

STONES 1.0 Introduction: All the building structures are composed of different types of materials. The grading of aggregates are done by the following methods (i) By trail – In this method, proportionating of aggregates as to give heaviest weight for same volume, yield the densest concrete (ii) By finesse modulus method (sieve analysis method): in this method, the samples of both coarse and fine aggregates are passed through a set of nine standard sieve and the percentage of sample retained on each of the said sieves is determined. Sedimentary rock: It is available in a variety of forms which differ from one another in colour Compaction, texture, hardness and durable a. Compact lime stone b. Granular lime stone c. Magnesia lime stone d. Kanker lime stone f. Used for paving, road metal, etc

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www.EasyEngineering.net Stones Page 7 1.4.5 Marble 1. Selection of stones In contemplating the use of stone for various engineering works, the selection of the nature and quality of stone is governed by the purpose in view, cost of stone, its ornamental value and durability Suitability various types of stones for different purposes and situation is briefly discussed below a. For face work, in general marble, granite and close-grained sand stone are used in the form of thin slabs (veneers) where the structure subjected to adverse weather effects. b. For pillars, balustrade, pedestals, columns statues and door and window sill and paving stone, granite marble and Downloaded From : www.EasyEngineering.net Downloaded From : www.EasyEngineering.net www.EasyEngineering.net Page 8 Building Materials & Construction compact lime stone can be recommend because they can take good polish. The total of these percentages divided by 100 gives the finesses modulus of sample (iii) By minimum voids method: This method is based on the fact, that so obtain dense concrete the quantity of cement should also be slightly in excess of voids more that the fine aggregates. 5. Misalliances: Stones are also used for (i) ballast for railways (ii) flux in blast furnace (iii) Blocks in the construction of bridges, piers, abutments, retaining walls, light houses, dams etc. f. For railway ballast, the stone should be hard, dense, durable, tough and easily workable sandstone, compact lime stone, trap and quartzite are commonly used g. In situation like steps, doors sills, pavings etc where there is a regular flow of traffic, stone should be hard, dense, easily workable and durable. d. For bridges, piers, docks, break-waters and other marine structures the stone should be very hard, heavy, strong and durable granite and gneiss are recommended for this purpose e. For road metal, stones should be hard, tough, resistant to abrasion and durable. The presence of clay or dirt coating prevents the adhesion of cement on the surface of aggregates and ultimately retards the setting and hardening of cement and reduces the strength, durability and soundness of concrete. Downloaded From : www.EasyEngineering.net Downloaded From : www.EasyEngineering.net www.EasyEngineering.net Page 2 Building Materials & Construction a. Igneous rocks: Rocks that are formed by cooling of Magana (molten or pasty rocky material) are known as igneous rocks. Basic material: Stones are disintegrated and converted to form a basic material for cement concrete, morum of roads, calcareous cements, artificial stones, hallow blocks etc. Coarse aggregates usually obtained by crashing granite, gneiss, crystalline lime stone and good variety of sandstone etc. Downloaded From : www.EasyEngineering.net Downloaded From : www.EasyEngineering.net www.EasyEngineering.net Stones Page 11 Grading the aggregates is so graded as to have minimum voids when mixed with all ingredients, and water should render a concrete mass of easy workability. According to this, the rocks are

classified into three types a. Stratified Rocks: These rocks possess planes of stratification or cleavage and such rocks can be easily split along these planes Ex: sedimentary rocks b. An stratified rocks: The structure may be crystalline granular or compact granular. Suitable for decorative works, wall lining columns, pile, table slabs, hearths, tiled floors, steps of stair case etc.

1.7 Aggregates – Grading: Aggregates is derived from igneous, sedimentary and metamorphic rocks or is manufacture from clays, slag etc. The properties of concrete are directly related to those of its constituents and should be hard, strong, Downloaded From : www.EasyEngineering.net Downloaded From : www.EasyEngineering.net www.EasyEngineering.net Page 10 Building Materials & Construction durable, and free from clay, loam, vegetables and other such foreign matters. In addition to material economy, the correct use of material results in better structural strength, functional efficiency and esthetic appearance

1.1 Classification of Rocks: Building stones are obtained from rocks occurring in nature and classified in three ways. Toughness Index: Impact test, the value of toughness less than 13 – Not tough, between 13 and 19 – Moderate, greater than 19– high

1.4 Characteristics of stones In order to ensure suitable selection of stone of particular work, one must be conversant with its composition, characteristics, uses and place of availability. Used for ornamental, road metal, railway ballast, aggregate for concrete; for construction of bridges, piers and marine works etc. It should not contain more than 1 to 8% of fine particles, which may be obtained from sea, river, lake or pit may be used as fine aggregates but care should be taken all its impurities must be removed (ii) Coarse Aggregates: The material whose particles are of such size as are retained on 4.75mm, I.S sieve are called coarse aggregates. Grading of Aggregates: Grading of aggregates consists of proportionating the fine and coarse aggregates in such a ratio, so as to get strongest and densest mix with the least amount of cement. It is very essential for a builder, may be an architecture or engineer or contractor, to become conversant thoroughly with these building materials. Structure: Stones are used for foundations, walls, columns, lintels, arches, roofs, floors, damp proof course etc. Examples: gravel, sandstone, limestone, gypsum, lignite etc. Artificial stones may take up various forms such as a. Cement concrete: This is the mixture of cement, fine aggregates, coarse aggregates and water. Crushed hard stone and gravel is the common materials used as coarse aggregates for structural concretes. In this method the voids in the fine and coarse aggregates are separately found out with the help of graduated cylinder and water. The knowledge of different types of material, their properties and uses for different purposes provides an important tool in the hands of the builders in achieving economy in material cost. Examples: Quartzite, Schist, Slate, Marble and Gneisses. Downloaded From : www.EasyEngineering.net Downloaded From : www.EasyEngineering.net www.EasyEngineering.net Stones Page 3

