

2009-31

Sixty-Year Design Concrete Pavement-Performance Model Development: **MnROAD** Cell 53 Construction Report



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Technical Report Documentation Page

1. Report No. MN/RC 2009-31	2.	3. Recipients Accession No.	
4. Title and Subtitle Sixty-Year Design Concrete Pavement-Performance Model		5. Report Date September 2009	
Development: MnROAD Cell 53 Construction Report		6.	
7. Author(s) Ryan J. Rohne		8. Performing Organization I	Report No.
9. Performing Organization Name and Address Minnesota Department of Transpo	ortation	10. Project/Task/Work Unit	No.
Office of Materials and Road Rese	earch	11. Contract (C) or Grant (G) No.
Maplewood, Minnesota 55109			
12. Sponsoring Organization Name and Address Minnesota Department of Transpo	ss prtation	13. Type of Report and Period Covered Construction Report for MnROAD Cell 53	
395 John Ireland Boulevard Mail S	Stop 330	14. Sponsoring Agency Code	e
St. Paul, Winnesota 55155 15. Supplementary Notes	16	1	
http://www.lrrb.org/pdf/200931.pc 16. Abstract (Limit: 200 words)	lf		
http://www.lrrb.org/pdf/200931.pdf 16. Abstract (Limit: 200 words) The primary objective of this research study is to develop an impr Minnesota Department of Transportation's (Mn/DOT's) current 6 objectives include understanding the behavior of these pavements thermal expansion. These objectives will be accomplished throug construction, and conducting seasonal load response testing under pavement test cell (Cell 53) built to Mn/DOT's current 60-year de traditional designs constructed in MnROAD Phase I will be used prediction model. This construction report describes the construc Volume Road test Cell 53. A summary of U.S. and international included.		oved service life preduction- over concrete pavem with regard to maturit the extensive testing of the controlled loads of an esign standards. Load the in the development of the tion and material testin long-life concrete pave	ction model for the nent designs. Secondary y, slab warp and curl, and materials during instrumented concrete response testing of the improved life ng done on MnROAD Low ement designs is also
Cell 53, Concrete pavements, Pavement performance, Pavement design, 60 year concrete pavement design, Long life concrete pavements, Service life		No restriction. Document available from: National Technical Information Services, Springfield, Virginia 22161	
19. Security Class (this report) Unclassified	20. Security Class (this page) Unclassified	21. No. of Pages 76	22. Price

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Final Report

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September 2009

Published by

Minnesota Department of Transportation Research Services Section 395 John Ireland Boulevard, MS 330 St. Paul, Minnesota 55155-1899

The contents of this report reflect the views of the author who is responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the views or policies of the Minnesota Department of Transportation at the time of publication. This report does not constitute a standard, specification, or regulation.

ACKNOWLEDGEMENTS

The author is indebted to Keith Shannon, materials and road research office director, and Research Manager Maureen Jensen for fostering this and similar research initiatives. Appreciation also goes to the MnROAD operations team of Benjamin Worel, Tim Clyne, Leonard Palek, Jack Herndon, Robert Strommen, Chavonne Hopson, and Douglas Lindenfelser for all their assistance.

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EXECUTIVE SUMMARY

The primary objective of this research study is to develop an improved service life prediction model for the Minnesota Department of Transportation's (Mn/DOT's) current 60-year concrete pavement designs. Secondary objectives include understanding the behavior of these pavements with regard to maturity, slab warp and curl, and thermal expansion. These objectives will be accomplished through extensive testing of materials during construction, and conducting seasonal load response testing under controlled loads of an instrumented concrete pavement test cell (Cell 53) built to Mn/DOT's current 60-year design standards. Load response testing of traditional designs constructed in MnROAD Phase I will be used in the development of the improved life prediction model.

The adoption of changes in long-life concrete design based on MnROAD findings would not only benefit the state of Minnesota, but could also benefit other agencies (national and international) that accept the findings. Given the current backlog of needs for improving or maintaining the highway system, money saved on the optimization of long-life concrete pavements could be used to lengthen a project, or provide additional safety features.

The research objectives for this project include the following:

- Develop an improved service life prediction model for Mn/DOT's current 60-year concrete pavement designs.
- Understand the behavior of these pavements with regard to maturity, slab warp and curl, and thermal expansion.
- Understand the behavior of the thin concrete shoulder (4in.) to environmental loads.

New MnROAD Low Volume Road test Cell 53 was built with a large number of electronic sensors embedded in it to measure the pavement's response to load and environmental effects. Tables and figures describing the type, number, and layout of the sensors are included.

Samples of the subgrade soil, aggregate base material, and concrete mixes were taken during construction of the cell. Initial test results of these samples can be found in this report. In addition to material testing results, this report describes the design and techniques used to construct Cell 53. A review of U.S. and international long-life concrete pavement designs is also included.

INTRODUCTION

MnROAD Facility

MnROAD is a pavement research facility located along Interstate 94 in Albertville Minnesota, forty miles northwest of Minneapolis/St. Paul. Initially constructed by the Minnesota Department of Transportation (Mn/DOT) between 1990 and 1994 (Phase I), MnROAD consists of two primary roadway test segments, Mainline and Low Volume Road (LVR), containing several dozen distinct test cells, Appendix A. Subgrade, aggregate base, roadbed structure, drainage methods, and materials vary from cell to cell. Automated sensors are configured to record data continuously to the MnROAD database. All historical sensor, sampling, testing, and construction data can be found in the MnROAD database and in various publications [1].

The mainline test section consists of a 3.5 mile, two lane interstate roadway carrying "live" traffic diverted from Westbound I94. The Low Volume Road (LVR) is adjacent to Interstate 94 and the Mainline test sections. The LVR is a two lane, 2.5 mile closed loop that contains over 30 test cells. Controlled loading on the LVR is applied by an 80 kip, 18 wheel, five axle tractor/trailer. The tractor/trailer travels 80 laps daily on the inside lane of the LVR loop. The outside lane, monitored for environmental effects, remains unloaded except for lightweight test vehicles [2]. Additional isolated test sections have been installed and monitored at the MnROAD test site and throughout the state of Minnesota. Phase II reconstruction at MnROAD started in 2007 and is expected to be complete during the 2009 construction season. Phase II encompasses more than 20 research projects and reconstruction of 35 test cells.

Project Background

Due to increased traffic congestion and reduced highway construction budgets, emphasis is now being placed on designing and constructing longer life pavements. Using the current Mn/DOT design guide for concrete pavement design (based on 1981 AASHTO design guide), Mn/DOT is now constructing what is believed to be 60-year design concrete pavements. However, during the design process, both the traffic prediction and service life of the concrete pavement is being extrapolated far beyond the available charts in the current design method.

The primary objective of this research study is to develop an improved service life prediction model for Mn/DOT's current 60-year concrete pavement designs. Secondary objectives include understanding the behavior of these pavements with regards to maturity, slab warp and curl, and thermal expansion and also the behavior of the thin concrete shoulder to environmental loads. These objectives will be accomplished through extensive testing of materials during construction, and conducting seasonal load response testing under controlled loads of an instrumented concrete pavement test cell (MnROAD LVR Cell 53) built to Mn/DOT's current 60-year design standards. The work plan for Cell 53 is included in Appendix B. Load response testing of traditional designs constructed in MnROAD Phase I will be used in the development of the improved life prediction model.

Concrete pavement design standards in Minnesota may be altered if the Mn/DOT Pavement Engineering Section, through the findings from this study, believe that current 60-year concrete pavements designs are over or under designed. Alternatively, the life cycle costs of current Mn/DOT 60-year concrete pavement designs could be updated to more accurately reflect their potential performance. The data and results will also be available for organizations like FHWA and NCHRP, so they can improve their development of future concrete pavement design methods, e.i. MEPDG [3].

The research methods include:

- Construct and instrument a concrete pavement test cell based on Mn/DOT's current 60year design standards.
- Collect and analyze sensor measurements including maturity, dynamic and environmental strain, displacement, slab warp and curl during and shortly after construction.
- On a monthly basis, collect and analyze dynamic and environmental strain, displacement, and slab warp and curl measurements.
- Frequently (at least seasonally) monitor surface distress and ride quality of the test cell for a 4-year period.
- After 2 years of traffic application, develop preliminary life prediction models based on available MnROAD data. Refine load response testing schemes if necessary.
- After 4 years of traffic has been applied, complete a life prediction model and prepare, publish, and present research papers and final reports based on the findings.

Research Objectives

The research objective for Cell 53 includes the following:

- Develop an improved service life prediction model for Mn/DOT's current 60-year concrete pavement designs.
- Understand the behavior of these pavements with regards to maturity, slab warp and curl, and thermal expansion.
- Understand the behavior of the thin concrete shoulder to environmental loads.

Report Organization

This chapter introduced the MnROAD test facility and the research objectives for this project. Chapter 2 describes Mn/DOT's long-life concrete pavement design. A summary of long-life concrete pavement designs from other states and countries is also included. Chapter 3 describes the construction of Cell 53. The geometric dimensions and construction techniques of the test cell are described along with tests done on the concrete and base layers. Chapter 4 describes the instrumentation installed in this test cell as well as initial warp and curl measurements and concrete maturity. Chapter 5 contains a summary and conclusions.

The appendices contain additional information. Appendix A summarizes the test cells on the MnROAD Mainline and Low Volume Road (LVR). Appendix B contains the work plan for this study and summarizes each project task. The concrete mix design used is included in Appendix

C and Appendix D includes the concrete tickets. Construction pictures are included in Appendix E and Appendix F includes sensor types and locations.

SYNTHESIS ON LONG-LIFE CONCRETE PAVEMENTS

Darter and Barenberg [4] conducted a study on "zero maintenance" JPCP characteristics. They determined that the use of dowel bars, short joint-spacing, good subdrainage, adequate sealing of joints, increased slab thickness, and increased foundation support are necessary to prevent joint faulting. Concrete shoulders should be of equal thickness to mainline pavement thickness and tie bars should be used. Transverse joints identical to the ones used in the traffic lanes should be used in the shoulders as well as the same subgrade which should have adequate drainage.

Cable and McDaniel [5] presented the common distress types in PCC pavement and their corresponding influencing factors. They found that deterioration of a concrete pavement is a continuous process where one form of distress can cause additional distresses. For example, cracking due to misaligned dowels can cause increased moisture absorption by the slab and freeze-thaw damage. Water plays an important role in pavement distress and should be removed to create well performing pavements. Drainage as well as grading of the subsurface is very important with good subbase drainage essential for long-term performance.

A reduction in permeability of high-performance concrete pavements over standard PCC mixes is considered to be an important factor of their potential longevity in extreme climates [4]. Many bridges are currently being designed for 100 year service lives. The same durability problems that affect concrete bridges affect concrete pavements. In 100 year bridge designs, the durability issues related to the concrete are controlled by increasing the strength and decreasing the permeability. Ion permeability test requirements of 2000 coulombs or less at 56 days was required in a 100 year design bridge in Louisiana [6].

Freeze-thaw damage and other durability problems in concrete are initiated by the presence of water. Substantial damage is only able to occur when water and ionic elements are free to migrate into and out of the concrete. Low w/cm ratio (below 0.40) as well as the inclusion of supplementary cementitious materials, decreases concretes permeability by forming a discontinuous capillary-void system [7].

Mn/DOT's 60-Year Concrete Pavement Design

The Minnesota Department of Transportation began building high-performance concrete pavements (HPCP) in 2000 under the FHWA TE-30 program. Since that time, the HPCP design has become the standard for most urban high-volume highways. The current design service life for Minnesota's HPCP is 60 years [8]. Minnesota's current long-life PCC pavement design is a Jointed Plain Concrete Pavement (JPCP) and is summarized in Table 1 below.

Corrosion of dowel bars is an important issue in a climate as severe as Minnesota's. Standard epoxy-coated steel dowel bars in Minnesota have had life spans as short as 15 years. In 2006, Mn/DOT approved of six types of dowel bars to be used in HPCP projects. Table 2 lists the types and properties of the approved dowel bars. All dowel bars are 15 in. long, mounted in a dowel basket, and are required to have a smooth surface [8].

Design Feature	Material	Typical Dimensions
Slab thickness	HPCP mix	12 - 13 in.
Base course	Mn/DOT Class 5 material*	4 in.
Subbase	Mn/DOT select granular**	Minimum 36 in.
Transvorso joints	Preformed Elastomeric	15 ft. spacing, perpendicular to
Transverse joints	Compression Seal	direction of traffic
Dowal hars	Correction registant	1.5 in. diameter, 15 in. long, spaced
Dower bars	Corrosion resistant	12 in. apart on center
Taytuna Astro Turf or broom dro		1/25 in. average depth using ASTM
Texture	Asuo-Turr of broom drag	E965

Table 1. Typical design features for HPCP in Minnesota [8].

*Mn/DOT Class 5 is a dense graded granular material containing a minimum of 10% crushed particles **See specification 3149 (Mn/DOT 2005) for information on the gradation of Mn/DOT select granular material

Design Feature	Material(s)	Minimum Out -side Diameter	Additional Details
Stainless steel clad	316L stainless steel/carbon steel	1.5 in.	1.5 mm cladding thickness over Grade60 (min) carbon steel
Stainless steel tube -Steel insert	316L stainless steel/carbon steel	1.5 in.	1.5 mm wall thickness, press-filled with Grade 60 (min) carbon steel
Stainless steel tube -Resin/Grout fill	316L stainless steel/resin or grout	1.5 in.	3.0 mm wall thickness, filled with resin or grout with minimum compressive strength 5000 psi
Stainless steel pipe -Schedule 40	316L stainless steel	1.25 in.	Pipe must conform to ASTM A312, have wall thickness of 3.5 mm, be filled or capped to prevent intrusion of concrete or other materials
Stainless Steel -Solid	316L stainless steel	1.5 in.	Solid stainless steel bar
Rolled zinc alloy -Clad	Zinc alloy (U.N.S. Z41121)/carbon steel	1.5 in.	1.0 mm cladding thickness over Grade 60 (min) carbon steel

Table 2. Approved dowel bar types for HPCP projects in Minnesota [8].

The fine aggregates for HPCP are tested for ASR potential based on the accelerated mortar bar test method according to ASTM C 1260. Expansions greater than or equal to 0.15% require mitigation through the use of supplementary cementitious materials. If the expansion is greater than 0.30%, the aggregate is rejected [8]. Mn/DOT also uses a well graded combined aggregate gradation based on an 8-18 specification. The percent retained on all specified sieves should be

between 8% and 18% except for the coarsest sieve and sieves finer than No. 30, where the percent retained can be less than 18%. The acceptable gradation band for HPCP aggregates is shown in Figure 1 [8].

Mn/DOT uses supplementary cementitious materials to reduce the permeability and protect against durability issues such as ASR in HPCP mixes. A rapid chloride ion permeability value of 2,500 coulombs or less at 28 days is specified. Contractors typically meet this specification by using Class C fly ash. To protect against freeze-thaw damage, Mn/DOT specifies an air content of $7.0\pm1.5\%$ for HPCP projects. The high air content is to protect against loss of air due to over-vibration and infilling of voids. Current projects provide incentives for w/cm ratios under 0.40.

Mn/DOT requires that new pavements be closed to traffic for 7 days or until a flexural strength of 350 psi is reached. A minimum cementitious content of 530 lb/yd³ and a minimum cement content of 400 lb/yd³ is required. The concrete is cured using poly-alpha-methylstyrene curing membranes. The supplementary cementitious content limits are 30% fly ash or 35% ground granulated blast furnace slag (GGBFS). SCM's are used to decrease permeability, improve durability, and mitigate ASR [8]. Aggregate quality is very important in long-life concrete. In Minnesota, the absorption content of aggregates is limited to 1.5% and the carbonate content is limited to less than or equal to 20% [7].



Figure 1. 8-18 Aggregate gradation acceptance band for Minnesota HPCP mixes [8].

Long-Life Concrete Pavements: Domestic Practices in the U.S.

The definition of long-life concrete pavements in others states vary but typically it refers to pavements with service lives of 30 to 40 years or more. While the climates and conditions vary tremendously throughout the United States, common to all the long-life PCC designs are well

graded aggregates, high strength concrete (approximately 650 psi flexure at 28 days), drainable bases, and in the case of JPCP, joint spacing near 15 ft. In every state investigated in this study, premature failures were attributed to saturated base layers even when high quality concrete was used.

Illinois

Illinois began investigating a long-life pavement program in the late 1990's. Illinois high volume pavements are typically Continuously Reinforced Concrete Pavement (CRCP) designs. The main changes that were made to the existing concrete pavement design in order to extend the service life was more rigorous concrete materials requirements in order to better resist freeze-thaw and ASR damage, and stricter construction tolerances [5]. The more rigorous material requirements include limiting the freeze-thaw expansion to 0.025 % elongation and if the ASTM C 1260 expansion test results in 0.10 % expansion, the equivalent alkalis in the cement are limited to 0.60 percent [9]. Table 3 summarizes Illinois long-life concrete mixture design.

Illinois uses a w/cm ratio less than 0.40 along with fly ash, or GGBFS, and entrained air. A hot mix asphalt stabilized base is also used. The subbase consists of a 12 in. aggregate layer. The maximum aggregate size of the top 3 in. of this layer is limited to 1.5 in. The maximum aggregate size of the bottom 9 in. of this layer is limited to 8 in. [9].

Ingredient	Quantity
Coarse Aggregate	1840 - 1920 lbs
Fine Aggregate	1150 - 1250 lbs
Cement (Type I)	430 - 490 lbs
Fly Ash	135 - 145 lbs
Water	217 - 255 lbs
Admixtures	Air entrainment, water reducer

Table 3. Typical Illinois long-life concrete mix design [9].

Texas

The Texas DOT (TxDOT) primarily uses CRCP for long-life pavements. In their experience, the primary failures in CRCP are punchouts, wide cracks, spalling, and construction joint failures. In almost all cases, punchout was preceded by pumping and erosion of the base. Absence of tied shoulders and insufficient slab thickness also contributed to punchout failure [10]. In order to improve pavement performance, TxDOT requires a stabilized base, tied shoulders, increased slab thickness, and the Coefficient of Thermal Expansion (CTE) is limited to decrease spalling [11].

Two types of stabilized bases are used in Texas. One consists of 6 in. of cement-stabilized base with a 1in. asphalt layer on top. The other is 4 in. of asphalt-stabilized base. TxDOT found that aggregate with high CTE creates issues with spalling. Based on this finding, the CTE of coarse aggregates is limited to 6.0E-6 in./in./°F [10].

It was found that the use of tied concrete shoulders limited FWD deflection on the CRCP edge to 1/3 that of asphalt shoulders. The deflections measured were similar to those of an interior slab and it is expected that concrete shoulders will result in less erosion and pumping [10].

Washington

Washington typically uses jointed plain concrete designs for long-life PCC pavements. About 38% of the concrete pavements were older than 35 years as of 2006 in Washington. The three primary distresses found in these pavements are: joint faulting due to lack of dowels and poor underlying conditions, surface wear due to studded tires, and longitudinal cracking which is believed to have occurred early in the pavements life due to traffic loading. While the pavements are considered deficient in thickness (8-9 in.) and load transfer (no dowels at joints) for long-life, they have performed very well due to the use of high quality materials including large aggregate size with excellent characteristics [11].

The thickness of concrete pavements has increased to 13 in. in the high volume areas of Seattle, to accommodate diamond grinding around years 20-25 in order to remove wear due to studded tires. The bases typically consist of four inches of dense-graded HMA over 4 in. of crushed stone. This base was chosen based on the performance of three types of bases traditionally used in Washington [12]:

- Cement-treated base Pavement had severe joint faulting, pumping, and cracking. Showed signs of erosion and voids and is no longer allowed in Washington.
- Asphalt-treated base Pavements had minimal joint faulting. It was found that joint faulting occurred due to stripping because of the low asphalt content (2.5 to 4.5%).
- Crushed stone Pavement faulted. Fines migrated from the base and subgrade to the top of the base course contributing to joint faulting. The height of the joint faulting was directly related to the height of the migrated fines.

Current concrete mix designs allow either gap or continuously graded aggregates with 0.8 in. max aggregate size. If used, fly ash is Class F and is limited to 35% replacement of the total cementitious content. Ground Granulated Blast Furnace Slag (GGBFS) or combinations of GGBFS and blended cements are permitted. Traffic opening is allowed when a compressive strength of 2,466 psi is reached as determined from compression tests or maturity measurements. Stainless steel dowels are used in all JPCP [12].

