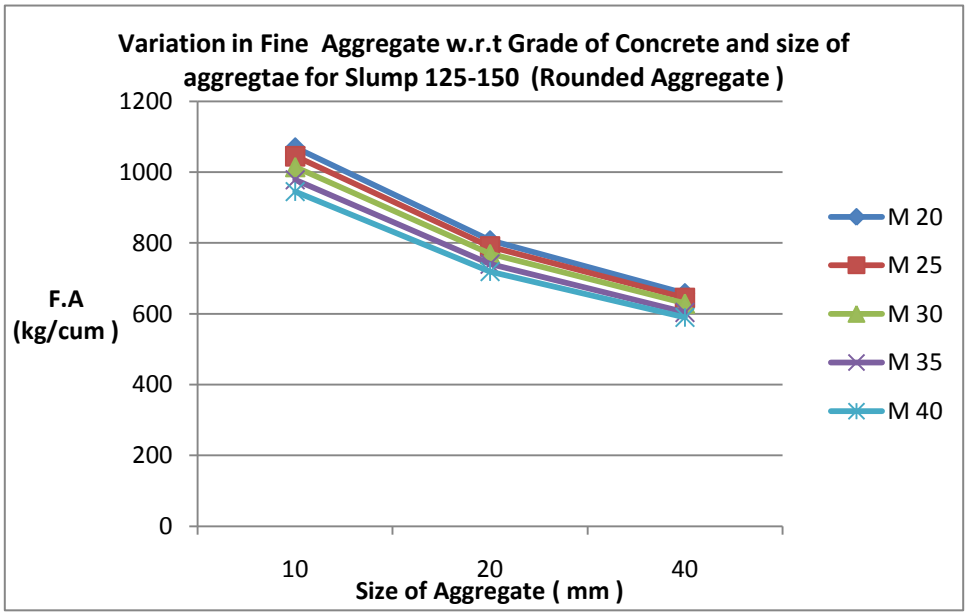

Variation in Fine Aggregate w.r.t Grade of Concrete and size of aggregtae for Slump 0-25 (Rounded Aggregate)
F.A (kg/cum)
1200
1000
800
600
400
200
0
10
20
40
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40

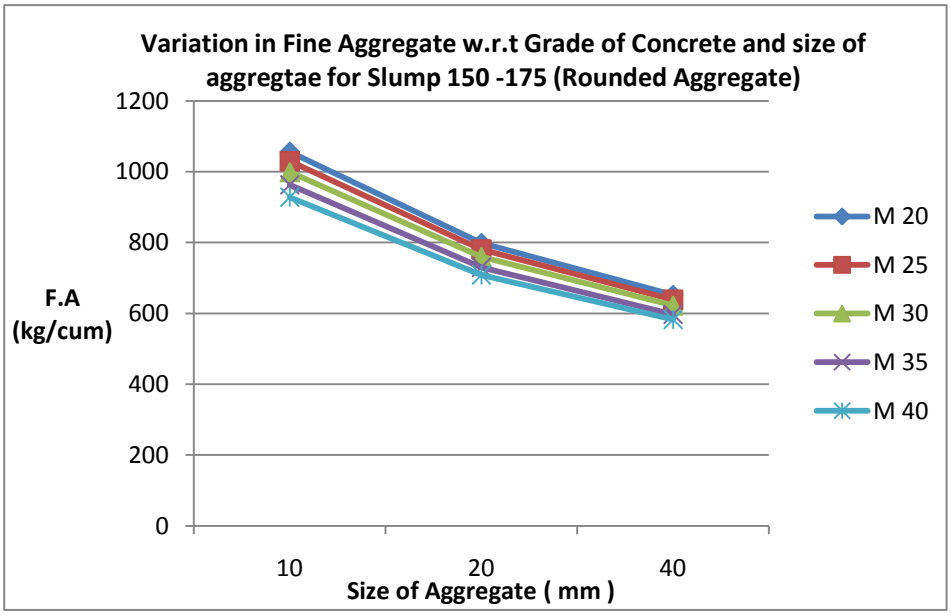

Variation in Fine Aggregate w.r.t Grade of Concrete and Size of Aggregate for slump 25-50 (Rounded Aggregate)
F.A (kg/cum)
1200
1000
800
600
400
200
0
10
20
40
Size of Aggregate(mm)
M 20
M 25
M 30
M 35
M 40

