New Hampshire DOT

Research

Incorporating Impact of Aging on Cracking Performance of Mixtures during Design

Final Report

Prepared by University of New Hampshire Department of Civil and Environmental Engineering
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16. Abstract

Aging can significantly affect the properties of asphalt binders and mixtures, causing increase in stiffness, reduction in relaxation capability, and increase in brittleness. Eleven mixtures were evaluated in this project using different laboratory conditioning protocols to evaluate how the properties of asphalt binders and mixtures, including rheological properties, fatigue, and fracture behavior will change over time. Comparisons between different aging levels, binders and mixture properties are conducted by using complex modulus (E*), Simplified Viscoelastic Continuum Damage (S-VECD) approach, Semi Circular Bending (SCB) and Disk Shaped Compact Tension (DCT) fracture tests on mix, and 4mm Dynamic Shear Rheometer (DSR) test on binder. By employing the various performance indices of asphalt mixtures and binders measured from the tests, the aging and cracking susceptibility of the mixtures and binders are quantitatively evaluated and investigated. The results show that the two virgin binders and mixtures generally show the good cracking performance after each aging condition. The binders and mixtures with the softer grade and the largest difference between performance grade (PG) high and low temperatures typically have good cracking performance originally, however, they show higher aging susceptibility compared with other materials. Finally, based on the findings from the testing and analysis, suggestions and guidance are developed for NHDOT to quantitatively evaluate the aging and cracking susceptibility of asphalt binders and mixtures during material selection and mixture design incorporating the impact of aging.

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DISCLAIMER

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EXECUTIVE SUMMARY

This report presents the experimental, analytical, and computational research conducted under the NHDOT 26962O project. The project's goals were to (1) Develop a screening tool (including aging protocol) to identify crack susceptible binders/mixtures during material selection and mix design; and (2) Quantitatively evaluate how the cracking potential of typical NHDOT mixtures change with different aging levels for future maintenance and rehabilitation planning.

In order to capture the long-term performance of the asphalt mixtures and binders, and simulate the physical and chemical changes of asphalt material in field, the appropriate laboratory aging conditioning methods are needed. Three long-term aging protocols (24 hr. at 135°C on loose mix following the Asphalt Institute procedure and the NCHRP 09-54 project recommended 95°C for 5 and 12 days on loose mix) were included and evaluated in this study.

To evaluate the impact of aging on mixture properties in this project, a set of 11 different mixtures from NHDOT were subject to the aging protocols and then tested using different mixture performance tests. Mixture characterization (including the field cores) was done by performing Complex Modulus, Simplified Viscoelastic Continuum Damage (SVECD) fatigue, Semi Circular Bending (SCB) and Disc-Shaped Compact Tension (DCT) testing to measure the linear viscoelastic (LVE) properties, fatigue behavior, and fracture performance, respectively. Various mixture performance indices calculated from the test measurements were used to quantitatively evaluate and investigate the aging and cracking susceptibility of the mixtures. The results show that the two virgin mixtures generally have good cracking performance after each aging condition. The mixtures with softer binders generally show higher aging susceptibility based on the measured LVE properties. The two mixtures with the largest difference between performance grade high temperature (PGHT) and low temperature (PGLT) show the most impact from aging based on the fracture and fatigue testing results. Also, a simplified and experimental mixture aging model that can evaluate the aging susceptibility and predict the cracking performance of the asphalt mixtures was developed based on the mixture testing results.

To evaluate the impact of aging on the binder properties in this project, binder samples extracted and recovered from the aged mixtures and field cores (three 0.5" layers) were tested using the 4mm Dynamic Shear Rheometer (DSR) geometry. Rheological indices calculated from the binder tests were employed to evaluate the aging and cracking susceptibility of the binder samples. The results of the binder tests showed that the two virgin binders (extracted from the two virgin mixtures) are expected to have good cracking performance at each aging condition. Two binders with the softer PGLT and the binder sample with the largest difference between PGHT and PGLT show higher aging susceptibility. Also, by comparing the binder aging method with the different laboratory mixture aging protocols, the 20 hours PAV binder conditioning protocol generally causes less aging of asphalt material than 5 days at 95°C mixture conditioning method. The binder samples extracted from the field cores clearly show the aging gradient in the field, with the top layers (first inch of the pavement) aged the most.

Finally, based on the findings from the mixture and binder tests, guidelines were developed for NHDOT to quantitatively evaluate the aging and cracking susceptibility of asphalt binders and mixtures during

material selection and mixture design. The limitations of the guidelines and recommended future work are also described.

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND AND OBJECTIVES

Cracking – both environmental and load related - is a primary concern for asphalt pavements in New Hampshire. Cracking affects ride quality and allows water to penetrate from the surface to underlying soil layers, decreasing the life of the pavement and requiring more frequent maintenance or rehabilitation. It has been well recognized in the literature and through field observations that a mixture's resistance to cracking decreases with time as the mixture ages in the field. The inclusion of already aged material in the form of RAP would also be expected to decrease the cracking resistance. Not all mixtures age at the same rate or to the same extent, and therefore, different mixtures could have very similar cracking properties soon after construction but may have drastically different properties after some level of aging. Therefore, it is important to have an understanding of how the cracking resistance of a mixture will change over time at the time when materials are selected and mix designs are performed.

Asphalt pavements undergo aging during construction (short term aging, mostly evaporation of lighter weight molecules at the high production temperatures), and also over the pavement service life (long term aging due to oxidation and continued loss of lighter weight hydrocarbons), which increases the brittleness and cracking susceptibility of asphalt binders and mixtures. New Hampshire Department of Transportation (NHDOT), however, presently relies upon the performance grading of the binder to ensure the appropriate selection of materials to resist cracking in the field. Recent research presented at various conferences and the FHWA Expert Task Group meetings has shown that the current PAV aging for binders may only represent the condition of in service pavements after 2-3 years. In some cases, this is not adequate to differentiate or screen materials that may age quickly and lead to increased cracking Therefore, there is a need for a new accelerated laboratory aging method that can simulate and predict the change of binder and mixture properties over the whole service life, which will help to minimize maintenance and rehabilitation cost due to the different pavement distress and to increase the confidence level of the design of the pavement. Also, research has shown the importance of evaluating the mixture properties to include the effect of aggregate structure and mineralogy on cracking performance; this is currently not part of the NHDOT specification.

This project builds upon the work conducted under Project No. 15680R, which provided guidance on the best way to evaluate the performance of high RAP mixtures during the mix design stage by investigating the differences between binder and mixture testing, and materials produced in the lab and in the plant while only taking the short-term aging condition (during production of the mix) into account. The primary objective of this project is to evaluate how the properties of typical NHDOT mixtures change with different aging levels in order to capture the long-term performance of those mixtures, which builds upon the previous project. The results of this project will help NHDOT to improve the selection of asphalt mixtures to resist cracking, resulting in long term cost savings and better ride quality. The experimental study

described in this report provides the NHDOT and industry with information on cracking characteristics of mixtures including different percentages of RAP, different binder grades, and different aging conditions.

The objectives of this project are to:

- Develop a screening tool (including aging protocol) to identify crack susceptible binders/mixtures during material selection and mix design; and,
- Quantitatively evaluate how the cracking potential of typical NHDOT mixtures change with different aging levels for future maintenance and rehabilitation planning.

1.2 RESEARCH METHOD

A set of 11 NHDOT mixtures evaluated in this study are varied in terms of volumetric properties, virgin binder grade, modified and unmodified binders, and mixtures containing different percentages of reclaimed asphalt pavement (RAP). Mixture (including field cores) characterization is done by performing Complex Modulus, Simplified Viscoelastic Continuum Damage (SVECD) fatigue, Semi Circular Bending (SCB) and Disc-Shaped Compact Tension (DCT) testing, which are commonly used and accepted to relate mixture properties to field performance. Binder testing is performed on the Dynamic Shear Rheometer (DSR) with 4mm plates to measure rheological parameters. By employing the various performance indices of asphalt mixtures and binders measured from the tests, the aging and cracking susceptibility of the mixtures and binders are quantitatively evaluated and investigated. Finally, suggestions and guidance for NHDOT to select and design the asphalt mixtures with good cracking performance are proposed and developed. Figure 1.1 presents a simplified process diagram of the project.

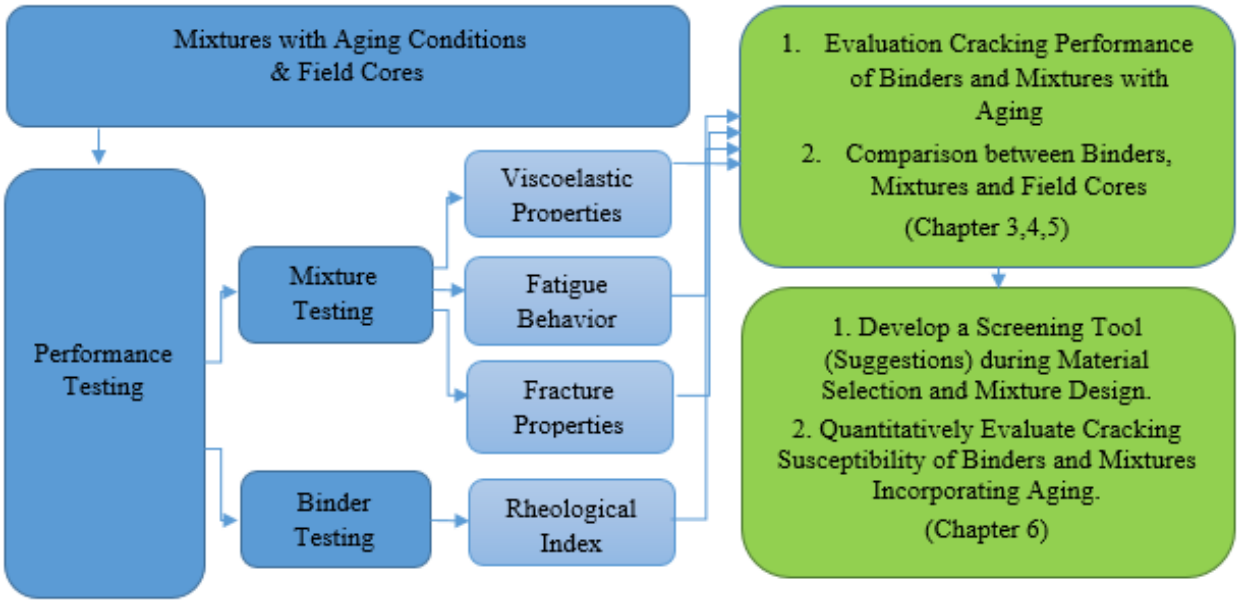

Figure 1.1 Simplified Process Diagram for this Project

1.3 ORGANIZATION OF THE REPORT

This report is organized into six chapters with appendices. Chapter 1 covers the introduction and motivation for this research, as well as the study objectives. Chapter 2 briefly discusses the materials that have been evaluated in this study, followed by a description on the mechanistic and performance-based laboratory tests that have been used to characterize the asphalt mixtures and binders. Chapter 3 evaluates how the mixture performance, including linear viscoelastic properties, fracture properties and fatigue behavior evolve with different aging conditions. The comparison between the laboratory aging methods with field aging, as well as the development of the mixture aging model are included in Chapter 3. Chapter 4 evaluates how the binder properties change over time by employing various rheological indices. The comparison between the laboratory mixture aging protocols with the binder aging method, as well as the aging gradient in field are discussed in this chapter. Chapter 5 presents the potential correlations between the mixture performance indices with the binder performance parameters. Based on the findings from the previous chapters, Chapter 6 provides guidance for NHDOT to quantitatively evaluate the aging and cracking susceptibility of asphalt binders and mixtures during material selection and mixture design. The appendices provide the data measured and calculated from the laboratory tests.

CHAPTER 2: MATERIALS AND METHODS

2.1 MATERIALS

2.1.1 Asphalt Mixtures

This study includes laboratory testing on eleven plant mixed, lab compacted surface mixtures. Table 2.1 below shows the mixture information (Recycled binder content is the ratio of the weight of recycled binder to the total binder weight). The aging conditions are described in section 2.2 below. Letters in the cells indicate the testing conducted at each of the mixture-aging combinations. The mix ID has the specific meaning: the first four-digit numbers indicate binder PG grade, the following letters “S” and “L” mean the nominal maximum aggregate size (NMAS) of 9.5mm and 12.5mm, respectively. The last letter represents the recycled binder content: “V” means no recycled binder, “M” means 14.8-18.9% recycled binder content, “L” means 28.3% recycled binder content. Four mixtures (5234LM, 5234LL, 5828LM and 5828LL) from the NHDOT project No. 15680R, “Correlation between Laboratory and Plant produced High RAP/RAS Mixtures”, were placed in the field along New Hampshire (NH) State Route 12 near Westmoreland during the 2013 construction season. Field cores were taken in 2017 after approximately four years of service. The other seven mixtures were produced during the 2017 construction season; field cores are not available for these mixtures.

Table 2.1 Mixtures Properties and Information

Mixture ID	Virgin Binder Grade	Design Gyration Levels	NMAS (mm)	Total Binder Content (%)	Recycled Binder Content (%)	STA	LTOA			Field Cores
							5 days 95°C	12 days 95°C	24 hours 135°C	
5234LM	PG 52-34	50	12.5	5.3	18.9	A	ABCD	ABCD	ABCD	ABC
5234LL	PG 52-34	50	12.5	5.3	28.3	A	ABCD	ABCD	ABCD	ABC
5834LM	PG 58-34	50	12.5	5.4	18.5	CD	CD	CD	CD	*NA*
5828SM	PG 58-28	50	9.5	5.9	16.9	ABCD	ABCD	ABCD	ABCD	*NA*
5828LM	PG 58-28	50	12.5	5.3	18.9	A	D	ABCD	ABCD	ABC
5828LL	PG 58-28	75	12.5	5.3	28.3	A	D	ABCD	ABCD	ABC
6428SV	PG 64-28	75	9.5	6.4	0	ABCD	ABCD	ABCD	ABCD	*NA*
6428SM	PG 64-28	75	9.5	6.3	18.5	ABCD	ABCD	ABCD	ABCD	*NA*
6428LM	PG 64-28	75	12.5	5.8	18.5	ABCD	ABCD	ABCD	ABCD	*NA*
7034LV	PG 70-34	75	12.5	5.8	0	ABCD	ABCD	ABCD	ABCD	*NA*
7628SM	PG 76-28	75	9.5	6.1	14.8	ABCD	ABCD	ABCD	ABCD	*NA*

A: Complex Modulus Testing; B: S-VECD Fatigue Testing; C: SCB Testing; D: DCT Testing;

2.1.2 Asphalt Binders

Table 2.2 below shows the summary information for binder samples extracted and recovered from the eleven project mixtures with different aging conditions. The field cores from the four Westmoreland mixtures were cut into three layers (0.5" each as shown in Figure 2.1) and then subjected to the extraction and recovery process. The binder extraction was performed by NHDOT in accordance with AASHTO T 164, procedure 12, using a centrifuge extractor and toluene solvent in order to determine the asphalt binder content. The asphalt binder was recovered based on ASTM D7906-14 using a rotary evaporator. Additionally, seven binder samples (virgin tank samples with 20hr. PAV aging) from the 2017 paving projects were received and tested at UNH.

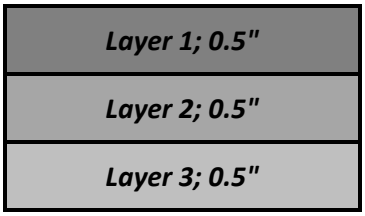

Figure 2.1 Schematic of Cutting of the Field Cores (surface layer) for Binder Extraction and Recovery

Table 2.2 Summary Information for Binder Samples

Binder Type	Mixture ID	Total Binder Content (%)	Recycled Binder Content (%)	Testing/Analysis (4mm DSR)					
				STA	95°C@5d	95°C@12d	135°C@ 24hr.	Field Cores	Original Binder (20 hr. PAV)
PG 52-34	5234LM	5.3	18.9	✓	✓	✓	✓	✓	*NA*
PG 52-34	5234LL	5.3	28.3	✓	✓	✓	✓	✓	*NA*
PG 58-34	5834LM	5.4	18.5	✓	✓	✓	*NA*	*NA*	✓
PG 58-28	5828SM	5.9	16.9	*NA*	*NA*	*NA*	*NA*	*NA*	✓
PG 58-28	5828LM	5.3	18.9	✓	NA	✓	✓	✓	*NA*
PG 58-28	5828LL	5.3	28.3	✓	NA	✓	✓	✓	*NA*
PG 64-28	6428SV	6.4	0	✓	✓	✓	*NA*	*NA*	✓
PG 64-28	6428SM	6.3	18.5	✓	✓	✓	*NA*	*NA*	✓
PG 64-28	6428LM	5.8	18.5	*NA*	*NA*	*NA*	*NA*	*NA*	✓
PG 70-34	7034LV	5.8	0	✓	✓	✓	*NA*	*NA*	✓
PG 76-28	7628SM	6.1	14.8	✓	✓	✓	*NA*	*NA*	✓

2.2 AGING AND SPECIMEN FABRICATION METHODS

Several asphalt mixture laboratory aging procedures are used to simulate the aging in the field. These procedures can be generally classified based on the state of material during aging: compacted specimen and loose mix. In the AASHTO R30 procedure, the loose asphalt mixture is placed in a forced draft oven at 135 ± 3°C (275 ± 5°F) for 4 hr. ± 5 min to simulate short term aging (STA) during production and placement (Bell et al., 1994). For long term aging, short term aged mixtures are compacted using gyratory compactor (following AASHTO T 312) into a specimen that is then conditioned in a forced-draft oven for 5 days at 85°C to represent five to ten years of aging in the field (Harrigan et al., 2007). However, research (Kim et al., 2013; Elwardany et al., 2017) has shown that this method may not be appropriate to simulate the field aging under all conditions. The AASHTO procedure only includes a single conditioning time and temperature which is considered to match field aging at any location, regardless of the temperature history and climatic region of the pavement of interest. Furthermore, aging on the compacted specimen leads to the development of an aging gradient from the specimen's center to its periphery, which violates the representative volume element requirement for performance testing.

