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Get Access to: Ask & get answers from experts & other users Play Quiz and test your skills Free Download eBooks, Notes, Templates, etc. Study Materials Latest Articles Have an account? Sign In Flakiness and Elongation Index Test are very important tests to be performed on aggregate in the laboratory. This test gives the percentage of flaky and
elongate aggregate present in the total aggregate sample. Aggregate shape, size, and surface texture majorly affect the properties of freshly mixed concrete than the properties of freshly mixed concrete the
compact aggregate. Also, such irregular-shaped aggregate, when used in the construction of pavement must also be increased to maintain the water-cement ratio. Elongated and flaky aggregate, when used in the construction of pavement must also be increased to maintain the water-cement ratio. Elongated and flaky aggregate, when used in the construction of pavement must also be increased to maintain the water-cement ratio. Elongated and flaky aggregate, when used in the construction of pavement must also be increased to maintain the water-cement ratio.
of flaky and elongated aggregate within permissible levels. Generally, flaky and elongated aggregate is the % by weight of the total aggregate is the % by weight of the particles (aggregates) whose thickness
is less than 3/5th(0.6 times) of their mean dimension. The Elongation index of aggregate is the % by weight of the particles (aggregates) whose length is greater than 1 and 4/5th (1.8 times) of their mean dimension. This method uses to measure the Flakiness Index and Elongation index of aggregate use in the construction of Highway pavement and
concrete structures. Reference:- IS 2386 (Part 1) 1963 PDF. The balance used to measure the aggregate has sufficient capacity. Its accuracy is 0.1% of the weight of the test sample. The metal gauge used to measure the thickness/elongation is looked like this figure shown below: The IS Sieves: 63 mm, 50 mm, 40 mm, 31.5 mm, 25 mm, 20 mm, 16
mm, 12.5 mm, 10 mm, 6.3 mm. SIZE OF AGGREGATESPASSING THROUGH IS SIEVESRETAINED ON IS SIEVETHICKNESS GAUGELENGTH GAUGE123463 MM50 MM31.5 MM19.50 MM58.5 MM31.5 MM25 MM16.95 MM25 MM20 MM13.50 MM40.5 MM20 MM16 MM10.80 MM32.4 MM16
MM12.5 MM08.55MM25.6 MM12.5 MM06.75 MM20.2 MM10 MM06.75 MM20.2 MM20.2 MM10 MM06.75 MM20.2 M
aggregate sample for the test by sieving between IS sieve 6.3 mm size at the bottom and 63 mm IS sieve at top. A separate sample retains on each sieve. The collected aggregate sample should have at least 200 numbers of individual aggregate sample retains on each sieve.
mm IS Sieve. (Separate test can be conducted on each range of Flakiness gauge slot. Try to pass the aggregate width-wise through the slot of 10mm to 6.3 mm on a flakiness gauge. A separate sample passed through this slot
and weight (W2) Note: Test can be conducted for each range of Flakiness gauge slot. Passing through IS sieve(mm)Retained on IS sieves(mm)Flakiness Gauge(mm)Weight passing on Flakiness Gauge
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(W1) = (W2/W1) x 100 For example, Weight of aggregate passed through width gauge of 10 mm to 6.3 mm (W2) = 200 gm and Total weight of aggregate in the range of 10 mm to 6.3 mm is 20%. Read More: Abrasion Test on Aggregate (Los
Angeles Test) The Following is the procedure for elongation index, Try to pass the aggregate length-wise through the slot of 10mm to 6.3 mm on the length gauge slot. Passing through IS sieve(mm)Retained on IS
sieves(mm)Elongation Gauge(mm)Weight retain on length Gauge (W2)63MM50MM050MM40MM81.5MM25.6MM12.5MM25.6MM12.5MM20MM40.5MM20.2MM10MM20.2MM10MM20.5MM20MM40.5MM20.2MM10MM20.5MM20.3MM10.5MM20.2MM10MM20.2MM10MM20.2MM10MM20.2MM10MM20.2MM10MM20.2MM10MM20.3MM14.7MM Flakiness Index = weight of aggregate retained on length gauge of 10 mm to 6.3 mm (W2) / Sieves(mm)Elongation Gauge (mm)Weight retain on length gauge of 10 mm to 6.3 mm (W2) / Sieves(mm)Elongation Gauge (mm)Weight retain on length gauge of 10 mm to 6.3 mm (W2) / Sieves(mm)Elongation Gauge (mm)Weight retain on length gauge of 10 mm to 6.3 mm (W2) / Sieves(mm)Elongation Gauge (mm)Weight retain on length gauge of 10 mm to 6.3 mm (W2) / Sieves(mm)Elongation Gauge (mm)Weight retain on length gauge of 10 mm to 6.3 mm (W2) / Sieves(mm)Elongation Gauge (mm)Weight retain on length gauge of 10 mm to 6.3 mm (W2) / Sieves(mm)Elongation Gauge (mm)Weight retain on length gauge of 10 mm to 6.3 mm (W2) / Sieves(mm)Elongation Gauge (mm)Weight retain on length gauge of 10 mm to 6.3 mm (W2) / Sieves(mm)Elongation Gauge (mm)Weight retain on length gauge of 10 mm to 6.3 mm (W2) / Sieves(mm)Elongation Gauge (mm)Weight retain on length gauge of 10 mm to 6.3 mm (W2) / Sieves(mm)Elongation Gauge (mm)Weight retain on length gauge of 10 mm to 6.3 mm (W2) / Sieves(mm)Elongation Gauge (mm)Elongation Gauge 
