May 6, 2012

From: Jon Belkowitz
Intelligent Concrete, LLC
173 Woodcrest Drive
Freehold, NJ 07728

To: David Loe
Lythic Solutions
11304 NE 66th St
Ste 102
Vancouver, WA 98662

Re: Final Report on **LYTHIC SOLUTIONS** Product Evaluation, Abrasion Resistance of Concrete (ASTM C 779, Procedure C)

The intent of this document is to track the abrasion resistance with the LYTHIC SOLUTIONS DAY1For the purposes of information security, the DAY1 sizes and gradations will not be included in this report. All LYTHIC SOLUTIONS DAY1 packages will be referred to by pre-designated DAY1 names.

Materials

A Type I/II OPC (Ordinary Portland Cement) with a Blaine fineness of 3790 cm^2/g was used for this experiment. The cement was mixed with potable water at a water-to-cementitious ratio of 0.44. The fine aggregate used was ASTM C 33 concrete sand and the coarse aggregate was an alluvial 67/57 graded rock. **Table 1** documents the constituents used in each of the mixtures for the conducted experiments. All mixes were batched and mixed at 1.75 cubic feet.

Casting

Concrete samples were cast in accordance to ASTM C 192 - Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory. After mixing, the concrete was cast into 4 inch diameter by 8 inch tall plastic cylinders. The cylinders were filled in two equally sized lifts (by volume). Each lift was consolidated 25 times with a metal mold measuring 3/8 inch in diameter. Tapping the outside of the mold 15 times with an open hand consolidated the lifts further.

The experimental samples were finished with the LYTHIC SOLUTIONS DAY1 Product at the following times from the original casting time:

1. Immediately After casting
2. 6 Hours from casting time
3. 24 Hours from casting time

Curing

The samples were cast and cured for 56-days before the abrasion tests was conducted. The samples were marked according to MIX ID and application time. The samples were cast and cured in a temperature and humidity controlled room until and through the test dates.

Process

The function of abrasion resistance of concrete test is dependent upon the abrasive action of a rapidly rotating ball bearing under load on a wet concrete test surface. Water is used to flush out loose particles from the test path, bringing the ball bearing in contact with sand and stone particles still bonded to the concrete surface, thus providing impact as well as sliding friction. The apparatus consists of a motor-driven, hollow, vertical shaft resting on and turning ball bearings, which rest on the concrete surface. As the ball bearings cut into the concrete surface, depth-of-wear readings can be taken continuously without stopping the test. A digital clock is electrically connected to the drive motor so that both the drive motor and the clock can be started simultaneously. The abrasion tool is composed of eight 18-mm diameter steel balls equally spaced in a retainer ring.

The machine was mounted firmly and securely on the concrete samples by use of a vacuum hold-down device. A sheet of paper was placed between the test surface and the ball bearings under the load of the motor. The drive shaft was revolved several times by hand; ensure a complete circular mark formed on the paper. If not, the plumbness of the drive shaft was adjusted and the procedure repeated until was circle is obtained. Water was then supplied to the drive shaft. The dial gage was clamped to the supporting shaft to bear on the sliding bracket of the motor and drive shaft. The digital clock was reset to zero. A reference dial micrometer reading was taken immediately following the slight jump of the dial, just after the motor is started. Readings were taken to an accuracy of at least 0.001 in. of the depth of abrasion at least every 50 seconds for a total period of 1200 seconds, or until a maximum depth of 0.1225 in. is reached. An average reading of the pulsating micrometer dial was taken. Three samples were of the concrete to be evaluated.

The test determines the depth of wear for each interval of the test. The comparison of curves showing a plot of depth of wear versus time for each series of concrete surfaces tested indicates the relative abrasion resistance of these different concrete surfaces. A material that is uniform in abrasion resistance will have a curve approximating a half-parabola inclined toward the time axis. A comparison of curves will indicate whether the resistance to abrasion is primarily at the surface or at greater depth. When comparing test results of concrete surfaces of a wide range in abrasion resistance, curves were established with time required (x-axis) to reach a particular depth (y-axis).

Results

The Lythic Solutions DAY1 Product showed a reduction in the abrasive wear, as shown in **Figure 1.** The 56-day results showed the immediate application of the DAY1 resulted in most effective reduction in abrasive wear. As the DAY1 application was delayed, abrasive wear reduction over the control was not as pronounced: 6 hours gave generated a minimal reduction and 24 hours showed an

actual increase of abrasive wear over the control sample, which is interpreted as the DAY1 product having little significant effect, long term, on the abrasion resistance if the application is delayed by a day after concrete placement.

Conclusions

The Lythic Solutions DAY1 applied immediately after concrete placement appears to successfully increase resistance to abrasive wear at the concrete slab surface. By densifying the surface and sub-surface of the concrete slab, the DAY1 effectively increases the strength and toughness of said surface. In all cases, a concrete slab section allowed to cure in a more optimum environment will have a higher resistance to abrasive wear than a concrete slab cured in less than optimum conditions, if all other properties of the slab are equal.