In order to address the problems discussed above, the Asphalt Institute recommends conditioning the loose mix asphalt for 24 hr. at 135°C to simulate long term aging in the field. Loose mixture aging produces uniform aging and reduces the aging time significantly as compared to compacted specimens (Blankenship et al., 2010). This level of conditioning is expected to simulate 7 to 10 years of aging in the field (Arega et al., 2013). However, Yousefi et al. (2017) proposed that chemical changes of the binder under higher temperature can lead to significantly different cracking performance results compared to those when the conditioning temperature is below 95°C. The recent findings of the National Cooperative Highway Research Program (NCHRP) 09-54 project on long term aging of asphalt mixtures suggests 95°C as an optimal temperature for aging loose mix considering the relationship between binder rheology and chemistry (Kim et al., 2018). The recommended aging time varies with the geographical location of the pavement and should be adjusted based on climate conditions and pavement depth.

In this study, the Asphalt Institute procedure (24 hr. at 135°C on loose mix) and the NCHRP recommended 95°C for 5 and 12 days on loose mix are used to condition the eleven plant produced mixtures which have already undergone STA during production. After aging, the mixtures were cooled and then reheated at 135°C for 2 hours and compacted to achieve final test specimens with air void contents of 6 ± 0.5%.

Field cores were further processed by coring (complex modulus and fatigue test) and cutting (Semi Circular Bending test) horizontally to obtain the test specimen(s) from the surface layer, the average air void contents of those samples for different tests are documented in Table 2.3. The air voids of the samples for complex modulus and S-VECD fatigue tests cored from the field cores are generally lower than the laboratory aged and fabricated samples, while the SCB test samples of the field cores are typically higher.

Table 2.3 Air Voids for Samples from Field Cores

MIX ID (Field Cores)	Replicates	5234LM	5234LL	5828LM	5828LL
Complex Modulus and S-VECD Fatigue Test	Replicate 1	4.83%	4.43%	5.26%	6.65%
	Replicate 2	4.37%	5.01%	2.56%	7.57%
	Replicate 3	6.85%	7.48%	4.59%	2.14%
	Replicate 4	5.69%	6.03%	3.49%	3.74%
	Average	**5.41%**	**5.74%**	**3.91%**	**5.03%**
SCB Fracture Test	Replicate 1	7.23%	9.03%	12.00%	8.06%
	Replicate 2	7.47%	9.31%	12.12%	8.24%
	Replicate 3	12.12%	11.38%	3.89%	7.39%
	Replicate 4	14.18%	11.40%	2.82%	7.49%
	Average	**10.25%**	**10.28%**	**7.71%**	**7.79%**

The climatic aging index (CAI) was also developed from NCHRP 09-54 to determine laboratory aging durations at 95°C for asphalt mixtures that best reflect the time, climate, and pavement depth for a given pavement location in the United States using Enhanced Integrated Climatic Model (EICM) hourly pavement temperature data. The detailed calculation of CAI is shown below:

$$t_{oven}=CAI= \sum_{i=1}^{N} DA\ exp(-E_a/RT_i)/24 \quad (2.1)$$

$$D = \begin{cases} 3.4311*d^{-0.683}, & 6mm \le d \le 35mm \\ 0.3056, & d \ge 35mm \end{cases} \quad (2.2)$$

Where,

t_{oven} is the required oven aging duration at 95°C to reflect field aging;

CAI is climatic aging index;

D is the depth correction factor;

A is the reaction frequency factor;

E_a is the reaction activation energy;

R is the universal gas constant;

T_i is the pavement temperature obtained from Enhanced Integrated Climatic Model (EICM) at the depth of interest at the hour of interest;

B is the depth dependent fitting parameter;

d is depth of interest.

2.3 TESTING AND ANALYSIS METHODS

2.3.1 Mixture Testing

2.3.1.1 Complex Modulus Testing

The complex modulus test is performed in accordance with AASHTO T342 standard using an Asphalt Mixture Performance Tester (AMPT) machine on 150×100 mm cylindrical specimens (110×38 mm for field cores). The test is conducted on three replicate specimens at different temperatures (4.4, 21.1 and 37.8°C; 2.9, 18.0, 30.0°C for field cores) and loading frequencies (25, 10, 5, 1, 0.5, 0.1 Hz) to characterize the linear viscoelastic properties of the asphalt mixtures: dynamic modulus |E*| and phase angle (δ). The test is conducted using a sinusoidal loading protocol and three Linear Variable Differential Transformers (LVDTs) are used to measure the on-specimen strains. In order to use the results of testing the dynamic modulus and phase angle master-curves are constructed at a reference temperature of 21.1°C using appropriate shift factors. Eq. 2.3 and 2.4 indicate the dynamic modulus and phase angle calculations. Figure 2.2 shows the test setup and one typical cycle of test data.

$$|E^*| = \frac{\sigma_{amp}}{\varepsilon_{amp}} \qquad (2.3)$$

$$\delta = 2\pi f \Delta t \qquad (2.4)$$

Where,

$|E^*|$: Dynamic modulus (psi),

σ_{amp}: Amplitude of applied stress (psi),

ε_{amp}: Amplitude of strain response (in/in),

δ: Phase angle (degrees),

f: Load frequency (Hz),

Δt: The time lag between stress and strain peak to peak.

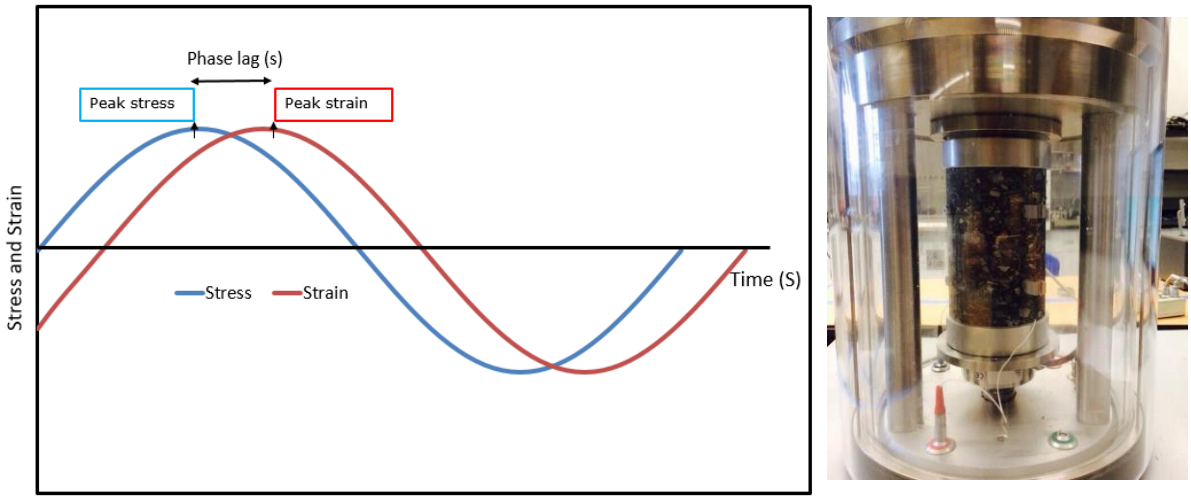

Figure 2.2 Complex Modulus Test Result and Setup

A generalized sigmoidal equation with five parameters is generally used to fit the |E*| master curves:

$$log|E^*| = \delta + \frac{\alpha}{1+e^{\beta+\gamma log(w)}} \quad (2.5)$$

Where,

$|E^*|$: dynamic modulus,

ω: frequency,

δ, α, β, and γ: fitting coefficients

The α and δ parameters are related to the glassy modulus (upper asymptote) and the equilibrium modulus (lower asymptote) of the master curve, respectively. The γ value controls the width of relaxation spectra, and the frequency of the inflection point can be calculated from $10^{-\beta/\gamma}$, which describes the elastic-viscous transition exhibited as a result of a shift between behavior dominated by the aggregate structure and the binder. These shape parameters from dynamic modulus master curves are described and illustrated in Figure 2.3. Generally, γ increases when aging level increases, while -β/γ decreases as aging level increases, which means the asphalt mixtures will become more elastic as the elastic-viscous transition point moves to a lower frequency, resulting in a flatter dynamic modulus curve.

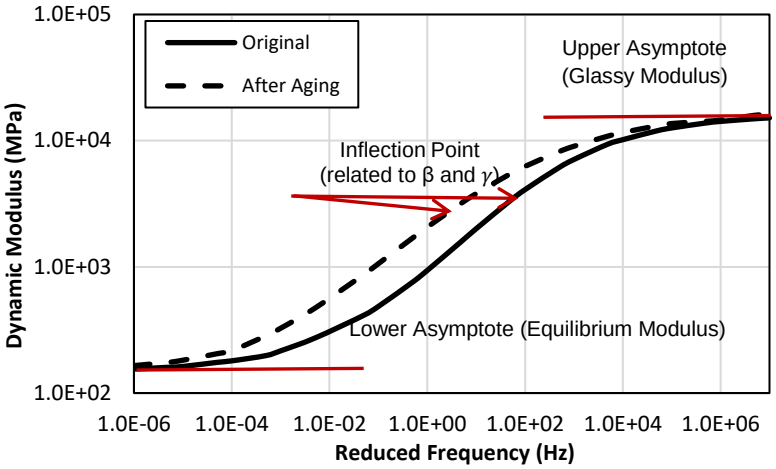

Figure 2.3 Shape Parameters from Dynamic Modulus Master Curve

A generalized Lorentzian model (Eq. 2.6) with three parameters is used to fit the δ master curves:

$$\delta = \frac{a.b^2}{[(log(w)-c)^2+b^2]} \qquad (2.6)$$

Where,

δ: phase angle,

ω: frequency,

a, b, and c: fitting coefficients

The "a" shows the peak value of phase angle, b controls the slope of the curve, and c is related to the horizontal position of the peak point (the frequency of the peak point can be calculated from 10^c). The "a" and c values typically decrease as aging level increases, moving the curve to the bottom left of the plot. The shape parameters from phase angle master curves are also described and illustrated in Fig. 2.4.

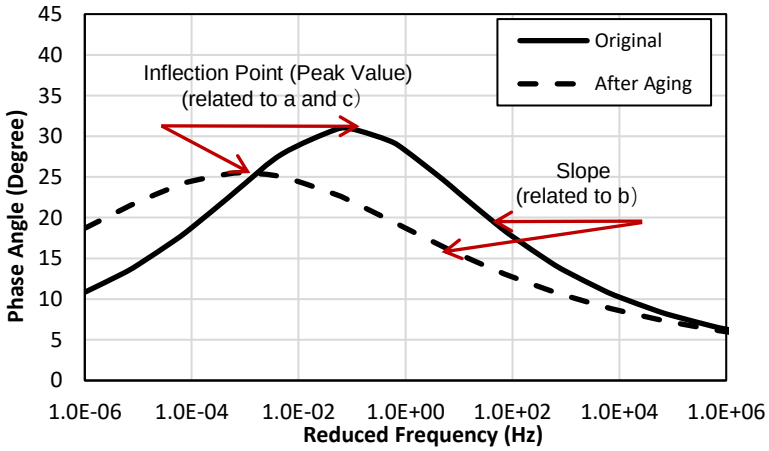

Figure 2.4 Shape Parameters from Phase Angle Master Curve

The mixture Glover-Rowe (G-R_m) parameter can be also calculated from the master curves. The Glover-Rowe parameter was initially proposed to assess the cracking resistance of asphalt binders. The basis of this approach was originally proposed by Glover et al. (2005). It suggested a correlation between a new DSR function with ductility using a temperature-frequency combination of 15°C and 1 rad/s. Rowe et al. (2011) rearranged Glover's criterion and using some simplifications, suggested a new expression to evaluate the cracking performance of binders. The Glover-Rowe (G-R) parameter captures the complex shear modulus (|G*|) and binder phase angle (δ) at a temperature-frequency combination of 15°C-0.005 rad/s. Later, Mensching et al. (2017) developed a parameter to evaluate the cracking performance of asphalt mixture in the format of the binder Glover-Rowe parameter, but employing stiffness and phase angle measured on the mixture (|E*| and δ), as shown in Eq. 2.7:

$$G - R_m = \frac{|E^*|(cos\delta)^2}{sin\delta} \quad (2.7)$$

where $|E^*|$ is dynamic modulus and δ is phase angle of the mixture. In this study, the parameter is calculated at the temperature-frequency combination of 20°C-5Hz, following additional development of the G-R_m parameter to use a typically measured point to evaluate the cracking performance of asphalt mixtures in the NCHRP 09-58 project (Epps Martin et al., 2015 & 2018; Oshone et al., 2019).

2.3.1.2 SEMI-CIRCULAR BEND (SCB) TEST

The Semi-Circular Bend test is performed to determine the intermediate temperature fracture properties of asphalt mixtures in accordance with AASHTO TP 124 standard. The test is conducted in monotonic loading conditions, using a line-load displacement rate of 50mm/min at 25°C for 4 replicates. Fracture energy (G_f), defined as the amount of energy required to create unit fracture surface, is calculated from the area under the load-displacement curve (Eq. 2.8). The Illinois Flexibility Index (FI), which normalizes the fracture energy by the post peak slope at the inflection point, is calculated using Eq. 2.9 (Ozer et al., 2016). While the fracture energy of different mixtures can be the same, the inclusion of the post peak slope has been shown to better discriminate the fracture resistance of mixtures. Figure 2.5 shows the test setup and one typical result for semi-circular bend test.

$$G_f = \frac{Area\ under\ load{-}displacement\ curve\ (Fracture\ work)}{Fracture\ Area} \quad (2.8)$$

$$FI = \frac{G_f}{Slope\ at\ post\ peak\ inflection\ point} \quad (2.9)$$

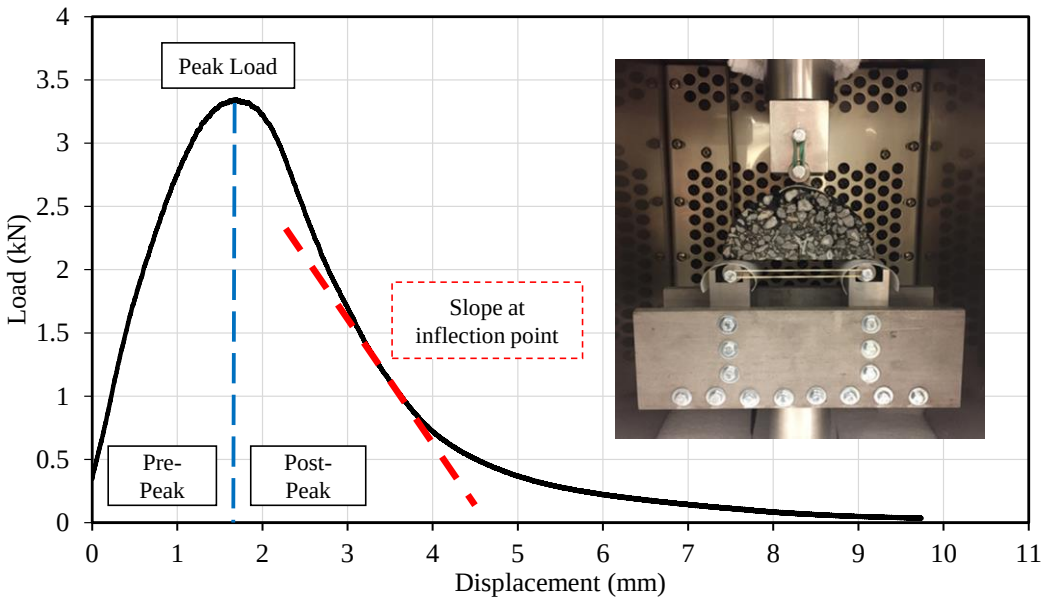

Figure 2.5 Semi-circular Bend Test Result and Setup

Since the SCB samples cut from the field cores have relatively higher air void content (as shown in table 2.3) and are thinner (around 1.5" from the surface layer), the correction of the measured fracture properties from SCB test on field cores is needed to be reasonably compared with the results from the SCB test on the laboratory aged and fabricated samples. Based on a previous study (Al-Qadi et al., 2012), Barry (2016) proposed the correction factors to adjust the flexibility index (FI) due to the difference in air void content and thickness, as shown in Eq. 2.10 and 2.11:

$$FI_{AV\ corrected} = FI * \frac{0.0651}{AV - AV^2} \quad (2.10)$$

$$FI_{Thickness\ corrected} = FI * \frac{t}{50} \quad (2.11)$$

Where,

FI: measured flexibility index,

AV: air void of the sample,

t: thickness of the sample.