Total weight of aggregate sample taken (W1) = (W2/W1) x 100 For example, the Weight of aggregate retained on length gauge of 10 mm to 6.3mm(W2) = 150 gm, and Total weight of aggregate Testing | 7 Test On Aggregate Sample = 1000 gm Elongation Index = (150 gm / 1000 gm) x 100 = 15% Read More: Aggregate Testing | 7 Test On Aggregate Sample = 1000 gm Elongation Index = (150 gm / 1000 gm) x 100 = 15% Read More: Aggregate Testing | 7 Test On Aggregate Sample = 1000 gm Elongation Index = (150 gm / 1000 gm) x 100 = 15% Read More: Aggregate Sample = 1000 gm Elongation Index = (150 gm / 1000 gm) x 100 = 15% Read More: Aggregate Sample = 1000 gm Elongation Index = (150 gm / 1000 gm) x 100 = 15% Read More: Aggregate Sample = 1000 gm Elongation Index = (150 gm / 1000 gm) x 100 = 15% Read More: Aggregate Sample = 1000 gm Elongation Index = (150 gm / 1000 gm) x 100 = 15% Read More: Aggregate Sample = 1000 gm Elongation Index = (150 gm / 1000 gm) x 100 = 15% Read More: Aggregate Sample = 1000 gm Elongation Index = (150 gm / 1000 gm) x 100 = 15% Read More: Aggregate Sample = 1000 gm Elongation Index = (150 gm / 1000 gm) x 100 = 15% Read More: Aggregate Sample = 1000 gm Elongation Index = (150 gm / 1000 gm) x 100 = 15% Read More: Aggregate Sample = 1000 gm Elongation Index = (150 gm / 1000 gm) x 100 = 15% Read More: Aggregate Sample = 1000 gm Elongation Index = (150 gm / 1000 gm) x 100 = 15% Read More: Aggregate Sample = 1000 gm Elongation Index = (150 gm / 1000 gm) x 100 = 15% Read More: Aggregate Sample = 1000 gm Elongation Index = (150 gm / 1000 gm) x 100 = 15% Read More: Aggregate Sample = 1000 gm Elongation Index = (150 gm / 1000 gm) x 100 = 15% Read More: Aggregate Sample = 1000 gm Elongation Index = (150 gm / 1000 gm) x 100 = 15% Read More: Aggregate Sample = 1000 gm Elongation Index = (150 gm / 1000 gm) x 100 = 15% Read More: Aggregate Sample = 1000 gm Elongation Index = (150 gm / 1000 gm) x 100 = 15% Read More: Aggregate Sample = 1000 gm Elongation Index = (150 gm / 1000 gm) x 100 = 15% Read More: Aggregate Sample = 100
percentage of flaky aggregate in the range of 10 mm to 6.3 mm is 15%. IRC recommended the Flakiness index value for road construction Wearing surface 15% lower granular layer 15%2 Concrete construction 3 Bituminous construction 25%4 Two
coat bituminous surface dressing 25%5 Bituminous macadam Base course 25%6 Dense bituminous macadam 35% The Flakiness Index is the percentage of particles are considered to be flaky, and can cause problems in
concrete by reducing the workability and increasing the amount of voids in the mix. The Elongation Index is the percentage of particles are considered to be elongated, and can cause problems in concrete by reducing the workability and
increasing the amount of voids in the mix. The Flakiness and Elongation Index Test is performed by sieving a sample of coarse aggregate through a set of standardized sieves, and then measuring the percentage of particles that are either flaky or elongated. You May Also Like Join TheConstructor to ask questions, answer questions, write articles, and
connect with other people. When you join you get additional benefits. Have an account? Sign In Elongation Index are both tests used to evaluate the shape and size of aggregates in construction materials. The Elongation Index are both tests used to evaluate the shape and size of aggregates in construction materials.
ratio to their average thickness. It helps determine the elongated or needle-like particles in the aggregate, which can affect the workability and strength of concrete. On the other hand, the Flakiness Index measures the percentage of particles in an aggregate sample that have a thickness less than a specified ratio to their average size. It identifies the
flat and elongated particles in the aggregate, which can impact the workability and durability of asphalt mixes. Both indices are crucial in assessing the quality of aggregates used in construction, two important parameters that are often
considered are the Elongation Index and Flakiness Index. These indices provide valuable information about the shape and size distribution of aggregates, which can impact the workability, strength, and durability of concrete and asphalt mixtures. In this article, we will explore the attributes of Elongation Index and Flakiness Index, highlighting their
significance and differences. Elongation Index is a measure of the elongated or elongated and flat particles retained on specified sieve sizes. The elongated particles have a length greater than their average thickness, while the flat particles
have a thickness less than their average length. The Elongation Index suggests that a significant portion of the aggregates and their suitability for various construction applications. A high Elongation Index suggests that a significant portion of the aggregates and their suitability for various construction applications. A high Elongation Index suggests that a significant portion of the aggregates and their suitability for various construction applications. A high Elongation Index suggests that a significant portion of the aggregates and their suitability for various construction applications. A high Elongation Index suggests that a significant portion of the aggregates and their suitability for various construction applications. A high Elongation Index suggests that a significant portion of the aggregates and their suitability for various construction applications.
concrete or asphalt mixtures. Elongated particles tend to interlock, resulting in a higher water demand and reduced flowability of the mixture. This can lead to difficulties in compaction and increased chances of segregation. Therefore, it is generally desirable to have a lower Elongation Index for aggregates used in high-quality construction
projects. On the other hand, a low Elongation Index indicates that the aggregate particles are more cubical or rounded, which enhances the workability of the mixture. Cubical or rounded particles are more cubical or rounded, which enhances the workability of the mixture.
