Quartzite Quotes

GO BIG RED...Rock Quartzite in Nebraska

Crushed quartzite aggregates are on the move to Nebraska. The Nebraska Department of Roads (NDOR) has formally accepted the use of crushed quartzite aggregates in concrete mixes. For years, the predominant coarse aggregate utilized in concrete mixes was limestone. In order to implement quartzite into concrete, approval from the NDOR had to be obtained on a project by project basis.

In today's construction industry, implementing the best possible construction materials into a project is the highest priority. Fuel and oil are driving the costs of construction higher and higher, therefore there is a lot to be said about building a project with quality aggregates from the start.

The purpose of this article is to inform and make clear that crushed quartzite's superior quality is specifically approved in Nebraska for use on Nebraska highways and bridges, as well as city streets, county roads, towns and villages throughout Nebraska.

Many consulting, city and county engineers as well as other government entities refer to the NDOR specifications for a guide in the concrete construction industry. That is why the public needs to be informed of this specification change. The specification allowing the use of quartzite was not drafted in time to get published in the new 2007 edition of the NDOR Standard Specifications for Highway Construction. A supplemental special provision that supersedes the Standard Specifications has been printed and distributed by the NDOR. The NDOR is currently implementing the following table into each NDOR specific project's special provisions, in order to help clarify the approval and acceptance of quartzite. As shown in Table 1002.02, the "Type of Coarse Aggregate" column is labeled with four asterisks. This footnote, as defined at the bottom of Table 1002.02, states that quartzite aggregate can be used in place of limestone.

When comparing quartzite to limestone, the differences in quality are obvious. Having superior quality coarse aggregates in concrete mixtures is a must in order to get the maximum longevity and durability out of a concrete pavement. It is evident how non-durable aggregates can fail under the harsh and repetitive freeze/thaw cycles in the Midwest. Not only are these concrete failures expensive, but they are unsightly, unsafe and add increased liability to every day life.

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TABLE 1002.02

Concrete Mixes (Cubic Yard Batch)

Class of Concrete (1)	Base Cement Type *	Portland Cement (Min lb/ cy)	Pre-Blended Class Fly Ash (Min. lb/ cy) *	GGBFS Slag (Min. lb/ cy)	Class C Fly Ash (Min. lb/ cy)	Silica Fume (Min. lb/ cy)	Total Cementi-tious Materials (Min lb/cy)	Total Agg. (Min. lb/ cy)	Total Agg. (Max lb/ cy)	Coarse Agg. (%) (3)	**Type of Coarse Aggregate ******	Air Content (% Min.-Max.) (2)	Water / Cement Ratio Max. (4)	28-Day Required Strength (Min. psi)
47B**	1PF	423	141	0	0	0	564	2850	3150	30±3	**Lime-stone**	7.5-10.0	0.48	3500
47B***	1PF	423	141	0	0	0	564	2850	3150	30±3	**Lime-stone**	6.0-8.5	0.48	3500
47BD	1PF	494	164	0	0	0	658	2500	3000	30±3	**Lime-stone**	6.0-8.5	0.42	4000
PR1	I/II	752	0	0	0	0	752	2500	2950	30±3	**Lime-stone**	6.0-8.5	0.36	3500
PR3	III	799	0	0	0	0	799	2500	2950	30±3	**Lime-stone**	6.0-8.5	0.45	3500
SF	I/II	564	0	0	0	25	589	2850	3200	50±3	**Lime-stone**	6.0-8.5	0.36	3500
47BHE	1PF	564	188	0	0	0	752	2500	3000	30±3	**Lime-stone**	6.0-8.5	0.40	3500
BX	1PF	423	141	0	0	0	564	2850	3150	0	**0 (5)**	6.0-10.0	0.48	3000
47BFS **(6)	1PF	338	113	113	0	0	564	2850	3150	30±3	**Lime-stone**	7.5-10.0	0.48	3500
47BFS ***(6)	1PF	338	113	113	0	0	564	2850	3150	30±3	**Lime-stone**	6.0-8.5	0.48	3500
47BDFS (6)	1PF	396	131	131	0	0	658	2500	3000	30±3	**Lime-stone**	6.0-8.5	0.42	4000

(1) Each class shall identify the minimum strength requirement. (For example, 47B-3500, where the last four digits indicate the strength in pounds per square inch. In the chart, strength of 3500 psi is indicated for 47B-3500; however, other strengths may be authorized elsewhere in the contract. The classes shown in the chart are typical examples.)
All classes of concrete shall be air-entrained.
A slump test shall be performed to check for consistency and/or workability. Any increase in slump must be pre-approved by the Engineer.
A water reducer admixture shall be used at the manufacturer's recommendations.