In addition to fracture energy (G_f) and flexibility index (FI), Nemati et al. (2019) developed the rate-dependent cracking index (RDCI) to better discriminate the asphalt mixtures with various mix variables. The calculation of RDCI is shown below:

$$RDCI = \frac{\int_{t_{peak}}^{t_{0.1\ peak}} W_C\, dt}{P_{t_{peak}} \times ligament\ area} \times C \quad (2.12)$$

Where,

RDCI: rate-dependent cracking index,

$\int_{t_{peak}}^{t_{0.1\,peak}} W_C \; dt$: the post-peak area under the cumulative work versus time curve,

P_{tpeak} : instantaneous power at peak force,

C: unit correction factor set to 0.01 to lower the order of magnitude of the RDCI and for simplicity of plotting

Ligament area is calculated by using the specimen thickness times the ligament length.

2.3.1.3 DIRECT TENSION CYCLIC FATIGUE TEST

The uniaxial fatigue test is performed in accordance with AASHTO TP 107 in a direct cyclic tension mode and the analysis is conducted using Simplified Viscoelastic Continuum Damage (S-VECD) theory. The test is conducted on 130×100 mm specimens (110×38 mm for field cores) that are preconditioned with respect to binder performance grade at temperature equal to $(\frac{PGHT-PGLT}{2} - 3°C)$. The test is conducted on four replicates each at a different strain level under cyclic tension and constant crosshead testing mode. The main output of this test and analysis is the Damage Characteristic Curve (DCC) which is a mixture property that is independent of loading mode and temperature and indicates the trend of reduction of pseudo stiffness (C) as damage grows. Pseudo stiffness can be considered as the material's internal integrity and its capacity to resist fatigue. As the loading cycle is applied, damage in the form of micro-cracks is induced in the whole body of the specimen. This results in reduction in material's capacity until micro-cracks are localized and form macro-cracks and specimen failure happens. Figure 2.6 indicates a typical DCC curve and the test setup.

Currently, there are three accepted fatigue criteria based on the S-VECD approach: G^R, D^R, and S_{app}. G^R is the rate of averaged dissipated pseudo strain energy which indicates the decrease in the mixture's energy storage capacity due to each loading cycle (Zhang et al. 2013). These parameters are defined in Eq. 2.13, 2.14 and 2.15 respectively. The number of cycles to failure at G^R equal to 100 (N_f @ G^R=100) is usually used to rank mixtures. D^R is the average reduction in pseudo stiffness per loading cycle and indicates the decrease in material integrity in terms of stiffness as the load is applied. D^R values usually range from 0.3 to 0.7 with higher values indicating better fatigue resistance (Wang et al. 2017). S_{app} is the accumulated damage when C is equal to 1-D^R (Wang et al. 2018).

$$G^R = \frac{\int_0^{N_f} w_c^R}{N^2{}_f} \qquad (2.13)$$

$$D^R = \frac{\int_0^{N_f} (1-C)}{N_f} \qquad (2.14)$$

$$S_{app} = \frac{1}{10000} \times \left(\frac{1}{C_{11}} \times D^R\right)^{\frac{1}{C_{12}}} \qquad (2.15)$$

Where:W_C^R: Total released pseudo strain energy, *C*: Pseudo stiffness, N_f: number of loading cycles to failure, C_{11} and C_{12}: Model coefficients of the damage characteristic curve

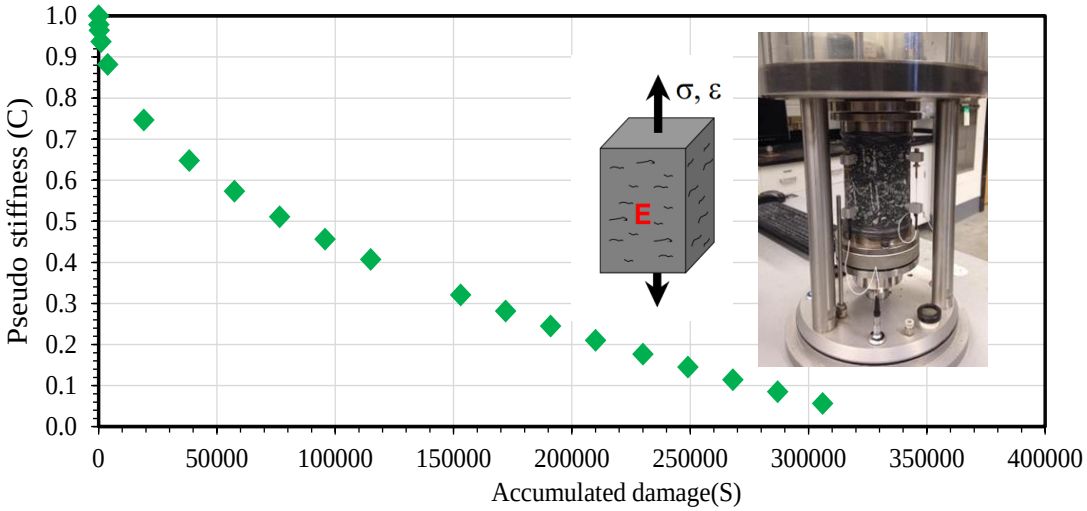

Figure 2.6 Damage Characteristic Curve and Direct Tension Cyclic Fatigue Test Setup

2.3.1.4 DISK-SHAPED COMPACT TENSION TEST (DCT)

The disk-shaped compact tension (DCT) test was performed in accordance with the ASTM D7313 standard testing method on three replicates. The test is conducted in monotonic loading conditions and measures the low temperature fracture properties of the asphalt mixtures. As opposed to SCB, the displacement measurements in DCT are controlled by using the crack mouth opening displacement (CMOD) which is perpendicular to the crack path and is conducted in a rate of 1 mm/min. In general, the DCT testing temperature is determined as 10°C+PGLT, however, in this study the LTTPBind software was used to determine the testing temperature as 10°C warmer than the 98% reliability pavement low temperature without rounding to nearest 6°C increment. In other words, continuous PGLT value on basis of the pavement location was used in the test temperature calculation. The two index parameters that are used to analyze the DCT test results are the Fracture Energy (G_f) and the Fracture Strain Tolerance (FST) where FST is determined by dividing G_f by the fracture strength (S_f) (Zhu et al. 2017). Figure 2.7 indicates a typical DCT test result and setup as well as the specimen geometry. Similar to SCB analysis, the fracture energy for DCT is calculated by normalizing the area under load-CMOD curve by the fracture area. Also, fracture strength is a geometry dependent parameter and is defined as the maximum stress that the specimen is able to withstand before crack is propagated. Eq. 2.16 and 2.17 show the calculations of S_f and FST respectively.

$$S_f = \frac{2P(2W+a)}{t(w-a)^2} \qquad (2.16)$$

$$FST = \frac{G_f}{S_f} \qquad (2.17)$$

Where,

S_f : Fracture strength

P: Maximum load sustained by specimen

w and a : geometry shown in Figure 2.7

t: Specimen thickness

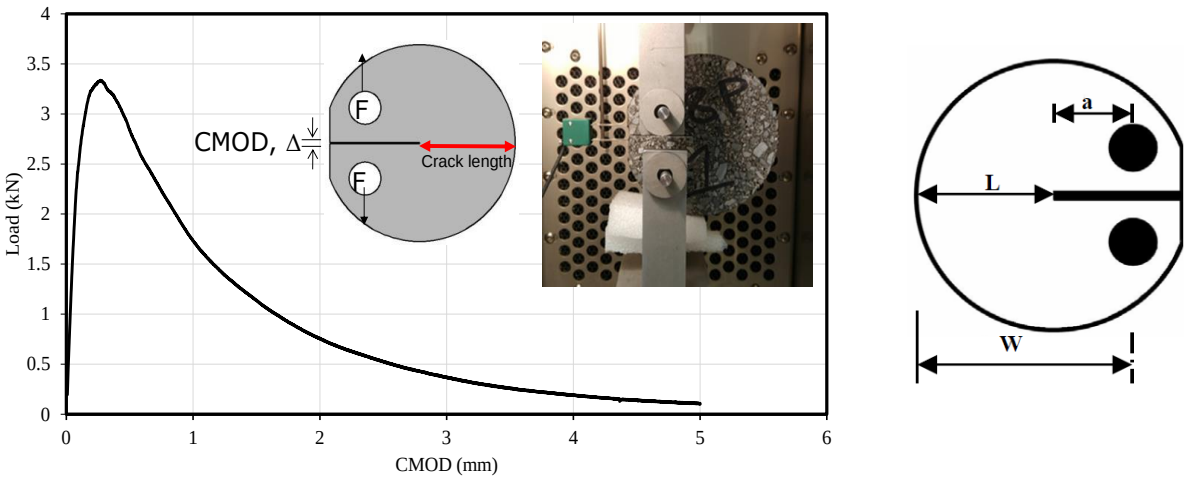

Figure 2.7 Disk-shaped Compact Tension Test Result, Setup and Specimen Geometry

2.3.2 Binder Testing

The rheological properties of asphalt binders were measured using a Dynamic Shear Rheometer (DSR) with a 4mm plate (Glaser et al., 2015). This test covers a wide range of temperatures (-36°C to 40°C, usually in 3-degree increments), and frequencies (15 frequencies from 100 rad/sec to 0.2 rad/sec), by using the appropriate strain level at each combination of test temperature and frequency. The isotherm tests are conducted from the coldest to the warmest temperature and from the highest to the lowest frequencies. The complex shear modulus master curve is constructed at certain reference temperature and converted to the relaxation modulus master curve using Christensen's equation. Eq. 2.18 and 2.19 below indicate the complex shear modulus and phase angle calculations. Figure 2.8 shows the test setup and one typical cycle of test data.

$$|G^*| = \frac{\sigma_{amp}}{\varepsilon_{amp}} \qquad (2.18)$$

$$\delta = 2\pi f \Delta t \qquad (2.19)$$

Where,

$|G^*|$: Complex shear modulus (pa),

σ_{amp}: Amplitude of applied stress (pa),

ε_{amp}: Amplitude of strain response (mm/mm),

δ: phase angle (degrees),

f: load frequency (Hz),

Δt: The time lag between stress and strain peak to peak.

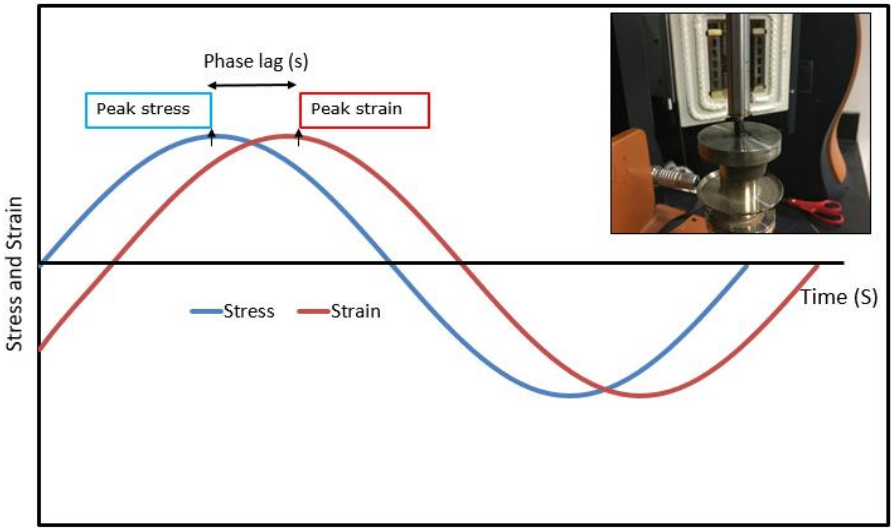

Figure 2.8 4mm DSR Test Result and Setup

Sui et al. (2011) developed a method to calculate the slope and magnitude of the shear stress relaxation modulus G(t) from the relaxation modulus master curve constructed from the 4mm DSR test at 60 seconds and 10°C warmer than the PG grading temperature, which are correlated with the corresponding S(t) and m-values at 60 seconds and 10°C above the true low PG grading temperature from BBR measurements. The ΔT_c parameter can be then calculated from the critical temperatures determined by the S(t) and m-value. ΔT_c is defined as the difference between the temperature at which the creep stiffness, S(t), and m-value criteria from the BBR testing are met, as shown in Eq. 2.20.

$$\Delta T_c = T_{(stiffness)} - T_{(m\text{-}slope)} \qquad (2.20)$$

$T_{(stiffness)}$ is the critical low temperature where S(60) =300 MPa, and $T_{(m\text{-}slope)}$ is the critical low temperature where m(60) = 0.300. When the ΔT_c value is higher than 0, the binder grade is controlled by the stiffness (S-controlled); when the ΔT_c value is lower than 0, the binder grade becomes m-controlled. S-controlled binders have "extra" relaxation capability and are therefore typically less prone to cracking. Asphalt Institute (Anderson et al., 2011; Rowe et al., 2011) suggests using ΔT_c = -2.5°C as a crack warning limit and ΔT_c = -5.0°C as the cracking limit.

The complex modulus master curve from 4mm DSR test is also used to calculate the R-value and binder Glover-Rowe parameter. R-value is the difference between the logarithmic glassy modulus and the logarithmic equilibrium modulus of the binder, simplified as Log |G*| at glassy asymptote minus Log |G*|

at the crossover frequency. Rowe et al. (2011) developed the binder Glover-Rowe parameter to evaluate the cracking susceptibility of asphalt binders, as shown in Eq. 2.21. A lower G-R parameter indicates better capability to resist durability cracking. A limiting value of 180kPa is proposed as a crack warning limit, a second value of 600kPa is suggested for the development of significant cracking (block cracking).

$$G - R = \frac{|G^*|(cos\delta)^2}{sin\delta} \qquad (2.21)$$

where $|G^*|$ is the complex shear modulus and δ is phase angle of the binder. The binder G-R parameter is generally calculated at the temperature and frequency combination of 15°C and 0.005rad/sec).

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CHAPTER 3: SUMMARY OF MIXTURE RESULTS

3.1 LINEAR VISCOELASTIC PROPERTIES OF ASPHALT MIXTURES

3.1.1 Complex Modulus and Phase Angle Master Curves

Dynamic modulus and phase angle master curves for different aging levels, as well as the available field cores are presented in Figure 3.1 and Figure 3.2 respectively; each series represents the average of three replicates. As expected, the aged materials show higher stiffness (dynamic modulus) and lower relaxation capability (phase angle), which, in combination, can result in higher cracking susceptibility. The peak phase angle also occurs at a lower frequency as materials age. Generally, the two higher levels of aging (24 hr. at 135°C and 12days at 95°C) show statistically similar dynamic modulus and phase angle values. There is no significant difference between the dynamic modulus and phase angle of the field cores (approximately 4 years in service) and the 5 days' lab aged mixtures. However, considering the lower air void content of the field cores (and resulting stiffer response), the 5 days aging condition likely simulates more than four years of field aging.