of the final concrete or asphalt product. Flakiness Index, is a measure of particles in an aggregate sample. The Flakiness Index is expressed as a percentage by weight of the particles retained on specified sieve
sizes. Flat particles have a thickness less than their average width, while elongated particles in the aggregate sample. These particles have a tendency to align parallel to each other, resulting in reduced workability
and increased void content in the mixture. The presence of flat and elongated particles can also lead to a higher surface area, which may require more binder material to achieve adequate coating and bonding. Therefore, a lower Flakiness Index is generally preferred for aggregates used in high-quality construction projects. Conversely, a low
Flakiness Index suggests that the aggregate particles are more cubical or rounded, which can enhance the workability of the mixture. Cubical or rounded particles have a better ability to interlock, resulting in improved cohesion and reduced void content. This can contribute to better compaction and higher strength of the final
concrete or asphalt product. Comparison While both the Elongation Index and Flakiness Index provide insights into the shape characteristics of aggregates, there are some key differences between them. The Elongation Index focuses on the presence of elongated particles, while the Flakiness Index considers both flat and elongated particles. This
means that the Flakiness Index provides a broader assessment of particle shape, taking into account a wider range of potential shape-related issues. Another difference lies in the specific sieve sizes used for the calculation of each index. The Elongation Index is typically determined by measuring the weight of particles retained on elongation sieves,
which have specific dimensions to capture elongated particles. On the other hand, the Flakiness Index is determined by measuring the weight of particles retained on flakiness Index and Flakiness Index have different threshold values for acceptability
The acceptable limits for these indices may vary depending on the specific construction application and standards followed. However, in general, a lower Elongation Index and Flakiness Index are preferred for high-quality construction application and standards followed.
Elongation Index and Flakiness Index are not the only factors to consider when evaluating the quality of aggregates. Other parameters such as angularity, surface texture, and particle size distribution also play significant roles in determining the overall suitability of aggregates for specific applications. Therefore, a comprehensive assessment of
multiple parameters is necessary to make informed decisions regarding aggregates used in construction. While the Elongation Index and Flakiness Index considers both flat and elongated
particles. Both indices provide insights into the workability, compaction, and strength of concrete and asphalt mixtures. A lower Elongation Index and Flakiness Index are generally preferred for high-quality construction projects to ensure better performance and durability. However, it is important to consider other parameters such as angularity and
particle size distribution in conjunction with these indices to make well-informed decisions regarding aggregate selection. Comparisons may contain inaccurate information about people, places, or facts. Please report any issues. HomeAggregateBy -AdminJuly 30,
2020Update: May 18, 2024 The flakiness index of aggregate is defined as the percentage by mass of particles (stones) in it whose greatest dimension (thickness) is less thanthree-fifths of their average dimension (thickness) is greater
than one and four-fifths oftheir average dimension. Why is Flakiness and Elongation Index Test on Aggregate sample to estimate the shape of aggregates sample to estimate the shape of aggregates and bituminous-construction, the presentence offlakyand elongated aggregate
particles are considered undesirableas they may cause inherent weakness with possibility of breaking down underheavy loads. Thus, evaluation of shape of the aggregate particles, particularly in breaking down underheavy loads. Thus, evaluation of shape of the aggregate particles, particularly in breaking down underheavy loads. Thus, evaluation of shape of the aggregate particles, particularly in breaking down underheavy loads. Thus, evaluation of shape of the aggregate particles, particularly in breaking down underheavy loads. Thus, evaluation of shape of the aggregate particles, particularly in breaking down underheavy loads. Thus, evaluation of shape of the aggregate particles, particularly in breaking down underheavy loads. Thus, evaluation of shape of the aggregate particles, particularly in breaking down underheavy loads. Thus, evaluation of shape of the aggregate particles, particularly in breaking down underheavy loads. Thus, evaluation of shape of the aggregate particles, particularly in breaking down underheavy loads. Thus, evaluation of shape of the aggregate particles, particularly in breaking down underheavy loads. Thus, evaluation of shape of the aggregate particles, particularly in breaking down underheavy loads. Thus, evaluation of shape of the aggregate particles, particularly in breaking down underheavy loads. Thus, evaluation of shape of the aggregate particles, particularly in breaking down underheavy loads. Thus, evaluation of shape of the aggregate particles, particularly in breaking down underheavy loads. Thus, evaluation of shape of the aggregate particles, particularly in breaking down underheavy loads. Thus, evaluation of shape of the aggregate particles, particularly in breaking down underheavy loads. Thus, evaluation of shape of the aggregate particles, particularly in breaking down underheavy loads. Thus, evaluation of shape of the aggregate particles, particularly in breaking down underheavy loads. Thus, evaluation of shape of the aggregate particles, particularly in breaking down un
 Flakiness indexis expressedas their weight as a percentage of the weight of the sample tested. The Elongation indexof an aggregate sample is found byseparating the elongated aggregates by sieving. Elongation indexisexpressed as their weight as a percentage of the weight of the sample tested. The test flakiness indexof aggregate is not applicable to
 thematerials passing through the 6.30 mm IS test sieve or retained on the 63.00 mmIS test sieve while the test elongation indexof aggregate is measured onparticles passing through IS sieve size of 63mm and retained on IS sieve size of 63mm and retained on IS sieve size of 63mm. Hi friends, you are welcomed in the world of Civil Allied Gyan. Here I have explained about the flakiness and
elongation indextest of coarse aggregate. Read definition, apparatus, IS code, procedure, observations, formula, result, lab report about flakiness and elongationindex test of coarse aggregate. Save in pdf. Thickness gaugeLength GaugeWeighing balanceGauging trowelSievesIS: 2386 (Part 1)1963, Method of test of aggregates for formation of the same aggregate.