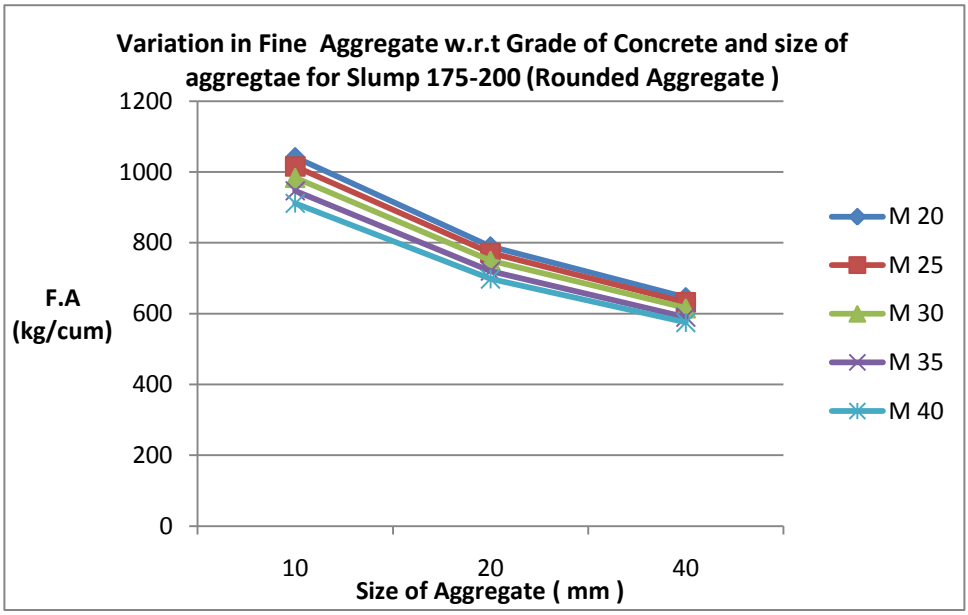

Variation in Fine Aggregate w.r.t Grade of Concrete and size of aggregtae for Slump 50-75 (Rounded Aggregate)
F.A (kg/cum)
1200
1000
800
600
400
200
0
10
20
40
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40

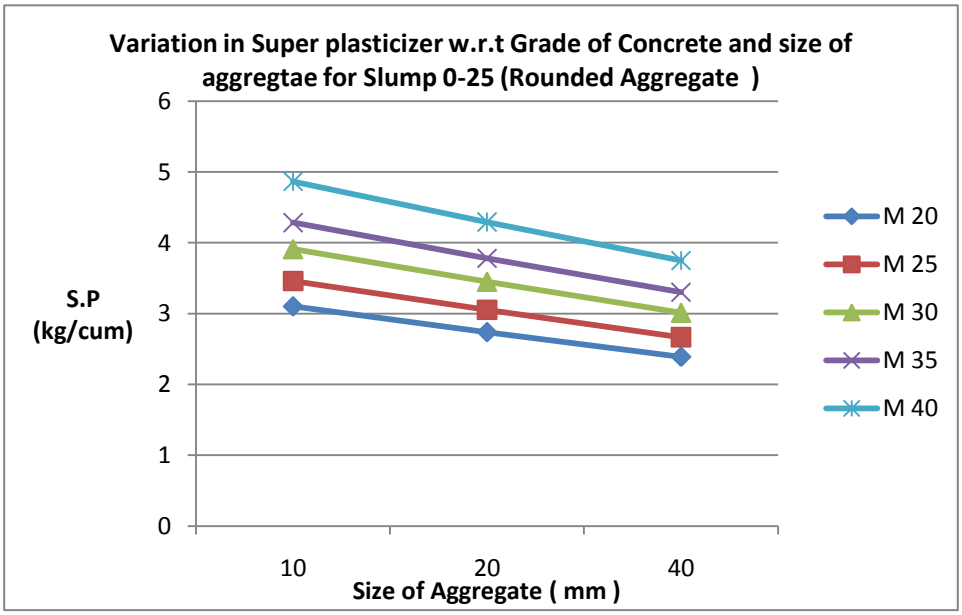

Variation in Fine Aggregate w.r.t Grade of Concrete and size of aggregtae for Slump 75- 100 (Rounded Aggregate)
1200
1000
800
600
400
200
0
F.A (kg/cum)
10
20
40
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40