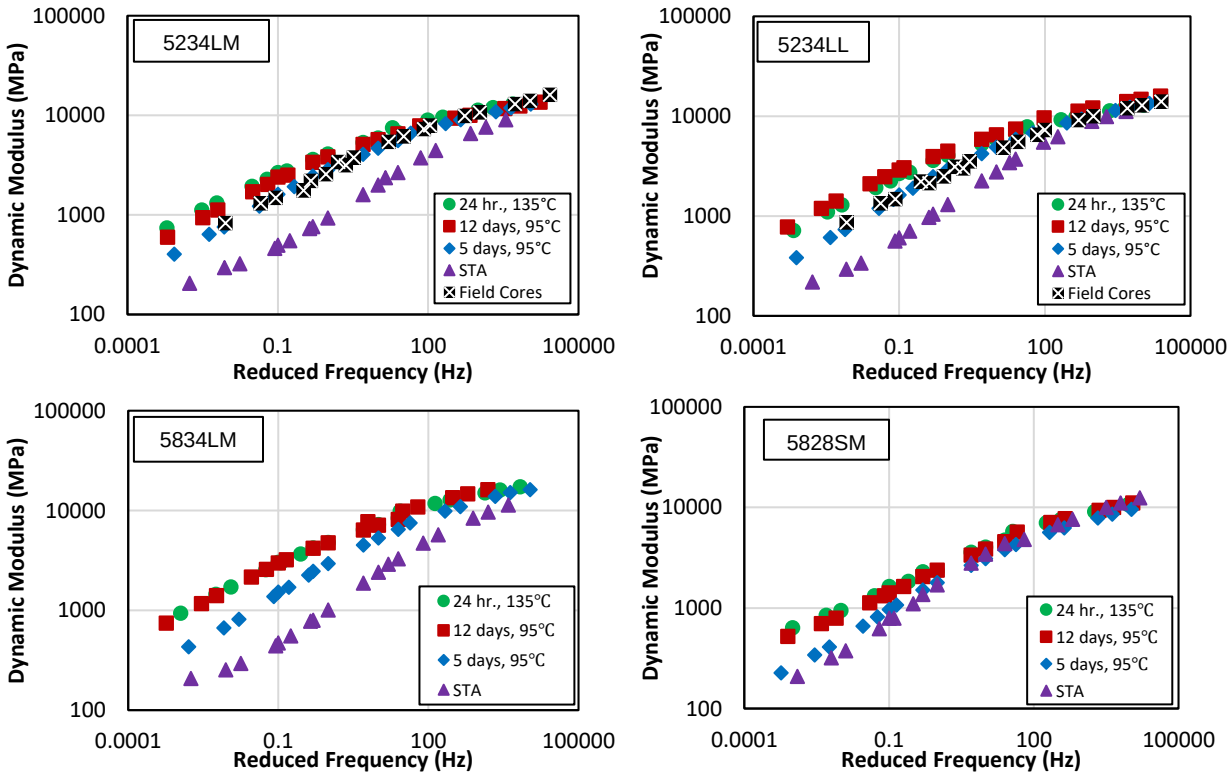

Figure 3.1 Comparison of Dynamic Modulus Curves for Eleven Mixture at Different Laboratory Aging Levels with Field Cores (Reference Temperature: 21.1°C)

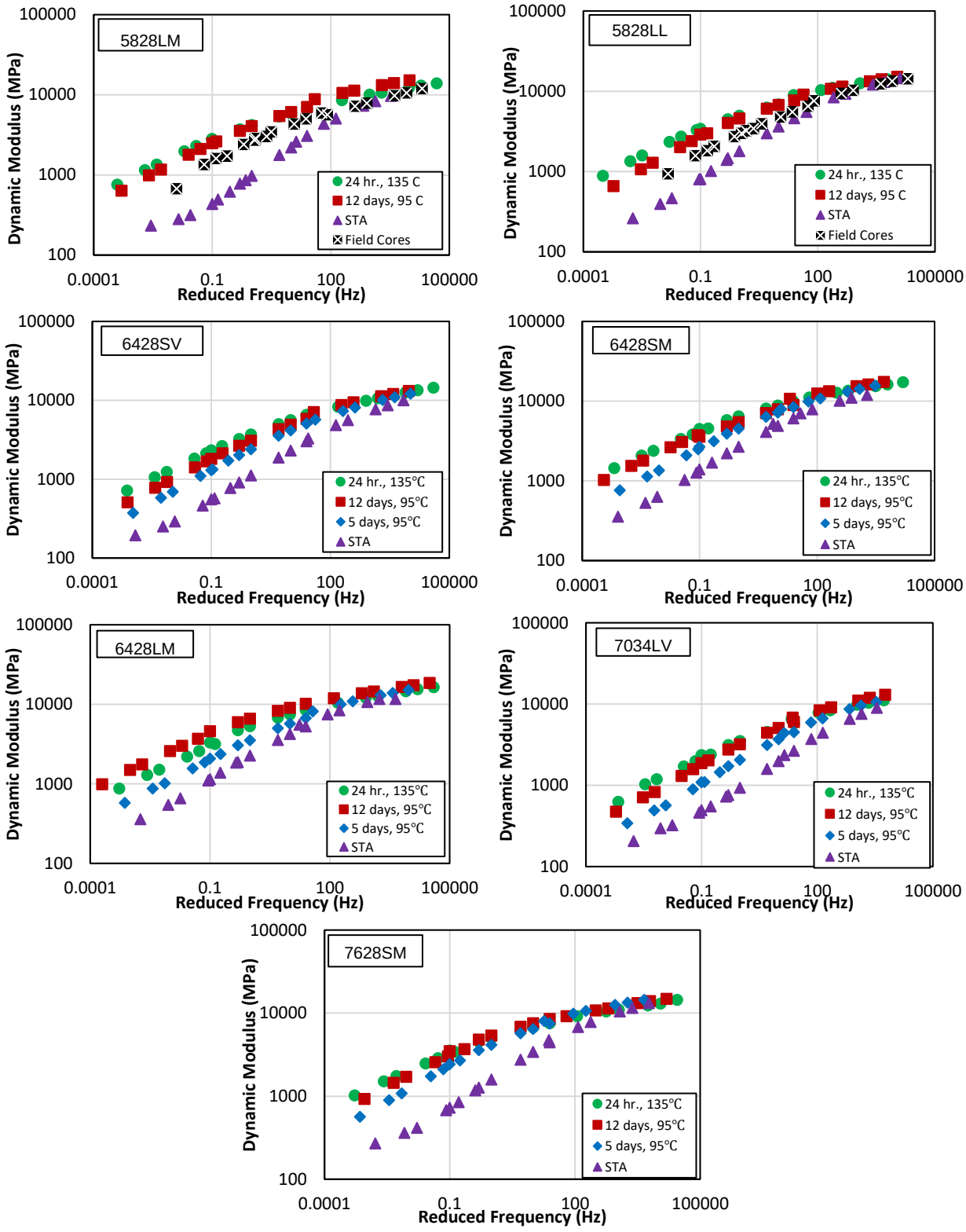

Figure 3.2 Comparison of Dynamic Modulus Curves for Eleven Mixture at Different Laboratory Aging Levels with Field Cores (Reference Temperature: 21.1°C) (Continued)

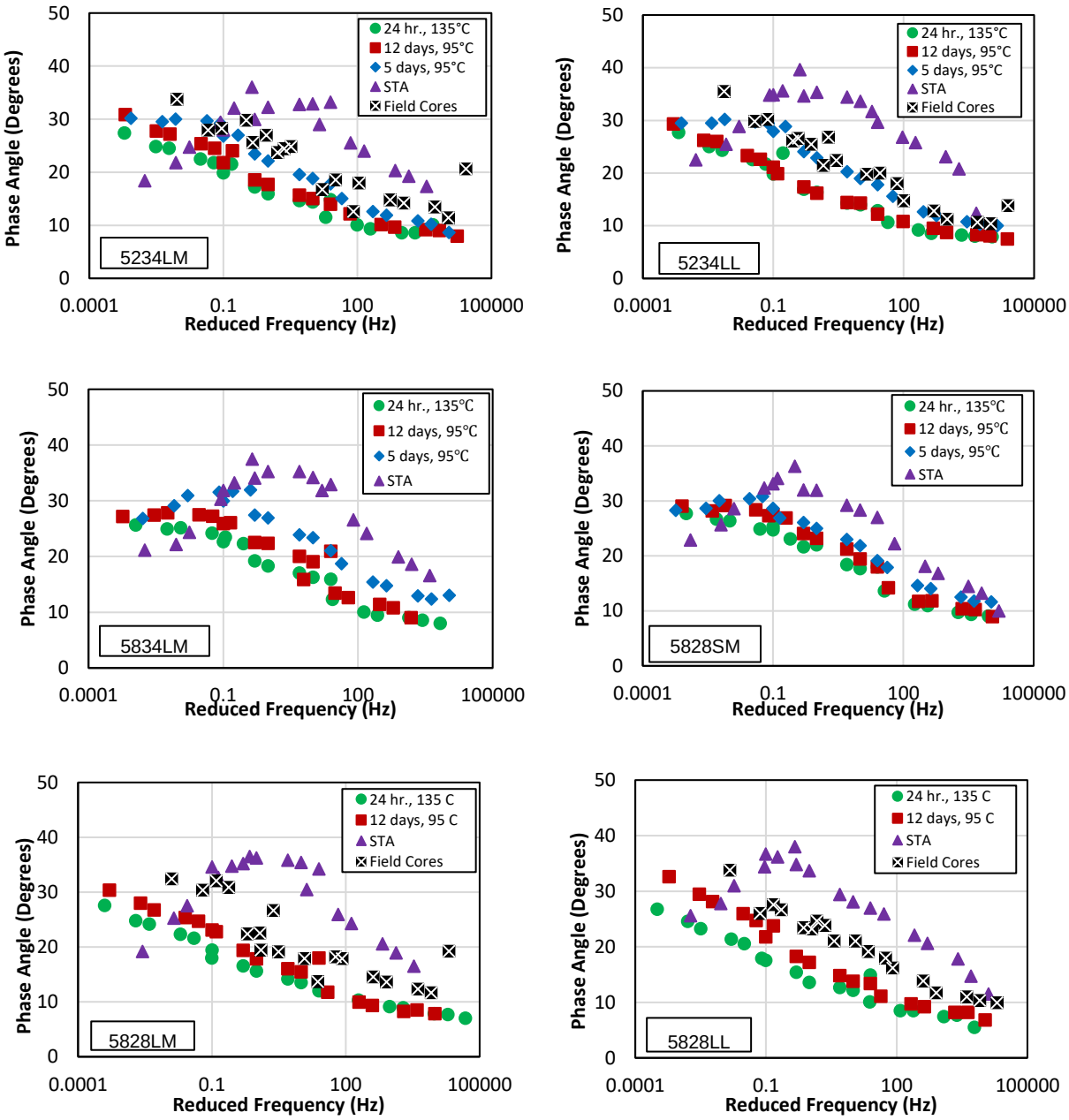

Figure 3.3 Comparison of Phase Angle Curves for Eleven Mixture at Different Laboratory Aging Levels with Field Cores (Reference Temperature: 21.1°C)

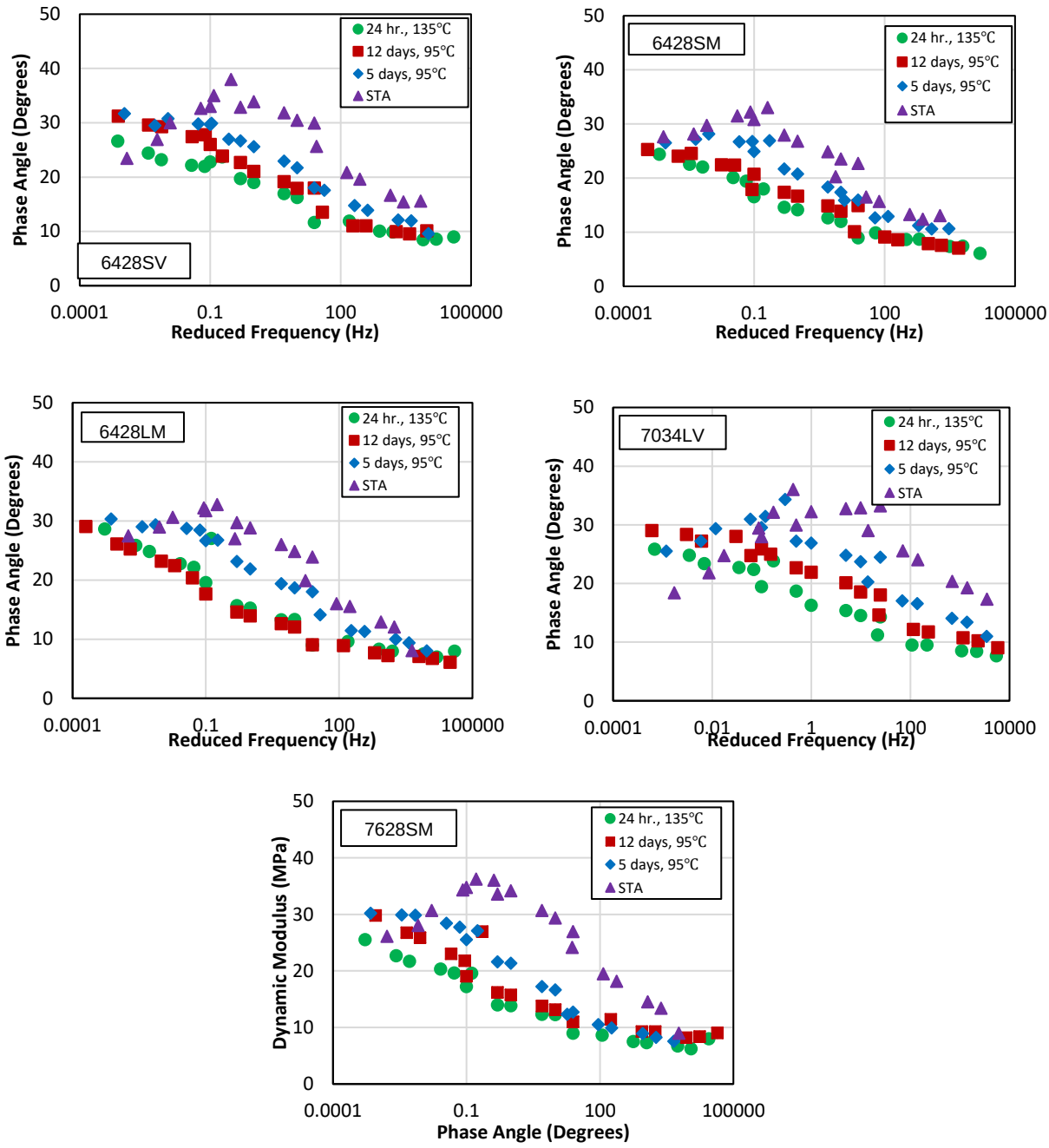

Figure 3.4 Comparison of Phase Angle Curves for Eleven Mixture at Different Laboratory Aging Levels with Field Cores (Reference Temperature: 21.1°C) (Continued)

3.1.2 Climatic Aging Index (CAI) Calculation

Figure 3.3 below shows the results of the CAI calculation based on the hourly pavement temperatures from the EICM. NCHRP 09-54 suggests that a depth of 20 mm can be used to evaluate the bulk behavior of a 37.5 mm thick surface layer. Based on the CAI calculation results, 5 days at 95°C lab aging condition should be equivalent to seven years of aging in the field in NH at a depth of 20 mm. However, the result

of the field cores shows that the 5 days at 95°C laboratory aging condition appears to simulate approximately four years of field aging in NH. In addition to the difference in air void contents described previously, this difference may be partially due to the fact that CAI calculation from NCHRP 09-54 is developed from the comparison of the binder G* value, and the comparison in this study is based on the complex modulus (E*) of the lab aged mixtures and the field cores. Also, the NCHRP 09-54 final report mentioned that the predicted G* needs to be calibrated based on specific project and climate conditions, which has not been done for NH conditions.

The complex modulus test results on the field cores correspond to four years of field aging at a depth of 4.3 mm using the 5 days at 95°C lab aging condition. The calculated field aging duration equivalent to the 12 days at 95°C lab aging condition at this depth is 9.6 years. Therefore, based on the linear viscoelastic properties of the mixtures evaluated in this study, the 5 days at 95°C laboratory aging condition is considered to simulate four years of field aging in NH, while the 12 days at 95°C laboratory aging condition is expected to simulate 9.6 years of field aging in NH. The comparison between the laboratory aging condition with the field aging duration will be also evaluated and described in chapter 4, which is based on the measured binder rheological properties.

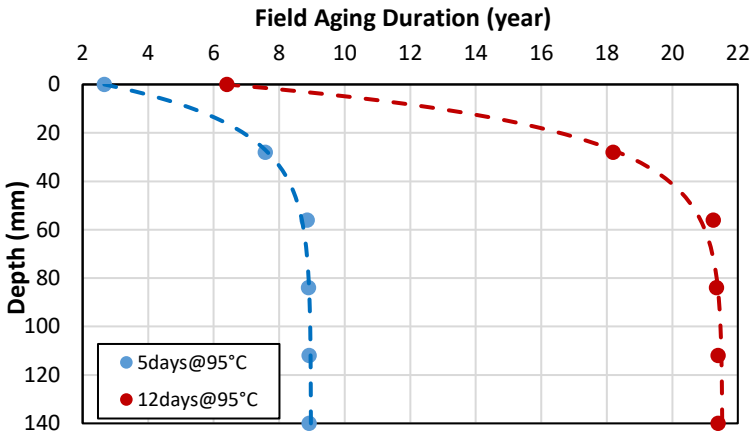

Figure 3.5 Relationship between Field Aging Duration and Pavement Depth Based on CAI Calculations (dashed lines show fitted curves to calculated values)

3.1.3 Mixture Glover-Rowe (G-R_m) parameter

Figures 3.4a and 3.4b show the G-R_m parameter, G-R_m aging ratio (LTOAs divided by STA) for all the mixtures, respectively. Generally, G-R_m and G-R_m aging ratio increase with increase of aging levels from STA to LTOAs. There is a statistically significant difference in G-R_m between the STA and all three LTOAs. After 5 days at 95°C aging, the G-R_m value for most of mixtures is above 8,500 MPa. After 12 days at 95°C aging, the G-R_m value is above 17,000 MPa for all except the two virgin mixtures 6428SV and 7034LV. The G-R_m ratio increases to 180-450% after 5 days at 95°C aging conditioning, while 12 days aging at 95°C increases the G-R_m parameter to 460-920% of the STA condition. The 24 hr. at 135°C condition generally causes a larger increase in G-R_m value and G-R_m aging ratio than the 12 days at 95°C.

The mixtures that have the same performance grade binder (5234LM, 5234LL; 5828LM, 5828LL; 6428SV, 6428SM, 6428LM) typically have higher G-R_m value with increasing RAP content at each aging condition. Mixtures with the softer binders (5234LM, 5234LL, 5834LM, 5828LM, 5828LL) generally have lower G-R_m values than the mixtures with the stiffer binders (6428SM, 6428LM and 7628SM) for STA. However, these mixtures show higher impact from aging on G-R_m values as evaluated by the aging ratios, as shown in Figure 3.4b.

Figure 3.4a also shows the two threshold values suggested by the NCHRP 09-58 project for STA (8000 MPa) and LTOA (19000 MPa) to minimize the material cracking potential. Generally, the G-R_m values for all mixtures in STA condition are under the threshold value. After 5 days at 95°C aging, the G-R_m value for most mixtures (except for 6428SM and 7628SM) is below the threshold value for LTOA. However, most mixtures after 12 days at 95°C and 24 hr. at 135°C condition exceed the threshold value for LTOA.