Iowa

Iowa typically uses JPCP design for long-life pavements. Ceylan, Cable, and Gopalakrishnan 2006 [13] conducted a survey on long-life concrete pavements in Iowa. Surveys were sent to the six Iowa DOT District Offices, 99 counties, and 40 cities. The survey asked to identify three pavements, 20 years old or older, that are performing well and three pavements that are under 20 years old which are not performing well. Twenty nine of the counties responded with 112 pavement sections and seven cities responded with 36 pavement sections. According to the Iowa DOT records, there are 30 pavement sections over 20 years old in the Interstate system and

according to the District Offices, there are 641 pavement sections over 20 years old that have not been resurfaced.

Limited data was available about the pavement subgrades. The well performing pavements had average w/cm ratio of 0.49 and the poor pavements had average w/cm ratios of 0.55. One of the most common distresses observed in the low and medium volume roads was longitudinal cracking. Longitudinal cracking can results from subgrade and concrete materials problems as well as heavy axle loads and subgrade failure.

Florida

Florida typically uses JPCP designs for long-life pavements. In Florida, pavements that range from 40 to 45 years old that are in good condition exist in the Interstate Highway System. These well performing long-life pavements typically have good subbase drainage, carefully constructed joints, and concrete materials and mixture designs that required longer curing times than typical pavements currently being used. The longer curing time allowed less restrained shrinkage and longer fatigue life [14].

The pavements that did not perform well typically had poor subbase drainage. Water was trapped between the subgrade and the pavement, causing pumping and corner cracks. Dowels were not used. Quality control was also an issue [14].

In a prematurely failed pavement, I-75, pumping was a problem. The base had low strength and the pavement had randomly spaced joints with some spaced more than 20 ft. Distress from thermal restraint also occurred because the longitudinal joints from all lanes and shoulders were tied [14]. As a result of the premature failures, Florida adopted new long-life concrete guidelines; all joints are doweled, no joint spacing greater than 15 ft, no randomly spaced joint patterns, no skewed joints, and all joints are sealed [14].

Two different drainable support designs are used in Florida. The first is 4 in. of asphalt- or cement-treated permeable base over a stabilized subgrade. An asphalt separation layer is used between the subgrade and base to prevent the migration of fines. The second support is a 5 ft. subgrade/embankment composed of special select material that meets AASHTO A-3 soil classification. The required permeability is 1.6×10^{-6} ft/s with less than 12% fines passing the No. 200 sieve. Since this layer lacks the fines to give adequate stiffness, 3 in. of AASHTO standard size 57 or 89 aggregate is placed on top of the subgrade (directly under the pavement) and blended with the top 6 in. of the special select material. An edge drain is also used in all concrete pavements in Florida [14].

California

California uses both CRCP and JPCP for long-life pavements. Rao, Darter, and Pyle 2006 [15], studied two CRCP in California; a stretch of I-80 between San Francisco and Sacramento, built in 1949 and the other, a section of I-5 in Tracy, built in 1971. Both pavements have served well beyond their design lives and capacity.

The I-80 project consisted of an 8 in. slab with two 12 ft. tied lanes using 0.63 in. diameter ties spaced at 30 in. A tongue and groove joint was used between the lanes with a 4 in. expansion joint at both ends of the one mile long CRCP lanes. The 360 day flexural strength of the concrete used was 810 psi. From 1949 to 2005 the lane carried about 40 million trucks. The remaining pavement in this section consisted of JPCP with 15 ft joint spacing. Cement treated 4 in. base (3.5%) was used over 8 in. of granular material under both sections. The concrete maximum aggregate size was 2.5 in. While the CRCP remains in good condition, the JPCP is not and has transverse cracking, corner breaks, and spalled joints [15]. The section of I-5 near Tracy, California was an 8.5 in. thick CRCP slab with 0.56% steel. The concrete used had a modulus of elasticity of 4.05E+06 psi and a 15 year flexural strength of 664 psi measured on cut beams. The CTE was measured to be 6.15E-6 in/in/°F. The base layer was also cement treated (4%) and placed over an A-2-4 granular subbase. This pavement is also currently in very good condition [15].

Evaluation of the M-E Design Guide was also part of this study and both of these pavements performed as the MEPDG 2002 [3] predicted and were not outliers. It is believed that the low mix shrinkage as well as the long curing time during low to moderate temperatures played a significant role in the performance of these two pavements. Based on California's experience with long-life pavements, they recommend 28-day flexural strength of at least 675 psi, CTE below 6.0E-6 in/in/°F, and using either a cement or asphalt treated base with good drainage properties [15].

Virginia

The typical high-performance pavement design in Virginia consists of a 9 in. doweled JPCP slab with 15 ft. joint spacing. Hossain and Elfino 2006 [16] investigated the premature failure of a JPCP in Virginia. They found that even though the concrete was of high quality and constructed with high quality materials, because drains were blocked, water was trapped under the pavement. Premature failure then occurred due to pumping of the trapped water. Pavement sections that did not have clogged drains remained in good condition.

The base consisted of 4 in. of AASHTO #57 aggregate mixed with 230 lb/yd^3 . Under this layer was 6 in. of cement-treated soil using 10% cement by volume. The shoulder consisted of 6 to 9 in. of variable depth, undoweled tied shoulders with 4 in. of dense graded base material and a pavement edge drain.

Long-Life Concrete Pavements: International Practices

Germany and Austria typically use CRCP and a design catalog to select pavement thickness. The design thicknesses are based on previous laboratory research and field observations. In the Netherlands and the United Kingdom, mechanistic-empirical design software is used but very few miles of concrete pavements are constructed in these two countries. In Germany and Austria, maximum slab thickness is a common feature in the design catalogs with the maximum slab thicknesses being thinner than in the United States for similar traffic levels with often heavier trucks. Fatigue cracking has not been an issue with the thinner slabs [17].

Australia

Australia's experience with concrete pavement is mainly limited to the populous New South Wales area. While the rest of the country has had little experience with concrete pavements, they have borrowed the best practices of other countries and adapted them to their material and climate conditions. Australia has developed a catalog for long-life heavy-duty pavements. Concrete has a required minimum flexural strength of 653 psi and compressive strength of 5,076 psi at 28 days. The JPCP is also debonded from the base layer to allow for free curl and warping of the concrete [18].

A lean-mix concrete base is used with minimum compressive strength of 725 psi at 42 days. This layer has no induced joints and limited construction joints. Tied concrete shoulders are used with widths of 7 to 10 ft in the curb lane and 2 ft. in the median lane. All joints are sealed and a minimum of 12 in. of the subbase is select material with a CBR greater than 30% after a 4-day soak, a PI of less than12, and compressive strength of 145 psi. The top 6 in. is stabilized with 2% hydrated lime if the material has a soaked California bearing ratio less than 30% [18].

Austria

In Austria, the highest-volume pavements (18-40 million design axle loads) are typically 10 in. thick JPCP on 2 in. bituminous interlay and either 18 in. of unbound base or 8 in. of cement stabilized base with 18 to 20 ft pavement joint spacing. All concrete pavements are built in two lifts with recycled or inexpensive aggregates used in the bottom 8 in. and more wear resistant aggregate used in the upper 1.5 in. with an exposed aggregate surface. Dowels in the transverse joints are 1 in. diameter and 20 in. long. They are spaced more closely in the traffic wheel paths and farther apart between the wheel paths. Tie bars in the longitudinal joints are 0.55 in. in diameter, 27.5 in. long, and spaced 6.5 ft apart for three tie bars per slab. Sealant reservoirs are sawed 0.3 in. wide in both transverse and longitudinal joints. Preformed seals are used in transverse joints and liquid sealant is used in longitudinal joints [17].

Austria requires European standard type CEM II cement with an initial set time of no less than 2 hours at 68°F, Blaine fineness no greater than 3,500 cm²/g, and 28-day cube strength no less than 1,000 psi. In the lower concrete course of the two lift construction; the required 28-day flexural strength is 800 psi and 28-day compressive strength is 5,000 psi. The upper course is required to have a 28-day flexural strength of 1,000 psi and a 28-day compressive strength of 5,800 psi. Aggregate used for exposed aggregate concrete must have a polished stone value of at least 50. The lower course may consist of recycled concrete or asphalt aggregate (10% maximum for asphalt aggregate). Slag replacements of 20-25% are used. The minimum cement content in the lower course is 594 lb/yd³ and 675 lb/yd³ in the upper layer. The required air content is 4.0 – 6.0% [17].

Belgium

The E5 motorway from Brussels to Liege is a CRCP that is still in good condition after 34 years and with 112,000 vehicles per day as of 2000. This road has had minimal maintenance during the first 30 years and it is expected that it will have a life span of 40 to 50 years [19].

The E5 is a CRCP with slab thickness of 7.9 in. It has a 2.4 in. asphalt base above 7.9. in. of lean-mix concrete and finally a 7.9 to 31.5 in. sand subbase. The required average concrete strength was 10,443 psi at 56 days and apparent dry density of 143 lb/ft³ [19]. The mix design used is shown in Table 4.

The E5 concrete was not air entrained because of the high strength and density. The w/cm ratio was 0.42. The required 56 day compressive strength of the lean concrete subbase was 1,450 psi and it had a cement content of 169 lb/yd³. To prevent cracking, a slow curing blast furnace slag cement was used. Immediately after finishing, a bituminous emulsion was sprayed on then covered with sand. The asphalt base also prevents reflective cracking from the subbase. The performance of this road is attributed to the high-strength concrete base and asphalt base course and the high quality concrete. Other reasons are the excellent bond between the asphalt layer and upper and lower concrete layers. The good drainage due to side gutters, sufficient cross slope, thick layer of drainage sand, and drainage pipes on the edge of the shoulder also significantly contributed [19].

Ingredient	Quantity
Crushed stone 22/40	1261 lbs
Crushed stone 8/22	631 lbs
Crushed stone 2/8	589 lbs
River sand 0/2	681 lbs
Cement (CEM I or CEM III)	673 lbs
Water	286 lbs
Admixtures	HRWR

Table 4. Concrete mix for CRCP on E5 Motorway [19].

The Walloon Motorway is another successful long-life pavement in Belgium that has been in service for 35 years with hardly any maintenance and with average daily traffic of over 15,000 heavy vehicles. The road is located in a wet temperate area that experiences freeze-thaw cycles during 5 to 6 months of the year. It was built on clay loam that was stabilized by applying quick lime on successive layers 11.8 in. thick. The CRCP used was 7.9 in. thick, with 2.4 in. of dense macadam, then a lean-concrete 7.9 in. thick and finally a drainage layer of sand 9.8 in. thick above the specially compacted subgrade (colliery shale) which was 3.3 to 4.9 ft thick. The lean concrete layer had a cement content of 152 to 170 lb/yd³. The largest aggregate used (22/40) was limestone with the other coarse aggregates being sandstone [20]. The concrete mix design is shown in Table 5. The w/c ratio varied from 0.40 to 0.42. The concrete used had 90 day compressive strengths ranging from 9,956 to 11,379 psi [19].

Ingredient	Quantity
Crushed stone 22/40	1269 lbs
Crushed stone 8/22	635 lbs
Crushed stone 2/8	592 lbs
Sand (FM 1.72 to 3.40)	719 - 731 lbs
Cement (HK40)	592 - 677 lbs
Water	254 - 271 lbs
Admixtures	HRWR

Table 5. Walloon Motorway mix design [19].

Canada

The standard concrete pavement used in Ontario is a doweled, JPCP with a 14 ft widened outside lane. Transverse joints are randomly spaced with an average spacing of 14 ft. Concrete thickness design is based on both the 1993 AASHTO Guide for the Design of Pavement Structures and the Canadian Portland Cement Association's mechanistic-empirical rigid design method with thicknesses ranging from 8 to 11 in. A 4 in. thick, asphalt-treated, open-graded drainage layer (0.75 in. maximum size aggregate, 1.8% asphalt cement) base layer is typically used. An open graded cement treated base is also an option [17].

Quebec has had problems with joint deterioration and frost heave in their concrete pavements in the past. In the mid 1990's, two standard concrete pavement designs were adopted by the Quebec Ministry of Transportation. The first was a JPCP with the slab thickness designed for truck traffic over a 30 year period with a thickness great enough to protect against frost heave (typically 10 to 13 in.). JPCP are dowelled, have sealed joints and a base of 6 in. of granular material with a granular subbase of varying thickness. These pavements have performed very well so far with the main distress types being joint and corner spalling. CRCP is the second standard pavement used in Quebec. A typical design uses an 11 in. CRCP slab on an open-graded cement-stabilized base [17].

A minimum concrete compressive strength of 4,350 psi is required in Ontario. An air content of $6.0\pm1.5\%$ is used. Up to 25% GGBFS or up to 10% fly ash can be used or a mixture of both (up to 25%) where the amount of fly ash shall not exceed 10% of the total cementitious materials. In Quebec, ternary mixes are allowed (Portland cement, blast furnace slag, and fly ash) in CRCP but not in JPCP. Blended cements are also allowed. A minimum compressive strength of 5,100 psi is required for both CRCP and JPCP [17].

Germany

Germany uses a design catalog to select total pavement thickness with the standard design based on a 30 year service life. The total thickness includes the concrete slab, base layer, and frost protection layer with typical JPCP thicknesses of 8.6 to 13.8 in. Germany requires the use of a geotextile between concrete pavements and cement stabilized bases to unbond the two layers [17]. The German standard sets the maximum w/c ratio at 0.50, the minimum cement content at 540 lb/yd³, and minimum air content at 4.0%. Beyond this standard, *Additional Guidelines for the Construction of Concrete Pavements* [17] sets the maximum w/c ratio at 0.45 and the minimum cement content for exposed aggregate layers at 702 lb/yd³. Portland cement grade CEM I 32.5 (ASTM Type 1) is used and with the client's agreement, portland slag cement, portland burnt shale cement, portland limestone cement, or blast furnace cement may be used. Only cement with alkali contents less than 1.0% can be used. Pozzolans may be used but fly ash and silica fume cannot be used together. Supplementary cementitious materials are not taken into consideration in the calculation of the cementitious content or w/c ratio. In two-coarse construction, recycled or inexpensive aggregates may be used in the lower layer and different strength requirements exist for each layer. Requirements for aggregates include; high freeze-thaw resistance, high polishing resistance, and at least 35% must be crushed. Concrete in the high-volume strength class must have 60 day compressive strength of 4,350 psi and 650 psi flexural strength at 28 days [17].

CONSTRUCTION

Base and Pavement Design

MnROAD Low Volume Road (LVR) test Cell 53 is 125 ft long between stations 210+85 and 212+00. It consists of a 12 in. JPCP over 5 in. of Class 5 base and 36 in. of Modified Select Granular Subbase. Each lane of Cell 53 has the same panel sizes of 12 feet wide by 15 feet long in both the driving and passing lanes. Five No.13 epoxy coated tie bars were used per panel. Stainless steel 1.5 in. diameter dowel bars were spaced every 1.0 ft with 12 per panel. The shoulders consisted of 8 inches of Class 5 underneath 4 inches of concrete. Both shoulders were 8 ft wide with 7.5 ft. tooled joints. The shoulders were not tied to the pavement.

Concrete Mixture Proportions

The concrete mix design for both the lanes and shoulders of Cell 53 followed Mn/DOT's specifications for High Performance Concrete Pavements (HPCP's). The submitted mix design is included in Appendix C and summarized below in Table 6.

Material	Quantity	Units
Water	205	lb/yd ³
Cement	410	lb/yd ³
Fly Ash	175	lb/yd ³
w/cm ratio	0.35	
Fine Agg. (oven dry)	1123	lb/yd ³
CA #1 (size #4, oven dry)	627	lb/yd ³
CA #2 (size #67, oven dry)	1154	lb/yd ³
CA #3 (size #9, oven dry)	224	lb/yd ³
Air content	7±1.5	%
AEA (Sika AIR)	As needed	oz/cwt
WRA (Sikament 686)	0-8.0	oz/cwt

Table 6. Concrete mix design.

Placement of Concrete

Formed paving was used for both lanes and shoulders. The inside instrumented lane was poured on September 29, 2008 and the sensors were covered with concrete at 1:00 PM. The outside lane was poured on October 16, 2008 and both shoulders were poured on October 21, 2009. The concrete tickets from both lane pours are included in Appendix D. The forms were removed the next day in all cases. An L2KT keyed longitudinal joint was used between the inside and outside lanes. The shoulders were not tied to the lanes. All joints were tooled. A McCleary screed was

used to compact the concrete. Prior to paving, concrete was placed around the sensors and compacted with a pensile vibrator. Construction pictures are included in Appendix E.

Concrete Material Sampling and Testing

During construction, material samples were taken for testing by American Engineering Testing (AET). Table 7 summarizes the quantity and type of standard test performed on concrete material samples taken during the construction of test Cell 53.

The University of Pittsburgh Civil Engineering Laboratory tested the concrete samples for coefficient of thermal expansion and American Engineering Testing tested the concrete samples for freeze-thaw durability, flexural, and compressive strength. In addition Mn/DOT made and tested additional flexure beams on site.

Test (Standard)	Number of Samples	Test Age (Days)
	2	3
Compressive Strength	2	7
(ASTM C 39)	2	21
	2	28
	1	1
Elevented Strength Third Doint	1	3
(ASTM C 78)	5	7
	3	28
	2	47
Freeze-Thaw (ASTM C 666)	3	-
Coefficient of Thermal Expansion	2	-
Rapid Chloride Ion Permeability (ASTM C 1202)	3	28

 Table 7. Material samples taken during construction.

Compressive Strength

Table 8 lists the results from compressive strength testing done on the concrete samples by AET. The cylinders listed in this table were cast on site then transported to AET's testing lab for curing. Mn/DOT requires 3000 psi to open a road to traffic. As shown in Table 8, the concrete used for this test cell had over 3000 psi at 3 days.

Flexural Strength

Table 9 lists the results from the flexural strength testing done by American Engineering Testing (AET) and Mn/DOT. The beams tested by AET were cured on site for the first 24 hours then transported and cured in a temperature controlled moist room. The Mn/DOT beams were cured

on site in a water bath. The difference in strengths between the AET and Mn/DOT beams reflects this difference in curing. A flexural strength of 350 psi is required by Mn/DOT to open a road to traffic. As shown in Table 9, the AET beams (lab cured) had more than 350 psi at 3 days and the Mn/DOT beams (field cured) had 525 psi at 7 days.

AET Inside Lane								
Age	Date Cast	Date Tested	Strength (psi)	Type of Failure				
3	9/29/08	10/02/08	3270	Shear				
3	9/29/08	10/02/08	3230	Cone & Shear				
7	9/29/08	10/06/08	4470	Shear				
7	9/29/08	10/06/08	4420	Cone & Split				
21	9/29/08	10/20/08	5370	Side Fracture				
21	9/29/08	10/20/08	5560	Cone & Split				
28	9/29/08	10/27/08	5950	Cone & Split				
28	9/29/08	10/27/08	5840	Cone				

Table 8. Compressive strength testing results.

 Table 9. Flexural strength testing results.

Age	Date Cast	Date Tested	Strength (psi)	Air Content (%)	Slump (in)	Concrete Temp (°F)				
AET Inside Lane										
1	9/29/08	9/30/08	280	-	-	-				
3	9/29/08	10/02/08	580	-	-	-				
7	9/29/08	10/06/08	790	-	-	-				
7	9/29/08	10/06/08	730	-	-	-				
28	9/29/08	10/27/08	1080	-	-	-				
28	9/29/08	10/27/08	1150	-	-	-				
	•	Mn/I	DOT Inside L	ane						
7	9/29/08	10/06/08	590	-	-	-				
7	9/29/08	10/06/08	460	-	-	-				
28	9/29/08	10/27/08	505	-	-	-				
AET Outside Lane										
7	10/16/08	10/23/08	710	6.2	2.25	62				
47	10/16/08	12/02/08	840	6.2	2.25	62				
47	10/16/08	12/02/08	930	6.2	2.25	62				

Coefficient of Thermal Expansion

Tests to determine the coefficient of thermal expansion (CTE) were done at the University of Pittsburgh. The length change due to temperature changes was measured by a Geokon 4200A-2 Vibrating Wire Strain Gauge. This strain gauge was cast in the concrete cylinder are shown in

Figure 2. The cylinders were then tested according to the AASHTO procedure except that length change was measured using the imbedded strain gauge. Table 10 shows the coefficient of thermal expansion testing results.