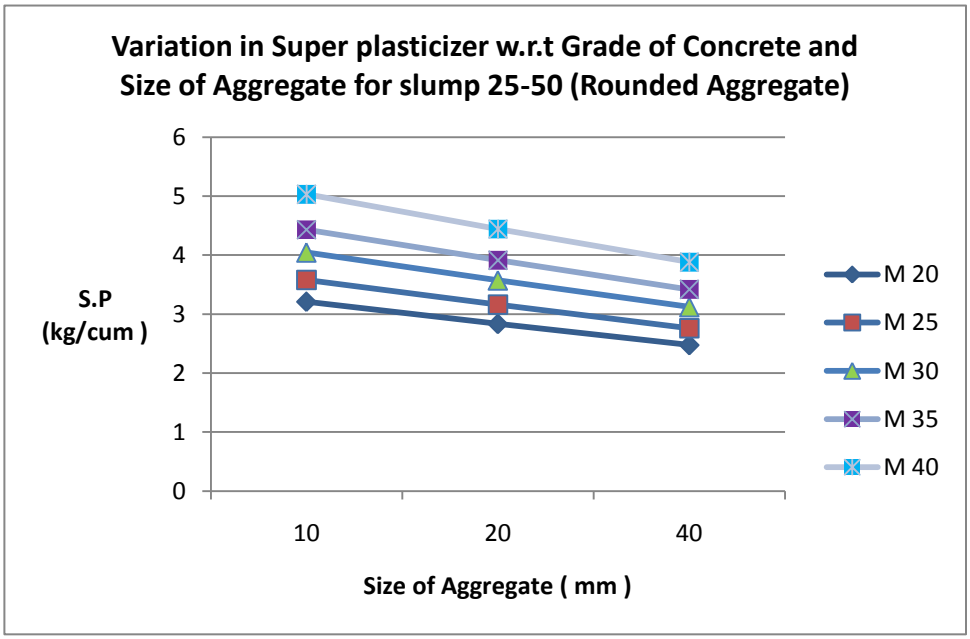

Variation in Fine Aggregate w.r.t Grade of Concrete and size of aggregtae for Slump 100-125 (Rounded Aggregate)
F.A (kg/cum)
1200
1000
800
600
400
200
0
10
20
40
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40

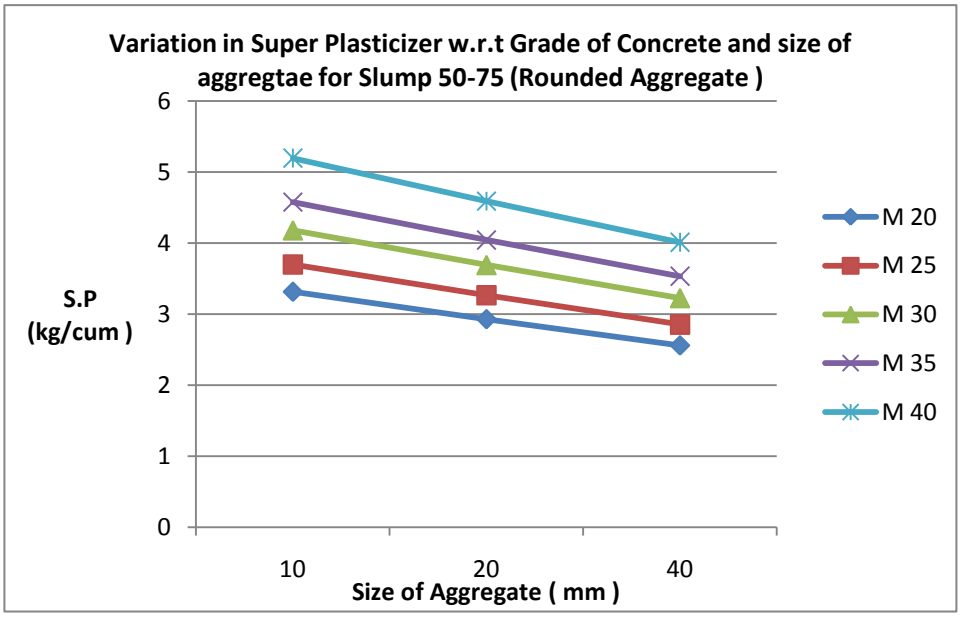

Variation in Fine Aggregate w.r.t Grade of Concrete and size of aggregtae for Slump 125-150 (Rounded Aggregate)
F.A (kg/cum)
1200
1000
800
600
400
200
0
10
20
40
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40