For both G-R_m value and G-R_m aging ratio, there is no significant difference for the 5234LM and 5234LL mixtures between the 5 days' lab aging conditioning and 4 years' field cores, similar to what was observed from the complex modulus testing.

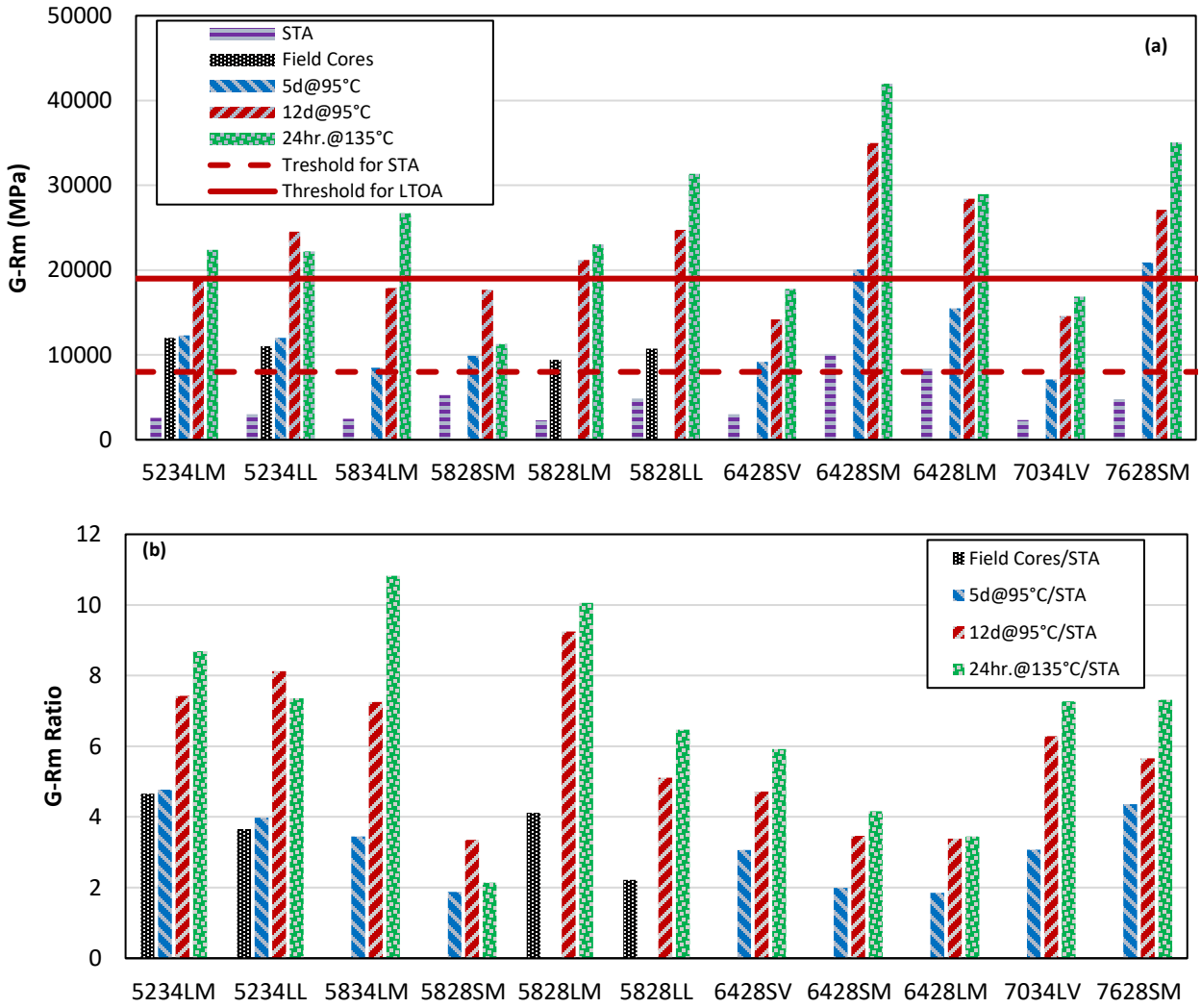

Figure 3.6 (a) Mixture Glover-Rowe Parameter; (b)Mixture Glover-Rowe Parameter Aging Ratio

3.1.4 Shape Parameters

3.1.4.1 Dynamic Modulus Master Curve Shape Parameters

Figures 3.5a and 3.5b show the dynamic modulus master curve shape parameter -β/γ and decrease in -β/γ with aging for all mixtures, respectively. Generally, -β/γ decreases as aging increases with no consistent trend between 24 hours and 12 days aging conditions. There is a statistically significant difference in -β/γ between the STA and the three long term aging levels.

Similar to the G-R_m parameter, the two virgin mixtures usually have higher -β/γ, showing less stiffness and good relaxation capability compared with other mixtures with RAP. The mixtures with the same performance grade binder (5234LM, 5234LL; 5828LM, 5828LL; 6428SV, 6428SM, 6428LM) generally have

lower -β/γ value with increase of RAP content at each aging condition. The mixtures with the softer binders (5234LM, 5234LL, 5834LM, 5828LM, 5828LL) typically have higher -β/γ and lower γ values than the mixtures with the stiffer binders (6428SM, 6428LM and 7628SM) for STA. However, these mixtures show higher impact from aging as evaluated by the decrease in -β/γ value with aging, as shown in Figure 3.5b.

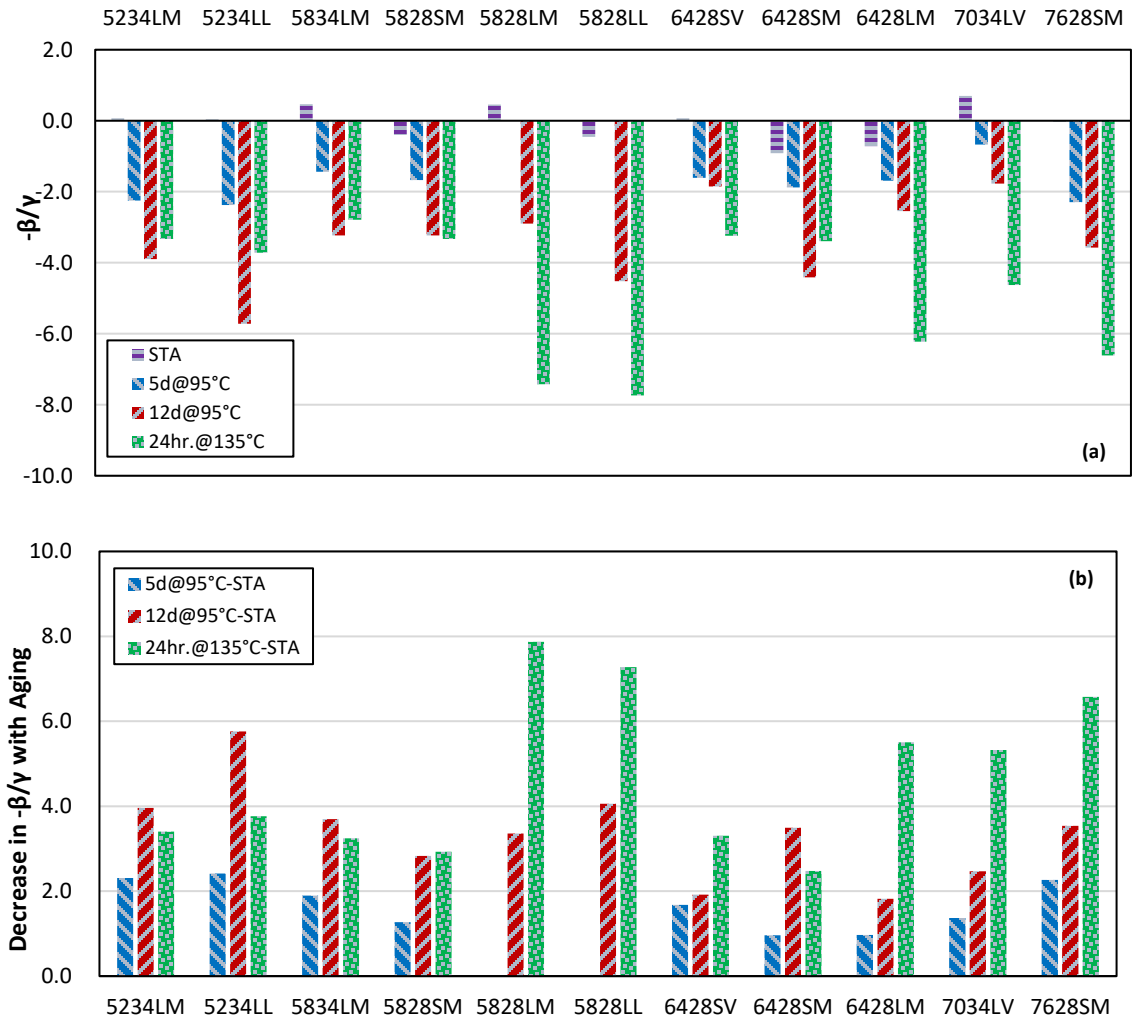

Figure 3.7 Shape Parameter from Dynamic Modulus Master Curves: (a) -β/γ; (b) Decrease in -β/γ with aging

Figures 3.6a and 3.6b show the shape parameter γ and increase in γ with aging for all mixtures, respectively. Generally, γ increases as aging increases with no consistent trend between 24 hours and 12 days aging conditions. There is a statistically significant difference in γ value between the STA and all three long term aging levels.

Similar to the G-R_m and -β/γ parameter, the two virgin mixtures usually have lower γ values. The mixtures with the same performance grade binder typically have a higher γ value with increase of RAP at each aging condition. The mixtures with the softer binders (5234LM, 5234LL, 5834LM, 5828LM, 5828LL) typically have lower γ values than the mixtures with the stiffer binders (6428SM, 6428LM and 7628SM) for STA.

However, these mixtures show greater impact from aging as evaluated by the increase in γ value with aging, as shown in Figure 3.6b.

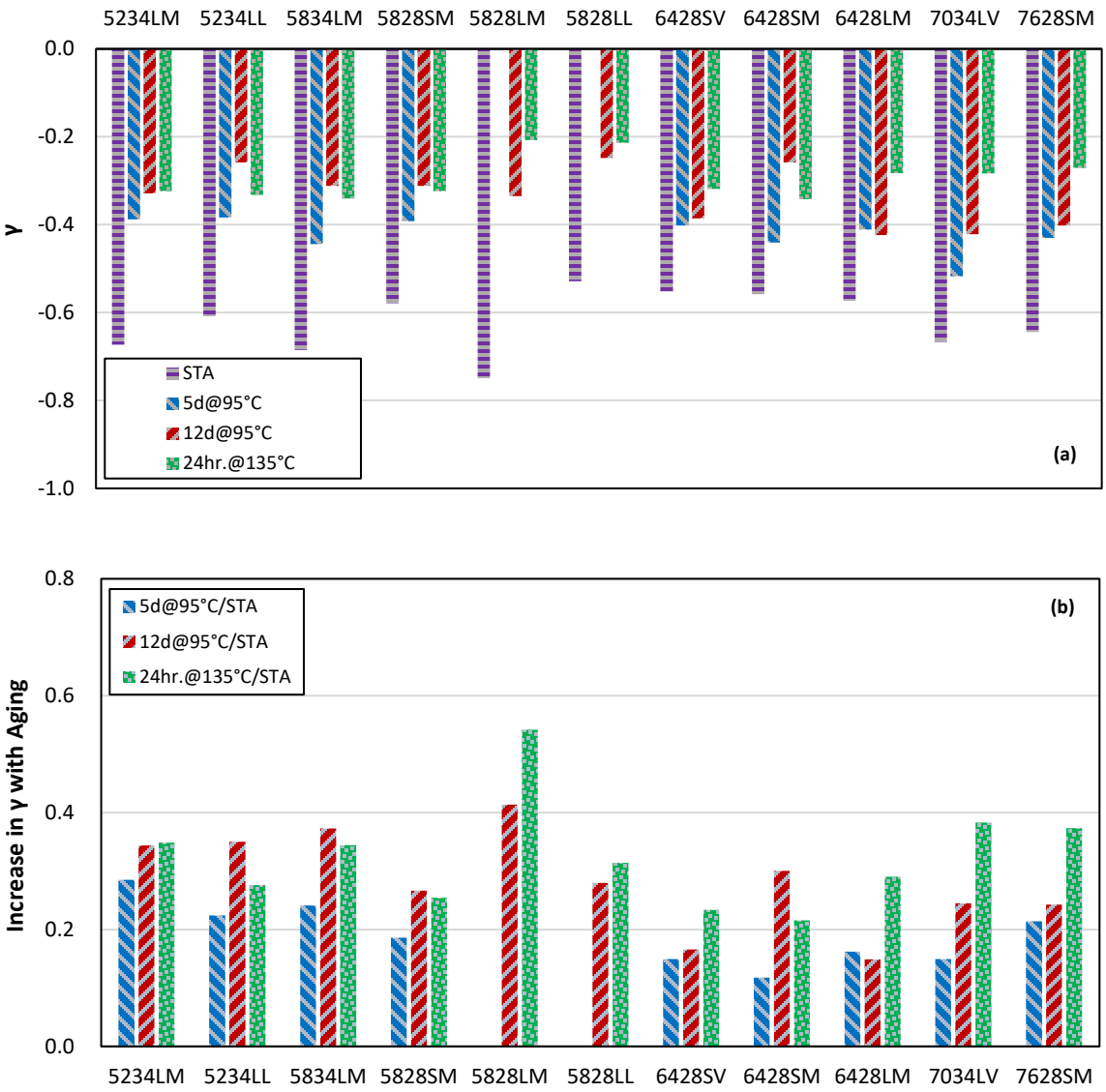

Figure 3.8 Change of Shape Parameters from Dynamic Modulus Master Curves with Aging: (a) γ; (b) Increase in γ with Aging

Figure 3.7 shows the inflection point parameter (-β/γ) versus relaxation spectra width parameter (γ) plot for the study mixtures and is similar in concept to a crossover frequency versus rheological index (R value) plot for binders. The -β/γ parameter decreases and γ increases, moving points towards the lower right as more aging occurs. The dashed lines connect the points for the STA and two (5 days and 12 days) loose mixture LTOA conditions; the 24hr LTOA condition is shown as a separate point. Figure 3.7 shows the inconsistency with the location of points for these two aging conditions. Another observation from this plot is that the mixtures with the softer binders (5234LM, 5234LL, 5834LM, 5828LM, 5828LL) typically have lower γ and higher -β/γ values (in the top left of plot) than other mixtures after STA. However, after

5 days aging condition, the γ and -β/γ values for all the mixtures are comparable, and the 12 days aging condition generally move the points of these mixtures with the softer binders to the further bottom right of the plot compared with other mixtures, indicating that these mixtures generally show greater aging susceptibility with the larger movement from STA to the two LTOAs. Therefore, this plot can be used to evaluate how the shape of mixture dynamic modulus master curve changes with time, and identify mixtures that are more susceptible to aging for material selection and mixture design.

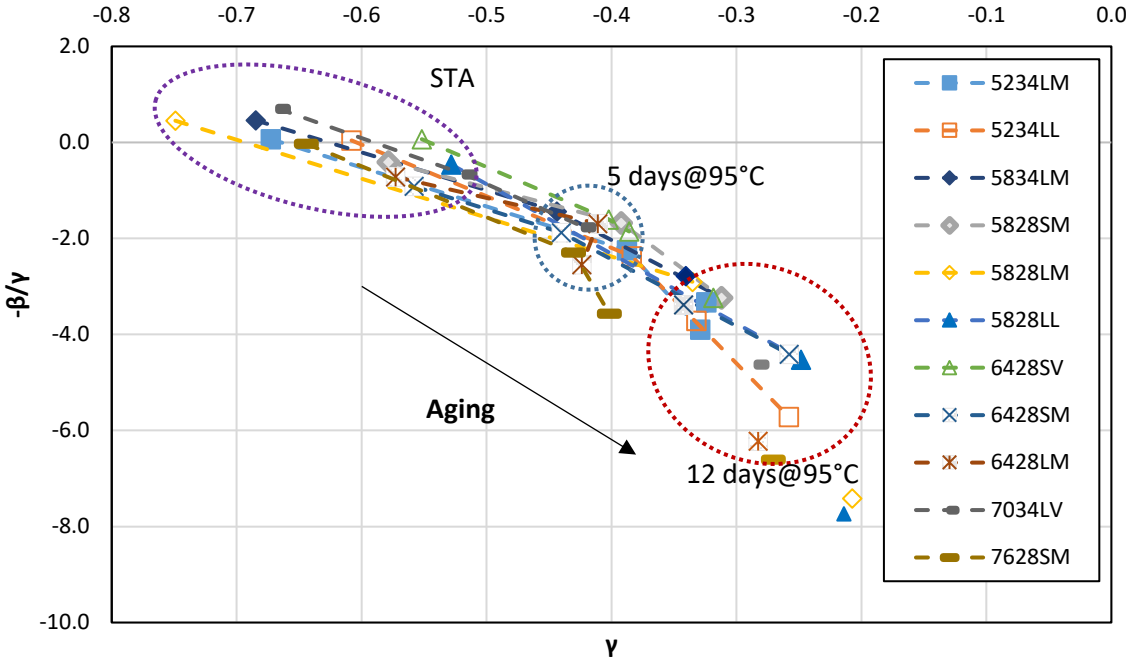

Figure 3.9 -β/γ versus γ with Aging

3.1.4.2 Phase Angle Master Curve

Figures 3.8a and 3.8b show the phase angle master curve shape parameter "a" and decrease in "a" with aging for all mixtures. There is a statistically significant difference in "a" value between the STA and the three long term aging levels. The "a" value for the mixtures after each aging condition is relatively consistent. The "a" value varies from 32 to 38 for STA. After 5 days aging, "a" value for all mixtures varies between 28 and 32, after 12 days aging, "a" value for most of the mixtures is within 27 and 31.