Figure 2. Orientation of strain gauges in CTE cylinders.

Specimen	1	2
Cast Date	9/29/08	9/29/08
Height (in)	12.125	12.125
Diameter (in)	6	6
CTE (10 ⁻⁶ /F)	5.3	5.3
Weight (lbs)	29.9	29.7
	Normal Concrete,	Normal Concrete,
Description	Intact,	Intact,
	no visible cracks	no visible cracks

Table 10. CTE testing results.

Freeze-Thaw Testing

American Engineering Testing collected concrete samples and made freeze-thaw beams on site. The beams were then cured and tested at their laboratory according to ASTM C 666A. While there is no standard for mass loss after 300 cycles, generally less than 5% is considered acceptable. Length change is limited to 0.10% and failure for Reduction in Dynamic Modulus of Elasticity (RDME) is 60% after 300 cycles. As shown in Table 11, length change, mass loss, and reduction in dynamic modulus all show that this mix had very good freeze-thaw durability.

Cycles	Test Criteria	Be	eam N	0.	Average
Completed		1	2	2	
20		1	2	3	0.0
30	Weight Loss (%)	.00	.01	.00	.00
	Length Exp. (%)	.00	.00	.00	.00
	RDME (%)	100	100	100	100
60	Weight Loss (%)	.00	.00	.01	.00
	Length Exp. (%)	.00	.00	.00	.00
	RDME (%)	100	100	100	100
92	Weight Loss (%)	.01	.02	.03	.02
	Length Exp. (%)	.01	.01	.01	.01
	RDME (%)	100	100	100	100
120	Weight Loss (%)	.04	.03	.04	.04
	Length Exp. (%)	.01	.01	.01	.01
	RDME (%)	100	100	100	100
153	Weight Loss (%)	.06	.05	.07	.06
	Length Exp. (%)	.01	.01	.01	.009
	RDME (%)	100	100	99	100
187	Weight Loss (%)	.1	.09	.16	.11
	Length Exp. (%)	.01	.01	.02	.01
	RDME (%)	98	99	98	98
213	Weight Loss (%)	.15	.18	.21	.18
	Length Exp. (%)	.02	.02	.02	.02
	RDME (%)	98	98	97	98
245	Weight Loss (%)	.20	.22	.27	.23
	Length Exp. (%)	.02	.02	.03	.02
	RDME (%)	97	97	95	98
276	Weight Loss (%)	.28	.26	.30	.28
	Length Exp. (%)	.03	.03	.04	.03
	RDME (%)	97	97	95	96
301	Weight Loss (%)	.31	.32	.33	.32
	Length Exp. (%)	.04	.04	.04	.04
	RDME (%)	96	96	94	95
Durał	96	96	94	95	

 Table 11. Freeze-thaw test results.

Rapid Chloride Ion Permeability

A concrete samples was not taken during the construction of this test cell but a sample was obtained from Cell 5 which used the same mix design. Three 2 in. thick pucks were cut from one 4x8 in. concrete cylinder. They were then tested according to ASTM C 1202. The test results are shown in Table 12. This mix had moderate to low ion permeability.

	Coulombs	Milliamps (max)
Trial 1	2100	118.5
Trial 2	2080	121.4
Trial 3	1940	108.4
Average	2040	116.1

Table 12. Rapid chloride ion permeability test results.

Base and Subgrade Testing

The base layers in Cell 53 consisted of a 5 in. thick Class 5 base on top of a 36 in. Modified Select Granular subbase on top of a clay subgrade. Samples of the clay subgrade and Modified Select Granular subbase were collected and proctor (Table 13) and gradation (Table 14) tests were performed. Material from the Class 5 base layer was not tested in Cell 53 but Class 5 was tested in other cells at MnROAD constructed at the same time as Cell 53. The average values from the Class 5 material tested in other MnROAD cells is shown in Tables 13 and 14. In addition Light Weight Deflectometer (LWD) tests were done on top of the Class 5 layer.

 Table 13. Base and subgrade proctors.

Material	Opt. Moisture	Max Density (lb/ft ³)	Liquid Limit	Plastic Limit	Plasticity Index	Mn/DOT Class	Clay %	Silt %	Sand %	AASHTO Group	Group Index	R Value
Clay Subgrade	16.0	111.3	33.0	18.6	14.4	L	13.8	41.1	45.1	A-6	5	22.3
Clay Subgrade	14.8	111.4	31.2	19.0	12.2	L	13.0	39.2	47.9	A-6	4	27.7
Select Granular	9.8	124.1								A-2-6		
Select Granular	9.7	119.3								A-2-6		
Avg Class 5	9.3	128.1								A-1-b		

Table 14. Base and subgrade gradations.

Material	1"	3/4"	5/8"	1/2"	3/8"	#4	#8	#10	#16	#20	#30	#40	#50	#60	#100	#200
Clay Subgrade		100			98	93		88		83		77		71	64	54.9
Clay Subgrade		100			99	94		87		83		77		70	61	52.1
Select Granular	100	100	99	97	95	90	82	79	70		52	37	25		11	6.8
Select Granular	100	100	100	98	96	93	86	83	74		55	40	25		10	5.9
Avg Class 5	100	98	95	90	86	73	64	61	52	42	36	26	19	15	9	6.9

INSTRUMENTATION AND EARLY TESTING

Instrumentation

An important feature on the Mn/ROAD project is the extensive infrastructure available to support the instrumentation of pavement sections. Test Cell 53 was built with a large number of electronic sensors embedded in it to measure the pavement's response to load and environmental effects. Table 15 summarizes the type and number of sensors. Appendix F contains more information regarding the function and location of the sensors. Figure 3 shows the layout of the sensors in Cell 53. Installation photos can be found in Appendix E.

Sensor Code	Sensor Type	Measurement Type	Quantities
CE	Tokyo Sokki PML-60	Dynamic Strain	24
DT	Schaevitz HCD-500	Displacement	6
DI	Linear Variable Differential Transducer	Displacement	0
EC	Decagon ECH ₂ O-TE	Moisture	8
HC	Tokyo Sokki PI-5	Joint Opening	6
IK	Intellirock	Maturity	10
IV	Invar Reference Rod	Elevation	4
TC	Omega Thermocouple (Type-T)	Temperature	24
VG	Geokon 4202 Vibrating Wire	Environmental Strain	3
VW	Geokon 4200A-2 Vibrating Wire	Environmental Strain	16
WM	Watermark	Freeze-thaw Cycles	12
XG	Geokon 4202 Vibrating Wire	Temperature	3
XV	Geokon 4200A-2 Vibrating Wire	Temperature	16

Table 15. Sensors used in Cell 53.



Figure 3. Sensor layout in Cell 53.

Early Testing

It is now realized that characterizing the early-age behavior of a concrete pavement can be paramount in understanding its long-term performance. The presence of "built-in curl and warp" can significantly affect how the slab response to dynamic vehicle loads. Another area of interest is in developing further understanding of how concrete maturity relates to stresses in the slabs, such that the timing of joint formation might be better predicted. To accomplish these objectives, intensive early age testing was carried out on Cell 53.

Warp and Curl Measurements

To characterize the built-in curl and warp of the new slabs, the a recently developed laser profiling device called the PALPS (Portable Automated Laser Profile System) was used over several of the panels in each test cell and shoulder to measure the slab profile during the first 72 hours of curing. The measurement locations are shown in Figure 4. The origin of all measurements was 6 in. from the pavement joint and 6 in. from the pavement edge as shown in the figure. Two longitudinal measurements and two diagonal measurements were then taken every 24 hours for the first four days after the pavement was poured.

The measured warp and curl for each measurement path is shown in Figures 5 through 8. At each measurement location, the measured warp and curl did not significantly change over the first four days. The built in warp and curl along measurement path G appears to be convex or "curled down." Along path H, the slab appears to be concave or "curled up." The initial drop in displacement at 1 ft in Figure 6 is from a surface sensor. Along path L, the slab is also "curled up." The drop in displacement at 9 ft is also from a surface sensor. The slab along path M is also "curled up" and also has a drop in displacement at 3 ft due to a surface sensor.



Figure 4. PALPS measurement paths.



Figure 5. PALPS measurement along path G.



Figure 6. PALPS measurement along path H.



Figure 7. PALPS measurement along path L.



Figure 8. PALPS measurement along path M.

Concrete Maturity

Two maturity "trees" with sensors at 5 depths through the slab were installed in this test cell. Both "trees" were installed approximately at mid panel with one 6 in. (Edge) from the pavement edge and the other 36 in. (Mid) from the edge. Of the ten maturity sensors installed, only four survived construction. Figure 9 show the maturity at four different locations in the slab. As shown in the figure, the maturity at 36 in. from the pavement edge was higher than at 6 in. and the maturity near the bottom of the pavement was higher than near the top.



Figure 9. Maturity versus time data from maturity sensors.
SUMMARY AND CONCLUSIONS

MnROAD Low Volume Road test Cell 53 was built to represent Mn/DOT's current Long-Life or High Performance Concrete Pavement design. The primary objective of this research study is to develop an improved service life prediction model for Mn/DOT's current 60-year concrete pavement designs. Secondary objectives include understanding the behavior of these pavements with regards to maturity, slab warp and curl, and thermal expansion. These objectives will be accomplished through extensive testing of materials during construction, and conducting seasonal load response testing under controlled loads of an instrumented concrete pavement test cell (Cell 53) built to Mn/DOT's current 60-year design standards. Load response testing of traditional designs constructed in MnROAD Phase I will be used in the development of the improved life prediction model.

REFERENCES

- 1. D. M. Tompkins, L. Khazanovich, and D. M. Johnson (2008). "Benefits of the Minnesota Road Research Project," *Transportation Research Record*, No. 2087, 12-19.
- B. J. Worel, T. R. Clyne, T. R. Burnham, D. M. Johnson, and D. M. Tompkins (2007). "Low-Volume-Road Lessons Learned: Minnesota Road Research Project," *Transportation Research Record*, No. 1989, 198-207.
- 3. NCHRP (2004), *Guide for Mechanistic-Empirical Design of Pavement Structures*, NCHRP Project 1-37A, National Cooperative Highway Research Program, Washington, D.C., 2004.
- 4. M. I. Darter and E. J. Barenberg (1977). *Design of Zero-Maintenance Plain Jointed Concrete Pavement*, Report No. FHWA-RD-77-111, Vol. 1, Federal Highway Administration, McLean, VA.
- 5. J. K. Cable and L. McDaniel (1998). *Performance Based Specifications*, Center for Transportation Research and Education (CTRE), Iowa State University, Ames, IA.
- 6. T. W. Aymond and D. Theobald (2000). "High Performance Concrete Extends Life of Charenton Canal Bridge," *PCI Journal*, Vol. 45, No. 4, July, pp. 52-62.
- P. R. Rangaraju (2003). "Development of Some Performance-Based Material Specifications of High-Performance Concrete Pavement," *Transportation Research Record*, No. 1834, pp. 69-76.
- 8. T. Burnham, B. Izevbekhai, and P. R. Rangaraju (2006). "The Evolution of High-Performance Concrete Pavement Design in Minnesota," *Proceedings of the International Conference on Long-Life Concrete Pavements*, Chicago, IL, October 25-27.
- 9. T. Winkelman (2006). "Design and Construction of Extended Life Concrete Pavements in Illinois," *Proceedings of the International Conference on Long-Life Concrete Pavements*, Chicago, IL, October 25-27.
- M. Won, D. H. Kim, Y. H. Cho, and C. Medina-Chavez (2006). "Long-Term Performance of Continuously Reinforced Concrete Pavement in Texas," *Proceedings of the International Conference on Long-Life Concrete Pavements*, Chicago, IL, October 25-27.
- 11. Federal Highway Administration (2007). Long-Life Concrete Pavements: Best Practices and Directions from the States, Report No. FHWA-HIF-07-030, Federal Highway Administration, McLean, VA.

- 12. S. Muench, L. Pierce, J. Uhlmeyer, and K. Anderson (2006). "The Evolution of Long-Life Concrete Pavements in Washington State," *Proceedings of the International Conference on Long-Life Concrete Pavements*, Chicago, IL, October 25-27.
- 13. H. Ceylan, J. Cable, and K. Gopalakrishnan (2006). "Defining the Attributes of Well-Performing, Long-Lasting Jointed Portland Cement Concrete Pavements," *Proceedings of the International Conference on Long-Life Concrete Pavements*, Chicago, IL, October 25-27.
- J. Armaghani and R. Schmitt (2006). "Long-Life Concrete Pavements-The Florida Perspective," *Proceedings of the International Conference on Long-Life Concrete Pavements*, Chicago, IL, October 25-27.
- 15. C. Rao, M. I. Darter, and T. Pyle (2006). "Extended Service Life of Continuously Reinforced Concrete Pavement in California," *Proceedings of the International Conference on Long-Life Concrete Pavements*, Chicago, IL, October 25-27.
- 16. S. Hossain and M. K. Elfino (2006). "Impact of Construction on the Life of a Jointed Plain Concrete Pavement in Virginia," *Proceedings of the International Conference on Long-Life Concrete Pavements*, Chicago, IL, October 25-27.
- 17. K. Hall, D. Dawood, S. Vanikar, R. Tally, Jr., T. Cackler, A. Correa, P. Deem, J. Duit, G. Geary, A. Gisi, A. Hanna, S. Kosmatka, R. Rasmussen, S. Tayabji, and G. Voigt (2007). *Long-Life Concrete Pavements in Europe and Canada*, Federal Highway Administration, Report No. FHWA-PL-07-027. Federal Highway Administration, McLean, VA.
- G. Vorobieff and J. Moss (2006). "Australia's Experience with Long-Life, Heavy-Duty Concrete Pavements," *Proceedings of the International Conference on Long-Life Concrete Pavements*, Chicago, IL, October 25-27.
- C. Caestecker (2006). "The Motorway E40 (Formerly E5) From Brussels to Liege," *Proceedings of the International Conference on Long-Life Concrete Pavements*, Chicago, IL, October 25-27.
- 20. V. Helmus (2006). "The Walloon Motorway, From One Millennium To Another," Proceedings of the International Conference on Long-Life Concrete Pavements, Chicago, IL, October 25-27.

Appendix A: MnROAD Test Cells

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3"cl4sp	6"	4" PSAB	PSAB	4" PSAB					58-28 1003 HM 4	58-28 1993 HMA	58-28 1993 HMA	58-28	58-28	58-28	58-28 03HM A	58-28 03HM A	58-28 93HMA	58-28 93HMA
27" CBm	CI4sp	3"cl4sp	3"cl4sp	3"cl4sp	4" PSAB	5"	5" Clára	5"	15555 11414			93HMA	93HMA	93HMA	Clay	Clay	Clay	Clay
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Sep 92	Sep 92	Sep 92	Sep 92	Sep 92	Sep 92	Sep 92	Sep 92	Sep 92	Oct 97	Oct 97	Oct 97	Oct 97	Oct 97	Oct 97	Oct 04	Oct 04	Oct 04	Oct 04
May 08	May 08	Current	Current	Current	Current	Current	Current	May 08	Oct 04	Oct 04	Oct 04	Current	Current	Current	Current	Current	Current	Current

Figure A1. Phase I MnROAD Mainline test sections.

Full Dep	th			LTC	Unbound	d			Low Ter	np		Mesabi		Unbond	ed PCC C)verlay	40.5	Compos	ite
Keclama	tion			Overlay	Kecycled	I Base			Crackin	g		Stone B:	ase	105	205	305	405	106	206
2 1" TBWC	3 1" TBWC	4		15 3= WM	16 5" WM	17 5" WM	18 5" WM	19 5= wM	20	21	22	23 5" WM	ſ	5	5	5	5	6 2"64-34	6 2"64-34
2"64-34 6" FDB	2"61-34 6" FDR	5 01 51		o wax	58-34	58-34	58-34	58-34	58-28	58-28	58-34	58-34		4" 1" PEAR	4" 19 MAR	5"	5"	5"	5=
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6"	2" FDR	utattu		64-22	100%	50% RePCC	12" 100%	12"	12"	12"	12"	12" Mesabi		93 PCC	'93 PCC	'93 PCC	cracked	6" Cl-1 Stab Age	6° Cl-1 Stab Agg
FDR	2"cl5sp	9=		1993 HMA	recycle PCC	50%	RAP	C1-5	C1-5	C1-5	C1-5	Ballast		3"cl4sp	3"cl4sp	3"cl4m	3"clásn		
		FDR + Fly Ash		Clay		Class 5								27"	27"	27"	27"	C1-5	C1-5
		Clay												Clasp	CESP	Cl3sp	C13sp	Clay	Clay
		ciay		58-34	12" Cl3sp	12" Cl3sp	12" Cl3sp	12" Cl3sp	12" Cl3:p	12" Cl3sp	12" CBsp	12" Cl3:p		0.10	Orie .			Masahi	Marahi
26"				Surface				•		•				20x14	20x14	Orig 20m14	Orig	4.75	4.75
Cl4sp	33" Cl3m			Dimner	7=	7"	7"	7"	7"	7"	7"	7"		20x13	20x13	20x14 20x13	20x14 20x13	SuperP	SuperP
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					Gran	Gran	Gran	Gran	Gran	Gran	Gran	Gran		1" dowel	1" dowel	1" dowel	1" dowel	15'x12'	15'x12'
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Clay									Non	30%	30%			Clay	Clay				
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Oct 08	Oct 08	Oct 08		Sept 08	Sept 08	Sept 08	Sept 08	Sept 08	Sept 08	Sept 08	Sept 08	Sept 08		Oct 08	Oct 08	Oct 08	Oct 08	Oct 08	Oct 08
Current	Current	Current		Current	Current	Current	Current	Current	Current	Current	Current	Current		Current	Current	Current	Current	Current	Current
2009 SH	RP-II						Thin				2008								
Compos	ite Desig1	ıs (Desigi	1 Stage)				Concret	e			Whiteto	pping							
1	70	71	72				113	213	313	413	114	214	314	414	514	614	714	814	914
3" HMA	3" SMA	3" PCC	3" PCC				15	13	13		14 6"	4" 4"	67	17 6"	67	17 6"	6	6"	6"
6" PCC	6" PCC	6" PCC	6" PCC				5"	5.5"	6"	6.5"	long broom	long broom	long broom	long broom	long broom	long broom	long broom	long broom	long broom
15% recyc	15% recyc	15% recyc	100% recy				5°CI-1	5°CI-1	5°CI-1	5°CI-1	5"58-28	5"58-28	6"58-28	6"58-28	7*	7"	7.5*	8"	8"
							5	4.5"	Stab Agg	Stab Agg	93 HMA	93 HMA	93HMA	93HMA	58-28 03HM A	58-28 03HMA	58-28	58-28	58-28
CI-5	ci-s	a.3	ci-s				CI-5	CI-5	CI-5	CI-5	Clay	Clay	Clay	Clay	Clay	Clay	SSHMA	SISIMA	SORIMA
22"	Clav	Class	Clay				Clay	Clay	Clay	Clay			6'x6'	6'x6'		610	Cay	Ciay	Cay
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							Current	Current	Current	Current	Current	Current	Current	Current	Current	Current	Current	Current	Current

Figure A2. Phase II MnROAD Mainline test sections.

\frown		Mn	RO	AD L	.ow	Volu	ume	Roa	d			
		33	34	35	36	37	38	39	40			
24	25	26	27	28	29	30	31	32	52	53	54	



32	33	34	35
е [.] Съ и	6° Clóip	67 C5 ę	6" G - 11
6" Cl-1e	6" Cl-1e	6" CI-11	е. е.
Clay	Clay	Clay	Cary
Multiple	Multiple	Multiple	Multiple
Jul 99	Jul 99	Ju199	Ju199
	Data hase ha complete in (Report an)	as the most formation y changes)	

Original	PCC			
36	37	38	39	40
6.5° Trans Tined 15x12 1° dowel	6.5" Trans Tined 12x12	6.5" Trans Tined 15x12 1" dowel	6.5° Trans Tined 20x12 1° dowel	6.3*-7.6* Trans Tined 15x12
57 05.p	12' G5p	5° CiSep	5° CiSep	5* C15ep
Sant	2007 Grind Strips Outside Lane	Chry	Chry	Clay
Jul 93 Current	Jul 93	Jal93 Carrent	Jul 93 May 08	Jul 93 Current





Figure A3. MnROAD Low Volume Road (LVR).