concreteIS: 3831970, Specification for coarse and fine aggregate fromnatural source for formation of concreteSieve the aggregate toprovide the minimum number of 200 pieces of any fraction to be tested. Then to separate the flaky materials, gauge each fraction for
thickness on a thickness gauge of the pattern shown in Fig 1or in bulk on sieves having elongated slots. The width of the slot used in the thickness gauge or sieve should be of the dimensions specified in column 4 of Table 1 for the appropriate size of material. Weigh the total amount of flaky material passing the gauge to an accuracy of at least 0.1
percent of the weight of thetest sample. Sieve the aggregate sample with sievesspecified in the given Table 2. Take sufficient quantity of aggregate toprovide the minimum number of 200 pieces of any fraction to be tested. Then to separate the elongated materials, gauge each fraction in tum for length on a length gauge of the pattern shown in Fig 2or
in bulk on sieves having flaky slots. The length gauge, used in the test, should be of the dimensions specified in column 4 of Table 2 forthe appropriate size of material. Weight the total amount of elongated aggregate retained by the length gauge to an accuracy of at least 0.1 percent of the weight of the test sample. Calculations and Observations:
Formula for flakiness indexofaggregate: X = The weight of material passing through thevarious thickness gauges andW = The weight of aggregate passing and retained on the specified length gauges andW = The weight of aggregate passing and retained on the specified sieves. Formula for elongation indexofaggregate passing and retained on the specified sieves.
on the specified sieves. Table 1: Dimensions of Thickness gauge Table 2: Dimensions of Length gauge Surface texture and aggregate shape influence the properties of hardened concrete more than the properties of hardened concrete than smooth,
rounded compact aggregates. Consequently, the cement contents must also be increased tomaintain the water-cement (W/C) ratio. Generally, flat and elongated aggregate particles are avoided or are limited to about 15 % by weight of the total aggregate. Recommended Values of Flakiness Index and Elongation IndexThe aggregate shape tests give
only a roughidea of the relative shapes of aggregate particles and elongated aggregate particles aggregated agg
Penetration macadam (iii) Bituminous surface dressing (single coat, double coats and precoated) (iv) Built up spray grout 15 3 (i) Bituminous macadam Angularity number test of aggregate Thanks for reading this article. Please, dont forget to share
 it. We all know that there are a variety of indices used to measure the quality of a material. Two of the most commonly used indices are the flakiness index and the elongation index. We will also explore how understanding and using these indices can help improve the quality of material production. Flakiness index and elongation index are two
important measures used to evaluate the quality of coarse aggregate. The flakiness index is a measure of the long, thin particles present in the same sample of aggregate, while the elongation index is
expressed as a ratio. The flakiness index is used to assess the potential for the aggregate to cause surface defects in concrete mixtures, while the elongation index, also known as the flat and elongated particle index, is a measure of
the shape of aggregate particles. It is calculated by dividing the length of the longest particle axis, giving a ratio that indicates how flat or elongated the particle is. In contrast, the flakiness index is a measure of the thickness of aggregate particles, calculated by dividing the thickness of the thinnest particle axis by the
thickness of the thickest particle axis. Therefore, the elongation index reflects the shape of the particles and the flakiness index are lects the thickness of the particle axis. Therefore, the elongation index are lects the thickness of the particle axis. Therefore, the elongation index are lects the shape of the particles and the flakiness index are lects the thickness of the particles.
two important metrics used to measure the particle size distribution of a material. The flakiness index is a measure of the amount of material that is long and thin. The flakiness index is a measure of the amount of material that is flat and thin, while the elongation index is a measure of the amount of material that is flat and thin, while the elongation index is a measure of the amount of material that is flat and thin, while the elongation index is a measure of the amount of material that is flat and thin, while the elongation index is a measure of the amount of material that is flat and thin, while the elongation index is a measure of the amount of material that is flat and thin, while the elongation index is a measure of the amount of material that is flat and thin, while the elongation index is a measure of the amount of material that is flat and thin, while the elongation index is a measure of the amount of material that is flat and thin, while the elongation index is a measure of the amount of material that is flat and thin, while the elongation index is a measure of the amount of material that is flat and thin, while the elongation index is a measure of the amount of material that is flat and thin, while the elongation index is a measure of the amount of material that is flat and thin, while the elongation index is a measure of the amount of material that is flat and thin, while the elongation index is a measure of the amount of material that is flat and thin, while the elongation index is a measure of the amount of material that is flat and thin, while the elongation index is a measure of the amount of material that is flat and thin, while the elongation index is a measure of the amount of material that is flat and thin, while the elongation index is a measure of the amount of material that is flat and thin, while the elongation index is a measure of the amount of material that is a measure of the elongation index is a measure of the material that is a measure of the elongation index is a measure of t
flat and thin by the total weight of the sample, while the elongation index is calculated by dividing the total weight of all the particles in the sample that are flat and thin by the total weight of the sample. The flakiness index is calculated by dividing the total weight of all the particles in the sample that are flat and thin by the total weight of the sample.
while the elongation index is calculated by dividing the total weight of all the particles in the sample. Both metrics are useful for assessing the quality of many materials, from sands and gravels to chemicals and minerals. The flakiness index is important for determining the strength of concrete,
 while the elongation index is important for assessing the suitability of a material for certain applications, such as filtration. Flakiness Index and Elongation Index are two important measurements for evaluating the quality of aggregates. The Flakiness Index are two important measurements for evaluating the quality of aggregates.