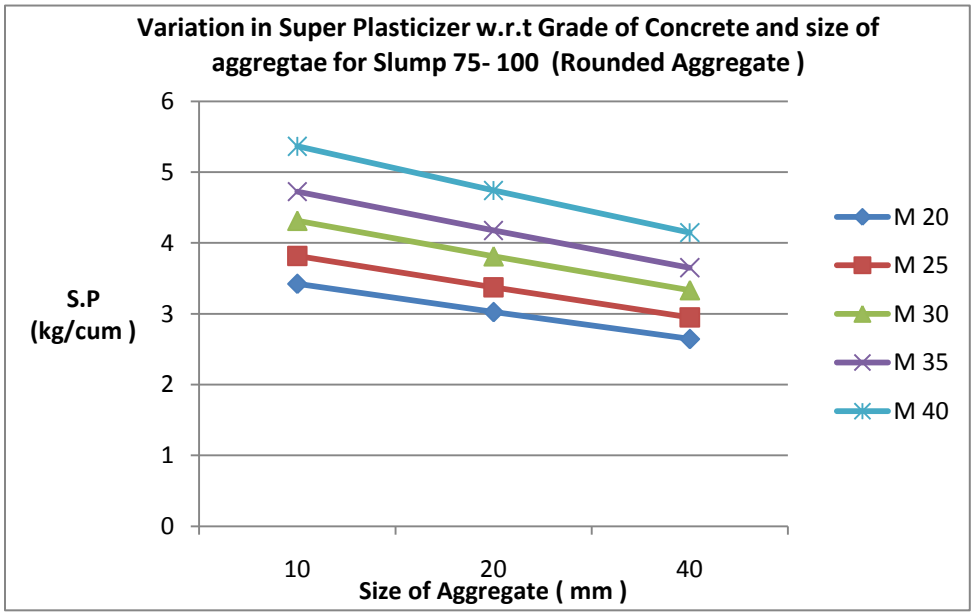

Variation in Fine Aggregate w.r.t Grade of Concrete and size of aggregtae for Slump 150 -175 (Rounded Aggregate)
F.A (kg/cum)
1200
1000
800
600
400
200
0
10
20
40
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40

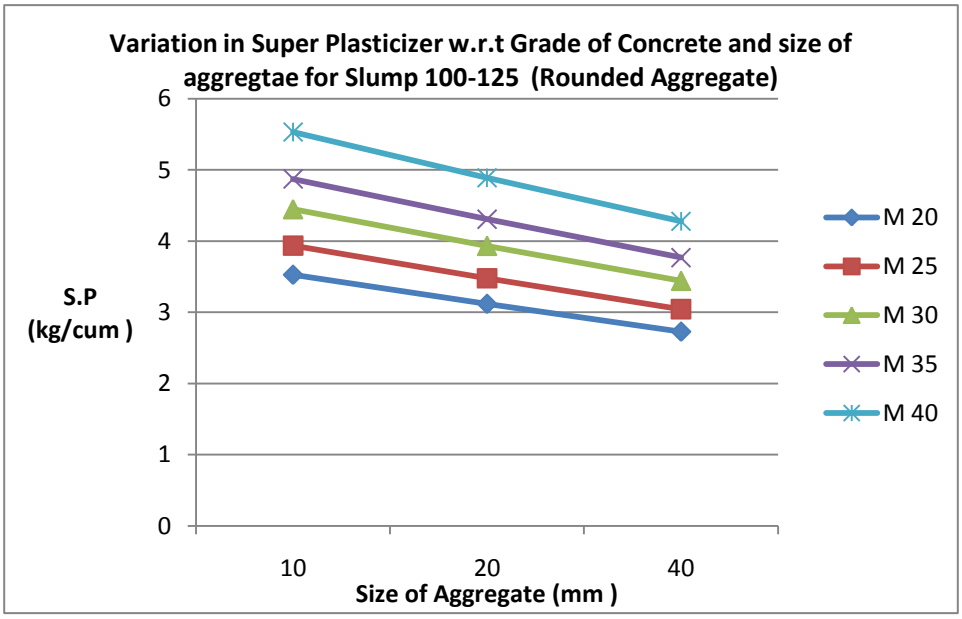

Variation in Fine Aggregate w.r.t Grade of Concrete and size of aggregtae for Slump 175-200 (Rounded Aggregate)
F.A (kg/cum)
1200
1000
800
600
400
200
0
10
20
40
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40