Appendix B: Work Plan

PROPOSED WORKPLAN FOR SIXTY-YEAR DESIGN CONCRETE PAVEMENT – PERFORMANCE MODEL DEVELOPMENT

Principal Investigator:

Name: Ryan Rohne, E.I.T Department: Minnesota Department of Transportation Office of Materials and Road Research Title: Research Project Engineer Address: 1400 Gervais Avenue, Maplewood, MN 55109 Phone : 651 366 5449 Fax: 651 366 5461 E-mail: Ryan.Rohne@dot.state.mn.us

Proposal Abstract

Due to increased traffic congestion and reduced highway construction budgets, emphasis is now being placed on designing and constructing longer life pavements. For concrete pavements, the new goal for urban high volume highways in Minnesota is toward a 60-year design life. Using the current Mn/DOT design guide for concrete pavement design (based on 1981 AASHTO design guide), Mn/DOT is now constructing what is believed to be 60-year design concrete pavements. However, during the design process, both the traffic prediction and service life of the concrete pavement is being extrapolated far beyond the available charts in the current design method.

The primary objective of this research study is to develop an improved service life prediction model for Mn/DOT's current 60-year concrete pavement designs. Secondary objectives include understanding the behavior of these pavements with regards to maturity, slab warp and curl, and thermal expansion. These objectives will be accomplished through extensive testing of materials during construction, and conducting seasonal load response testing under controlled loads of an instrumented concrete pavement test cell (MnROAD LVR Cell 53) built to Mn/DOT's current 60-year design standards. Load response testing of traditional designs constructed in MnROAD Phase I will be used in the development of the improved life prediction model.

Anticipated duration of research project: 54 Months

Total Budget Direct & Indirect Cost: \$113300 Budget details (Direct & Indirect Costs):

Salaries: \$106000 Supplies: Office Supplies & Instrumentation = \$7300

Matching Funds: To facilitate the research process Mn/DOT will construct a Mn/DOT 60-year design concrete pavement test cell at MnROAD (on the low volume loop portion) for \$43,113.

Research Matrix & Methods

- Construct and instrument a concrete pavement test cell based on Mn/DOT current 60-year design standards.
- Collect and analyze sensor measurements including maturity, dynamic and environmental strain, displacement, slab warp and curl during and shortly after construction.
- On a monthly basis, collect and analyze dynamic and environmental strain, displacement, and slab warp and curl measurements.
- Frequently (at least seasonally) monitor surface distress and ride quality of the test cell for a 4-year period.
- After 2 years of traffic application, develop preliminary life prediction models based on available MnROAD data. Refine load response testing schemes if necessary.
- After 4 years of traffic has been applied, complete a life prediction model and prepare, publish, and present research papers and final reports based on the findings.

Required Instrumentation

To perform the proposed measurements and monitoring, the following instrumentation would be required: dynamic and environmental strain sensors, thermocouples, slab moisture sensors, maturity dataloggers, invar elevation reference rods, and frost pins.

Work plan

1. Task 1

Test cell layout, instrumentation, and data collection plan development

This task involves includes determining the overall geometric layout and structural layers of the test cell, and the placement of the instrumentation to accomplish the research study objectives. Construction materials and specifications will also be developed.

The geometric layout of the test cell will follow current Mn/DOT standards for 60-year design concrete pavements.

The instrumentation plan will include detailed information on the geometric location of the sensors, and their function in achieving the study objectives. Data collection frequency will also be outlined and related to research objectives.

The test cell load response data collection plan will be developed based on the research objectives and standard MnROAD facility operation practices. The plan will outline the suggested schedule of load response and non-destructive testing, distress survey, and ride quality measurement events.

Deliverables for Task 1: Powerpoint presentation and a summary report detailing the following:

- Geometric layout and structural layers details for test Cell 53
- A copy of the construction plans and special provisions to the specifications
- Layout of instrumentation
- Performance monitoring plan

Duration of Task 1: September 2007 to March 2008

2. Task 2

Literature review on long life concrete pavement life prediction models

This includes an investigation of the current research initiatives and historical results related to the development of life prediction models for long life concrete pavements. Associated subject areas in the investigation will include maturity, dynamic and environmental strain, displacement, slab warp and curl, joint load transfer efficiency, joint faulting, and surface distress and ride quality of long life concrete pavements.

Based on the findings of the investigation, final research objectives may be adjusted so as to not to repeat the study of well established parameters related to long life concrete pavements. A summary report of the investigation will be prepared and disseminated.

Deliverables for Task 2: Powerpoint presentation and summary report of the literature review investigation, including recommendations for adjusting preliminary research objectives.

Duration of Task 2: November 2007 to December 2007, November 2008 to February 2009.

3. Task 3

Test section construction report

This report will discuss the construction process and document the results from material tests performed during or shortly after the construction. The report will also include the results from maturity testing and early slab warp and curl measurements. As-built geometric and layer thickness data will also be included in the report and input into the MnROAD database.

Deliverables for Task 3: Powerpoint presentation and construction report. Excel spreadsheets with updated cell and instrumentation data for input into the MnROAD database.

Duration of Task 3: Beginning 12 weeks after the date of paving, and ending 12 weeks later.

4. Task 4

Data Collection and Analysis

Based on the data collection plan developed in Task 1, data will be collected, organized, and analyzed to characterize the load response of test Cell 53. Similar data will be collected from other MnROAD concrete pavement test cells in a effort to compare to the

results from Cell 53. Data organization (including insertion into the MnROAD database) and analysis will be done on a timely basis.

Deliverables for Task 4: Excel spreadsheets with data and analysis results from this task for input into the MnROAD database.

Duration of Task 4: Beginning 1 month after the date of traffic application on test Cell 53, and ending 36 months later.

5. Task 5

Develop Preliminary Life Prediction Model

Based on the analysis results from Task 4, a preliminary life prediction model for Mn/DOT's 60-year concrete pavement design will be developed. Based on the model developed, adjustments to the remaining data collection scheme will be invoked. An interim report will be written outlining the preliminary model that was developed.

Deliverables for Task 5: Powerpoint presentation and interim research paper/report. A modified data collection scheme will be implemented (if necessary).

Duration of Task 5: Beginning 2 years after the date of traffic application on test Cell 53 and ending 16 weeks later.

6. Task 6

Develop Final Life Prediction Model and Summarize Other Performance Observations

Using additional data collected since the completion of Task 5, a final life prediction model will be developed. Findings related to secondary research objectives will also be disseminated. This may include a forensic investigation and report of the performance or characteristics of test Cell 53.

Deliverables for Task 6: Powerpoint presentations, a research paper/report describing the life prediction model developed, and paper(s) summarizing the findings of secondary research objectives.

Duration of Task 6: Beginning 3 years after the date of traffic application on test Cell 53 and ending 6 months later.

7. Task 7

Technical Brief, Implementation Strategies Report

Based on recommendations of the Technical Advisory Panel, a four page technical brief, summarizing the findings of the study, will be prepared for general distribution. A brief report will also be prepared outlining suggested implementation strategies for the findings of the study.

Deliverables for task 8: A technical brief and a brief report on implementation strategies.

Appendix C: Concrete Mix Design

JMF 08-033

REQUEST FOR CONCRETE MIX APPROVAL Requested by Tom Schmit Phone 651-319-2369 Firm Name Aggregate Industries Agency Enginner/Inspector S.P. 8680-157 Proposed Aggregate Sources CA #1 CA #2 CA #3 Sand Pit Number 171041 171041 119004 119004 Pit Name Agg. Ind. Agg. Ind. Agg. Ind. Agg. Ind. Nearest Town Elk River Elk River Lakeville Lakeville Size #4 #67 #9 C. Sand Sp. G. & Abs. 2.75 0.009 2.69 0.013 2.69 0.014 2.64 0.008 (Provided by MN/DOT) Proposed Cementitious Sources Cement Ely Ash Other Manufacturer/Distributor Lafarge Head Waters Resources Mill/Power Plant Davenport, IA Coal Creek, ND Type/Class 1/11 C/F Specific Gravity 3.15 2.55 Proposed Mix Designs MN/DOT Mix Number 3A41HPC Water (lbs/C.Y.) 205 Cement (lbs/C.Y.) 410 Flyash (lbs/C.Y.) 175 Other Cementitious (lbs/C.Y.) 0 W/CM Ratio 0.035 Sand (Oven Dry, Ibs/C.Y.) 1123 CA #1 (Oven Dry, Ibs/C.Y.) 627 1154

The above mixes are approved for use, contingent upon satisfactory site performance and continuous acceptability of all materials sources, by:

Concrete Engineering Specialist

Comments: Mix is designed for the materials at Agg. Ind. Rogers Plant (#2)

5P 8680-157 JMF08-033 TOTAL % RETAINED 눈걸 이 걸 은 o 2 #200 JMF WORKING RANGE #100 88825534522405 #50 **FOTAL % WORKING** RANGE 1.6% max LIMITS +) +| +| +| +| +| +| +| ي ج **Optional Or Required Gradation Incentive Specification** 2 + #30 PASSING 100.00% <u>5</u>5 - 8 5 8 99 13 49 98 9 ŝ #16 (% retained above 3/8" / % retained above #8) (Stay in the Area Between Lines) FA #2 8 3/8" MA SIEVE SIZE Job Mix Formula 3A41HPC.xis Coarseness Factor FA #1 L.V. Sand CA #4 36.00% 0.00 000 100.0 00.00 0,00 0.00 100.0 92.0 72.0 44.0 14.0 20 3 1/2" CA #3 L.V.#9 7.00% 0.00 100.0 1000 100.0 100.0 96.0 2.6 80 34" E.R. #67 37.00% 100.0 CA#2 100.0 0.00 97.1 61.3 38.5 0.0 88 0.000 35 11/2" (% bassing #8) Workability Factor E.R. # 20,00% CA #1 100.0 53.9 0.0 00 00 0.0 00 6.3 0 3 2 2 2 2 440 ° 9 4 0 0 AGGREGATE SIZE PROPORTION, % 11/2" 314" 112" ## #160 #160 #200 ŝ **GEVAINED**

C-2

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Appendix D: Concrete Tickets