materials particles. ALSO READ: Difference Between Classical And Nonclassical Carbocation Together, these measures are used to determine the suitability of the material for its intended use. The Flakiness Index is especially useful for making sure that the
material is strong and durable. The Elongation Index is useful for materials that are used in construction applications, as it helps to ensure that the particles are strong and uniform. By using both measurements, the quality of the material can be accurately assessed, providing peace of mind to those who use it. Flakiness and elongation indexes are two
common measurements used to quantify the particles in comparison to their width, while the elongation index measures the ratio between the length and width of the particles. Both of these measurements are important for determining the suitability
of a material for a particular application, such as for use in construction or in the manufacture of the shape of the particles. In general, particles with higher flakiness and elongation indexes are usually more
suitable for use in construction or other applications. The difference between flakiness index and elongation index measures the shape of the particles in a material and the elongation index measures the shape of the particles. The flakiness index measures the shape of the particles in a material and the elongation index measures the shape of the particles.
maximum dimension larger than a certain size, with the total weight of the materials particles that have a maximum dimension larger than the same
size.ALSO READ: Difference Between All Terrain And Rough Terrain CraneThe elongation index, on the other hand, is determined by dividing the weight of the materials particles that have a maximum dimension larger than the same size. Both of
these indexes are used to evaluate the quality and consistency of a material. The main difference between flakiness index is used to measure the flatness of particles in a sample, while elongation index is used to measure the flatness index and elongation index is used to measure the flatness index and elongation index is used to measure the flatness index is used to meas
flatness of particles in aggregate, while elongation index is used to measure the shape of particles in aggregate materials. Susan Dziubinski: Hi, I'm Susan Dziubinski with
Morningstar. Inflation is making a comeback this year, in the new issue of Morningstar FundInvestor, editor Russ Kinnel unpacks a variety of direct and indirect hedges for inflation protection and whether they're worth owning. He's here today to share his take. Thanks for being here, Russ. Russ Kinnel: Glad to be here. Dziubinski: Let's start by first
 taking a step back and talk a little bit about what's going on with inflation today, and how big a risk it really is to certain types of investors. Kinnel: The latest reported inflation has definitely ticked up. It's up about 5% year-on-year, though of course a year ago, as you recall, the economy was hitting the brakes. So it's not a perfect number, but inflation today, and how big a risk it really is to certain types of investors. Kinnel: The latest reported inflation has definitely ticked up. It's up about 5% year-on-year, though of course a year ago, as you recall, the economy was hitting the brakes. So it's not a perfect number, but inflation has definitely ticked up. It's up about 5% year-on-year, though of course a year ago, as you recall, the economy was hitting the brakes. So it's not a perfect number, but inflation today, and how big a risk it really is to certain types of investors.
 acting like there's no inflation. So the bond market signals that the consensus is inflation risk? Kinnel: Really, it's the higher
quality ones, where a lot of your value is coming down the road when you get the payment at the end. And so that tends to be longer-term bond funds, higher-quality bond funds, higher-quality bond funds, they're more susceptible to rising inflation. Dziubinski: You talk in your article about two different types of funds that are considered to be more direct inflation hedges, the
on the CPI. So essentially, you're pretty much protected that you will get that interest rate, and then it will adjust for inflation. And so there are funds that you can really depend on--you're not going to get big yields, but at least you've got some
protection there. Dziubinski: And then a second direct inflation hedge that you talk about in your article are commodities funds. Let's talk a little bit about what they're investing in, and again how good of a job have they actually done protecting against inflation. Kinnel: That's right. Commodities
 course, commodities are far more vulnerable than TIPS. So if you own a TIPS fund, year-on-year you might have some ups and downs, but it's pretty mild-mannered. Commodities funds are very wolatile hedge, you have to be pretty careful in using it because it
really is one of the most volatile mutual fund types out there. So you definitely have to be careful, I think the best way to handle that is, if you're going to invest there, keep it at 5% or below of your portfolio, because you just don't want it dominating your portfolio. It's just really volatile. And the long-term returns lately have not been very good.
Obviously, that can change, but you definitely have to be careful there. Dziubinski: And then you talk about a couple of more indirect inflation hedges in your article one being bank-loan funds, let's talk a little bit about those, and under what environments bank-loan funds would do pretty well against inflation. Kinnel: Bank loans adjust for changes in
interest rates. So these are loans to corporations, almost all of them are below-investment-grade. And they adjust as interest rates change. Interest rates are loans to corporations, almost all of them are below-investment-grade. And then lastly, there are
gold funds. Let's talk a little bit about those. How good of a job they do against inflation; they seem to be another one of those boom-or-bust types of funds as you referred to earlier, right? Kinnel: Exactly. It's very extreme performance. They tend to do well when inflation rises, they tend to do well when the economy has a problem, there's some world
crisis. But they don't always do that. Sometimes they sell off sharply. So, it's fairly random. And of course, if commodities funds include gold as one component, having just gold is less great, I think as a hedge because it's only one component, having just gold is less great, I think as a hedge because it's only one component, having just gold is less great, I think as a hedge because it's only one component.