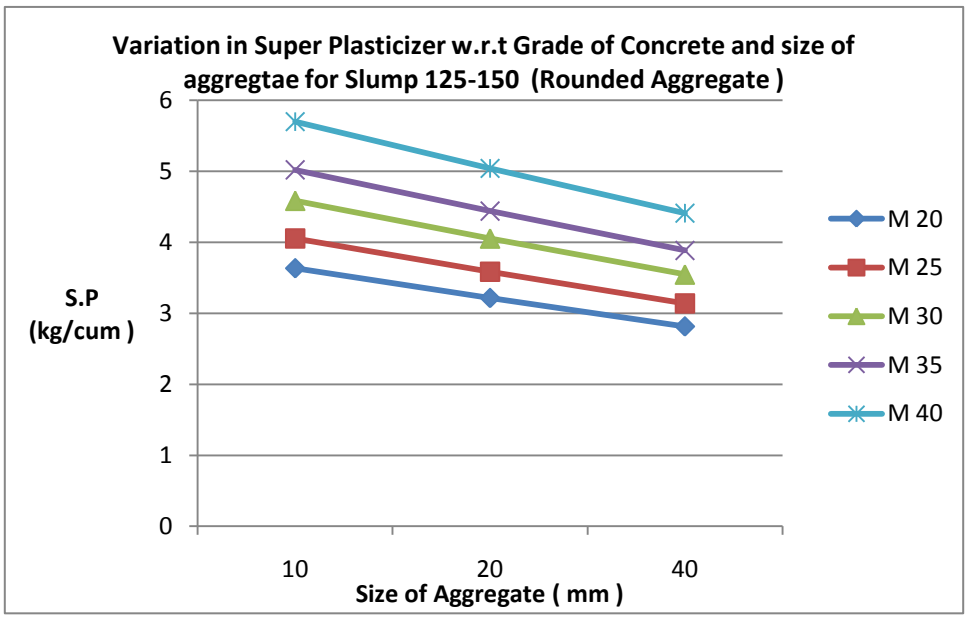

Variation in Super plasticizer w.r.t Grade of Concrete and size of aggregtae for Slump 0-25 (Rounded Aggregate)
S.P (kg/cum)
6
5
4
3
2
1
0
10
20
40
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40

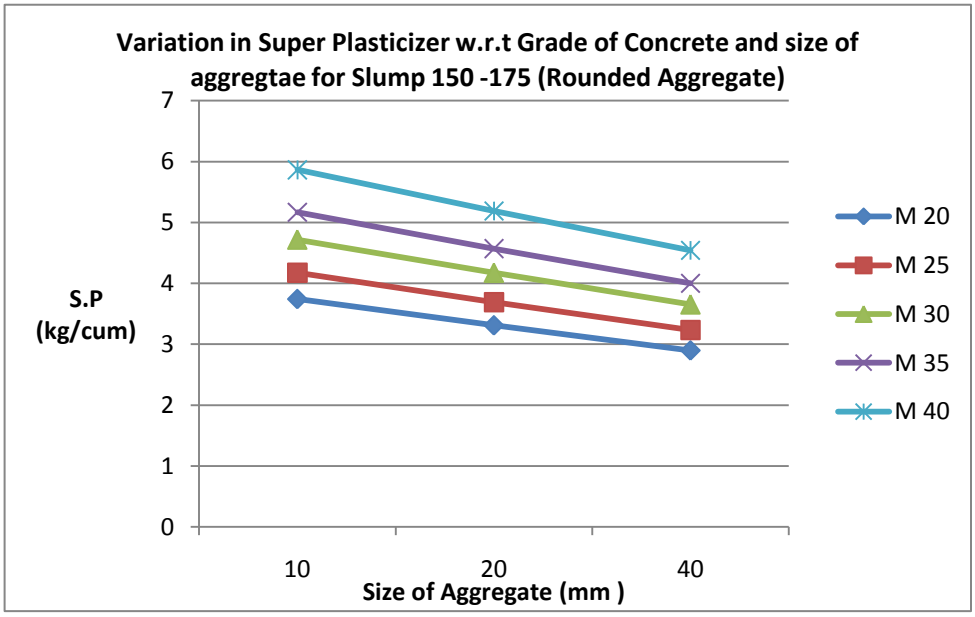

Variation in Super plasticizer w.r.t Grade of Concrete and Size of Aggregate for slump 25-50 (Rounded Aggregate)
S.P (kg/cum)
6
5
4
3
2
1
0
10
20
40
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40