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	Buendan BABO	REF. / BRIDGE NO.	MIX NO.	TRUCK NO.	CAD OTY: 19	SHULLANE O	A.S. Western	CIRC AND CARACTER
9/29/2008	SP 8680-157	001092	3A41HPC1	405	9.25	37	TOTA	0.00
Ingredient	Source	MCFac AbFac	6D	Abs SSD	Free Nst	CY Targ	Target (Actual .1 Error
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C Sand that	19064 LKV1	0.040 0.014	1127	9 1172	2.8	233	2160	11089 2.81
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WATER	Water Totals	20. 0. 6.8	285	-35 205	-44.6	160	1253	1236 -1.4%
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	Trim Water:	-3 gallons			T	otal Wat	ert 164	Bangaran Persenangan
Mix Wat	er/Cement Ratio:	0.35	1.1	Water	Availa	ble to A	dd: 2	6 gallons
Retual Wat	er/Cement Ratio:	0.31		Wat	er Adde	at Pla	ALCONTRACTOR	analigations /
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CONCRET Provide	Δ	- F	Ready Mix	Division		CU	STOMER P	ROVIDED	RODUCTS	:			
Market Schere Market S			915 Waters Roa agan Minnesota Aain Office Aetro Dispatch	d Suite 105 55121	(651) 683-060 (651) 683-815		USTOMER SUARANTEI ADDITIONA AGGREGATE	PROVIDED P ES/WARRANT L FEES APPLY E INDUSTRIES	RODUCTS A TIES. 7 FOR ADDI 5.	NG PROD	UCTS NOT	VOIDS ALL	
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BOT DOCUTION CONTINUE NAME ORDER NO. Usade.cost 9/29/2008 6.6514 PCI 3570 PRVING NET NN RCAD RECONCTRUCTIONAL DEFIVILLE 0 PRVING 0 OPEN Truck: 405 Olump: 3 COME IN OFF 37 TO MN ROAD AT ONDERD PV 0 0 MICHING ANT CLORE FROM THERE. MICHENS, TELLY 0 14:2 Ref TO-DIRECT FROM THERE. MICHENS, TELLY 0 14:2 Ref ANALIPCE DESCRIPTION ONE Ref Ref Ref ANALIPCE DESCRIPTION ONE Ref Ref Ref ANALIPCE SS / 2,55 46.25 CV 0.00 0.00 SALIPPCI FLAST PCI SIZES 0 0 0 ROBERS PLANT 2 PCI SIZES 0 0 0 0 SZS 400 Ref / MEDOS NO MAR NO. TRACK NO MARAGE 0 0 0 0 0 SZS 40 SZS 5	intiet vath skin in tation bersi	sts. KEEP OUT	righty with water FOR THE REACH	of CHILDRI	edical attention IN:	NO FOR	CREDIT A	LLOWED FO	OR CONCR	TURN CH	URNED. HECK CH	SEE REVER: ARGES.	
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Ingredient Source NCF a. ShF ac OD Abs SSD Free Met CY Jarg Target Actual X Error 1.5" (14) E.R. 0.010 0.013 627 8 635 1.9 633 5860 5990 2.04 1.5" (14) E.R. 0.010 0.013 627 8 635 1.9 633 5860 5990 2.04 2. Sand Lkv1 19004 Lkv1 0.038 0.008 1123 9 1132 33.7 1165 10780 10820 0.45 20530(667)E.R. 171041 E.R. 0.013 0.013 1154 15 1169 6.9 1176 10860 1040 1.55 20530(67)E.R. 171041 E.R. 0.013 0.013 1154 15 1165 10780 10828 0.45 20530(67)E.R. 175 0.013 1154 15 1169 6.53 1.65 1040 1.55 1.65 205300 175 0.013	ROGERS	PLANT	2		CISTOMER PC 1		512	custolida a		TAX SUB TOTO TRUCK TH OTHER		0	
1.5" (14) E.R. 0.010 0.013 627 9 635 1.9 633 5869 5969 2.6* H9 Livit 119004 Livit 0.018 0.014 224 3 227 5.8 233 2160 2509 15.7* C. Sand Livit 19004 Livit 0.038 0.008 1123 9 112 33.7 1165 10789 10820 0.4* DAS0(067)E.R. 171041 E.R. 0.013 0.013 1154 15 1159 6.9 1176 10880 1040 1.5* Datase C/F Reh CDCLINED 1175 0 0.0 175 160 0.0 175 1619 1655 1.6* Class C/F Reh CDCLINED 175 0 0.0 175 160 1291 1286 -0.4* Sika Air SIAIR 4 0 0.0 4 216 216 0.6* Nix Water / Ceaent Ratio: 0.35 32 32 32 10 10 10 1164 140 21 21 10 10 10 10<	R06ERS 8406 9/29/2008	PLANT SP 86	2 2 80-157	Z:5 HIRAH OF CO 7 BRIDGE NO. 0010 %	CUSTOMER PC 1 MIX NO. 3A41HPC1	TRUCK NO: 177	512 LOAD QT 9, 25	CUSTOMER 8 153 Y. CUMULA 6 46, 25	IDE THE	тах sus тото отнек тота		9 0 9.90	
19 Livit 19004 Livit 0.003 0.004 224 3 327 5.8 233 2160 2009 15.75 C. Sand Livit 19004 Livit 0.038 0.008 1123 9 1132 33.7 1166 10780 10820 0.44 1.55 Datase C/F Rsh COUNNO 1154 15 1169 6.9 1175 10820 1040 1.55 Lass C/F Rsh COUNNO 175 0 0.0 175 1619 1635 1.65 Lass C/F Rsh COUNNO 175 0 0.0 175 0 0.0 175 1619 1635 1.65 Lass C/F Rsh COUNNO 175 0 0.0 175 1619 1635 1.65 Lass C/F Rsh COUNNO 175 0 0.0 4 37 37 0.65 Sika Air SIAR 205 35 395 44.6 160 1291 1285 1.65 Nix Water / Cement Ratio: 0.35 24 0 0.0 4 216	ROGERS BATE 9/29/2008 Ingredient	PLANT SP BE Source	2 PLANT P 2 REF. 80157	Z.S. HIRAIE OF GO OBIOGE NO. 001036: NCF 5. 9bl	C SMPHANCE CUSTOMER PC 1 MIC NO. 304 1HPC 1 Fac 05	TRUCK NO. 177 Abs SSD	512 512 10AD QT 9, 25 Free	CUSTOMER 1 153 Y. CUMBULA 46.25 Net CY 1	nde mis mve orv ; Jarg Tai	TAX SUB TOTA DIALEK THE OTHER TOTAL	Actual	0 0 0.00 * Error	
DRS0(467)E.R. 171041 E.R. 0.013 0.013 1154 15 1169 6.9 1176 108800 11040 1.55 Holcis I HOLNCIA 410 3 0.0 0.0 410 3792 3785 425 Class C/F Ash COCUMND 175 0 0.0 175 1619 1635 1.65 AATER Mater Totals 175 0 0.0 175 1619 1635 1.65 AATER Mater Totals 175 0 0.0 4 37 37 0.05 Sika Air SIAIR 4 0 0 0.0 4 216 216 0.05 Sika Air SIAIR 4 0 0 0.0 4 216 216 0.05 Sika Air SIAIR 4 0 0 0.0 4 216 216 0.05 Sika Air SIAIR 4 0 0 0.0 4 216 216 0.05 Mix Water Cement Ratio: 0.35 324 1041 <t< td=""><td>ROGERS 2402 9/29/2008 Ingredient 1,5" (14) E.R.</td><td>SP 86 Source 171041 E.R.</td><td>2 2 80-157</td><td>Z:5 HIICALE OF CO 7 BRIDGE NO. 0010 5: NCF = 9bi 0,010 0</td><td>CUSTOMER PC 1 MDC NO. 3A & 1 HPC 1 Fac 05 .013 627</td><td>TRUCK NO: 177 Abs: SSD 8 6</td><td>512 LOAD QT 9, 25 Free 5</td><td>CUSTOMER S 1153 Y CUMBULA 16,25 Net CY 1 1.9</td><td>INVE OTVE</td><td>TAX SUB TOTA TOTAL TOTAL rget { 5660</td><td>Actual Sign</td><td>0 0 0.00 * Error 2.65</td></t<>	ROGERS 2402 9/29/2008 Ingredient 1,5" (14) E.R.	SP 86 Source 171041 E.R.	2 2 80-157	Z:5 HIICALE OF CO 7 BRIDGE NO. 0010 5: NCF = 9bi 0,010 0	CUSTOMER PC 1 MDC NO. 3A & 1 HPC 1 Fac 05 .013 627	TRUCK NO: 177 Abs: SSD 8 6	512 LOAD QT 9, 25 Free 5	CUSTOMER S 1153 Y CUMBULA 16,25 Net CY 1 1.9	INVE OTVE	TAX SUB TOTA TOTAL TOTAL rget { 5660	Actual Sign	0 0 0.00 * Error 2.65	
Moleis I HOLMCIA 410 9 0 6.9 410 3792 3785 425 Class C/F Ash COCUMME 175 0 0 0.0 175 1619 1635 1.055 MATER Mater Totals 205 35 305 44.6 160 1291 1286 -0.45 Sika Air SIAIR 3 0 0.0 4 37 37 0.05 Sika Air SIAIR 4 0 0.0 4 37 37 0.05 Sika Air SIAIR 4 0 0.0 4 216 216 0.05 Sika Air SIAIR 4 0 0.0 4 216 216 0.05 Sika Air SIAIR 4 0 0.0 4 216 216 0.05 Sika Air SIAIR 4 0 0.0 4 216 216 0.05 Mix Water/Cement Ratio: 0.35 Water Added at Plant: gallons 10 tal Mater: 10 tal Mater: 10 tal Mater: 10 tal Mater:	RDGERS BATE 9/29/2008 Ingredient 1.5" (14) E.R. 19 Liv) . Sapi Livi	PLANT PLANT SP 86 Source 171041 E.R. 119004 Lkul 19004 Lkul	2 2 80-157	Z.S. HIRALI OF CO 2010 56: NCF 5: 510 0.010 0. 0.010 0. 0.010 0.	G SXPHIANCI COSTOMER PC 1 MDC NO. 3A41HPC1 Fac 00 .013 627 .014 224 .024 123	TRUCK NO. 177 Abs SSD 8 6 3 2 9 11	512 10AD QT 9, 25 17 27 12	CUSTOMER # 153 X CUMULA 5 46.25 Net CY 1 1.9 5.8 3.7	noc mue orw G Jarg Tai 233 1 166 1	785 508 TO7A 194CK TH OTHER TOTAL 195869 2160 8788	Actual 5966 2509	0 0 0.00 * Error 2.0% 15.7% 8.4%	
Class C/F Rsh. CUCUMPD 175 0 0 0.0 175 1619 1635 1.64 MATER Water Totals 205 35 205 44.6 160 1291 1286 -0.44 Sika Air SIAIR 4 0 0.0 4 37 37 0.04 Sika Air SIAIR 4 0 0.0 4 216 216 0.04 Sika Air SIAIR 4 0 0.0 4 216 216 0.04 Sikament 686 SIKA686 4 0 0.0 4 216 216 0.04 Mix Water/Cement Ratio: 0.35 Uater Available to Add: 21 gallons Neture Added at Job Site: gallons Tobil Actual Water: 10s Batch Time: 14:03 276 104 Water Added at Job Site: gallons Tobil Actual Water: 0 0.0 105 105 105 Water Added at Job Site: gallons 105 105 105 105 S96150 276 10	RDGERS Date 9/29/2008 Ingredient 1.5" (14) E.R. 19 Liv) 2. Sand Liv1 2580 (167) E.R.	PLANT PLANT SP 86 Source 171041 E.R. 119004 Lkv1 171041 E.R.	2 PLANT 0 2 REF. 80157	Z:5 HIIKALI OF CO BIODGE NO. 001056 NCF - Shi 0.010 0 0.010 0 0.010 0 0.010 0 0.010 0 0.013 0	Costomer PC 1 MDC NO. 3A41HPC 1 Fac 00 .013 627 .014 224 .008 1123 .012 1154	TRUCK NO. 177 Abs SSD 3 2 9 11 15 11	512 10AP QT 9, 25 7 27 12 13 69	CustoMen a 153 K CUMULA 5 46.25 Net CY 1 1.9 5.8 33.7 1 6.9 1	1000 mile of xx 5 Targ Tai 633 1 233 1166 11 1176 11	783: SUB TOTA CRACK THE OTHER TOTAL 19860 2160 2160 2160 2160 2080 2080	Actual 5966 2509 10828 11040	0 0 0 2.00 * Error 2.6% 15.7% 8.4% 1.5%	
Sika Air SIAIR 4 0 0.0 4 37 37 0.0 Sika Air SIAIR 4 0 0.0 4 37 37 0.0 Sika Air SIAIR 4 0 0.0 4 37 37 0.0 Sika Air SIAIR 4 0 0.0 4 216 216 0.0 Sika Air SIAIR 4 0 0.0 4 216 216 0.0 Sika Air Sika Air SIAIR 4 0 0.0 4 216 216 0.0 Sika Air Si Air 37 37 0.0 0.0 4 216 216 0.0 Mix Water/Cement Ratio: 0.35 Uater Available to Add: 21 gallons Not of the actual Water 14:03 2767 Water Added at Job Site: gallons Tobal Actual Water: 14:03 2767 Ibs By signing this delivery ticket you agree to t 4 0 0 0 0 0 0 0 <t< td=""><td>ROGERS 9/29/2008 Ingredient 1.5" (14) E.R. 19 Liv) 2. Sand Liv) 2. Sand Liv) 2. Sand Liv) 2. Sand Liv)</td><td>PLANT PLANT SP 86 Source 171041 E.R. 119004 Lkv1 171041 E.R. HOLYCIA</td><td>2 2 80 80-157</td><td>Z.S. MIKATE OF CO MIKATE OF</td><td>Costomer PC 1 Milk NO. 344 (HPC 1 Fac 08 .013 627 .014 624 .028 1123 .013 1154 410</td><td>TRUCK HO: 177 Abs SSD 8 6 3 2 9 11 15 11 8</td><td>512 10AP QT 7, 25 Free 55 27 12 13 15 9 0</td><td>Custolida a 153 7 Cunauta 6 46.25 Net CY 1 19 5.8 3.7 1 6.9 1 0.0</td><td>ID: 11 Inve orv: Jarg Tal 633 1 233 1 166 10 1176 10 110</td><td>7832 SUB TOTA TRACK THE OTHER TOTAL 101AL 102AL 100 8789 0689 3792</td><td>Actual 5990 2509 10828 11040 3785</td><td>0 0 0 2.00 5 Error 2.05 15.77 8.45 1.55 25</td></t<>	ROGERS 9/29/2008 Ingredient 1.5" (14) E.R. 19 Liv) 2. Sand Liv) 2. Sand Liv) 2. Sand Liv) 2. Sand Liv)	PLANT PLANT SP 86 Source 171041 E.R. 119004 Lkv1 171041 E.R. HOLYCIA	2 2 80 80-157	Z.S. MIKATE OF CO MIKATE OF	Costomer PC 1 Milk NO. 344 (HPC 1 Fac 08 .013 627 .014 624 .028 1123 .013 1154 410	TRUCK HO: 177 Abs SSD 8 6 3 2 9 11 15 11 8	512 10AP QT 7, 25 Free 55 27 12 13 15 9 0	Custolida a 153 7 Cunauta 6 46.25 Net CY 1 19 5.8 3.7 1 6.9 1 0.0	ID: 11 Inve orv: Jarg Tal 633 1 233 1 166 10 1176 10 110	7832 SUB TOTA TRACK THE OTHER TOTAL 101AL 102AL 100 8789 0689 3792	Actual 5990 2509 10828 11040 3785	0 0 0 2.00 5 Error 2.05 15.77 8.45 1.55 25	
Sikament 686 SIKA686 i 0 0 0.0 4 216 216 0.0 Trim Water: -2.5 gallons Interview of the second se	ROGERS 9/29/2008 Ingredient 1.5" (14) E.R. 19 Livi 2. Sand Livi 3. San	PLANT PLANT SP 86 Source 171041 E.R. 119004 Lkv1 171041 E.R. HOLNCIA COCUMED Hateo Table	2 2 80-157	Z.S. MICATE OF CO MICE NO. 001075: NCF - Abi 0.010 0 0.038 0 0.038 0 0.038 0	Costomer PC 1 Mills NO. 3A4 1HPC 1 Fac 08 .013 627 .014 624 .008 1123 .013 1154 410 175 .05	TRUCK HO. 177 Abs SSD 8 6 3 2 9 11 15 11 8 0	512 LOAD QT 3. 25 Free 35 27 12 13 12 13 9 0 9	CustoMar 4 153 X cumutas 6 46.25 Net CY 1 1.9 5.8 33.7 1 6.9 1 8.0 8.0	Targ Tal 633 Tal 233 Tal 166 Di 1175 Di 410 175 Second	7%5c SUB TOTA TRACK TH OTHER TOTAL 101AL 15860 2160 0799 0680 3792 1619 1291	Actual 5968 2509 10828 11040 3785 1635	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
Tris Water: -2.5 gallons Mix Water/Cement Ratio: 0.35 Retual Water Cement Ratio: 0.32 Batch Time: 14:08 WN DOT - CERTIFICATE OF COMPLIANCE MN DOT - CERTIFICATE OF COMPLIANCE S96150 Batch Complex Comp	ROGERS 9/29/2006 Ingredient L.S" (14) E.R. 19 Livi 2. Sand Livi 3. Sand Livi 2. Sand Livi 3. San	SP B6 Source 171041 E.R. 119004 Lkv1 171041 E.R. 119004 Lkv1 171041 E.R. HOLMCIA COCUNIO Water Totals SIAIR	2 PLANT 0 2 REF 80-157	Z.S. MICATE OF CO A BRIDGE NO. 001075 NCF = Abl 0.010 0. 0.040 0 0.040 0 0.038 0 0.013 0	CUSTOMER PC 1 MIDE NO. 3A4 1HPC 1 Fac 05 .013 627 .014 624 .008 1123 .013 1154 410 175 .205 .4	TRUCK NO. 177 Abs: SSD 8 6 3 2 9 11 15 11 8 0 35 2 0	512 LOAD QT 9, 25 Free 35 27 12 32 39 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	CustoMen a 153 X cumulau 46.25 Net CY 1 1.9 5.8 33.7 1 6.9 1 8.0 8.0 4.6 0.0	IDC Internet	7%% 508 TOTA 508 TOTA 7945 TOTAL 7945 F 5860 2160 0780 0780 0780 0780 0780 0780 0780 07	Actual 5999 2509 10828 11040 3765 1685 1286 37	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
Triw Water: -2.5 gallons Jotal Water: 1698 lbs Mix Water/Cement Ratio: 0.35 Uater Available to Add: 21 gallons Rectual Water: Cement Ratio: 0.32 Water Added at Plant: gallons Batch Time: 14:03 2012 VIN DOT - CERTIFICATE OF COMPLIANCE Batch Convert S96150 Batch Convert	ROGERS BADE 9/29/2008 Ingredient 1.5" (14) E.R. H9 (14) E	SP BE Source 171041 E.R. 119064 Lkv1 19064 Lkv1 171041 E.R. 119064 Lkv1 171041 E.R. 19064 Lkv1 SIGIA COLUMO Water Totals SIGIR SIKA686	2 2 80-157	Z:5 HIRALI OF CO 2 BAIDGE NO. 00105: NCT Shi 0.018 0. 0.018 0. 0.018 0. 0.038 0. 0.038 0. 0.019 0.	G SCHHANCI CUSTOMER PC 1 MIX NO. 3A41HPC1 53C 00 013 627 014 624 008 1123 013 1154 115 205 4 3	TRUCK NO. 177 Abs SSD 8 6 3 2 9 11 15 11 8 0 35 2 0 0	512 10AP 07 9,25 15 15 12 12 12 15 19 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	CUSTOMER 8 153 K CUMULA 46.25 Net CY 1 1.9 5.8 33.7 1 6.9 1 6.9 1 4.6 0.0 4.6 0.0 0.0	Darg Tai 633 9 7166 10 1175 160 4 4	788 505 TOTA 505 TOTA 5860 2160 8789 80680 3792 1619 1291 37 216	Actual 5986 2508 10828 11046 13785 1635 1635 1635 1286 37 216	0 0 0 2.00 x Error 2.0x 15.7x 9.4x 1.5x 1.5x 1.6x 0.4x 0.0x 0.00	
Mix water/Lement Ratio: 0.35 Uater Hvallable to Hdd: 21 gallons Actual Water/Cement Ratio: 0.32 Water Added at Plant: gallons Batch Time: 14:03 2562 VIN DOT - CERTIFICATE OF COMPLIANCE Batch Convert S961.50 Batch Convert	RDGERS 9/29/2008 Ingredient 1.5" (84) E.R. #9 Lkol C. Sand Lkol CASO (867)E.R. Holeis I Class C/F Ash WATER Sika Air Sika Air Sika ant 686	SP BE Source 171041 E.R. 119004 Lkv1 171041 E.R. 119004 Lkv1 171041 E.R. HOLMCIA COCUNIO Water Totals SIAIR SIKA686	2 2 80-157	Z.S. MICATE OF CO A BRIDGE NO. 001075 0.010 0. 0.010 0. 0.038 0. 0.038 0. 0.038 0.	G CUSTOMER PC 1 MDC NO. 3A4 1HPC 1 Fac 08 .013 627 .014 624 .008 1123 .013 1154 410 175 .205 .4 .4 .4 .4 .05 .05 .05 .05 .014 .05 .014 .05 .015 .05 .014 .05 .015 .05 .014 .05 .015 .05 .014 .05 .015 .05 .05 .05 .05 .05 .05 .05 .05	TRUCK NO. 177 Ab: SSD 8 6 3 2 9 11 15 11 8 0 35 2 0 9	512 LOAP QT 9, 25 Free 35 27 12 12 13 12 13 12 13 12 13 12 13 19 0 9 0 9 0 9 9 0 5 -4 0 9 0 9	CustoMan a 153 X cumulau 46.25 Net CY 1 1.9 5.8 33.7 1.9 5.8 33.7 1.9 5.8 33.7 1.9 5.8 33.7 1.9 5.8 33.7 1.9 5.8 33.7 1.9 5.8 33.7 1.9 5.8 30.7 1.9 5.8 30.7 1.9 5.8 30.7 1.9 5.8 30.7 1.9 5.8 30.7 1.9 5.8 30.7 1.9 5.8 30.7 1.9 5.8 30.7 1.9 5.8 5.8 5.8 5.8 5.8 5.8 5.8 5.8	Ibe free or view of the or view of t	788 508 TOTA TRACK TH OTHER TOTAL 1017AL 5860 2160 0780 0880 2160 0780 0880 2160 0780 0880 2160 0780 0880 2160 1891 37 216	Actual 5969 2509 10828 11048 3765 1286 37 216 26 10 216	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
Batch Time: 14:08 2562 Water Added at Job Site: gallons Total Actual Nater: 1bs By signing this delivery ticket you agree to t terms & conditions on the back side of this t RECEIVED BY (legible signature)	ROGERS 9/29/2008 Ingredient 1.5" (14) E.R. #9 Lkvl C. Sand Lkvl CASO (467)E.R. Holeis I Class C/F Ash WATER Sika Air Sika ment 686	SP BE Source 171041 E.R. 119004 Lkv1 171041 E.R. 119004 Lkv1 171041 E.R. HOLMCIA COCUNNO Water Totals SIAIR SIKA686 Trin	2 2 80-157 Water: -2.	Z.S. MICATE OF CO MICE NO. 001005 001005 NCF 3 94 0.010 0 0.038 8 0.013 0 0.013 0 0.013 0 0.013 0 0.013 0 0.013 0 0.013 0 0.013 0 0.013 0 0.015 0 0.010 0 0.000 0 0	G CUSTOMER PC 1 MIDE NO. 3A4 1HPC 1 Fac 05 .013 627 .014 224 .008 1123 .013 1154 410 175 .205 .4 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3	TRUCK NO. 177 Abs: SSD 8 6 3 2 9 11 15 11 0 35 2 0 9	512 LOAP QT 9, 25 Free 35 27 12 36 9 0 8 9 0 9 0 9 0 9 0 9 0 9	Customer 1 153 Y. Cumulan 46.25 Net CY 1 1.9 5.8 3.7 1.9 5.8 3.7 1.9 5.8 3.7 1.9 5.8 3.7 1.9 5.8 3.7 1.9 5.8 3.7 1.9 5.8 3.7 1.9 5.8 3.7 1.9 5.8 3.7 1.9 5.8 3.7 1.9 5.8 3.7 1.9 5.8 3.7 1.9 5.8 3.7 1.9 5.8 3.7 1.9 5.8 3.7 1.9 5.8 3.7 1.9 5.8 5.8 5.8 5.8 5.8 5.8 5.8 5.8	INVE OTV INVE OTV 5 Jarg Tal 633 1 233 1 1166 1 1175 1 160 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	1221 1232 1232 1232 1232 1232 1231 1231	Actual 5999 2509 10828 11049 3785 1635 1286 37 216 95 108 10 108 10 108 10 108 10 108 10 108 10 108 10 108 10 108 10 108 10 108 10 108 10 108 108	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
Total Actual Mater: 1bs By signing this delivery ticket you agree to t terms & conditions on the back side of this 1 RECEIVED BY (legible signature)	RDGERS 9/29/2008 Ingredient 1.5"(14) E.R. #9 Lkvl C. Sand Lkvl CASO(467)E.R. Holeis I Class C/F Ash WATER Sika Air Sika Air Sika ment 686 Mix Wat	SP 86 Source 171041 E.R. 119004 Lkv1 171041 E.R. 119004 Lkv1 171044 E.R. HOLMCIA COCUNNO Water Totals SIAIR SIKA686 Trib er/Cement er/Cement	2 2 80-157 Water: -2. Ratio: 0. Ratio: 0.	Z:5 MICATE OF CO MICE NO. 001092 MICE - 940 0.010 0 0.010 0	G CUSTOMER PC 1 MIDE NO. 3A4 1HPC 1 Fac 05 .013 627 .014 224 .008 1123 .013 1154 410 175 .205 .4 .3 .3 .3 .3 .3 .3 .3 .3 .3 .3	TRUCK NO. 177 Abs SSD 8 6 3 2 9 11 15 11 8 0 35 2 0 9	512 10AP QT 9, 25 7 3, 25 7 12 35 9 0 8 9 0 9 0 9 0 9 0 9 0 9 0 9 0 9 0 9	Customer 1 153 v cumular 146.25 Net CY 1 1.9 5.8 3.7 1.9 5.8 3.7 1.9 5.8 0.0 4.6 0.0 0.0 Design Total Jable t ded at	Nove of the second seco	1828 506 TOTO TRUCK THE OTHER TOTAL TOTAL 160 8798 8689 2160 8798 8689 2160 1619 1291 37 216 189 169 2	Actual 5999 2509 10828 11049 3785 1635 1286 37 216 96 1 b 28 1 b 28 1 b 28 1 b 28 1 b 28 1 b 28 1 b 28 216	0.00 × Error 2.9 15.7 8.4 1.5 .6 .6 .6 .6 .6 .6 .6 .6 .6 .6	
596150 BATCH CODY	ROGERS 9/29/2008 Ingredient 1.5"(14) E.R. 19 Lkol C. Sand Lkol DSS0(667)E.R. Holeis I Class C/F Ash MATER Sika Air Sika Air Sikament 686 Mix Wat Batch Tim	PLANT SP 86 Source 171041 E.R. 119004 Lkv1 171044 E.R. HOLMCIA COCUNED Water Totals SIAIR SIKA686 Triu er /Cement er Cement er 14:	2 0 REF. 80-157 Water: -2. Ratio: 0. Ratio: 0. 03	Z:5 HICATS OF CO 2 MICE NO. 001072 MCE 3 Abb 0.010 0 0.010 0 0.038 0 0.013 0 0.010 0	G CUSTOMER PC I MIDC NO. 3A4 1HPC 1 Fac 05 .013 627 .014 624 .008 1123 .013 1154 410 175 205 4 3 4	TRUCK NO. 177 Ab: SSD 8 6 3 2 9 11 15 11 8 0 35 2 0 0 0 0 0 Uate Wate Wate	512 LOAP OT 9.25 Free 35 27 12 35 9 0 8 9 0 8 9 0 9 0 9 0 9 0 9 0 9 0 9 0	Customer 1 153 v cumular 146.25 Net CY 1 1.9 5.8 3.7 1.9 5.8 3.7 1.9 5.8 0.0 0.0 0.0 0.0 0.0 1.0 1.0 1.0	Mater: Water: Water: Water: Diang Tal 633 1 233 1 1166 1 1175 1 1660 4 4 4 Water: Diant: Diant: Diant:	788 506 TOTO TRUCK THE OTHER TOTAL TOTAL 160 8798 8689 2160 8798 8699 2160 1819 1291 37 216 189 169 2	Actual 5999 2509 10828 11048 3785 1635 1286 37 216 96 1 b 8 1 b 8 1 b 1 ga ga ga	0.00 × Error 2.9x 15.7x 8.4x 1.5x • 2x 1.5x • 4x 0.9x 0.9x 0.9x 1.0x 1.10	
596150 BATCH CODY	ROGERS PADE 9/29/2008 Ingredient L.5" (14) E.R. 19 Livil C. Sand Lkvil DCS0 (667) E.R. Holeis I Class C/F Ash MATER Sika Air Sika Air Sika Air Sika ment 686 Mix Wat Patch Tim	SP 86 Source 171041 E.R. 119004 Lkv1 171041 E.R. 119004 Lkv1 171041 E.R. 171041 E.R. 171041 E.R. 171041 E.R. 19004 Lkv1 171041 E.R. 171041	2 0 REF. 800-157 Nater: -2. Ratio: 0. Ratio: 0. 03 2.62	Z:5 HIICALLOI CO 2 BAIDGE NO. 2 BAIDGE NO. 0 010 5: NCF 5 Science 1 0,010 0 0,010 0 0	G SCHHANCI CUSTOMER PC 1 MIX NO. 3A41HPC1 5A 41HPC1 613 627 .014 624 .013 627 .014 624 .013 1154 .012 1154 .012 1154 .013 1154 .013 1154 .013 1154 .014 224 .013 1154 .014 224 .015 1154 .014 224 .015 1154 .015 1154 .0155 1154 .015 1154 .015 1154 .0155 1154 .0155 1154 .0155 1155	TRUCK NO. 177 Abs: SSD 8 6 3 2 9 11 15 11 8 0 35 2 0 9 Uate Wate Wate	512 LOAD OF 9,25 Free 35 27 22 35 69 0 8 9 0 8 9 0 8 9 0 8 9 0 8 9 0 8 9 0 8 9 0 8 9 0 8 9 0 8 9 0 8 9 0 8 9 0 8 9 8 9	LUSTOMEN 1 153 V COMMUNA 46.25 Net CY 1 1.9 5.8 33.7 1 1.9 5.8 33.7 1 1.9 5.8 33.7 1 1.9 5.8 0.0 0.0 0.0 0.0 0.0 0.0 1.0 1.9 1.9 5.8 0.0 0.0 0.0 1.0 1.0 1.9 1.9 5.8 0.0 0.0 0.0 1.0 1.0 1.0 1.0 1.0	Mater: Water: Water: Water: Plant: Dister: Nate:	788 500 TOTO TOTAL TOTAL TOTAL TOTAL TOTAL 160 160 169 169 169 169 169 169 169 169	Actual 5996 2509 10828 11040 3785 1635 1286 37 216 06 1 b 08 1 b 11 ga ga ga ga tet you back sid	0 0 0 2.00 * Error 2.6% 15.7% 9.4% 1.5% -2.6% 1.5% -0.4% 9.6% 5 5 110ns 110ns 5 5 110ns 110ns 5 5 6 6 6 7	
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READYIMM ROGERS DATE 9/29/2008 Ingredient 1.5"(84) E.R. 99 Lkv1 C. Sand Lkv1 CR50(657)E. R. Holcim I /Class C/F Sch WATER Sika Air Sikament 686	PLANT PLANT SP 9 Source 171041 E. R. 113004 Lkv1 171041 E. R. HOLMCIA COCUNIO Water Total SIAIR SIAIR SIKA686	PLANT # 2 PO 580 - 157 6	3: / 3 CERTIFICATE OF REF. / BRIDGE NO 001092 MDFar 9 0,018 0,018 0,038 0,019	COMP1 CU 90. 90. 90. 90. 90. 90. 90. 90. 90. 90.	A10 IANCE STOMER PE 1 MIX NO. 304111PC1 00 627 224 1123 1154 1154 1175 205 4 1	10 TRUC 2 Rbs 8 3 9 15 8 8 35 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	C A	51215 51215 500 QTV: 4 8.75 Free Not -1.9 5.8 33.7 6.9 8.9 8.9 8.9 8.9 8.9 8.9 8.9 8.9 9.9 9	TOMER 3 55 CY	Targ 633 233 1166 1976 1976 1976	TA SUB T TRUCK TY. OTH TO Jarget 2040 10290 10200 1000 10	0X OTAL TIME KEB IAL Actual 5680 2020 10196 103400 103400 103400 103400 103400 103400	0.00 3 Error 2.55 -1.05 -2.55 -1.05 0.55 0.55 0.55 0.25 0.55 0.25 0.55 0.25 0.55 0.25 0.55 0.25 0.2
RDGERS DATE 9/29/2008 Ingredient 1.5°(14) E.R. 9 Lkv1 C. Sand Lkv1 C. Sand Lkv1 CASO(167)E.R. Holcin I Class C/F Sch WATER Sika Air Sikanent 686	PLANT PLANT SP 8 Source 171041 E. R. 119004 Lkv1 19004 Lkv1 19004 Lkv1 171041 E. R. HOLMCIA COCUNND Water Total SIAIR SIAIR SIKA686	PLANT # PO 5BØ-157 e s m Water:	3. 15 CERTIFICATE OF REF. / BRIDGE NO 001092 MDFac 9 0,010 0,038 0,019	COMP1 CU: 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	A10 IANCE STOMER PC 1 MIX NO. 30411/PC1 90 627 224 1123 1154 410 175 305 4 3	10 TRUC C 0 0 15 0 0 0 55 0 0	C A	51215 51215 50 QTV: 4 8.75 Free Mot -1.9 5.8 33.7 6.9 8.8 6.8 6.8 6.8 6.8 6.8 6.8 7 1.9 5.8 7 33.7 6.9 8 8.8 8 8.8 8 9 8 9 8 9 8 9 8 9 8 9 8	comment 3 55 CY	Targ 633 233 1166 1175 160 4 4 4 4 4	TA SUB T TRUCK TR. OTT TO Jarget 2040 10290 1000 100	0X OTAL TIME EEB TAL Actual 5688 2020 10186 10346 10356 10356 10356 103666 10366 103666 103666 103666 103666 103666 103666 103666 103666 103666 103666 103666 1036666 103666 1036666 103666 10366666 1036666 10366666 1036666 1036666 10366666 1036666 1036666 1036666 1036666 1036666 1036666 1036666 1036666 1036666 1036666 1036666 1036666 1036666 1036666 1036666 1036666 1036666 1036666 10366666 10366666 10366666 10366666 10366666 10366666 10366666 10366666 10366666 10366666 10366666 10366666 1036666 10366666 10366666 1036666 10366666 10366666 10366666 10366666 10366666 103666666666 103666666666666666666666666666666666666	0 0 0 3 5 5 5 5 5 5 6 2 5 5 6 2 5 5 6 2 5 5 6 5 5 6 5 5 6 5 5 6 6 5 5 7 6 7 5 7 6 7 7 7 7
RDGERS DATE 9/29/2008 Ingredient 1.5°(14) E.R. 9 LV1 C. Sand LKV1 CASO(167)E.R. Holcim I Class C/F Sch WATER Sika Air Sikament 686	PLANT PLANT SP 8 Source 171041 E. R. 119004 Lkv1 19004 Lkv1 171041 E. R. HOLMCIA COCUMND Water Total SIAIR SIAA686 Tri er/Centen	PLANT # PO EB0-157 e water: t Ratio:	3. / 5 CERTIFICATE OF REF. / BRIDGE NO 001092 MDFac 9 0,010 0,038 0,019	COMP1 CU: 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	A10 IANCE STOMER PC 1 MIX NO. 304 11 IPC 1 00 627 224 1123 1154 1154 1154 1154 1154 1154 1154 1154 1154 1154 1154 1154 1154 1154 1155 115	10 TRUC C PADE 8 39 15 8 9 15 8 8 9 15 8 8 9	C A	51215 51215 50 QTV: 4 8.75 Free Mot -1.9 5.8 33.7 6.9 8.8 6.8 6.8 6.8 6.8 6.8 0.0 0.0 De T Avaita	comparison 3 55 CY SS CY SS CY SS SS SS SS SS SS SS SS SS SS SS SS SS	Targ 633 233 1166 1175 160 4 4 4 1 4 1 4 1 175	TA SUB T TRUCK TR. OTH TRUCK TY. OTH TOJ Jarget 2040 10290 1000 100	0X OTAL TIME EB TAL Actual 5688 2020 10186 10346	0.00 5 Error 2.5% -1.0% -0.2% 0.5% 0.5% 0.5% 0.5% 0.2% -0.4% -1.1% 0.0% 2.9%
RDGERS DATE 9/29/2008 Ingredient 1.5°(44) E.R. 9 Lkv1 C. Sand Lkv1 C. Sand Lkv1 CAS0(467)E.R. Holcim I Class C/F Ash WATER Sika Air Sikament 686 Mix Wath Actual Wath	PLANT PLANT SP 8 Source 171041 E.R. 170041 E.R. 170041 E.R. 19004 Lkv1 171041 E.R. HOLMCIA COCUMNO Water Total SIAIR SIKA686 Tri er/Centen er/Centen	PLANT # PO EBØ-157 e water: t Ratio: t Ratio:	3. / 5 CERTIFICATE OF REF. / BRIDGE NO 001092 MDFac 9 0,010 0,038 0,019	COMP1 CU 986 a 0, 014 0, 014 0, 015 0, 013	A10 IANCE STOMER PC 1 MIX NO. 304 11 IPC 1 00 627 224 1123 1254 1123 1254 1175 305 4 1 3	10 TRUC 2 7 8 3 9 15 8 8 35 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	C A	51215 51215 50 2077 6 8. 75 57 ree Mot -1.9 5.8 33.7 6.9 8.8 8.8 8.8 8.8 8.8 8.8 8.8 8.8 8.8 8	comment 3 55 CY 55 CY 55 cy cy 55 cy 55 cy 55 cy 55 cy 55 cy 55 cy 55 cy 55 cy 55 cy 55 cy 55 cy 55 cy 55 cy c cy cy cy cy cy cy cy cy cy cy cy c	Targ 633 233 1166 175 160 4 4 4 1 4 175 160 4 4 4 175 160 4 175 160 4 175 160 175	TA SUB T TRUCK TRUCK TR TO TO Target 2040 10290 10200 10290 10290 10290 10290 10290 10290 10290 1000 100	0X OTAL TIME 4EB TAL Actual 5688 2020 10166 10340 3595 1525 1208 35 216 794 11 298 11 22 9 9	0.00 5 Error 2.5% -1.0% -0.2% 0.5% 0.5% 0.5% 0.2% -0.4% -1.1% 0.0% 2.9%
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Accesses Ready Mix Division 2915 Waters Road Suite 105 Eagan Minnesota 55121 Main Office Control (651) 683-0600 Metro Dispatch Customer PROVIDED PRODUCTS: Customer PROVIDED PRODUCTS added to The Mix Voids ALL Guarantes/Warranties. BURN WARNING: Freshly mixed concrete, corrent, mortar or grout mey couse skin initiation, severe chemical butti and/or serious ceric damage. (651) 683-0600 Metro Dispatch Waters Additional PROVIDED PRODUCTS added to The Mix Voids ALL Guarantes/Warranties. BURN WARNING: Freshly mixed concrete, corrent, mortar or grout mey couse skin initiation, severe chemical butti and/or serious ceric damage. (651) 683-0600 Metro Dispatch Waters Additional Waters Added to This Concrete will Reduce This Streength Any Water added to This Concrete will Reduce the addition of the maximum severe chemical attention, in case of control with skin, flush through with water and see med cal attention. Mater Texter No. Customer Name Onder No. Usage concerte curves to severe for Terms, conditions and return check charges. Mater Texter No. Customer Name Order No. Usage code Mater No READ RECONSTRUCTIONAL BERTVILLE Map Prev Trucks 147 Stuarp: 4 Contered by Addition of the maximum severe Contered by Take LEFT *##
BURN WARNING: Freshly mixed concrete, corrent, mortar or grout may cause skin initiation, severe chemical burn and/or serious cyc damage. Avoid contact with skin and cycs. In case of contact with eye, flish thoroughly with water and seek immediate medical attention. In case of contact with skin, flush thoroughly with water and seek immediate medical attention. In case of initiation persists. KEEP OUT OF THE REACH OF CHILDREN. Date Ticket No. Customer Name ORDER No. Usage code 100/16/2008 69172 PC1 6246 PAVING Delivery address MN_RCAD_RECONSTRUCTIONAL BERTVILLE MAP MAP Prev Trucks 147 Strap: 4 ORDERED BY ANRIVAL Prev Trucks 147 Strap: 4 ORDERED BY Strap: 4 MARE DRIVER NAME ZONE Sch. ARR. Prev Trucks 147 Strap: 4 ORDERED BY Strap: 7 ORDERED BY TAKE LEFT **** DRIVER NAME ZONE Sch. ARR.
Couse skin intration, severe chemical buth and/or sectors eye damage. Avoid contact with skin and seek immediate medical attention. Contact with skin, flush thoroughly with water and see medical attention. If in tation persists. KEEP OUT OF THE REACH OF CHILDREN. DATE TCKETNO. Customer Name ORDER NO. U0/16/2008 69172 PEI 5246 PARTE PAVING Very Trucks 147 Preventions: ORDERED BY Preventions: ORDERED BY Preventions: Preventions: Preventions: ORDERED BY April Name Sch AR Preventions: ORDERED BY April Name Sch AR Preventions: ORDERED BY Preventions: ORDERED BY Preventions: ORDERED BY Preventions: Preventions: Preventions: DRIVER NAME Driver NAME Sch AR Proventions: Proventions: Preventions: DRIVER NAME Driver NAME Sch AR Pound Start
Intervention with water and seek immediate medical attention. In case of contact with skin, flush thoroughly with water and see medical attention. If it lation persists. KEEP OUT OF THE REACH OF CHILDREN. Intervention descent and see medical attention. In case of contact with skin, flush thoroughly with water and see medical attention. If it lation persists. KEEP OUT OF THE REACH OF CHILDREN. Intervention descent and see medical attention. If it lation persists. KEEP OUT OF THE REACH OF CHILDREN. Intervention descent and see medical attention. If it lation persists. KEEP OUT OF THE REACH OF CHILDREN. Intervention descent and see medical attention. If it lation persists. KEEP OUT OF THE REACH OF CHILDREN. Intervention descent and see medical attention. If it lation persists. KEEP OUT OF THE REACH OF CHILDREN. Intervention descent attention. If it lation persists. KEEP OUT OF THE REACH OF CHILDREN. Intervention descent attention. If it lation persists. KEEP OUT OF THE REACH OF CHILDREN. Intervention descent attention. If it lation persists. KEEP OUT OF THE REACH OF CHILDREN. Intervention descent attention. If it lation persists. KEEP OUT OF THE REACH OF CHILDREN. Intervention descent attention. If it lation persists. KEEP OUT OF THE REACH OF CHILDREN. Intervention descent attention. If it lation persists. KEEP OUT OF THE REACH OF CHILDREN. Intervention descent attention. If it lation persists. KEEP OUT OF THE REACH OF CHILDREN. </td
DATE TICKET NO. CUSTOMER NAME ORDER NO. USAGE CODE 10/16/2008 69172 PCI 5246 PAVING DEUVERY ADDRESS MN READ RECONSTRUCTIONALBERTVILLE MAP PAGE MAP PAGE INSTRUCTIONS: ORDERED BY ANRIVAL JOB / 3/2 Prev Trucks 147 Slump: 4 GO IN MAIN GATE AT MN ROAD, TAKE LEFT *** DRIVER NAME ZOME
10/16/2008 69172 PCI 6246 PRVING DELIVERY ADDRESS MN RCAD RECONSTRUCTIONALBERTVILLE MAP PAGE INSTRUCTIONS: Prev Trucks 147 Sluap: 4 E0 IN MAIN GATE AT MN ROAD, TAKE LEFT **** ORDERED BY ARRIVAL START DRIVER NAME ZONE SCH. ARR POUR
DELIVERY ADDRESS MN READ RECONSTRUCTIONALBERTVILLE MAP PAGE INSTRUCTIONS: Prev Trucks 147 Slump: 4 50B ORDERED BY ANRIVAL JOB / 3/2 Prev Trucks 147 Slump: 4 50B DRIVER NAME ZONE SCH. ARR
Instructions: ORDERED BY ARRIVAL Prev Trucks 147 Slump: 4 Start E0 IN MAIN GATE AT MN ROAD, DRIVER NAME ZONE TAKE LEFT *** DRIVER NAME ZONE
Prev Truck: 147 Slump: 4 EO IN MAIN GATE AT MN ROAD, TAKE LEFT *** DRIVER NAME ZONE SCH. ARR POUR
TAKE LEFT ***
UNGER, ROM 2 13:3 FINSH
PRODUCT CODE DESCRIPTION CARDER LOAD SERT UNIT PRICE AMOUNT
3A41HPC1 MN ROAD HI PERFORMANCE P 57.01 9.5 19 CY 0.00 0.00
51F STATE INSPECTION 1 9.5 19 CY 0.00 0.00 FUEL FUEL SURCHARGE 1 1 2 LD 0.00 0.00
HOT H20 HOT WATER CHARGE 1 9.5 19 CY 0.00 0.00
3. CERTIFICATE OF COMPLIANCE
READY MIX PLANT # CUSTOMER NO. SUB TOTAL
ROMERS PLANT 2 PEI SI2153 TRUCK TIME
DATE SP / PO REF. / BREDGE NO. MIX NO. TRUCK NO. LOAD QTY. CUMULATIVE QTY. OTHER
10/16/2008 SP 8680-157 001092 3841HPC1 409 9.5 19 TOTAL 9.00
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	A ANT SP /	90	REF. / BRIDGE NO.	Dr I MX	NO.	TRUC	K NO. 10	5121	CUMUE	ATIVE OT		IME R	-12
10/16/2008	SP 86-	80~157	001092	304)	HPCL	4.03	2	95	28.5	, yn g 1 , w	τοτΑ	AL Ø	1. 00.
Ingradient 1.5"(#4) E.R. 17 #9 Lkvl 11 C. Sand Lkvl 19 CASD(#67)E.R. 11 Holcis I HI Class C/F Ash CI HATER MA Sika Air 31 Sikasent 685 S	Sourc 71041 E.R. 19004 Lkvl 9004 Lkvl 9004 Lkvl 71041 E.R. 01.MCIA 021.0400 14547 Total 1AIR 1418	1	MCFac Abr 0.008 0. 0.027 0. 0.035 0. 0.027 0.	ac 013 014 099 013	00 627 224 1123 1154 410 175 205 4 4	Nbs 8 9 15 0 5 0 5 0 5 0 8 0 5 0 8 0 5 0 8 0 5 0 8 0 5 0 8 0 5 0 5	550 635 227 1132 1169 0 205 0 9	Free Ma -3. 2. 31. 16. 3. 4. -\$7. 8. 8.	t CY CY E C C C C C C C C C C C C C C C C C C C	Targ 532 210 1153 1195 1195 1258 4 4 4	Target 6000 2180 11050 11260 3095 1682 1251 33 222	Actual 5960 2160 11120 11360 3960 1650 1295 33 222	* Error -0. 73 -0. 9% 0. 55 1. 74 -0. 72 -0. 72 2. 8% 0. 9% 0. 9%
Nix Water Actual Water Batch Time:	Tri -/Cemen -/Cemen : 13	s Water: 5 Ratio: 5 Ratio: 126	-3 gallon 0.35 0.31	5 	Sen S	л Ю	Water Wate Nater	D Avail Added Tot By ten	esign Total able ed at at J signing ms & o	Wat Vat to A Pla Iob S gabist onditio	er: 19 er: 17 dd: nt: ite: telivery tic ons on the	48 1 bi 46 1 bi 22 ga) 94 ga ga ket youla back sid	llans llans llans llans agree to the e of this form.
596799) 	CHIR UP I	untar Hanare E	BATCH	COPY			RECE	IVED B	IY (leg	ible signat	ture)	-

