Chapter 1 : Transportation Engineering Lab Manual

Lab Manuals for Transportation Engineering 1 - TE1 10 Classroom notes, Engineering exam notes, previous year questions for Engineering, PDF free download.

Jayashree Sengupta See discussions, stats, and author profiles for this publication at: Jayashree Sengupta Retrieved on: Department of Civil Engg. Highway Engineering Lab Experiment No: To determine the aggregate impact value of coarse aggregate. The property of a material to resist impact is known as toughness. Due to movement of vehicles on the road the aggregates are subjected to impact resulting in their breaking down into smaller pieces. The aggregates should therefore have sufficient toughness to resist their disintegration due to impact. This characteristic is measured by impact value test. The aggregate impact value is a measure of resistance to sudden impact or shock, which may differ from its resistance to gradually applied compressive load. The machine consists of a metal base. A detachable cylindrical steel cup of internal diameter A metal hammer of weight between An arrangement for raising the hammer and allow it to fall freely between vertical guides from a height of 38cm on the test sample in the cup. Then it is tamped 25 times. The test sample is subjected to a total of 15 such blows each being delivered at an interval of not less than one second. The crushed aggregate is then removed from the cup and the whole of it is sieved on 2. The fraction passing the sieve is weighed accurate to 0. Repeat the above steps with other fresh sample. S sieve be gm. Total weight of aggregate sample filling the cylinder 1. Also the tampering should be uniform over the surface of the aggregate taking care that the tamping rod does not frequently strike against the walls of the mould. Aggregate impact value is used to classify the stones in respect of their toughness property as indicated below in Table 1. Abrasion is a measure of resistance to wear or hardness. It is an essential property for road aggregates especially when used in wearing course. Due to the movements of traffic, the road stones used in the surfacing course are subjected to wearing actions at the top. When traffic moves on the road the fine particle dust, soil etc which comes between the wheel and road surface causes abrasion on the road stone. The principle of Los Angeles abrasion test is to produce the abrasive action by use of standard steel balls which when mixed with the aggregates and rotated in a drum for specific number of revolutions also causes impact on aggregates. The percentage wear of the aggregates due to rubbing with steel balls is determined and is known as Los Angeles Abrasion Value. It consists of a hollow steel cylinder, closed at both the ends with an internal diameter of mm and length mm and capable of rotating about its horizontal axis. A removable steel shaft projecting radially 88 mm into cylinder and extending full length i. The shelf is placed at a distance mm minimum from the opening in the direction of rotation. Cast iron or steel balls, approximately 48 mm in diameter and each weighing between to g; 6 to 12 balls are required. S sieve, the material is first separated into two parts and the finer position is taken out and sieved further on a 1. S sieve after the test be gm. Weight of Specimen, W1 gm Weight of specimen after abrasion test, 2. Standard specification of Los Angeles abrasion values is also available for various types of pavement constructions. Los Angeles abrasion Types of pavement layer No. To determine water absorption of the given aggregate sample. Water absorption gives an idea of strength of aggregate. Aggregates having more water absorption are more porous in nature and are generally considered unsuitable unless they are found to be acceptable based on strength, impact and hardness tests. In case it is necessary to transfer the basket and the sample to a different tank for weighing, they should be jolted 25 times as described above in the new tank to remove air before weighing. The basket and the aggregate are then removed from water and allowed to drain for a few minutes, after which the aggregates are transferred to one of the dry absorbent clothes. Then the aggregates are transferred to the second dry cloth spread in a single layer, covered and allowed to dry for at least 10 minutes until the aggregates are completely surface dry. At least two tests should be carried out, but not concurrently. Description Trial 1 Trial 2 Average No. Weight of saturated aggregate suspended in water 1. Weight of basket suspended in water, W2 gm Weight of saturated aggregate in water , 3. W4 gm Weight of water equal to the volume of the 5. To determine the flakiness Index and elongation index of a given aggregates sample. The particle shape of aggregate is determined by the percentages of flaky and elongated particles contained in it. In case of gravel it is determined by its Angularity