Similar to G-R_m parameter and dynamic modulus master curve parameters γ and -β/γ, the mixtures that have the same performance grade binder (5828LM, 5828LL; 6428SV, 6428SM, 6428LM) generally have a lower a value with increase of RAP content at each aging condition. The mixtures with the softer binders (5234LM, 5234LL, 5834LM, 5828LM, 5828LL) generally have higher "a" values than the mixtures with the stiffer binders (6428SM, 6428LM and 7628SM) for STA. However, these mixtures show higher impact from aging as evaluated by the decrease in "a" value with aging, as shown in Figure 3.8b.

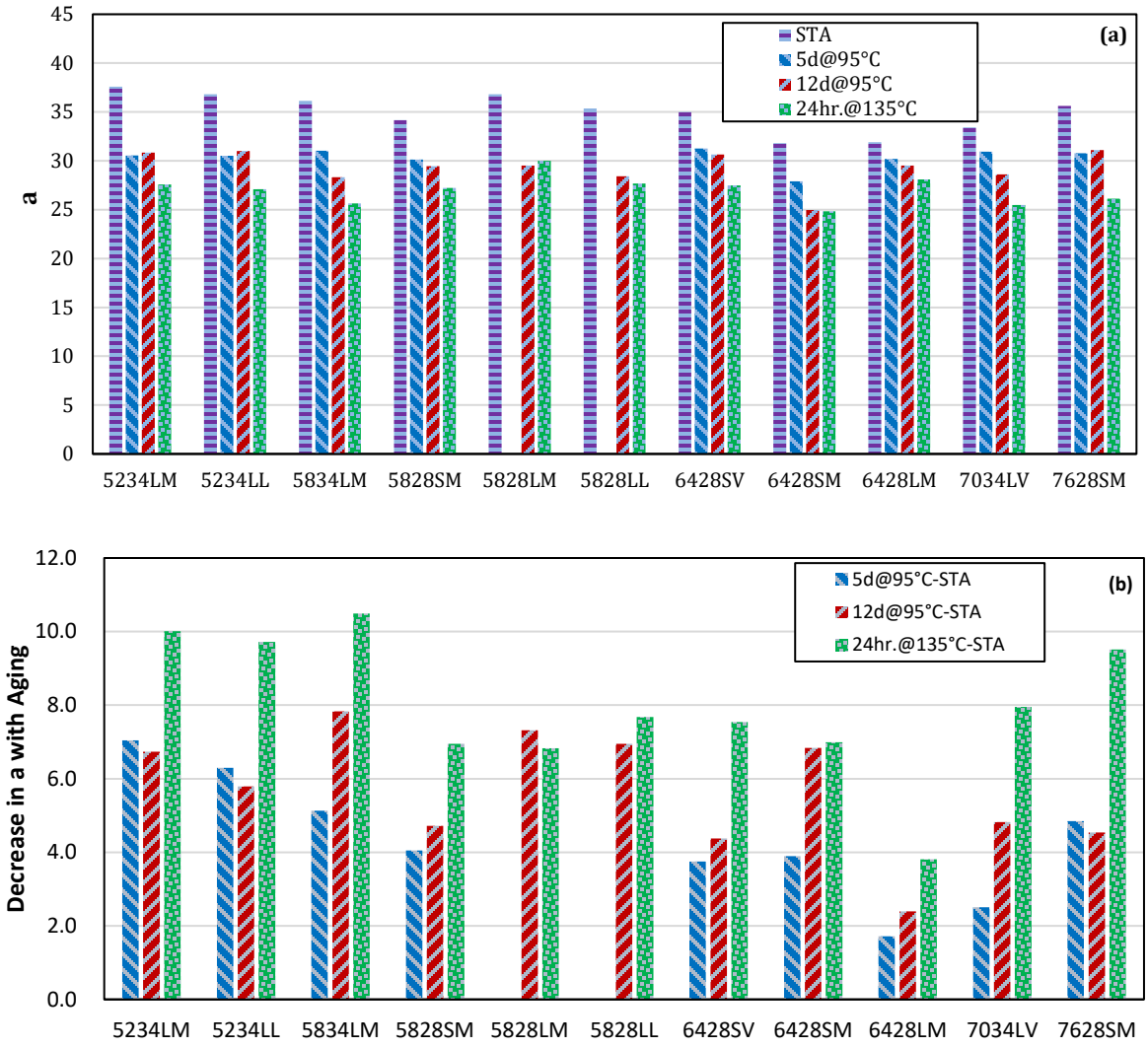

Figure 3.10 Shape Parameters from Phase Angle Master Curves: (a) a; (b) Decrease in a with aging

Figures 3.9a and 3.9b show the shape parameter c and decrease in c for all mixtures, respectively. Generally, c value decreases as aging increases with no consistent trend between 24 hours and 12 days aging conditions. There is a statistically significant difference in c value between the STA and the three long term aging levels.

Similar to G-R_m parameter and dynamic modulus master curve parameters γ and -β/γ, the mixtures with the same performance grade binder (5828LM, 5828LL; 6428SV, 6428SM, 6428LM) generally show the lower c value with increase of RAP content. The mixtures with the softer binders (5234LM, 5234LL, 5834LM, 5828LM, 5828LL) generally have higher c values than the mixtures with the stiffer binders (6428SM, 6428LM and 7628SM) for STA. However, these mixtures show higher impact from aging as evaluated by the decrease in c value with aging, as shown in Figure 3.9b.

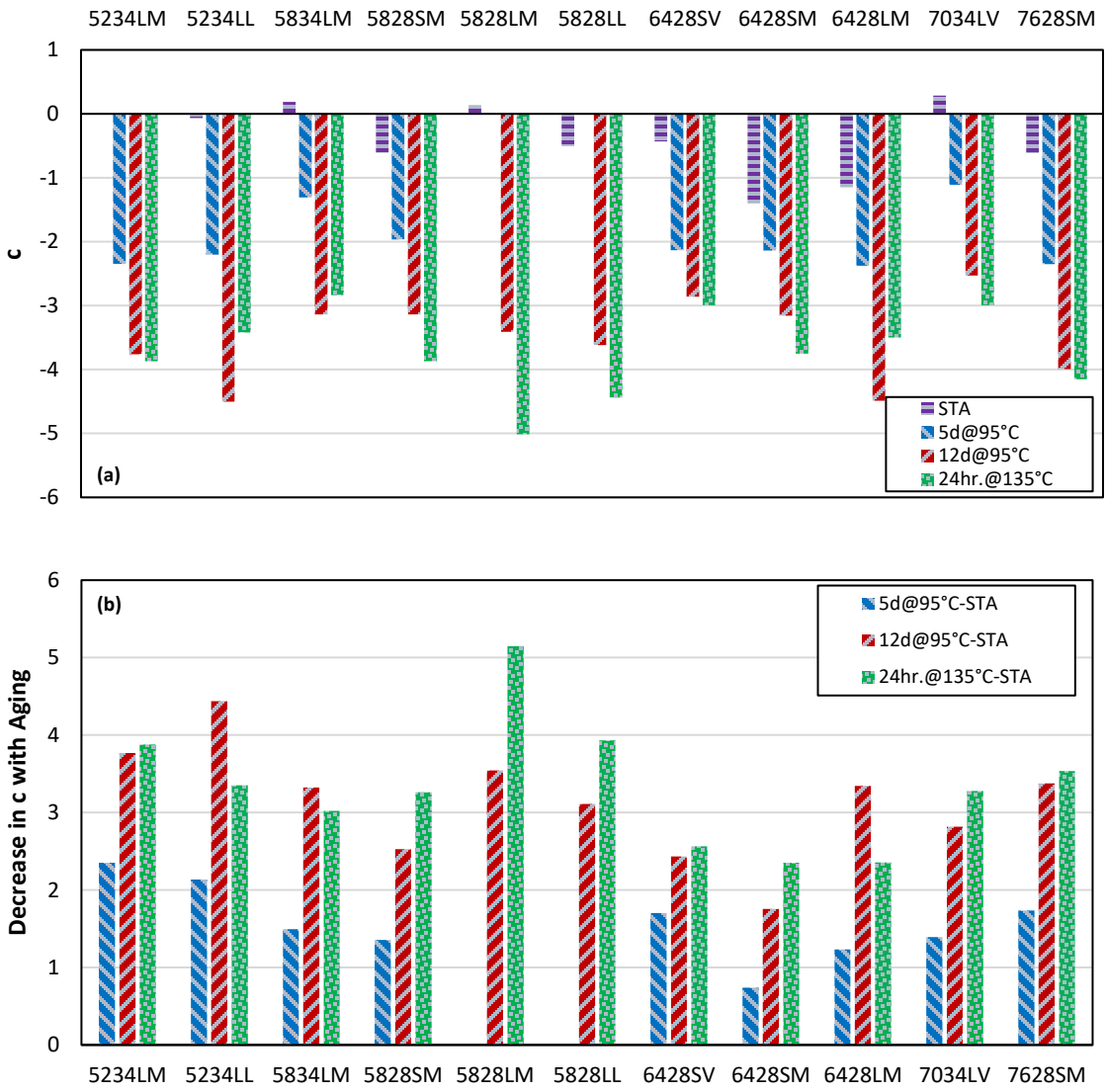

Figure 3.11 Change of Shape Parameters from Phase Angle Master Curves with Aging: (a) c; (b) Decrease in c with aging

Figure 3.10 shows that both "a" and "c" values decrease with increased aging level, moving the points towards the bottom left of the plot. The plot can be an indicator of the relaxation capability of asphalt mixtures. The mixtures with higher "a" and c values are expected to have higher relaxation capability to resist cracking.

Similar to the result from the -β/γ versus γ plot, since there is no consistent trend of the phase modulus shape parameters "a" and "c" between 24 hours and 12 days aging conditions as described above, Figure 3.10 shows the inconsistency with the location of points for these two aging conditions. The mixtures with the softer binders (5234LM, 5234LL, 5834LM, 5828LM, 5828LL) typically have higher "a" and "c" values (in the top right of plot) than other mixtures after STA. However, after 5 days aging condition, the "a" and "c" values for most mixtures are comparable, showing these mixtures that have the softer binders typically are more susceptible to aging with the larger movement from STA to 5 days aging condition, as

shown in Figure 3.10. Therefore, this plot can also be used to evaluate how the shape of mixture phase angle master curve changes with time, and identify mixtures that are more susceptible to aging.

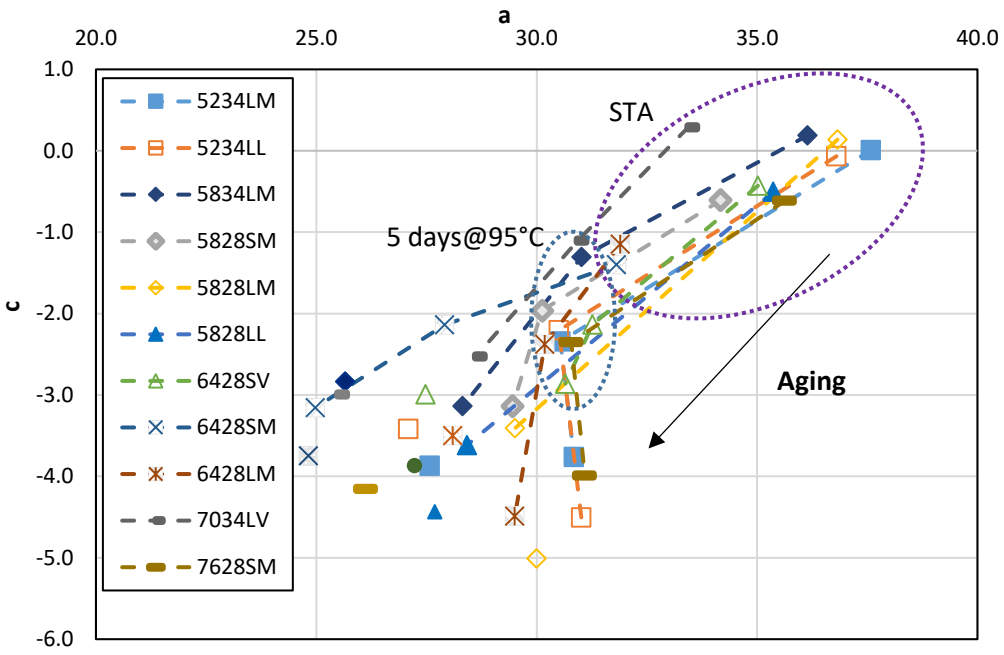

Figure 3.12 Evolution of phase angle shape parameters "c" versus "a" with Aging

3.2 FRACTURE PROPERTIES OF ASPHALT MIXTURES

Figures 3.11a and 3.11b show the flexibility index (FI) parameter, FI aging ratio (LTOA divided by STA) from the SCB tests, respectively. The average of 3 to 4 replicates for each mixture is shown and the error bars represent one standard deviation interval. Generally, FI and FI aging ratio decrease with increase of aging levels. There is a statistically significant difference in FI between the STA and all three long term aging levels. After 5 days at 95°C aging, the FI value of all mixtures except 7034LV is below 7.5. After 12 days at 95°C aging, the FI value for most of the mixtures is below 5. The FI ratio drops to 20-40% after 5 days at 95°C age conditioning, while 12 days aging at 95°C drops the FI to 5-30% of the STA condition, which indicates that the mixtures lose cracking resistance very quickly with aging, especially within the first several years. The 24 hr. at 135°C condition causes a larger drop in FI aging ratio than the 12 days at 95°C.

The two mixtures without RAP (6428SV and 7034LV) generally have higher FI values at each aging level compared with other mixtures with RAP. The mixtures with the softer binders (5828SM, 5834LM, 5828LM and 5234LM) generally have higher FI values than the mixtures with the stiffer binders (6428SM and 6428LM) when they have comparable RAP content. The 7628SM and 7034LV mixtures, which have the largest difference between PGHT and PGLT, show the most impact from aging on FI values. The FI aging ratio for the other five mixtures is relatively consistent at each aging level (30-40% after 5 days at 95°C; 20-30% after 12 days at 95°C; 10-17% after 24 hr. at 135°C). However, it is important to note that the FI value for 7034LV mixture after aging is still higher than other mixtures.

Figure 3.11a also shows the flexibility index (FI) (adjusted by thickness and air void) from the field cores (four years in service) for the four Westmoreland mixtures. The mixture with the same binder grade shows the lower FI value with increase of RAP content for both mixtures and field cores. The FI value for the field cores is generally lower than the 5 days aging condition, but higher than 12 days. Therefore, 5 days at 95°C aging condition is not sufficient to simulate 4 years of field aging based on the SCB fracture test result. One possible explanation is that comparing with the lab aged mixtures, the field cores extracted from the pavement have been subjected to the repeated traffic loading for 4 years, as a result, the mixtures have some level of damage, resulting in the smaller FI value. Also, aging gradient in the field cores (pavement) may lead to the difference of FI value.