a. Siliceous rocks: In these rocks, silica is predominates. Downloaded From : www.EasyEngineering.net Downloaded From : www.EasyEngineering.net www.EasyEngineering.net www.EasyEngineering.net Page 4 Building Materials & Construction

1.3 Qualities of a good building stone: The following are the qualities or requirements of a good building stone. The factors like heat and cold alternative wet and dry, dissolved gases in rain, high wind velocity etc affect the durability. Texture: A good building stone should have compact fine crystalline structure should be free from cavities, cracks or patches of stuff or loose material. It is available in variety of formations fine grained, coarse grained compact or porous

3.c. For ornamental works such as moulding

and carvings, fine grained sand stone, fine grained marble and fine grained granite are used. It may be cast in site Downloaded From : www.EasyEngineering.net Downloaded From : www.EasyEngineering.net Stones Page 9 or pre-cast if steel is used with cement concrete, it is known as reinforced cement concrete. Cavities may be kept in artificial stones to convey pipes, electric wires etc. Depending upon their size, the aggregates are classified as (i) Fine Aggregative (ii) coarse aggregates. Eg: Granite, Basalt and Dolerite etc. b. Sedimentary rocks: these rocks are formed by the deposition of production of weathering on the pre-existing rocks. Paving stones: These are used to cover floor of building of various types such as residential, commercial, industrial etc. Appearance: Good building stone should be a uniform colour, and free from clay holes, spots of other colour bands etc capable of preserving the colour for longtime. Composed of quart, felspar and mica and minerals 3. Specify gravity 2.7 and compressive strength 700 to 1300 kg/cm² 8. Downloaded From : www.EasyEngineering.net Downloaded From : www.EasyEngineering.net www.EasyEngineering.net Page 6 Building Materials & Construction 1.4.2 Balast 1. Specific gravity is 3 and compressive strength varies 1530 to 1890 kg/cm². Used for ornamental, rail road ballast, aggregates for concrete etc. Used for providing damp proof course, paving dados etc 1.5. Basalt and coarse-grained granite are generally recommended for this purpose. It is used for bathrooms residential buildings, temples etc. Grooves can be kept in artificial stone while it is being cast which are useful for fixing various fittings. It can be made in a single piece and hence trouble of getting large blocks of stone for lintels, beams etc is avoided. Natural bed is absent in artificial stones and hence, the question of taking precautions with respect to the natural bed of stones does not arise. Examples: Igneous rocks and Sedimentary rocks affected by movements of the earth. The rocks are hard; durable and not easily effected by weathering agencies. c. Calcareous rocks: In these rocks, calcium carbonate predominates. The durability to these rocks will depend upon the constituents present in surrounding atmosphere. They are also adopted to form paving of roads, foot paths etc. Non absorbent, compact fine grained and produce metallic ringing sound when struck 2. b. Mosaic tiles: Pre-Cast concrete tiles with marble chips at top surface are known as tiles. c. Terrazo : This is a mixture of marble chips and cement. The maximum size may be 23mm for mass concrete such as dams etc. Ex: Granite, Quartzite, etc. Ex: slates, Laterites etc. Ex: Lime Stone, marble etc. Wall are of bricks and facing is done in stones of desired shades. Crushing strength: For a good building stone, the crushing strength should be greater than 1000kg per cm² . Sandstone, Argillaceous stone resists fire quite well 8. Downloaded From : www.EasyEngineering.net Downloaded From : www.EasyEngineering.net www.EasyEngineering.net Stones Page 5 10. Water absorption: For a good building stone, the percentage absorption by weight after 24 hours should not exceed 0.60. Compressive strength is 650kgs / cm² 6. Marble, slates and sand stones are commonly use in such places. (i) Fine Aggregates: The material, most of when passes through 4.75mm I.S. sieve size, is termed as fine aggregates. Geological classification 2. Chemical classification I. Geological Classification: According to this classification, the rocks are of the following types. These rocks are formed by the change in character of the pre-existing rocks. Igneous as well as sedimentary rocks are changed in character when they are subject to great heat and pressure. II. Physical Classification: This classification based on general structure of rocks. c. Foliated Rocks: These

rocks have a tendency to split up in a definite direction only. Chemical Classification: According to this classification rocks are classified into three types. b. Argillaceous Rocks: In these rocks, clay predominates. The rocks may be dense and compact or may be soft. This is known as composite masonry. Durability: A good building stone should be durable. It is between 14 to 17, medium hardness, less 14 said be poor hardness. Seasoning: Stones should be well seasoned before putting into use. High .resistance to weathering 6. Physical classification 3. III. 1. 3. 4. 1. 2. 3. 4. 5. 6. 7. 11. 12. 5. 4. 3. 2. 3. 5