(2) As determined by ASTM C 138 or ASTM C 231.
FOR INFORMATION ONLY. The contractor may develop a Quality Control Program to check the quantity of air content on any given project; such as, checking air content behind the paver.

(3) Coarse aggregate shall be limestone unless otherwise specified.

(4) The Contractor is responsible to adjust the water/cement ratio so that the concrete supplied achieves the required compressive strength without exceeding the maximum water/cement ratio. The minimum water/cement ratio for any slip form concrete pavement is 0.38.

(5) Single aggregate (sand-gravel) used for these classes of concrete.

(6) 47BFS is an acceptable substitute for 47B and 47BDFS is an acceptable substitute for 47BD.

(*) Mixes with Type 1PF and Class F fly ash designation are pre-blended or interground with Class F fly ash by the cement mill producer at a rate of 25%±2%, no additional Class F fly ash is added at the batch plant.

(**) For slip form applications.

(***) For hand-pours and substructures applications.

(****) Quartzite aggregate can be used in place of limestone providing the aggregate meets Paragraph 3.b.of subsection 1033.02 of the Standard Specifications.

As a result of non-durable concrete pavements in the Kansas City Metro Area that contain poor quality coarse aggregates, many city streets and paving districts were experiencing failures of concrete pavements and structures well before their life expectancy was due. Numerous entities in the Kansas City Metropolitan Area have gone to the extent of establishing a group called the Kansas City Metro Materials Board (KCMMB). This group set standards and specification in order to eliminate poor quality coarse aggregates in concrete.

Aggregate Quality Testing

Listed below are numerous quality tests that compare Quartzite and commonly used Limestone aggregates in the Nebraska region. The tests below are commonly used in the aggregate testing industry for classifying and determining the suitability of aggregates.

Los Angeles Abrasion Loss (ASTM C 131)

The Los Angeles Abrasion Loss test method measures the degradation of a mineral aggregate resulting from a combination of actions including abrasion, impact and grinding. Quartzite has a loss of approximately 15% - 20%, whereas limestone has anywhere from a 27% to 32% loss. The lower the percentage of loss being the better, exemplifies quartzite's superior hardness and durability.

Specific Gravity & Absorption (ASTM C 127)

Measuring the coarse aggregate's density and percent of absorption is the purpose of the specific gravity and absorption test. When water is absorbed into the pores of an aggregate and freezes, the expansive force from freezing breaks the aggregate apart and cracks the concrete (D-cracking). Quartzite has absorption of approximately .25% to .30% compared to 1.0% to 1.5% absorption with limestone. The lesser the absorption percentage results in less water the aggregate will take on, which is very significant during winter freeze / thaw cycles.

Soundness by Freeze / Thaw (AASHTO T 103)

Soundness by Freeze / Thaw simulates the effects of freeze / thaw on an aggregate by alternately freezing and thawing an aggregate that is saturated with water. After 25 freeze / thaw cycles, quartzite experienced less than 0.2% loss while limestone exceeded 5% loss.

Sulfate Soundness (ASTM C 88)

The Sulfate Soundness test method covers the testing of aggregates to estimate their soundness when subjected to weathering action in concrete. This is accomplished by repeated immersion in saturated solutions of magnesium sulfate followed by oven drying to partially dehydrate the salt precipitated in permeable pore spaces. Quartzite showed a loss of less than 1% compared to a loss of greater than 5% by limestone. Once again this exhibits the hard, durable nature of quartzite.

The superior quality of quartzite clearly stands out. Implementing quartzite into today's concrete projects will greatly increase the concrete life expectancy and reassure that the project owner is getting optimum quality aggregates.

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