 again a limited one. Dziubinski: Well, Russ, thank you so much for your perspective on these inflation hedges and not-quite hedges today. We appreciate it. Kinnel: You're welcome. Dziubinski: I'm Susan Dziubinski: I'm Susan Dziubinski with Morningstar. Thanks for tuning in. Flakiness and Elongation Index Test are very important tests to be performed on aggregate in the
produce workable concrete than the smooth, rounded compact aggregate. Also, such irregular-shaped aggregate cement content must also be increased to maintain the water-cement ratio. Elongated and flaky aggregate, when used in the construction of pavement may result in failure of the pavement due to their random position under repeated
 loading and vibration. It is important to keep the amount of flaky and elongated aggregate within permissible levels. Generally, flaky and elongated aggregate are avoided or are limited to about 15 % by the weight of the total aggregate is the %
 by weight of the particles (aggregates) whose thickness is less than 3/5th(0.6 times) of their mean dimension. The Elongation index of aggregate is the % by weight of the particles (aggregates) whose length is greater than 1 and 4/5th (1.8 times) of their mean dimension. This method uses to measure the Flakiness Index and Elongation index of
 aggregate use in the construction of Highway pavement and concrete structures. Reference:- IS 2386 (Part 1) 1963 PDF. The balance used to measure the aggregate has sufficient capacity. Its accuracy is 0.1% of the weight of the test sample. The metal gauge used to measure the thickness/elongation is looked like this figure shown below: The IS
Aggregate Crushing Value Test Procedure and Result Prepare aggregate sample for the test by sieving between IS sieve 6.3 mm size at the bottom and 63 mm IS sieve at top. A separate sample retains on each sieve. The collected aggregate sample should have at least 200 numbers of individual aggregate for accurate test results from each range of
IS sieve. We take a range of aggregate sample collected for tests as W1. Note: Test can be conducted for each range of Flakiness gauge slot. Try to pass the aggregate width-wise through the slot of 10mm to 6.3 mm
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 (W1) = (W2/W1) \times 100 For example, Weight of aggregate passed through width gauge of 10 mm to 6.3 mm (W2) = 200 gm and Total weight of aggregate in the range of 10 mm to 6.3 mm is 20%. Read More: Abrasion Test on Aggregate (Los
 percentage of flaky aggregate in the range of 10 mm to 6.3 mm is 15%. IRC recommended the Flakiness index value for road construction be below 35%. SR NO. TYPE OF CONSTRUCTIONALLOWABLE FLAKINESS INDEX1 WBM construction be below 35%. SR NO. TYPE OF CONSTRUCTIONALLOWABLE FLAKINESS INDEX1 WBM construction be below 35%. SR NO. TYPE OF CONSTRUCTIONALLOWABLE FLAKINESS INDEX1 WBM construction be below 35%. SR NO. TYPE OF CONSTRUCTIONALLOWABLE FLAKINESS INDEX1 WBM construction be below 35%. SR NO. TYPE OF CONSTRUCTIONALLOWABLE FLAKINESS INDEX1 WBM construction be below 35%. SR NO. TYPE OF CONSTRUCTIONALLOWABLE FLAKINESS INDEX1 WBM construction be below 35%. SR NO. TYPE OF CONSTRUCTIONALLOWABLE FLAKINESS INDEX1 WBM construction be below 35%. SR NO. TYPE OF CONSTRUCTIONALLOWABLE FLAKINESS INDEX1 WBM construction be below 35%. SR NO. TYPE OF CONSTRUCTIONALLOWABLE FLAKINESS INDEX1 WBM construction be below 35%. SR NO. TYPE OF CONSTRUCTIONALLOWABLE FLAKINESS INDEX1 WBM construction be below 35%. SR NO. TYPE OF CONSTRUCTIONALLOWABLE FLAKINESS INDEX1 WBM construction be below 35%. SR NO. TYPE OF CONSTRUCTIONALLOWABLE FLAKINESS INDEX1 WBM construction be below 35%. SR NO. TYPE OF CONSTRUCTIONALLOWABLE FLAKINESS INDEX1 WBM construction be below 35%. SR NO. TYPE OF CONSTRUCTIONAL WBM construction be below 35%. SR NO. TYPE OF CONSTRUCTIONAL WBM construction be below 35%. SR NO. TYPE OF CONSTRUCTION BE ACCURATE TO THE 
coat bituminous surface dressing 25%5 Bituminous macadam Base course 25%6 Dense bituminous macadam Base course 25%6 Dense bituminous macadam Base course aggregate sample that have a thickness less than three-fifths of their mean dimension. These particles are considered to be flaky, and can cause problems in
concrete by reducing the workability and increasing the amount of voids in the mix. The Elongation Index is the percentage of particles are considered to be elongated, and can cause problems in concrete by reducing the workability and
increasing the amount of voids in the mix. The Flakiness and Elongation Index Test is performed by sieving a sample of coarse aggregate through a set of standardized sieves, and then measuring the percentage of particles that are either flaky or elongated. You May Also Like The flakiness and elongation index show the shape quality of aggregates.
 Flaky particles are thin and flat, while elongated particles are long and narrow. These indices help in checking how many such poorly shaped particles are present in a sample. A high value means the aggregate has many weak-shaped particles are present in a sample. A high value means the aggregate has many weak-shaped particles are present in a sample. A high value means the aggregate has many weak-shaped particles are long and narrow. These indices help in checking how many such poorly shaped particles are present in a sample. A high value means the aggregate has many weak-shaped particles are long and narrow.