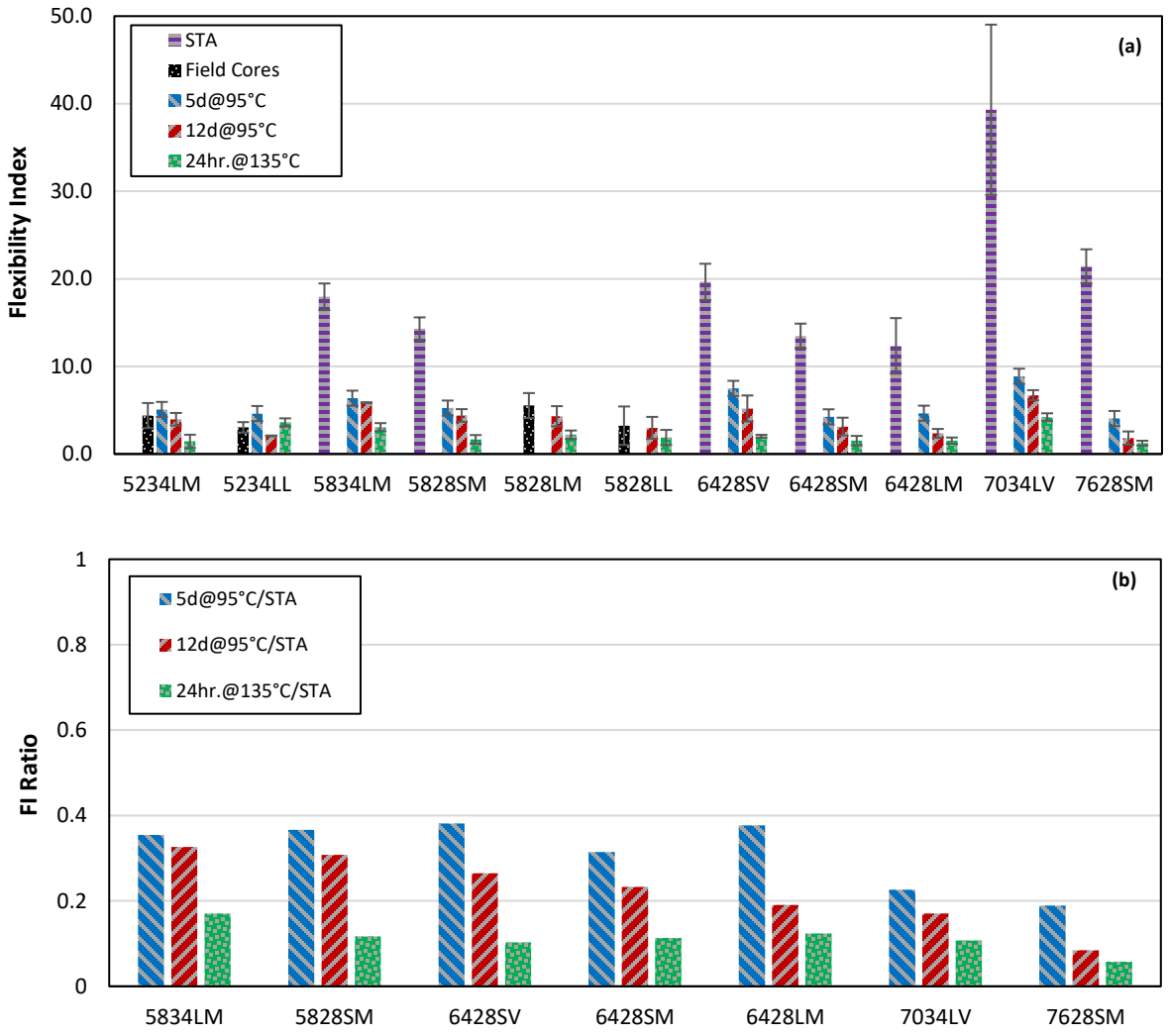

Figure 3.13 (a) Flexibility Index Values; (b) Flexibility Index Aging Ratio from SCB Test

Figures 3.12a and 3.12b show the rate-dependent cracking index (RDCI), RDCI aging ratio (LTOA divided by STA) from the SCB tests, respectively. The average of 3 to 4 replicates for each mixture is shown and the error bars represent one standard deviation interval. Generally, RDCI and RDCI aging ratio decrease with increase of aging levels. There is a statistically significant difference in RDCI between the STA and all three long term aging levels. After 5 days at 95°C aging, the RDCI value of all mixtures except 7034LV is below 15. After 12 days at 95°C aging, the RDCI value for most of the mixtures is below 10. The RDCI ratio drops to 30-45% after 5 days at 95°C age conditioning, while 12 days aging at 95°C drops the RDCI to 35-10% of the STA condition, which indicates that the mixtures lose cracking resistance very quickly with aging, especially within the first several years. The 24 hr. at 135°C condition generally causes a larger drop in RDCI aging ratio than the 12 days at 95°C.

Similar to the FI result, the two mixtures without RAP (6428SV and 7034LV) and the mixture 5834LM generally have higher RDCI values at each aging level compared with other mixtures. The mixtures with the softer binders (5828SM, 5834LM, 5828LM and 5234LM) generally have higher RDCI values than the

mixtures with the stiffer binders (6428SM and 6428LM) when they have comparable RAP content. The 7628SM and 7034LV mixtures, which have the largest difference between PGHT and PGLT, show the most impact from aging on RDCI values, as shown in Figure 3,12b. However, it is important to note that the RDCI value for 7034LV mixture after aging is still higher than other mixtures.

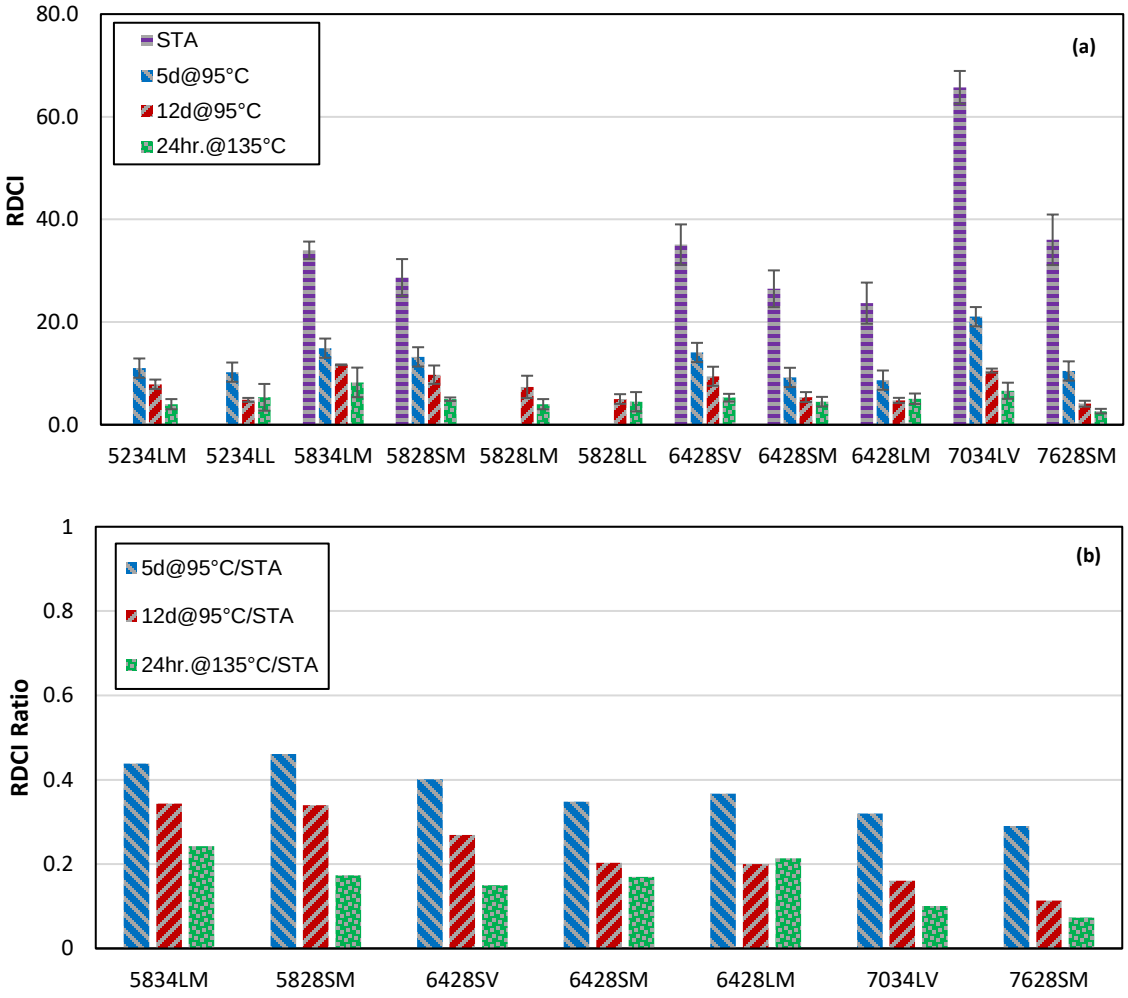

Figure 3.14 (a) Rate-dependent Cracking Index Values; (b) Rate-dependent Cracking Index Aging Ratio from SCB Test

Figures 3.13a and 3.13b show the low temperature fracture properties from DCT test in form of fracture strain tolerance (FST), FST aging ratio (LTOA divided by STA for all mixtures, respectively. The DCT testing temperature is based on the in-service location, as shown in Figure 3.13a. Generally, FST and FST aging ratio decrease when aging level increases. There is a statistically significant difference in FST between the STA and the two long term aging levels. After 5 days aging, except for the 7034LV mixture, the FST value for all mixtures is below 150. After 12 days aging, the FST value for most of the mixtures is below 140. The FST ratio drops to 50-95% of the STA condition after 5 days aging condition, while 12 days aging drops the FST to 37-90% of the STA condition. The decrease of FST value is more severe in the early aging stage and the 24hr. at 135°C condition causes a larger drop in FST aging ratio than the 12 days at 95°C.

Similar to the SCB results, the virgin mixtures usually have higher FST values and higher RAP contents result in lower FST values after aging. The 7628SM and 7034LV mixtures have the largest decrease in FST with aging and the FST aging ratio for the other five mixtures is relatively consistent at each aging level (85-95% after 5 days at 95°C; 75-92% after 12 days at 95°C; 70-89% after 24 hr. at 135°C). However, the FST value for the 7034LV mixture after aging is still higher than other mixtures.

As the complex modulus and fracture testing results show, the two higher levels of aging (24 hr. at 135°C and 12days at 95°C) show statistically similar viscoelastic behavior, while mixtures after 24hr. at 135°C condition typically show the worst fracture properties. This may be a result of disrupted polar molecular associations that lead to thermal decomposition of sulfoxides in asphalt binders at temperatures above 100°C (Petersen et al., 2011; Glaser et al., 2013); this leads to significantly different cracking performance results compared to the material aged below 100°C (Yousefi et al., 2017).

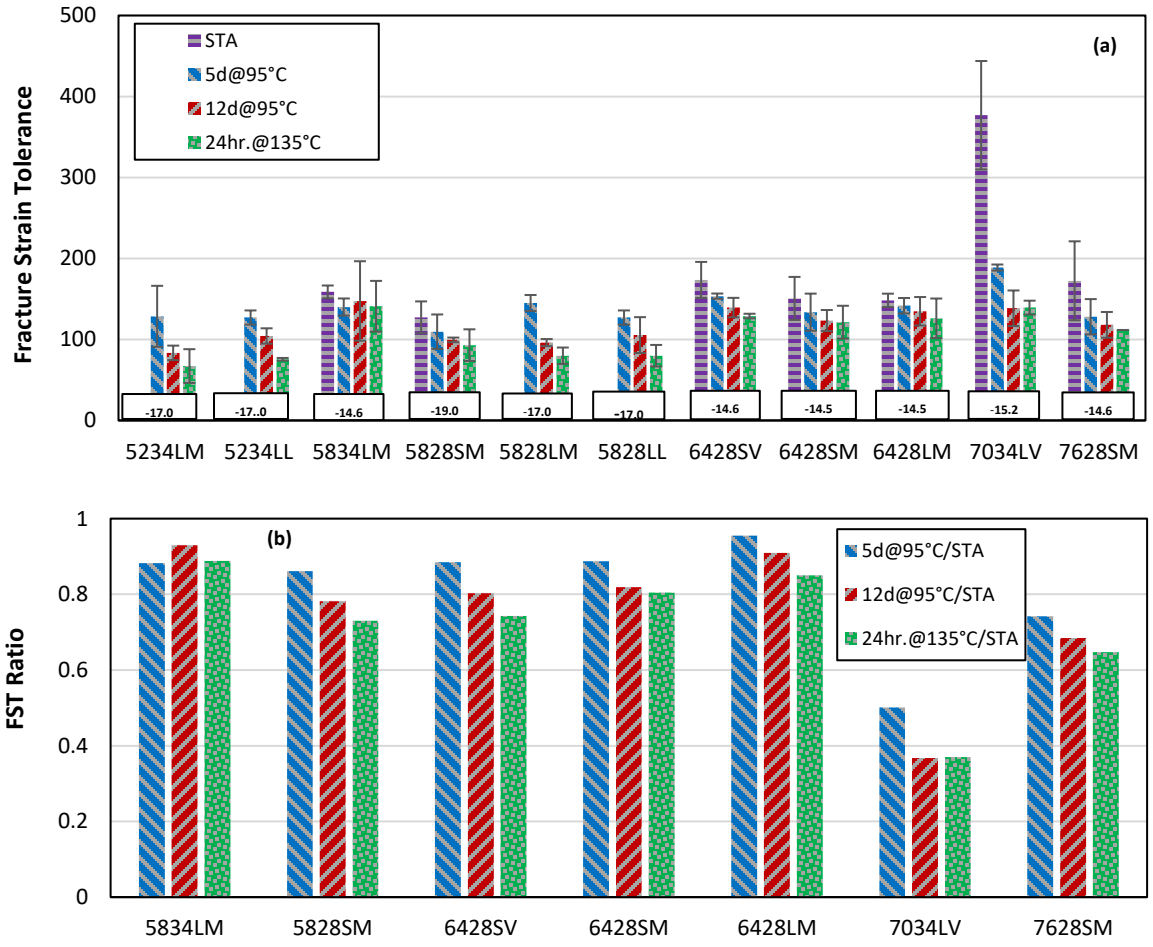

Figure 3.15 (a) Fracture Strain Tolerance Values; (b) Fracture Strain Tolerance Aging Ratio from DCT Tests

3.3 FATIGUE BEHAVIOR OF ASPHALT MIXTURES

Figures 3.14a and 3.14b show D^R values, D^R aging ratio (LTOA divided by STA) for the tested mixtures from S-VECD fatigue testing, respectively. Generally, the higher D^R value indicates better fatigue behavior. The D^R values and D^R aging ratio show a consistent trend with decreasing value with longer aging, which is similar to the SCB and DCT results. Statistical analysis shows that there is no significant difference in D^R values between the two long term aging levels. One possible explanation is that D^R value is developed from the simplified viscoelastic continuum damage (S-VECD) model, and related to the pseudo stiffness of the mixtures (Wang et al., 2017). Since the mixtures after two LTOAs show similar viscoelastic properties, the D^R value for the mixtures at the two LTOAs also generally show a close trend. Also, the D^R ratio drops to 65-95% of the STA condition after 5 days at 95°C aging condition, while 12 days at 95°C and 24hr. at 135°C aging drops the D^R to 35-85% of the STA condition. Similar to the SCB and DCT result, the decrease of D^R value is more severe in the early aging stage.

Similar to the SCB and DCT results, the virgin mixtures and softer base binder grades have higher D^R value after aging. The D^R aging ratio for the 7628SM and 7034LV mixtures shows the largest drop with aging as compared to the other mixtures.

Figure 3.14a also shows the D^R measured from the S-VECD fatigue test for the field cores (four years in service) from four Westmoreland mixtures. The D^R value for the field cores is generally smaller than the D^R values measured from the three LTOA aging levels. One possible explanation is that comparing with the lab aged mixtures, the field cores extracted from the pavement (from Westmoreland project) have been subjected to the repeated traffic loading for 4 years, and may have some damage, resulting in the smaller D^R value. Also, the relatively lower air void of the field cores (4.2-5.5%) compared to the lab aged mixtures (around 6%), as well as the aging gradient in the field cores (pavement) may lead to the difference of D^R value.

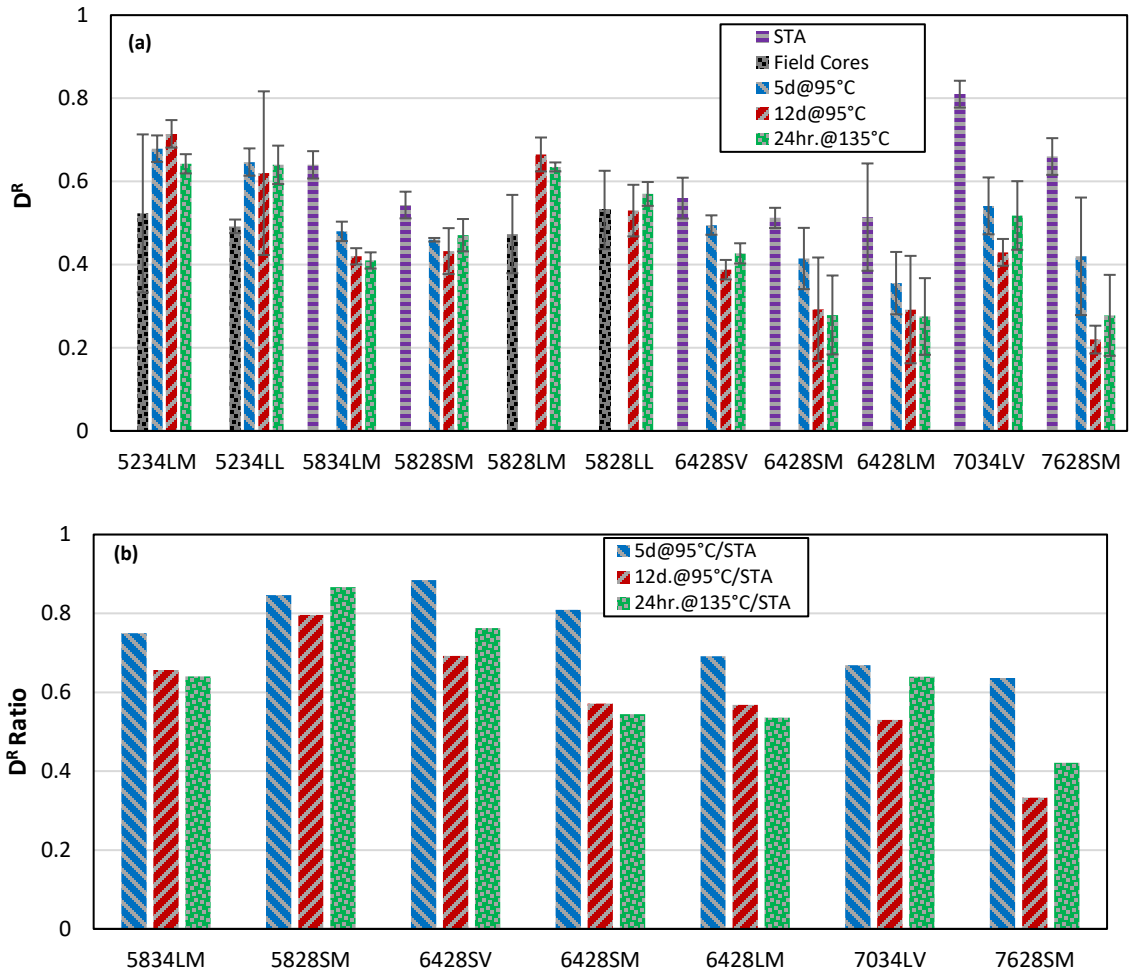

Figure 3.16 (a) D^R Values; (b) D^R Aging Ratio from S-VECD Fatigue Tests

3.4 MIXTURE AGING MODEL

In this section, a simplified mixture aging model is developed and validated with six project mixtures, taking into account mixture variables such as performance grade (PG), RAP amount, and binder content. The mixture Glover-Rowe (G-R_m) parameter is selected and used as the Aging Index Properties (AIP) to model the change of mixture properties with aging. The main advantage of using the G-R_m parameter as the AIP is that it incorporates both stiffness and relaxation capacity (phase angle) to evaluate the cracking performance of asphalt mixtures.

