Engineering and construction assignment - lab report example

Engineering

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The type R signifies that the bar used for the link is the Plain Round Bar of Grade 250. The latest British Standards dictate other types which are R type for Ribbed bars of Grade 500 and S for Stainless steel. 2. The cover is provided so that the interaction of the steel with the environment can be reduced and to protect the steel reinforcement from corrosion and rusting. These environments can be any for instance the column of the bridge comes in interaction to the sea/river water which is corrosive and destroys the steel; therefore the strength of the structure is reduced. Secondly the reason for the cover is that it gives a good finished surface which can be painted and decorated easily. 3. 25 H 20 -6-200 B1 is the bar call up code, in this 25 is the bar no, H is the bar type/Class, 20 is the bar diameter, 6 is the earmark on the respective drawing, 200 is the spacing between the bars in mm and lastly B1 is the suffix. 4. The basic philosophy behind the bar shapes is to standardize the bending and shape process, this is done for several reasons, firstly this is done so that the reader or the working person should know what are the angles between the shapes, then what is the total length of the bar as we are well aware that the bending will cause a change in length that is reduced in the bend. Then the designer does so to facilitate the workers and the contractor, because a unusual shape might be very difficult to fabricate and will require additional cost and time. 5. There are several ways to maintain the clear cover in concrete; this normally depends on the type of component we are concreting. The spacer plates/ bars are attached to the reinforcement in between the shuttering and steel. Then another spacer way is to provide the spacer chairs, and lift the mesh of the reinforcement to a

desirable height. Another way is to provide plastic sheeting and metal tip spacer chairs. 6. a) coarse aggregate = 122. 4 Kg b) fine aggregate = 81. 6 Kg c) cement = 40 Kg d) water = 22 Kg 7. At SSD conditions the Water cement ratio of the concrete is (weight of water / weight of cement) is w/c = 22/40 = 0. 55. SSD stands for Saturated Surface Dry , this is a condition of an aggregate in which the aggregate is immersed in water for some time and let it soak as much water as it can, this results into filling of all the pores in the aggregate and then after this the aggregate are dried from the surface so that no additional water remains on the surface. This condition of the aggregate is of vital importance, as we know that dry aggregate soak water so when they are used in directly in concrete they will absorb the water of the concrete which was supposed to be used in the hydration of cement and concrete as whole, eventually we have to increase the water cement ratio, but this ratio is almost impossible to maintain. Where as if the due required water is not provided this will result into lesser ultimate strength and the concrete might have microcracks in it. On the other hand if the saturated aggregates are not surface dried then this will firstly result into increase in water which will decrease the strength of the concrete and secondly there will be a water film that will be developed at the surface of the aggregate and the due bond between the cement and the aggregate will not be developed. 8. The form should be cleaned before the concrete is to be poured. The reason for this primarily is simple but very important in essence. The primary reason is that any unrequired material in the form will be added to the concrete hence disturbing the mix design and eventually disturbing the strength of the concrete. Secondly of the is some material in the

formwork and when the concrete is poured this material clings with the surface of the concrete. This will affect in two adverse ways firstly there is chance that the clear cover is breached and the reinforcement might be naked when the alien material is taken off, secondly the due required smooth surface of the concrete will not be acquired, resulting into additional cost on the maintenance and repair. 9. There are few indications that compaction process is complete, firstly that there is no decrease in the height of the concrete, secondly that there is no strong shaking in the concrete and thirdly that the water starts to appear on the surface of the concrete and a water film is formed at the top if the vibration is not stopped at this point there will be segregation in the concrete. 10. The basic mechanism that takes place when the concrete is compacted is that the density of the concrete is increased and as we are well aware that the higher the density higher will be the material presence in the specific shape, hence higher will be the resistance offered to any loading therefore higher will be the strength. Concluding that compaction is directly proportional to strength of the concrete. Then the compaction process eliminates the air voids in the concrete and it is to be noted that the these air voids aids the failure crack propagation and its is seen that the failure planes normally pass through these air voids. Hence in order to reduce the air voids and increase the strength compaction must be done. 11. 15mm is a clear cover that is normally used for ordinary construction, normal environmental conditions and common loading. As we are aware of the fact that the bridges interaction with extraordinary loadings and environmental conditions. As bridges are made on rivers and seas where the temperature variation is very

high and these results into excessive freezing and thawing cycles hence the concrete can spall off the surface of the beams making the reinforcement naked. Then the moist and corrosive nature of the air around a bridge results into excessive corrosion of steel reinforcement. Hence the requirement of the cover is more in case of a structure such as a bridge. It is suggested that the cover must be more than 50mm. 12. The procedures for concrete cube making are given in British Standard (BS) 1881: 1983 Testing Concrete and the size of the cube forms are 150 x 150 mm and the basic reason for this to standardize the test and the result can be validated. The process is long and there are several points where care if of utmost importance for the validity of the test results. First of the entire cube forms must be cleaned and it should be ensured that surfaces of the cubes are clean. Then the faces of the cube must be oiled so that while extraction of the concrete sample later can be made easily. Then the sample of the concrete must be brought near the cubes and the cubes must be filled with appropriate apparatus such as scoops. Now the concrete is laid into the cube moulds in layers normally three layers and after laying each layer it should be compacted. The general procedure of compaction is hammering by a Rod this is a steel rod of 380 mm length steel bar, weighs 1. 8 kg and has a 25 mm square end for ramming. The minimum number of strokes per layer required to produce full compaction will depend upon the workability of the concrete, but at least 35 strokes will be necessary. It must be noted that there will be three no of layers. Then eventually the top surface is planed and evened by using the straight edge or appropriate apparatus. Then a mark is left in the cube sample so that the mould can be retrieved later, this can be done by several

ways which include engraving the date and specimen no the sample with a pointed edge or just stick a small page on the concrete with the details on it. Lastly is the curing of the sample, which must be done in a curing tank if the sample is to be immersed in the water fully or it can be done by placing the sample in moist room with a humidity level of more than 95 %. The process of curing will need some time and after which the sample is retrieved and then after drying placed into the compression machine for the test. 13. Depth to reinforcing = d = 280 mm = 0. 28 m Beam width = b = 150 mm = 0. 15 m Reinforcing steel area = As = 402 mm2 = 4. 02 x 10-4(2 no 16 bars) Concrete compressive strength = f'c = 20 MPa Reinforcing yield strength = fy = 500 MPa Calculation of Moment Capacity of the member a. Solve for a using the ? F = 0. As fy = a b ? 1 f'c 4. 02 x 10-4 (500) = a (0. 15)(0. 85)(20) a = 0. 0788 m = 78. 8 mm b. Es = Ey = 500 / 200, 000 = 0. 0025 c. Determine moment from force couple ?? Mn = ?? Asfy (d - a / 2)?? Mn = 0. 9(402)(500)(280 – 78. 8 / 2) x 10-6 ?? Mn = 43. 52 kN. m Reaction forces at the support = P/2 + 1. 08 kN Max moment = Area under Shear force diagram Max Moment = (P/2 + P/2 +1. 08)(1)(0. 5) = P/2 +0. 56 kN. m Therefore P/2 +0. 56 = 43. 52 P = 85. 92 kN