							Del	ivery	Ticket				
		eady N 915 Water agan Minn Iain Office letro Dispa	Aix Division s Road Suite 10 esota 55121 atch) 5 (65 (65	1) 683-060 1) 683-815	0	CUSTO • CUS GUA • ADD AGO	OMER PROTOMER PROTOMER PROTOMER PROTOMER PROTOMER PROTOKEN PROTOKE	OVIDED P OVIDED PR WARRANTI EES APPLY NDUSTRIES.	RODUCT RODUCT IES. FOR AL	CTS: TS ADDED TO DDING PROD	D THE MIX	VOIDS ALL SUPPLIED BY
BURN WARNING	: Freshly mixe	d concrete	, cement, morta	ar or g	grout may		ITS ST	r: additic Rength. /	NAL WATE	er add R adde	ed to this d is at cus	CONCRETE TOMER'S	WILL'REDUCE RISK.
cause skin irritat Avoid contact w	tion, severe cl vith skin and	hemical bu eyes. In c	im and/or seriou ase of contact v	us eye with e	damage. yes, flush		EXPOSE ACTION	D CONCRET	E: TO HELP I NG AND TH/	PREVENT AWING	I CONCRETE P WE RECOMM	ROM SCALI	NG DUE TO THE 6% TO 8% AIR
contact with skin if irritation persi	water and set), flush thorou ists. KEEP OUT	ghly with a OF THE RE	water and see me EACH OF CHILDR	ntion. edical EN.	In case of attention		NO CR		OWED FO		CONCRETE, P	TURNED.	E CURING.
DATE	TICKET NO.		CUSTOMER NA	ME	9362670	-	RDER NO.	crimis, cc			JSAGE CODI		ARGES.
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READY MIX ROGERS Date 10/16/2005	(PLANT SPLANT SP / PL SP 868(PLANT # 2 0 2-157	cfrificate of c REF. / Bridge NO. জন্ট1.উণ্ড2.	CUS CUS	NNCE TOMER PC J MIX NO. R41HPC 1	TRUCI 5,04	KNO, LI	5123 540 QTY. 9.5	STOMER N CUMULAT	Q. TNE QTY	TAX SUB TOT, TRUCK TH OTHER TOTA	AL ME L	9 Q 3. 90
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READY MIX RUGERS DATE 10/16/2005 Ingrediant 1.5°(14) E.R. 19 14a)	(PLANT	PLANT # 2 D	CERTIFICATE OF C REE / BRIDGE NO. 9년 1.092 MCF.ac. Ab 9. 809 원 9. 809 원	COMPLIA CUS F 34 35 35 35 35 35 35 35 35 35 35 35 35 35	ANCE TOMER DC J MIX NO. 0D 627 226	TRUCI 5,014 Rbs 8 3	K NO: LI 4 55D 635 227	512) 0AD QTY. 9.5 Free Hi -3. 2	STOMER N 53 CUMULAT 38 38 38 38 38 38 38 38 38 38 38 38 38	Q. INE QTY 3*9 632 930	TAX SUB TOT. TRUCK TI OTHER TOTA Target 5060 2148	AL ME L Qctual 5980	0 0 5. 00 5 Error -0.3x 0.92
READY MIX ROGERS DATE 10/16/2005 Ingrodient L.5"(141) E.R. 19 Lkv1 C. Sand Lkv1	(PLANT SP / PLANT SP 8680 Source 171041 E.R. 119004 Lkv1	PLANT # 2 D 2-157	CERTIFICATE OF C REF. / BRIDGE NO. 9001.0992 MCF.ac. Ab 9.009 9 9.009 9 9.027 9 0.035 0	CUS CUS Fac 0.913 0.914 1.906	ANCE TOMER DC J MIX NO. 0D 627 224 1123	treco 4,Q4 8bs 8 3 9	K NO. LU 55D 635 227 L132	5125 5125 9.5 9.5 Free Ht -3. 2. 31.	STOMER N 53 CUMULAT 38 at EY T, 1 t 1 t 2 2 4 t	0. IVE QTY 3°9 612 230 163	TAX SUB TOT. TRUCK TI COTHER TOTA Target 2169 11050	AL ME L Actual 2980 2180 11020	2 2 3. 20 5.
READY MIX ROGERS DATE 10/16/2005 Ingrodiant 1.5°(94) S.R. 99 Lkv) C. Sand Lkv1 CRS9(967) S.R.	(PLANT SP / PLANT SP 86.00 Source 171041 E.R. 119004 Lkv1 19004 Lkv1 171041 E.R.	PLANT # 2 D 2-157	CERTIFICATE OF C REF. / BRIDGE NO. 9001.0992 MCF.ac. Ab 9.008 9 9.027 9 0.035 00 0.035 00	OMPLI/ CUS Fac 1.913 1.914 1.908 1.908	ANCE TOMER MIX NO. 0D 627 224 1123 ,1154	6 (04 6 (04 8 bs 8 3 9 15	K NO. LI 4 550 635 227 1132 1163	5121) 5121) 0.5 9.5 Free fit -3. 2. 31. 16.	53 CUMULAT 38 1 CY 1, 1 1 9 1 2 1	0. IVE QTY 3°9 632 230 163 185	TAX SUB TOT. TRUCK TIL TOTHER TOTA Comparison Target 5060 2168 11050 11260	AL ME (Actual 7988 2388 11020 11220	2 2 3. 20 5. 20 5. 20 6. 20 6. 20 6. 20 6. 20 70. 45
READY MIX ROGERS DATE 10/16/2005 Ingrodiant 1.5°(94) E.R. 99 Lkp) C. Sand Lkv1 CRS0(957)E.S. Holeis I	(PLANT SP / PLANY SP / P SP 8680 Source (71041 E. R. (19004 Lkv) (71041 E. R. (19004 Lkv) (71041 E. R. (1024) E. R.	PLANT # 2 D 2-157	CERTIFICATE OF C REF. 7 BRIDGE NO. නැති 1,0922 MCF ac Ab 9,068 9 9,627 0 0,036 0 1,0627 0	COMPLIA CUS Fac 0.013 0.014 0.014 0.014 0.013	ANCE TOMER DC J MIX NO.	6bs 8 3 9 15 6	K NO. LI 55D 635 227 1132 1169 0	5123) DAD QTY. 9.5 Free Hi -3. 2. 31. 18. 8.	53 CUMULAT 38 1 CY T, 1 4 9 1 2 1 2 1	0. IVE QTY 3*9 632 230 163 185 410	TAX SUB TOT. TRUCK TIL TOTA TOTA Content Total State State 11050 11266 3895	AL ME Actual 7980 2080 11020 11220 3950	2 0 2 5. 200 2 5. 200 -0. 32 -0. 32 -0. 42 -0. 42
READY MIX ROBERS DATE 10/16/2005 Ingrodisat 1.5°(94) E.R. 99 Lkp) C. Sand Lkvl CREQ(867)E.S. Holeis I Class C/F Osh Holeis T	(PLANT SP / PLANY SP / P SP 8680 Bource (71041 E. R. (19004 Lkv) (5004 Lkv)	PLANT # 2 D 2-157	CERTIFICATE OF C REF. 7 BRIDGE NO. නැට 1,092 MCF ac Ab 9,068 9 9,627 0 0,936 0 1,067 0	COMPLU CUS 134 34 35 35 35 35 35 35 35 35 35 35 35 35 35	ANCE TOMER DC J MIX NO. 0D 627 224 1123 1154 419 175 275	17RUCE 4,0/4 8bs 8 3 9 15 6 8	K NO. Lu 4 550 635 227 1132 1169 0 8	5123) DAD QTY. 9.5 Free Hi -3. 2. 31. 18. 8. 8.	53 CUMULAT 38 1 CY T, 1 4 9 1 2 1 2 1 8	0 NE QTY arg arg arg arg arg arg arg arg	TAX SUB TOT. TRUCK TH OTHER TOTA Target 5060 2160 2160 2160 2160 2160 2160 2160	AL () Actual () 2980 2080 11020 11020 11020 11020	2 0 2 2 Error -0. 32 0. 69 -0. 32 -0. 42 2. 12 2. 12
READY MIX ROBERS DATE 10/16/2005 Ingrodient 1.5°(94) E.R. 99 LAP C. Sand Lkvl CREQ(967)E.S. Holeis I Class C/F Osh WATER Sibe Gay	(PLANT SP / PLANY SP / P SP 8680 Source 171041 E.R. 119004 Lkv1 171041 E.R. NGLKJA COCNWE Vater Totals storp	PLANT # 2 D 2-157	CERTIFICATE OF C REF. 7 BRIDGE NO. ඉළු 1,092 MCF ac Ab 9,068 9 9,627 0 0,035 0 0,027 0	OMPLI CUS 134 34 34 34 34 34 34 34 34 34 34 34 34 3	ANCE TOMER DC J MIX NO. 0D 627 224 1123 ,1154 419 175 205 5	TRUCE 4,0/4 8bs 8 3 9 15 9 15 9 15 9 15 9	K NO. LU 4 55D 635 227 1132 1163 0 8 295 295	5123) DAD QTY. 9.5 Free He -3. 2. 31. 16. 8. 8. 8. 8.	53 CUMULAT 38 1 CY 1, 1 1 9 1 2 1 8 1 2 1 1 8	C. INE QTY 632 230 163 145 410 175 58	TAX SUB TOT. TRUCK TI TOTHER TOTA Target 5060 2168 11050 11260 3895 1662 1261 1262	AL ME 2990 2180 11020 11220 3960 1680 127	0 0 2 5. 00 2 Error -0. 32 0. 02 -0. 32 -0. 42 1. 12 1. 12 1. 12 1. 25 0. 07
READY MIX ROBERS DATE 10/16/2005 Ingrediant 1.5"(94) E.R. 99 Lhe) C. Sand Lkvl CRS0(967)E.R. Holeis I Class C/F Ash WATER Sika Air Sikasent 695	CPLANT SP 2007 SP 2007 Source 171041 E.R. 119004 Lkv1 171041 E.R. 10004 Lkv1 171941 E.R. 10004 Lkv1 171941 E.R. 100040 Starr Starr Starr Stars	PLANT #	CERTIFICATE OF C REF. / BRIDGE NO. 9001.092 MCF ac Abb 9.009 9 9.009	CMPLI/ CUS F 34 34 34 34 34 34 34 34 34 34 34 34 34	ANCE TOMER DC J MIX NO. 0D 627 224 1123 1154 419 175 205 4 4	TRUCH 5,024 8bs 8 3 9 15 6 9 15 6 9 15 6 9	K NO. LI 55D 635 227 1132 1163 9 8 295 9 \$	5121) DAD QTV. 9.5 Free His -3.2, 31. 18. 8, 8, -47. 8, 8, 8, 9, 9, 9, 9, 9, 9, 9, 9, 9, 9, 9, 9, 9,	53 CUMULAT 38 38 38 38 38 38 38 38 38 38 38 38 38	0. INE QTY arg 632 632 633 163 163 163 165 158 4 4 4 4 4 4 4 4 4 4 4 4 4	TAX SUB TOT. TRUCK TH TOTA TOTA TOTA Target S080 2180 2180 2180 11260 3895 1662 1261 32 222	AL ME 2980 2180 11020 11220 3960 1680 1220 3960 1680 3225	2 2 3. 20 5. 20 5. 20 6. 0 5. 20 6. 0 5. 20 6. 0 5. 20 6. 0 5. 20 6. 0 5. 20 7. 20 7
READY MIX ROBERS DATE 10/16/2005 Ingrodiant 1.5" (NA) E.R. 89 LAVI C. Sand LKVI CRB0 (867)E.S. Holeis I Class C/F Ash WATER Sikament 695	CPLANT SP 96.00 Source 171041 E.R. 119004 Lkv1 19004 Lkv1 19004 Lkv1 171941 E.R. HOLINCIR COLINED Water Totals STATP STAG685	PLANT #	CERTIFICATE OF C REF. / BRIDGE NO. 00/01/0/92 MCF.ac. Ab 9.009 0 9.009 0 9.000 0 9.0000 0 9.0000 0 9.0000 0 9.0000 0 9.0000 0 9.0000 0 9.0000 0 9.0000 0 9.0000 0 9.00000000000000000000000000000000000	CMPLI CUS F 34 34 34 34 34 34 34 34 34 34 34 34 34	ANCE TOMER XC J MIX NO. 141HPC1 0D 627 224 1123 1154 419 175 205 4 4	TRUCO 4,024 8be 8 3 9 15 8 9 15 8 9 15 8 9	K NO: LI 55D 635 227 1132 1163 0 8 205 9 8 9 205 9 8	5121) DAD QTV. 9.5 Free Hs -3. 2. 31. 16. 8. 8. 9. 747. 8.	53 CUMULAT 38 38 38 38 38 38 38 38 38 38 38 38 38	0. INE QTY 672 230 163 135 410 158 4 4 4 4 4 4 4 4 4 4 4 4 4	TAX SUB TOT. TRUCK TI TOTA TOTA TOTA Target 5000 2100 2100 2100 2100 2100 2100 2100	AL ME 2998 2380 11020 3960 1680 1276 33 225	2 2 3. 20 5. 20 5. 20 6. 20 6. 20 6. 20 6. 20 7. 0. 0. 20 7. 0. 0. 20 7. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.
READY MIX ROGERS DATE 10/16/2005 Ingrodient L.5"(H4) E.R. 99 Lke) C. Sand Lkel CRE0(B67)E.S. Holeis I Class C/F Ash WATER Sika far Sikament 605	CPLANY SP 96.00 Source 171041 E.R. 119094 Lkv1 19094 Lkv1 19094 Lkv1 191941 E.R. HOLICTA COLUMED Vater Totals STATP STKA685	PLANT #	CERTIFICATE OF C REE / BRIDGE NO. 901.092 MCF ac Ab 9.003 9.027 9 0.036 0 1.027 9 0.036 0 1.027 9	COMPLIA CUS F F ac 1.013 1.004 1.003	ANCE TOMER XC J MIX NO. 0D 627 224 1123 1154 1155 1155 1155 1155 1155 1155 115	TRUCI 4,014 8bs 9 15 9 15 9 15 9 15 9 9 15 9 9 15 9	K NO. LI 55D 635 227 1132 1163 9 0 0 205 9 \$	5123) DAD QTY. 9.5 Free He -3. 2. 31. 16. 31. 16. 8. 47. 8. 8. 9. 77. 8. 9. 9. 9. 9. 9. 9. 9. 9. 9. 9. 9. 9. 9.	STOMER N 53 CUMULAT 38 38 38 38 38 38 38 4 4 4 4 4 4 4 8 6 6 6 6 6	0. NE QTY 532 532 532 533 532 533 540 175 58 4 9 175 158 4 9 102 103 103 103 103 103 103 103 103	TAX SUB TOT. TRUCK TH TOTA TOTA Target 5060 2160 2160 2160 2160 2160 2160 2160 2	AL ME 2380 2380 11020 11220 3960 1680 1226 33 225 88 115 225	0 0 2 5. 00 5. 00 6. 00 6. 00 6. 00 6. 00 1. 12 1. 12 1. 12 1. 12 1. 12 0. 00 1. 42 5. 00 5. 000
READY MIX ROBERS DATE 10/16/2005 Ingrodient L.5" (M4) E.R. 99 Lkel C. Sand Lkvl CRS0(M67)E.R. Holeise I Class C/F Ash WATER Sika fair Sikasent 605 Disk Mat	CPLANY SP 96.00 Source 171041 E.R. 119004 Lkv1 171041 E.R. HGLBCTA COCMWED Water Totals STAFP SIXA605 Tris er/Cement	PLANT # 2 D D-157 Water: Ratio:	CERTIFICATE OF C REF / BRIDGE NO. 9001.092 MCF ac Ab 9.009 9.027 9 0.036 0 1.055 0 1.055 0 1.055 0 1.055 0 1.057 0 1.	COMPLIA CUS Far 1.013 5.014 5.0013	ANCE TOMER >C J MIX NO. 0D 627 224 1123 1154 1154 1155 419 175 205 4 4 4 10 10 10 10 10 10 10 10 10 10	₩ 4,0% 8 8 3 9 15 6 9 15 6 9 15 6 9 15 6 9 15 6 9	K NO. LU 55D 635 227 1132 1133 0 8 205 9 \$ \$	5121) DAD QTY. 9.5 Free He -3. 2. 31. 1. 8. 8. 47. 8. 8. 9. 9. 9. 9. 9. 9. 9. 9. 9. 9. 9. 9. 9.	STOMER N 53 CUMULAT 38 38 38 38 4 1 9 4 1 9 4 1 9 4 1 9 4 9 4 9 4 9 4 9	0. NEQTY 532 532 532 533 145 1419 175 4 4 175 58 4 4 10 175 158 4 4 10 175 158 4 4 10 175 158 4 10 10 10 10 10 10 10 10 10 10	TAX SUB TOT. TRUCK TIL OTHER TOTA Target 5060 2160 11050 11256 3895 1662 1261 32 222 Tr 176 176 177	AL ME 2960 2980 11020 11220 3960 1680 1225 3225 (8 1b) 25 1b)	0 0 1.00 2 Evrov -0.32 0.04 -0.42 -0.42 1.12 1.25 0.05 1.45
READY MIX ROGERS DATE 10/16/2005 Ingrodient L.5"(HA) E.R. 99 LAPI C. Sand Lkvl CRS0(H67)E.R. Holeis I Class C/F Ash WATER Sika far Sikament 605 Mix Mat fictual Mat	CPLANY SP 36.00 Source 171041 E.R. 119004 Lkv1 19004 Lkv1 19004 Lkv1 171041 E.R. HOLICTA COUMME Water Totals STATP SIXA605 Tris er/Cement, or/Cement	PLANT # 2 D D-157 Water: Ratio: Ratio:	CERTIFICATE OF C REF / BRIDGE NO. 9001.092 MCF ac Ab 9.009 9.027 9 0.035 0 1 0.35 0.35 0.31	COMPLIA CUS I 34 SFar 1.013 S.014 S.000 S.013	ANCE TOMER DC J MIX NO. 0D 627 224 1123 1154 1154 1154 419 175 205 4 4 4 10 10 0D 627 224 1154 419 175 205 4 4 9 0D 0D 627 224 1155 1154 1155 11	TRUCI 4,014 8bs 3 9 15 6 0 15 6 0 15 6 0 15 0 8	K.NO. LU 55D 635 227 1132 1136 9 8 205 9 \$ \$	5121) DAD QTY. 9.5 Free He -3. 2. 31. 8. 8. 47. 8. 8. 9. 9. 9. 9. 9. 9. 9. 9. 9. 9. 9. 9. 9.	STOMER N 53 CUMULAT 38 38 38 38 4 5 4 5 4 5 4 6 6 6 6 6 6 6 7 0 4 1 7 0 4 1 7 0 4 1 7 0 4 1 8 9 1 7 1 1 1 9 1 1 9 1 1 9 1 1 1 9 1 1 1 1	0. NE QTY 532 532 533 532 533 532 533 534 54 54 54 54 54 54 54 54 54 5	TAX SUB TOT. TRUCK TIL OTHER TOTA Target 5060 2160 11050 11256 3895 1662 1261 32 222 r: 194 r: 178 d: 2	AL ME 2360 2360 11020 11220 3960 1680 1275 33 225 168 1525 168 1525 25 18 15 25 25 25	0 0 1.00 2 Error -0.32 0.04 -0.42 1.12 1.12 1.12 1.12 1.12 1.12 1.45 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5
READY MIX ROBERS DATE 10/16/2005 Ingrodient 1.5"(94) E.R. 99 Lkp C. Sand Lkvl CR50(957)E.S. Holcis I Class C/F Ash WATER Sika Rir Sikasent 695 Mix Mat Actual Mat Batch Tim	CPLANT SPLANY SPLANY SPLANY SPLACK Source 171041 E.R. 119004 Lkv1 171041 E.R. HOLNCIA COCMMED Vater Totals STAIR STKA685 Trim er/Cement/ cer/Cement cet 13:	Vater: Ratio: Ratio:	CERTIFICATE OF C REF. / BRIDGE NO. 9001.092 MCFac Ab 9.009 9 9.009 9 0.035 0 0.35 0.31	COMPLIA CUS F 35 F ac 35 F ac 35 8 8 8 9 13 35 9 13 13 12 12 12 12 12 12 12 12 12 12 12 12 12	ANCE TOMER XC J MIX NO. 141HPC1 0D 627 228 1123 1158 1158 1158 1158 1158 419 175 205 4 4 4 4 4 4 4 4 4 4 4 4 4	muca 4,@4 8b∈ 3 9 15 9 15 9 5 -35 9 9 9	K NO. LU 55D 635 227 1132 1163 0 8 205 9 8 205 9 8 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	51235 5125 51255 512	STOMER N 53 CUMULAT 38 38 38 38 38 38 38 4 4 4 4 5 5 6 6 6 6 6 6 6 6 7 0 4 3 1 6 6 6 6 7 0 4 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0. NE QTY 379 379 379 379 379 379 379 379	TAX SUB TOT. TRUCK TIL TOTA TOTA Target 5000 2100 11050 11260 3895 1662 1261 32 222 r: 194 r: 178 d: 2 t: 178 t: 178	AL ME 2960 2960 2960 11020 1020 1020 1020 1020 1020 1020 1	0 0 2 5.00 2 Evrov -0.32 0.04 -0.32 -0.42 1.12 1.25 0.05 1.45 5.5 5.5 5.5 5.5 5.5 5.5 5.5 5.5 5.5
READY MIX ROGERS DATE 10/16/2008 Ingrediant 1.5"(94) E.R. 99 Lhv) C. Sand Lkvl CRS0(067)E.S. Holeis I Class C/F Ash WHTER Sika Air Sikasent 695 Mix Mat Batch Tim	CPLANY SPIP SP 8680 Source 171041 E.R. 119004 Lkv1 171041 E.R. 10004 Lkv1 171041 E.R. 1000400 Water Totals StAIR SIXN685 Tris er/Cement, er/Cement et 13:-	Vator: Ratio: Ratio: Ratio:	CFRTIFICATE OF C REF. 7 BRIDGE NO. 9001092 MCFac Ab 9.009 9 9.027 9 0.036 0 0.036 0 1.0.027 9 0.036 0 0.027 9 0.035 0 0.35 0.31	COMPLU CUS F 35 57 ac 1, 013 3, 014 3, 013 3, 013, 013 3,	ANCE TOMER DC J MIX NO. 0D 627 224 1123 1154 1123 1154 1155 4 123 175 205 4 4 125 4 4 125 4 4 125 4 4 4 125 4 4 4 125 4 4 4 125 4 4 4 125 4 4 4 125 4 4 4 125 4 4 4 125 4 4 4 125 4 4 125 4 125 4 125 4 125 125 125 125 125 125 125 125 125 125	TRUCE 5,024 8bs 8 3 9 15 8 9 15 8 9 15 8 9 15 8 9 15 8 9 15 8 9 15 8 9 15 8 8 15 8 15	K NO. LU 55D 635 227 1132 1163 0 9 205 9 9 9 9 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	5123 512 5123 5125 5125 5125 5125 5125 5125 5125 5125 5125 5125 5125 5	STOMER N 53 CUMULAT 38 38 38 38 38 4 4 4 5 6 6 6 6 7 0 tal 2 5 1 6 6 7 0 tal 1 2 5 1 6 8 8 6 8 8 8 7 0 tal 1 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	C. NEQTY arg arg arg arg arg arg arg arg	TAX SUB TOT. TRUCK TIL TOTA TOTA Target 5060 2100 11050 11260 3895 1662 1261 32 222 r: 176 t: 176 t: 176 t: 176 t: 176	AL ME 2990 2180 11020 100 10	0 0 2 5. 00 2 Error -0.32 0.02 -0.42 -0.42 1.12 1.25 0.05 1.45 5 5 1.005 1005 1005
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				Deliv	ery Ticke	et		~
	E Ready N 2915 Water Eagan Minr Main Office Metro Disp	Aix Division s Road Suite 105 nesota 55121 atch	(651) 683-0600 (651) 683-8150	CUSTOM • CUSTO GUARA • ADDITI AGGRE	IER PROVIDED MER PROVIDED NTEES/WABRA IONAL FEES/APP GATE INDUSTR	D PRODUCTS: PRODUCTS ADDED INTIES. PLY FOR ADDING PRO IES.	TO THE MIX	VOIDS ALL SUPPLIED BY
BURN WARNING: Fresh	alv mixed concrete	compol mortar	or arout may	- WATER: /	ADDITIONAL W	ATER ADDED TO THE	S CONCRETE	WILL REDUCE USK.
cause skin irritation, s Avoid contact with sk	evere chemical by in and eves. In c	im and/or serious ase of contact wit	eye damage. th eves flush	EXPOSED O	CONCRETE: TO HE	LP PREVENT CONCRETE	FROM SCAUN	IG DUE TO THE
thoroughly with water contact with skin, flush	and seek immedi thoroughly with	ate medical attent water and see med	ion. In case of lical attention	ENTRAININ	F FREEZING AND	THAWING WE RECOM 1 EX20SED CONCRETE	MEND THAT I	5% TO 8% AIR CURING.
if irritation persists. KE	EP OUT OF THE R	EACH OF CHILDREN	Ν.	FOR TER	MS, CONDITIC	ONS AND RETURN	CHECK CHA	ARGES.
DATE TICKET	NO.	CUSTOMER NAM		ORDER NO.		USAGE CO	DE	
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No.	\$-		BE	W.KO. TODD		0 14:21	FINISH POUR	7
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DATE	SP / PO	REF. / BRIDGE NO.	MIX NO.	TRUCK NO. LOA	D QTY. CUMU	LATIVE QTY. OTH	ER	
10/16/2008 5	P 8680-157	001092	3041HPC1	108 9	5 7.5	TOT	AL (1. DA
Ingredient L.5"(E4) E.R. 17104 89 Lkvl 11900 C. Sand Lkvl 19004 CR50(W67)E.R. 17104 Holcia I HELDE Class C/F Ash CDCUR WATER Water Sika Air STATE Sikawant 686 "STKAR	Seurce 1 E.R. 4 Livi 1 E.R. 1 E.R. 1 E.R. 10 10 10 10 10 10 10 10 10 10 10 10 10	-3 gallong 0.25	$\begin{array}{c} \text{ac} & \text{DB} & \text{f} \\ \text{D13} & \text{627} \\ \text{D13} & \text{627} \\ \text{D14} & \text{224} \\ \text{D09} & \text{1123} \\ \text{D13} & \text{1154} \\ \text{410} \\ 175 \\ 295 \\ \text{4} \\ \text{4} \\ 175 \\ 295 \\ \text{4} \\ \text{4} \\ \text{7} \\ \text$	No. 250 f 8 635 3 227 9 1132 15 1169 9 9 0 9 -35 205 9 0 70 9	Tree Net Ci -1.1 2.9 31.4 16.2 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9	V Tang Tanget 632 5000 236 2180 1163 11050 1135 11260 410 3895 175 1662 159 1261 4 33 4 222 n Water: 12 1 Kater: 12 4 Add:	Actus E000 2140 11060 11220 3395 1655 1284 33 222 244 155 222 244 155 222 244 155 222 244 24 155 24 155 24 155 222 240 240 240 240 240 240 240	S Ervor 1.3% -1.6% 0.1% -0.4% 0.0% -0.4% 1.6% 0.0% 0.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.0% 1.3% 1.3% 1.3% 1.3% 1.3% 1.3% 1.4%
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A					Delive	ery Tic	ket			
	Ready N 2915 Water Eagan Minr Main Office Metro Dispa	fix Division s Road Suite 105 nesota 55121 atch	(651) 683-060 (651) 683-8156	к <u>.</u> D D	CUSTOME • CUSTOM GUARAN • ADDITIO AGGREG	R PROVIL IER PROVIL ITEES/WAI NAL FEES ATE INDU:	DED PRODU DED PRODUC RRANTIES. APPLY FOR A STRIES.	ICTS: TS ADDED TO DDING PROD) THE MIX	VOIDS ALL. SUPPLIED BY
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cause skin irritation, sev Avoid contact with skin	ere chemical bu and eves. In c	irn and/or serious ase of contact wi	eye damage. Th eyes, flush		EXPOSED CO	NCRETE, TO	D HELP PREVEN	T CONCRETE F	ROM SCAL N	IS DUE TO THE
thoroughly with water a contact with skin, flush t	na seek immedi horouchly with	ate medical attent water and see med	tion. In case of dical attention		ENTRAINING	RELIANCE A	VALLEX20551	D CONCRETE, P	LUS PROPER	CURING.
if mitation persists. KEE	POUT OF THE R	EACH OF CHILDRE	N.		FOR TERM	IS, COND	ITIONS AND	RETURN C	HECK CHA	RGES.
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READY MIX PLANT	PLANT #		CUSTOMER	2260145 -	1997 1992 1973	CUSTO	MER NO.	SUB TOT	AT.	Ø Ø
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DATE	SP / PO	REF. 7 BRIDGE NO.	MIX NO.	TRUCK	NO. LOAD	QIV. CU	MULATIVE QT	TOTA		
10/16/2005 SP	8580-157	091092	3841HPC1	182	9.	5 5	7		¢	1. 190
Ingredient	Source	HEF ac Abb	ac DD	Abs	SSD Fr	rea Hist	CY Tars	Taruet	Actual	\$ Error
1.5" (\$4) E.R. 171041	E. R.	0.696 8.	013 627	8	635	-3.1	622	6080	6848	0.74
89 Lkv1 119804	Lkv1	6.627 Ø.	014 224	3	227	2.9	230	2169	2140	-1.8%
L. TRNG LK?I (9004) COSCIDENT D (9106)	C C	0,035 .9. 6.627 8	2000 11C3 617 1154	15	11202	334 % 16. 2	: 105	11000	11080	~9. (A 0. (A
Halcia I WLWI	4	0.01 0.	410 410	.0 0	5	9.9	4ið	3895	3898	-0.15
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WATER Vater	Totals		205	~35	205	-47.4	158	1261	1292	2.5%
Sika Air SIAIR			4	9	Û	0.8	4	32	33	容。 使此
Sikament bib SikAbB	b		4	¢	Ø	9,9	¢	EEL	225	1.42
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Mix Water/Ce	irim water: ment Ratio:		ి గిగ్	V L	later As	to: ailabi	tai war: le te An	er: 174 fel: 2	62 109 /3 89]	lanz
Actual Water/Ce	ment Ratios	0.32	r :		Water	Added	at Plan	nt:	ua)	lions
Batch Time:	14:18		A	ķ	later Re	ided at	t Job S:	ite:	gal	lons
			44		Ť¢	* By sigi	hing this c & conditio	elivery tick	ket you'a back side	igree to the
MN DOT - CERT	IFICATE OF	COMPLIANCE	$\sim R_{\odot}$		ſ	RECEIVE	D BY (legi	ible signat	ure)	
595205	015-30	F	BATCH COPY			V	(regi			ę
C.	40	þ.				Χ				

