



Haydite Expanded Shale
Lightweight Aggregate

Pumping Guidelines: Eight Critical Steps Needed to Achieve Problem Free Pumpable Structural Lightweight Concrete

Using Buildex Marquette, Kansas Plant Lightweight Aggregate

This commentary is intended to communicate to all parties involved what is needed to successfully pump lightweight concrete made with our Marquette plant lightweight aggregate. If you are not sure what aggregate will be used on your project, contact Buildex or the local concrete supplier.

Although most pump jobs involving lightweight concrete go smoothly, we understand that there are occasional problems. Success can only be achieved with a team effort.

This commentary is based on our more than 20 years experience pumping Buildex aggregate in projects of all kinds throughout the Midwest and Rocky Mountain states. All of the required steps also have economic consequences. Yet no single party has responsibility for enough of the steps to be able to

insure the concrete will pump satisfactorily on every job. Accordingly, Buildex does not warrant the pumpability of concrete it is used in. We can only warrant ASTM C 330 compliance. The Marquette aggregate is normally shipped dry and ambient saturated in the ready mix producer's stockpile prior to batching.

Contractors should expect the need to make mix and cost adjustments during construction when pricing pumped lightweight concrete for a project. These adjustments are driven by the factors that affect pumpability: The concrete specification, variations in cement materials, concrete sand and Buildex lightweight aggregate, the pump setup, weather and placement / finishing factors. They are discussed in detail below.

Buildex Inc.

Step	Responsibility	Comments
1. Design with and specify a mix that is pumpable	Architect Engineer	Specify 6-7% air for density, economy and to meet fire ratings. Many concrete sands in our trade area are deficient in fines. This can be compensated by using mixes with 75 to 125 lb fly ash, which provide improved pumpability over plain cement mixes with the same design strength. Specify 100 - 110 pcf calculated equilibrium density per ASTM C 567. This correlates to 112 - 118 pcf fresh pumped in place density, depending on the concrete mix design. Use the fresh density as basis for acceptance during construction. The estimated 28 day air dry density will be 108 - 115 pcf, but the air dry density should not be specified since it is no longer defined by ASTM C 567. Avoid high range water reducing admixtures; our experience is that it does not improve pumpability. Allow or specify mid-range water reducing admixtures instead; our experience is that they do improve pumpability over plain mixes. Allow 5" - 7" slump into the pump to achieve 3" - 5" slump at point of placement. Contact Buildex for mix design information and our guide specification.
2. Saturate the coarse lightweight aggregate for two weeks in your stockpile.	Ready Mix Contractor	Buildex will need to be wetted for seven to fourteen days before batching. If the contractor does not give the ready mix producer sufficient notice, it places the ready mix producer in an impossible situation where only marginally pumpable concrete can be expected.

Step	Responsibility	Comments
3. Develop pumpable mixes	Ready Mix	Buildex with lower moisture contents may require adjustments to other materials in the mix to maintain desired pumpability. Understand that the as-batched density of the aggregate and the pumpability of your mix are affected by two interrelated factors: the aggregate's oven dry density and the moisture content of the aggregate once it is vacuum saturated. Buildex can advise you concerning this.
4. Manage Buildex inventory to avoid problems and job delays	Ready Mix	Buildex aggregate will have a loose density of 50 – 52 pcf when properly saturated for pumping. We recommend allowing two weeks wetting to achieve reliable pumping. Loose density is determined using the ASTM C 29 shoveling procedure, not the rodded procedure! Keep a sufficient inventory to be able to work through possible delivery delays. Manage you inventory to avoid last-in first-out use of the material.
5. Monitor the sand gradation closely	Ready Mix Sand Supplier	Sand grading significantly affects pumpability. Sample sand during concrete production to insure it is not out of normal gradation, especially by being deficient in the #50 and #100 mesh sizes. Consider mixing mason sand with concrete sand to increase pumpability if needed, while still keeping the combined fine aggregate grading within C33 specification.
6. Q/A the concrete	Ready Mix	Determine the slump, air content, density and calculated yield and adjust when needed before the concrete leaves your plant. All factors affect pumpability. Understand that Buildex with lower density than used in the mix design will cause higher mix yield (lower effective cement content) and probably lead to increased slump loss. Both factors reduce pumpability.
7. Understand what it takes to make a pumpable lightweight mix	Contractors	Lean mixes start out cheaper but don't always pump well. Adding water to achieve pumpability delays set times, increasing your costs. Adding fly ash without cutting cement and/or increasing admixture dosages will need to be done in some cases. The mix will be air entrained for density, economy and fire rating, so plan for it when setting up finishing procedures.
8. Understand what it takes to successfully pump a lightweight mix.	Pumper	Four things that can be done to improve pumpability when needed: <ul style="list-style-type: none"> • Use 5" system, not 4" • Use a small diameter pump piston; the smaller, the better. • Avoid rubber & tight elbows whenever possible. • Use a fixed slickline setup rather than a boom.