Number. Flakiness and Elongation tests are conducted on coarse aggregates to assess the shape of aggregates. Aggregates which are flaky or elongated are harmful to higher workability and stability of mixes. They are not favorable to good interlocking and hence the mixes with an excess of such particles are difficult to compact to the required degree. For base coarse and construction of bituminous and cement concrete types, the presence of flaky and elongated particles are considered undesirable as they may cause inherent weakness with probabilities of breaking down under heavy loads. Rounded aggregates are preferred in cement concrete road construction as the workability of concrete improves. Angular shape of particles are desirable for granular base coarse due to increased stability derived from the better interlocking when the shape of aggregates deviates more from the spherical shape, as in the case of angular, flaky and elongated aggregates, the void content in an aggregate of any specified size increases and hence the grain size distribution of the graded aggregates has to be suitably altered in order to obtain minimum voids in the dry mix or the highest dry density. The test is not applicable to sizes smaller than 6. The elongation test is not applicable to sizes smaller than 6. Similarly the weights of the fractions passing and retained on the specified sieves be , , , etc. To determine California Baring Ratio C. The California Bearing Ratio C. The results obtained by these tests are used with the empirical curves to determine the thickness of pavement and its component layers. The CBR is a measure of resistance of a material to penetration of standard plunger under controlled density and moisture conditions. The CBR test may be conducted in remoulded or undisturbed specimen in the laboratory. The test is simple and has been extensively investigated for field correlations of flexible pavement thickness requirement. The test is conducted by causing a cylindrical plunger of some diameter to penetrate a pavement component material at 1. The loads, for 2. This load is expressed as a percentage of standard load value at a respective deformation level to obtain C. One annular metal weight and several slotted weights weighing 2. With a capacity of at least kg and equipped with a movable head or base that travels at an uniform rate of 1. Complete with load indicating device. For light compaction, compact the soil in 3 equal layers, each layer being given 55 blows by the 2. For heavy compaction compact the soil in 5 layers, 56 blows to each layer by the 4. Then the whole mould is placed in water tank for soaking. The initial dial gauge reading is recorded and the test set up is kept undisturbed in the water tank to allow soaking of the soil specimen for four full days or 96 hours. The mould with base plate is placed under penetration plunger of the loading machine. The dial gauge of the proving ring and the penetration dial gauge are set to zero. The load is applied through the penetration plunger at a uniform rate of 1. The load readings are recorded at penetration readings of 0. The maximum load value and the corresponding penetration value are recorded. The proving ring calibration factor is noted so that the load dial values can be converted into load in kg. Then the CBR value is calculated from the formula: Generally the CBR value at 2. However if higher CBR value is obtained at 5. If the value at 5. Calibration factor of the proving ring 1 Div. The load penetration curve is plotted taking penetration value on x-axis and Load values on Y-axis. If the initial portion of the curve is concave upwards, apply correction by drawing a tangent to the curve at the point of greatest slope and shift the origin. Find and record the correct load reading corresponding to each penetration. To determine the Specific gravity of given Bituminous material. The density of a bitumen binder is a fundamental property frequently used as an aid in classifying the binders for use in paving jobs. In most applications, the bitumen is weighed, but finally in use with aggregate system, the bitumen content is converted on volume basis. Thus an accurate density value is required for conversion of weight to volume. The specific gravity is greatly influenced by the chemical composition of binder. Increased amount of aromatic type compounds cause an increase in the specific gravity. The specific gravity bottle containing distilled water is now weighed. Let this be W2 gm.

Chapter 2 : Construction and Materials Manuals

Civil Engineering Department Transportation Engineering The elongation index of an aggregate is the percentage by weight of particles whose greatest dimension (length) is greater than 1 and 4/5 th times (1.

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Chapter 4 : NPTEL :: Civil Engineering - Transportation Engineering I

Civil v Transportation Engineering Unit 1,2,3,4,5,6,7,8. Transportation Engineering - Lab Manual-Passenger-Car Equivalents for Trucks and Buses on Specific Upgrades.

Chapter 5 : Lab Manuals for Transportation Engineering 1 - TE1 By joji babu

transportation engineering lab manual b e Ahsanullah University of Science and Technology January, 2 Preface This manual presents the standardized test procedures.

Chapter 6 : Department of Civil Engineering, IIT Delhi

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