of concrete or road surfaces. They do not pack well, cause voids, and make the mix less workable. That is why limits are set for these values in construction to ensure good performance and stability. Detailed Explanation: In civil engineering, the shape of aggregate particles plays a major role in the performance of concrete and road construction. The
flakiness index and elongation index are two important tests that tell us the shape characteristics of coarse aggregates. Flaky particles are those whose length is much more than their width or thickness, making them look long and
needle-like. These particles are generally considered undesirable in construction because the percentage of elongated particles. Both values are
concrete. Poor Packing and More Voids: Due to their irregular shape, flaky and elongated particles do not pack well. This increases cost and reduces strength. Workability Issues: Aggregates with high flakiness or elongation reduce the ease with which concrete can be
mixed, transported, and placed. They make the mix harsh and difficult to compact. Durability Problems: High flakiness or elongation increases the chance of water entering voids, which may lead to cracking, freeze-thaw damage, or other durability issues. Surface Finish and Stability: Concrete made with flaky and elongated particles often has poor
surface finish and reduced structural stability. These particles can orient in one direction, making the mix non-uniform and weak in certain areas. Acceptable Limits: As per standards, the flakiness index should usually be less than 25%, and the elongation index should also be limited, often under 15% to 20%, depending on the use. How they are
tested: Flakiness index is measured using a thickness gauge. Particles are passed through the slots of the gauge, and those that pass are considered flaky. Elongation index is measured using a length gauge. Particles are passed through the slots of the gauge. Particles are passed through the slots of the gauge, and those that pass are considered flaky. Elongation index is measured using a length gauge. Particles are passed through the slots of the gauge. Particles are passed through the slots of the gauge. Particles are passed through the slots of the gauge. Particles are passed through the slots of the gauge. Particles are passed through the slots of the gauge. Particles are passed through the slots of the gauge. Particles are passed through the slots of the gauge. Particles are passed through the slots of the gauge. Particles are passed through the slots of the gauge. Particles are passed through the slots of the gauge. Particles are passed through the slots of the gauge. Particles are passed through the slots of the gauge. Particles are passed through the slots of the gauge. Particles are passed through the slots of the gauge. Particles are passed through the slots of the gauge. Particles are passed through the slots of the gauge. Particles are passed through the slots of the gauge are passed through the slots of the gauge. Particles are passed through the slots of the gauge are passed through the gauge 
particles with the total weight of the sample. Conclusion: The flakiness and elongation index are important indicators of aggregates are poorly shaped, which affects the strength, workability, and durability of the final structure. Testing and limiting these indices ensure that only good-quality aggregates are used
in construction, leading to safer and longer-lasting buildings and roads. Coarse aggregate constitutes the biggest part of concrete. It is desirable that aggregates are of desired proper aggregates. Flakiness Index Test and Flakiness Index Test and Flakiness Index Test and Flakiness Index Test are used for selection of proper aggregates are of desired properties. Two shape tests namely Elongation Index Test and Flakiness Index Test are used for selection of proper aggregates. Flakiness Index Index Test and Flakiness Index 
particles in it whose least dimension is less than three-fifth of their mean dimension. Determine the Flakiness Index Procedure for Flakiness Index In
 weighed to an accuracy of at least 0.1 percent of the weight of particles whose greatest dimension is greater than 1.8 times its mean dimension. The test applies only to aggregates whose least dimension is not
 smaller than 6.3 mm.Determination of Elongation Indexlength gaugeDownload the Indian Standard code on methods of test for aggregates for concrete Sp 23 (1982) Handbook On Concrete Mixes [PDF] DownloadSP 24 1978.
 Explanatory Handbook On IS 456 [PDF] Download NBC 2016 Volume 1 & Volume 1 & Volume 1 by weight of particles in it, whose least dimension (i.e. thickness) is less than three-fifths of its mean dimension. Elongation Index is the percentage by weight of particles in it, whose largest dimension
(i.e. length) is greater than one and four-fifths times its mean dimension. Flaky and elongated particles may have adverse effects on concrete and bituminous mix. For instance, flaky and elongated particles are liable to break up
and disintegrate during the pavement rolling process. Advertisements This question is taken from book named A Closer Look at Prevailing Civil Engineering Practice What, Why and How by Vincent T. H. CHU. If you have a query, you can ask a question here. ASTM D 4791 This test is performed on coarse aggregates and is intended to determine the
 shape of aggregates i.e., rounded, angular, flaky, or elongated. In addition, the percentage of flaky or elongated particles in an aggregate sample can be determined and discarded. Rounded aggregate particles in an aggregate sample can be determined and discarded. Rounded aggregate particles in an aggregate sample can be determined and discarded. Rounded aggregate particles in an aggregate particles in an aggregate sample can be determined and discarded. Rounded aggregate particles in an aggregate particles in an aggregate sample can be determined and discarded. In addition, the percentage of flaky or elongated particles in an aggregate sample can be determined and discarded. Rounded aggregate particles in an aggregate particles in an aggregate particles in an aggregate particles in an aggregate sample can be determined and discarded. Rounded aggregate particles in an aggregate particles in aggregate 
 because they offer less inter-particle friction and enhance the workability of the concrete mix. Source: Rounded aggregates are generally found in the vicinity of a river body in the form of river gravel. Angular particles proves advantageous
 for particle inter-locking, making their use the best choice for a granular base coarse construction, conferring stability to the pavement. Source: Crushed rocks are usually angular in shape. A flaky particle is one whose least dimension (i.e., its thickness) is less than 0.6 times the mean size of the particle. These particles are a source of frailty for an
 aggregate mix and therefore, they must be identified and discarded. However, practically, an aggregate sample cannot be devoid of such particles in an aggregate mix. Quantitatively, a maximum limit of 30% flaky particles is imposed by the
standard and is regarded as acceptable. Nevertheless, a sample comprising flaky particles in an aggregate mix. It is a fractional value that represents the percentage by weight of flaky particles in an aggregate mix. It is mathematically calculated as the ratio of the weight of flaky
particles to the total sample weight. These particles have their lengths dominating the other two dimensions considerably. As an estimate, the particle size. These particles are also a source of weakness for an aggregate sample. However, as per the standards implications, a maximum percentage of
45% elongated particles in the mix is tolerable. Elongation Index: It represents the weight of elongated particles as a percentage of the total sample weight. Mathematically, Determination of the flakiness and elongation index of an aggregate sample
depends on the shape of the particles in the mix, therefore, too many flaky or elongated particles can prove an obstacle in achieving the desired packing of aggregates. Flaky and elongated particles tend to lower the workability of concrete mixes. This is because these particles have a very large value of the surface area to volume ratio. These particles
are inherently friable when subjected to heavy loading. Therefore, these are not desirable when preparing concrete mixes for structures that have to bear substantial loads. The flakiness and elongation index test cannot be performed on aggregates having a size smaller than 6.3mm or 1/4 in. Flakiness index gauge also called thickness
gaugeElongation index gauge also called length gaugeCoarse aggregate sampleWeighing balance Fig.: Flakiness Index Gauge Fig.: Elongation Index Gauge Fig.: Elonga
 into factions is to find the individual flakiness index corresponding to a particular size range. Weigh each group and record the weights. For each group, take individual aggregate particular opening of the thickness gauge. This is
 because doing this may break very weak particles and give misleading results. It is to be kept in mind that the particles through a particular slot of thickness gauge are the flaky ones and are a source of weakness for the sample. Weigh the fraction of aggregates in each group that passes through the thickness gauge. Determine the individual
 flakiness index of each huddle by dividing the weight of flaky particles in each group to the total weight of aggregates in the corresponding group. Cumulate the percentage values to determine the flakiness index of the entire aggregate sample. Sieve the aggregate sample into groups of closely limited particle sizes, e.g. 2.5-2 in., 0.5-0.375 in., etc. Pass index of the entire aggregate sample into groups of closely limited particles in each group to the total weight of aggregate sample.