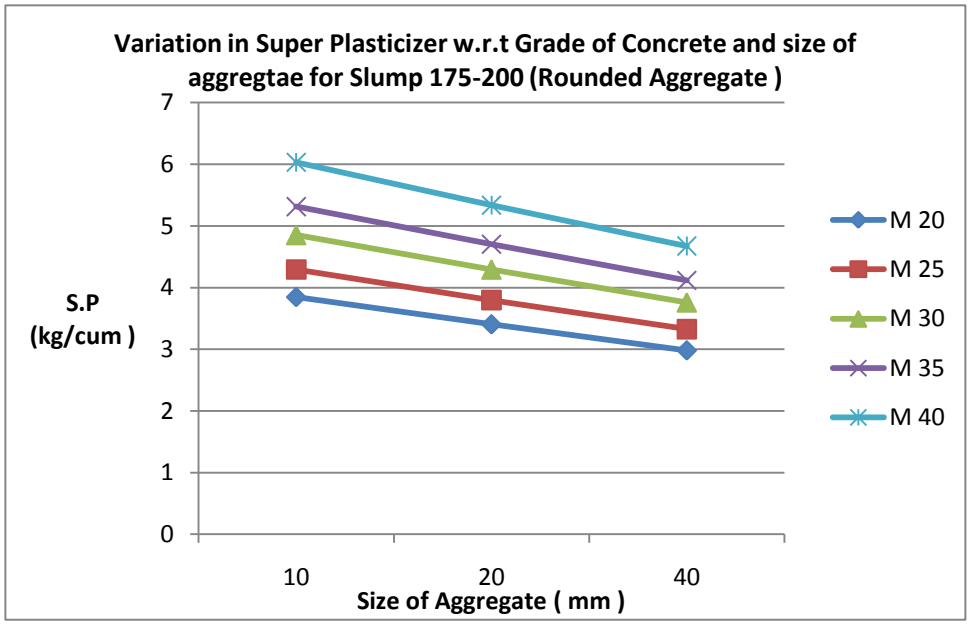

Variation in Super Plasticizer w.r.t Grade of Concrete and size of aggregtae for Slump 50-75 (Rounded Aggregate)
S.P (kg/cum)
6
5
4
3
2
1
0
10
20
40
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40


Variation in Super Plasticizer w.r.t Grade of Concrete and size of aggregtae for Slump 75- 100 (Rounded Aggregate)
S.P (kg/cum)
6
5
4
3
2
1
0
10
20
40
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40


Variation in Super Plasticizer w.r.t Grade of Concrete and size of aggregtae for Slump 100-125 (Rounded Aggregate)
S.P (kg/cum)
6
5
4
3
2
1
0
10
20
40
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40


Variation in Super Plasticizer w.r.t Grade of Concrete and size of aggregtae for Slump 125-150 (Rounded Aggregate)
S.P (kg/cum)
6
5
4
3
2
1
0
10
20
40
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40


Variation in Super Plasticizer w.r.t Grade of Concrete and size of aggregtae for Slump 150 -175 (Rounded Aggregate)
S.P (kg/cum)
7
6
5
4
3
2
1
0
10
20
40
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40


Variation in Super Plasticizer w.r.t Grade of Concrete and size of aggregtae for Slump 175-200 (Rounded Aggregate)
S.P (kg/cum)
7
6
5
4
3
2
1
0
10
20
40
Size of Aggregate (mm)
M 20
M 25
M 30
M 35
M 40

6.0 CONCLUSION

Following conclusions can be drawn :

1. The cement content in a concrete mix decreases with an increase the size of aggregates. It is shown more clearly for a better grade of concrete.
2. Amount of coarse aggregate increases with an increase in the size of aggregates for all the mixes. It is seen that for a particular size of aggregates, the amount of coarse aggregate is not very much different for different mixes.
3. Amount of the fine aggregate in a concrete mixes decreases with an increases in the maximum size of aggregate. It is seen that the minimum amount of fine aggregate is used for maximum grade for a particular for a maximum size of aggregate.
4. Amount of superplasticizer varies with the grade of concrete and maximum size of aggregate. Greater amount of superplasticizer is used for a higher mix if the maximum size of aggregate is increased; It leads to a decrease in the required amount of superplasticizer for a concrete grade.

5. The amount of cement for a particular value of desired slump decrease with the maximum size of aggregate while it is increases with an increase in the grade of concrete. The increase in the quantity of cement is less for the cases when lower grades are being upgraded.
6. The amount of cement for a particular slump and maximum size of aggregates is less for rounded aggregates compare to the angular ones.

7.0 REFERENCES

1. IS 456:2000 , Code of practice for Plain and Reinforced concrete.
2. SP 23 , Handbook on Concrete Mixes.