- ,				De	livery T	icket			
AGGREGATI	Ready M 2915 Waters Eagan Minn Main Office	Road Suite 105 esota 55121	(651) 683-0600	CUS • CL GU • At	TOMER PRO ISTOMER PRO JARANTEES/A DOITIONAL FE GGREGATE IN	OVIDED PRODU OVIDED PRODUC WARRANTIES. EES APPLY FOR A DUSTRIES.	JCTS: TS ADDED TO ADDING PROD	D THE MIX	Voids all Supplied by
INDUSTRIES	Metro Dispa	tch	(651) 683-8150	WAT ITS S	ER: ADDITIO	NAL WATER AD	DED TO THIS	CONCRETE	WILL REDUCE
cause skin irritation, se	vere chemical bu	, cement, mortar rn and/or serious	or grout may s eye damage. ith eves flush	EXPO	SED CONCRETE	: TO HELP PREVE	NT CONCRETE I	FROM SCALIN	G DUE TO THE
thoroughly with water a contact with skin, flush	ind seek immedia	te medical atten vater and see me	tion. In case of dical attention	ACTO ENTR	AINING BE USE	D IN ALL EXPOSE	D CONCRETE, P	LUS PROPER	CURING.
if irritation persists. KEE	P OUT OF THE RE	ACH OF CHILDRE	N.	FOR	TERMS, CO	NDITIONS AND	D RETURN C	HECK CHA	RGES.
DATE TICKET N	D.	CUSTOMER NAM	1E .	ORDER N	D.	<u> 22</u> 22 22 22	USAGE COD	E	
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READY MIX PLANT	IEL SUFCHARSI T WATER CHAR PLANT#	RGE 4 CERTIFICATE OF CO	DMPLIANCE CUSTOMER PCI		5121	STOMER NC.	TAX SUB TOT TRUCK T	TAL	: í , ø
READY MIX PLANT	IEL SUFCHARSI T WATER CHAR PLANT# IT 2 SP / PO	CERTIFICATE OF CO	DMPLIANCE CUSTOMER PCT MIX NO.	TRUCK NO.	CU 51211 LOAD QTY.	STOMER NC.	TAX SUB TOT TRUCK T TY. OTHE	TAL IME R	. j
READY MIX PLANT READY MIX PLANT ROBERS PLAN DATE 10/16/2004 SF	EL SUFCHARSE T WATER CHAR PLANT# IT 2 SP/PO 86680-157	CERTIFICATE OF CO REF. / BRIDGE NO.	DMPLIANCE CUSTOMER PCI MIX NO. 3R41NPC1	TRUCK NO. 147	Si21 LOAD QTY. 2	STOMER NG.	TAX SUB TOT TRUCK T TY. OTHE	ral IME R	- į , o
READY MIX PLANT STF ST FUEL FL NOT H20 HC ROGERS PLAN DATE 10/16/2006 SF Ingredient 1.5*(H4) E.R. 171041 H9 L4v1 11900- C. Sand Lkv1 19004 C. Sand Lkv1 19004 COS0 (667)E.R. 171041 Holcie T HCLNC Class C/F Ash COCINI MATER Mater Silva Air S184F Silvaent 58S SINA66	EL SUFCHARSE T WATER CHAR PLANT# IT 2 SP/PO 2 8680-157 Searce E.R. Lky Lky Lky Lky Lky Lky Lky Lky Lky Satals B Totals	1 CERTIFICATE OF CO 00010092 - NEFac 9,005 9,005 9,005 9,005 9,027 9,036 9,036 9,036	OMPLIANCE CUSTOMER PCI MIX NO. 3R441HPC1 Bac 00 .013 627 .014 824 .003 1123 .013 1154 .013 1154 .01544 .01544 .01544 .01544 .01544 .01544.	TRUCK NO. 147 147 9bs \$59 8 55 3 22 9 11 15 11 0 0 3 -35 20 9 9 9	Free M 5121 LOAD QTY. 2 Free M 5 5 5 16. 5 9 16. 5 9 16. 6 0 0 0 0 9 0 0 9 0 0 9 0 0 9 0 0 9 0 0 9 0 0 9 0 0 9 0	STOMER NG 5.3 CUMULATIVE Q 5.9 1 532 9 230 4 163 2 185 8 410 0 175 4 158 0 410 0 175 4 158 0 4	Target 1260 2330 2370 823 350 257 7 48	AL IME R Actual 1240 2350 275 325 284 7 51	2 0 0 0 0 0 0 0 0 0 0 0 0 0