 each aggregate particle separately through the elongation gauge and weight the fraction passing through the gauge. It is important to note that particles that are not able to pass through any slot or opening on the length gauge are the elongated ones. Determine the individual elongation index of each huddle by dividing the weight of elongated
particles in each group to the total weight of Flaky Particles (g) Individual elongation index of the aggregate Sample = Passing Sieve #RetainingSieve # Weight Retained (g) Weight of Flaky Particles (g) Individual Flakiness IndexWeighted Flakiness Index (%)
 1.5 in.1 in.3/4 in.3/4 in.3/4 in.3/4 in.3/4 in.3/4 in.1/2 in.3/8 in.1/2 in.3/8 in.3/8
 (%) = Elongation Index (%) = If the index values are less than the limiting values specified by the standard, the sample marked qualified for the intended use. The sample gradation curve can also be plotted using the standard can also
be assessed. However, the grading requirements of aggregates to be used in the base course and sub-base course are separately defined, considering the amount of load each course has to bear. Source: AASHTOs Guidelines If the samples gradation curve lies between the limiting curves plotted against the specified values given in the table, the
 sample is well-graded. If the samples distribution curve lies outside the extremities defined by the standard, it is said to be poorly graded. Do not force any particle through the slots on the thickness or length gauge. Doing this may distort or break the particles, giving inaccurate results. The aggregate quantity taken for the test should be ample so that
for each sieved huddle, enough aggregate quantity is available for the test. The significance of finding the individual flakiness index is that it helps in figuring out the particles in the determined range. Flakiness and
 Elongation Index Test are very important tests to be performed on aggregate in the laboratory. This test gives the percentage of flaky and elongate aggregate present in the total aggregate sample. Aggregate shape, size, and surface texture majorly affect the properties of freshly mixed concrete more than the properties of hardened concrete.
 Angular, flaky, rough-textured, and elongated aggregate particles require more water to produce workable concrete than the smooth, rounded compact aggregate cement ratio. Elongated and flaky aggregate, when used in the construction of
 pavement may result in failure of the pavement due to their random position under repeated loading and vibration. It is important to keep the amount of flaky and elongated aggregate are avoided or are limited to about 15 % by the weight of the total aggregate. Read More:
 Flakiness Gauge (W1)63MM50MM33.90MM50MM40MM27.00MM40MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.50MM31.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5MM19.5M
 aggregate sample taken (W1) = (W2/W1) \times 100 For example, Weight of aggregate passed through width gauge of 10 mm to 6.3 mm is 20%. Read More: Abrasion Test
on Aggregate (Los Angeles Test) The Following is the procedure for elongation index, Try to pass the aggregate length-wise through the slot of 10mm to 6.3 mm on the length gauge slot. Passing through is sleve(mm) Retained
on IS sieves(mm)Elongation Gauge(mm)Weight retain on length Gauge (W2)63MM50MM050MM40MM81.0MM40MM31.5MM25MM025MM20MM10MM6.3MM14.7MM Flakiness Index = weight of aggregate retained on length gauge of 10 mm to 6.3 mm
(W2) / Total weight of aggregate sample taken (W1) = (W2/W1) x 100 For example, the Weight of aggregate retained on length gauge of 10 mm to 6.3mm(W2) = 150 gm, and Total weight of aggregate sample = 1000 gm Elongation Index = (150 gm / 1000 gm) x 100 = 15% Read More: Aggregate Testing | 7 Test On Aggregates | Coarse Aggregate Test The percentage of flaky aggregate in the range of 10 mm to 6.3 mm is 15%. IRC recommended the Flakiness index value for road construction Wearing surface15% lower granular layer15%2 Concrete construction3 Bituminous
construction 25%4 Two coat bituminous surface dressing 25%5 Bituminous macadam Base course 25%6 Dense bituminous macadam 35% The Flakiness Index is the percentage of particles in a coarse aggregate sample that have a thickness less than three-fifths of their mean dimension. These particles are considered to be flaky, and
can cause problems in concrete by reducing the workability and increasing the amount of voids in the mix. The Elongation Index is the percentage of particles are considered to be elongated, and can cause problems in concrete by reducing
the workability and increasing the amount of voids in the mix. The Flakiness and Elongation Index Test is performed by sieving a sample of coarse aggregate through a set of standardized sieves, and then measuring the percentage of particles that are either flaky or elongated. You May Also Like
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