For and behalf of

Intelligent Concrete, LLC

Name: Jon Belkowitz

Title: President

Date: 6 May 2013

For and on behalf of

Intelligent Concrete, LLC

COLORADO REGISTERED P. R. BRYANT 29932 PROFESSIONAL ENGINEER 06 May 13

Name: Paul Bryant

Title: Professional Engineer

Date: 6 May 2013

Table 1 – Constituent Proportions for Mortar Mixtures

LBS PER CUBIC YARD				
MATERIALS (lbs)	**CONTROL**	**IMMED AP**	**6 HR DELAY**	**24 HR DELAY**
Type I/II Cement	708			
67/57 Rock	1757			
Concrete Sand	1168			
Total Water	310			
Air Entrainment (fl.oz/cwt)	0.5			
High Range Water Reducer (fl.oz/cwt)	3.5			

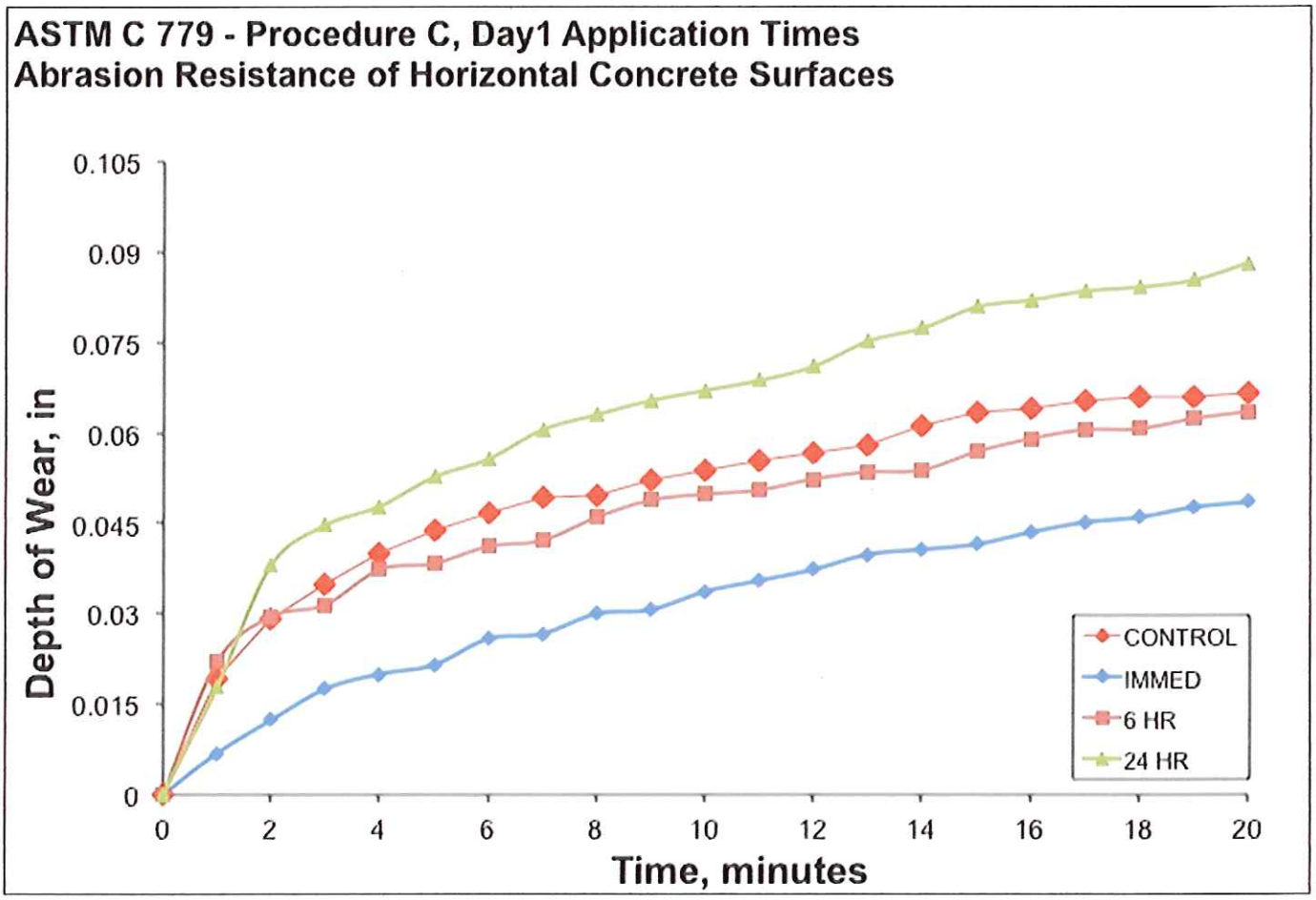

Figure 1 –56 Day Abrasion Measurements