Appendix E: Construction Pictures



Figure E1. Placement of concrete around sensors.



Figure E2. McCleary screed used to compact the concrete.



Figure E3. Tooled joint and concrete finishing methods.



Figure E4. Instrumentation used in Cell 53.



Figure E5. Vibrating wire strain gauges.
Appendix F: Cell 53 Instrumentation

CELL	MODEL	SEQ	ORIENTATION	STATION (FT)	OFFSET (FT)	DEPTH (IN)
53	CE	101	LONGITUDINAL	-7.5	-11.5	11.748
53	CE	102	TRANSVERSE	-7.5	-6	0.252
53	CE	103	LONGITUDINAL	-3	-11.5	0.252
53	CE	104	39°	-2.5	-10	0.252
53	CE	105	TRANSVERSE	-1	-9	0.252
53	CE	106	TRANSVERSE	-1	-6	0.252
53	CE	107	LONGITUDINAL	7.5	-11.5	0.252
53	CE	108	LONGITUDINAL	7.5	-11.5	11.748
53	CE	109	TRANSVERSE	7.5	-9	0.252
53	CE	110	TRANSVERSE	7.5	-9	11.748
53	CE	111	LONGITUDINAL	7.6	-9	0.252
53	CE	112	LONGITUDINAL	7.6	-9	11.748
53	CE	113	TRANSVERSE	7.5	-6	0.252
53	CE	114	TRANSVERSE	7.5	-6	11.748
53	CE	115	LONGITUDINAL	7.6	-6	0.252
53	CE	116	LONGITUDINAL	7.6	-6	11.748
53	CE	117	LONGITUDINAL	12	-11.5	0.252
53	CE	118	LONGITUDINAL	12	-11.5	11.748
53	CE	119	39°	12.5	-10	0.252
53	CE	120	39°	12.5	-10	11.748
53	CE	121	TRANSVERSE	14	-9	0.252
53	CE	122	TRANSVERSE	14	-9	11.748
53	CE	123	TRANSVERSE	14	-6	0.252
53	CE	124	TRANSVERSE	14	-6	11.748
53	DT	101		-7.5	-12.2	0.75
53	DT	102		0	-12.2	0.75
53	DT	103		0	-12.2	0.75
53	DT	104		7.5	-12.2	0.75
53	DT	105		15	-12.2	0.75
53	DT	106		15	-12.2	0.75
53	EC	101		16	-11.2	15
53	EC	102		17	-10.2	18
53	EC	103		18	-9.2	24
53	EC	104		19	-8.2	30
53	EC	105		20	-7.2	36
53	EC	106		21	-6.2	48
53	EC	107		22	-5.2	60
53	EC	108		23	-4.2	72
53	HC	101		0	-11	0.996
53	HC	102		0	-11	11.004
53	HC	103		0	-6	0.996
53	HC	104		0	-6	11.004
53	HC	105		15	-11	6
53	HC	106		15	-6	6
53	IK	101		-7.6	-7	0.996

Table F1. Cell 53 sensor locations.

CELL	MODEL	SEQ	ORIENTATION	STATION (FT)	OFFSET (FT)	DEPTH (IN)
53	IK	102		-7.6	-7	3.504
53	IK	103		-7.6	-7	6
53	IK	104		-7.6	-7	8.496
53	IK	105		-7.6	-7	11.004
53	IK	106		-7.6	-7	0.996
53	IK	107		-6.6	-6	3.5
53	IK	108		-5.6	-5	6
53	IK	109		-4.6	-4	8.5
53	IK	110		-3.6	-3	11
53	IV	101		-7.5	-12.2	6
53	IV	102		0	-12.2	6
53	IV	103		7.5	-12.2	6
53	IV	104		15	-12.2	6
53	TC	101		1	-11.5	0.5
53	TC	102		1	-11.5	1
53	TC	103		1	-11.5	2
53	TC	104		1	-11.5	3
53	TC	105		2	-10.5	4
53	TC	106		1	-11.5	5
53	TC	107		1	-11.5	8
53	TC	108		1	-11.5	11
53	TC	109		7	-6	0.5
53	TC	110		7	-6	1
53	TC	111		7	-6	1.5
53	TC	112		7	-6	3
53	TC	113		7	-6	5
53	TC	114		7	-6	8
53	TC	115		7	-6	11
53	TC	116		7	-6	15
53	TC	117		7	-6	18
53	TC	118		7	-6	24
53	TC	119		7	-6	30
53	TC	120		7	-6	36
53	TC	121		7	-6	48
54	TC	122		7	-6	54
55	TC	123		7	-6	60
56	TC	124		7	-6	72
53	VG	101	LONGITUDINAL	-6	-6.5	0.996
53	VG	102	LONGITUDINAL	-6	-6.5	6
53	VG	103	LONGITUDINAL	-6	-6.5	11.004
53	VW	101	LONGITUDINAL	-12	-11	0.996
53	VW	102	LONGITUDINAL	-12	-11	11.004
53	VW	103	39°	-12.5	-10	0.996
53	VW	104	39°	-12.5	-10	11.004
53	VW	105	TRANSVERSE	-14	-9	0.996
53	VW	106	TRANSVERSE	-14	-9	11.004

 Table F1. Sensor locations (cont).

CELL	MODEL	SEQ	ORIENTATION	STATION (FT)	OFFSET (FT)	DEPTH (IN)
53	VW	107	LONGITUDINAL	-14	-6	0.996
53	VW	108	LONGITUDINAL	-14	-6	11.004
53	VW	109	TRANSVERSE	-13.5	-6	0.996
53	VW	110	TRANSVERSE	-13.5	-6	11.004
53	VW	111	LONGITUDINAL	-7.5	-11	0.996
53	VW	112	LONGITUDINAL	-7.5	-11	11.004
53	VW	113	LONGITUDINAL	-8	-6	0.996
53	VW	114	LONGITUDINAL	-8	-6	11.004
53	VW	115	TRANSVERSE	-7	-6	0.996
53	VW	116	TRANSVERSE	-7	-6	11.004
53	WM	101		7	-6.5	14.496
53	WM	102		7	-6.5	18
53	WM	103		7	-6.5	30
53	WM	104		7	-6.5	42
53	WM	105		7	-6.5	51.96
53	WM	106		7	-6.5	56.04
53	WM	107		0.5	-11.5	14.496
53	WM	108		0.5	-11.5	18
53	WM	109		0.5	-11.5	30
53	WM	110		0.5	-11.5	42
53	WM	111		0.5	-11.5	51.96
53	WM	112		0.5	-11.5	56.04
53	XG	101	LONGITUDINAL	-6	-6.5	0.996
53	XG	102	LONGITUDINAL	-6	-6.5	6
53	XG	103	LONGITUDINAL	-6	-6.5	11.004
53	XV	101	LONGITUDINAL	-12	-11	0.996
53	XV	102	LONGITUDINAL	-12	-11	11.004
53	XV	103	39°	-12.5	-10	0.996
53	XV	104	39°	-12.5	-10	11.004
53	XV	105	TRANSVERSE	-14	-9	0.996
53	XV	106	TRANSVERSE	-14	-9	11.004
53	XV	107	LONGITUDINAL	-14	-6	0.996
53	XV	108	LONGITUDINAL	-14	-6	11.004
53	XV	109	TRANSVERSE	-13.5	-6	0.996
53	XV	110	TRANSVERSE	-13.5	-6	11.004
53	XV	111	LONGITUDINAL	-7.5	-11	0.996
53	XV	112	LONGITUDINAL	-7.5	-11	11.004
53	XV	113	LONGITUDINAL	-8	-6	0.996
53	XV	114	LONGITUDINAL	-8	-6	11.004
53	XV	115	TRANSVERSE	-7	-6	0.996
53	XV	116	TRANSVERSE	-7	-6	11.004

 Table F1. Sensor locations (cont).