3.4.1 Development of the Mixture Aging Model

To model the aging of asphalt mixtures, multiple aging conditioning levels beyond the three primary conditions used in the study (STA, 5 days and 12 days) are needed. Table 3.1 below shows the summary of the aging levels evaluated for each individual mixture. The first four mixtures (5834LM, 6428SV, 6428LM and 7628SM) are used to develop the mixture aging model and the other two mixtures (6428SM and 7034LV) are used to validate the model.

Table 3.1 Summary of the Aging Conditions on Mixtures

Mix ID	STA	1 Day @95°C	3 Days @95°C	5 Days @95°C	8 Days @95°C	10 Days @95°C	12 Days @95°C
5834LM	✓	✓	*NA*	✓	✓	*NA*	✓
6428SV	✓	✓	*NA*	✓	*NA*	✓	✓
6428LM	✓	✓	*NA*	✓	✓	*NA*	✓
7628SM	✓	✓	✓	✓	*NA*	*NA*	✓
6428SM	✓	NA	✓	✓	*NA*	*NA*	✓
7034LV	✓	✓	✓	✓	*NA*	*NA*	✓

Figures 3.15 and 3.16 show the dynamic modulus and phase angle master curves for the four mixtures with different aging levels used to develop the aging model. Mixture 6428LM clearly shows the smaller movement in both dynamic modulus and phase angle from STA to 1 day aging condition, indicating a difference in initial aging rate.

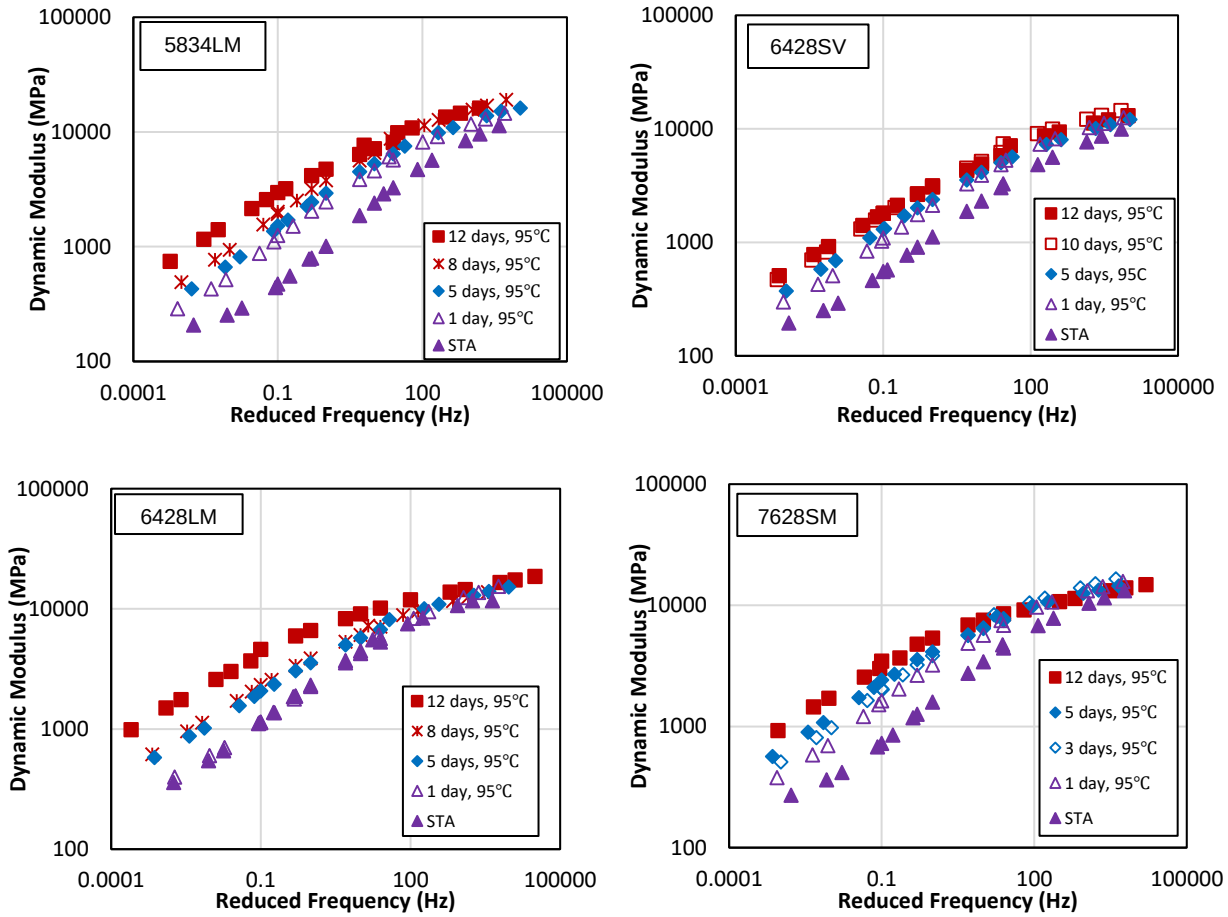

Figure 3.17 Dynamic Modulus Mastercurves for Mixtures used to Develop the Aging Model

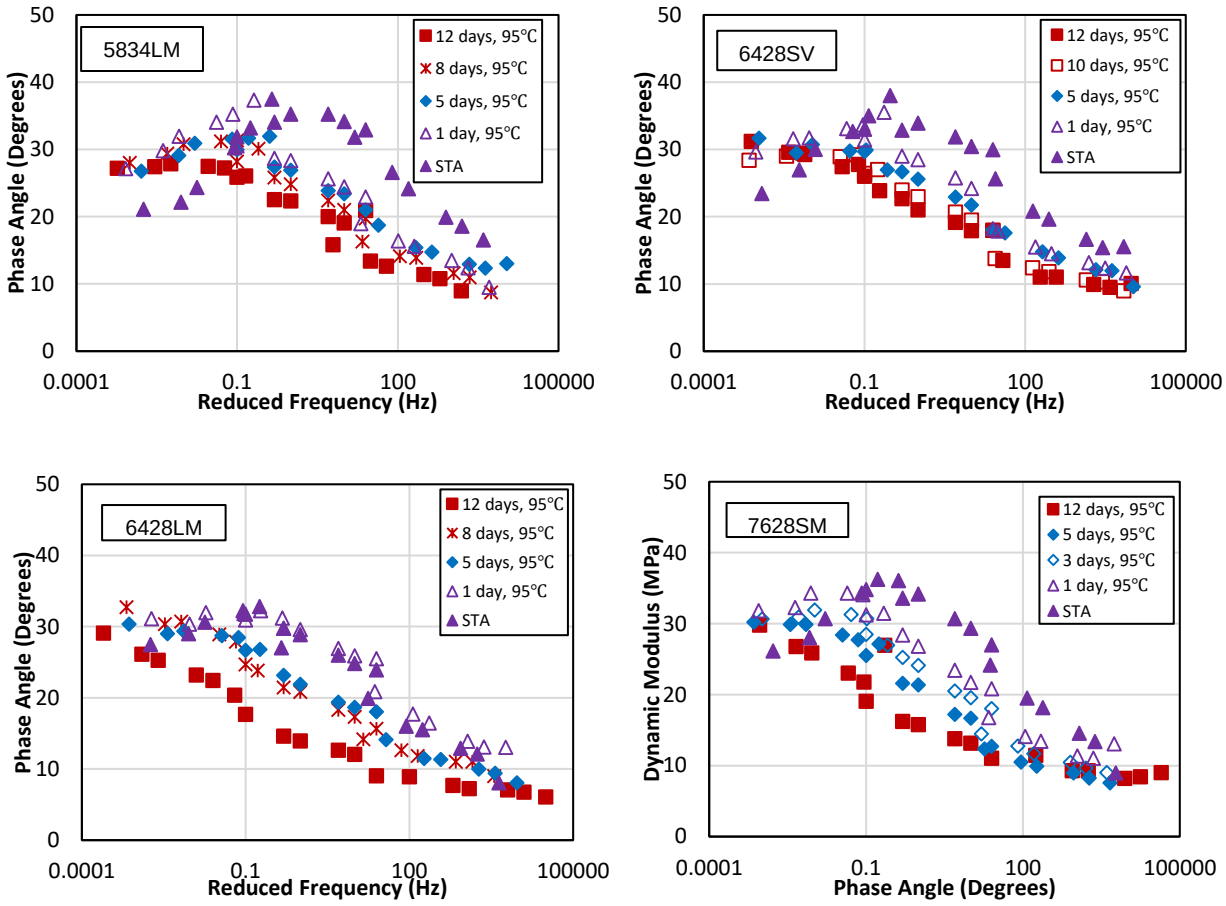

Figure 3.18 Phase Angle Mastercurves for Mixtures used to Develop the Aging Model

Figure 3.17 shows how the G-R_m parameter increases with lab aging duration in a semi-logarithmic plot. There are clearly two stages of aging observed: at the early stage from STA (0 days) to approximately 2 days lab aging duration, the G-R_m parameter increases dramatically compared with the later stage where the rate of increase in G-R_m parameter is relatively consistent. This general trend has also been observed for asphalt binders (Petersen et al. 1996, Petersen 1998, Petersen et al. 2011, Prapaitrakul 2009, Han 2011). All asphalt materials exhibit relatively similar kinetics consisting of an initial fast reaction period, also known as spurt, followed by a slower reaction period that has an approximately constant rate. These two reaction periods are known to be made up of fundamentally different chemical reactions (Petersen 1998). Petersen et al. (1996) explains that during the spurt, sulfoxides are the major oxidation product and cause an increase in viscosity. During the slower reaction period, ketones are the major product that cause the increase in viscosity. Figure 3.18 depicts the dual oxidative reaction mechanism of asphalt binders proposed by Petersen et al. (2011).

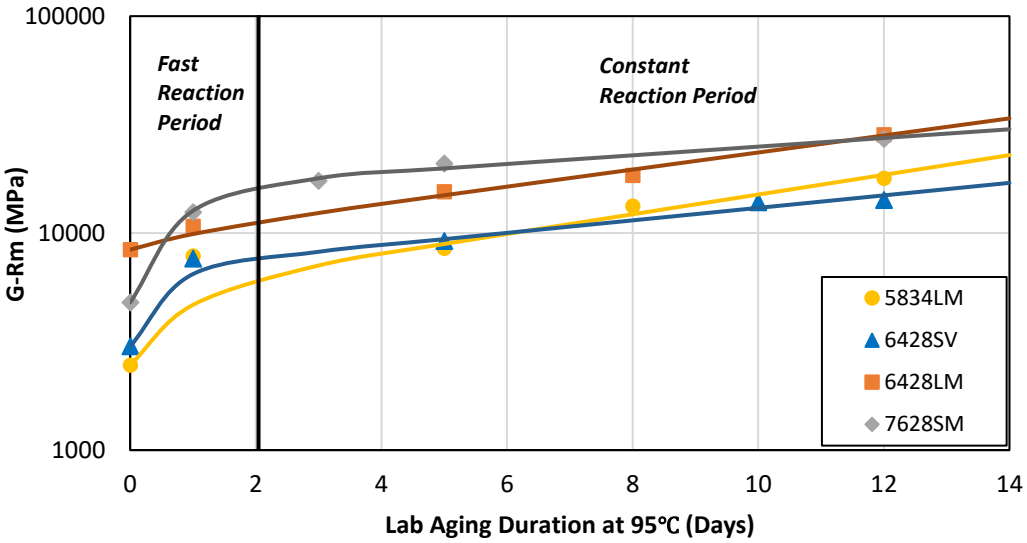

Figure 3.19 G-R_m Parameter for Mixtures with Different Aging Durations

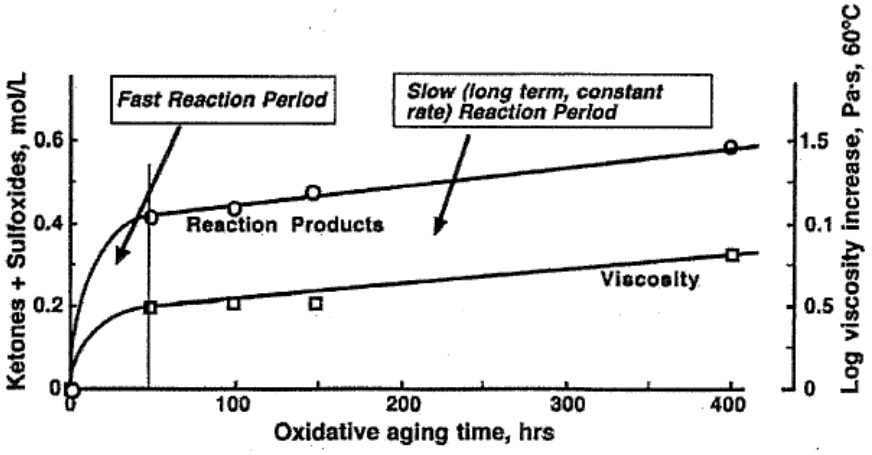

Figure 3.20 Dual Oxidation Mechanisms for Asphalt Binder (Petersen et al. 2011)

An aging model for asphalt mixtures should be able to capture the two reaction periods, which can be accomplished using the form shown in Eq. 3.1:

$$Log(G - R_m) = Log(G - R_{m\,STA}) + M\left(1 - exp(-R_s t)\right) + R_l t \qquad (3.1)$$

Where,

$G\text{-}R_{m\,STA}$ is the G-R_m value for mixtures after STA;

M is the material-based parameter;

R_s is short-term aging constant;

R_l is long term aging constant.

The parameters M and R_s are associated with the fast reaction period, higher M and R_s value indicate the high aging rate of asphalt mixtures during the very early stage (short-term) of pavement service life. The long term aging constant R_l is calculated from the constant reaction period, indicating the aging rate of asphalts mixtures during the long-term period.

In this model, G-$R_{m\,STA}$ can be measured directly on mixtures with STA, the other 3 parameters (M, R_s and R_l) need to be determined from analysis of testing data. Using linear regression on the constant-rate data, R_l value is obtained as the slope of the constant-rate line in the constant reaction period. The M value can be calculated by Eq.3.2 below:

$$M = Intercept - Log(G - R_{m\,STA}) \qquad (3.2)$$

Where,

M is the intercept of the constant-rate line in the constant reaction period;

G-$R_{m\,STA}$ is the G-R_m value for mixtures after STA.

Once the M and R_l value are determined from the constant rate period, the only unknown parameter in Eq. 3.1 is R_s. In order to calculate the R_s parameter, an optimization approach is employed. The objective of the optimization is to minimize the mean square error of model estimates of G-R_m at all aging conditions. The optimization is done using the Solver function in Excel. In summary, in order to calibrate the three model coefficients M, R_s and R_l, three aging conditions (at least) are typically needed. One intermediate aging condition associated with one long-term aging condition are needed to calibrate the R_l, as well as M from the constant reaction period. The STA is also generally needed to calculate G-$R_{m\,STA}$, M and R_s value.

The curves in Figure 3.17 are fitted by the aging model with calibrated model coefficients M, R_s and R_l (as shown in Table 3.2, all aging conditions are used for calibration). The R2 (coefficient of determination, as shown in Table 3.2) shows the quality of the aging model to predict the change of mixture properties over time. Also, the mixture 5834LM, 6428SV and 7628SM are found to have the higher short-term aging susceptibility with the higher model coefficients M and R_s compared with mixture 6428LM, while 5834LM and 6428LM show the high log-term aging susceptibility with high value of R_l.

Table 3.2 Summary of the Model Coefficients for Mixtures used for Development of the Model

Mix ID	M	R_s	R_l	R^2
5834LM	0.332	1.20	0.039	0.942
6428SV	0.350	2.03	0.029	0.975
6428LM	0.055	0.90	0.038	0.991
7628SM	0.518	1.50	0.020	0.995

To further evaluate the mixture aging model, another two mixtures 6428SM and 7034LV are subjected to different aging conditions in laboratory, and the complex modulus tests were conducted on the aged mixtures. Figures 3.19 and 3.20 show the dynamic modulus and phase angle master curves for these two mixtures with various aging conditions.

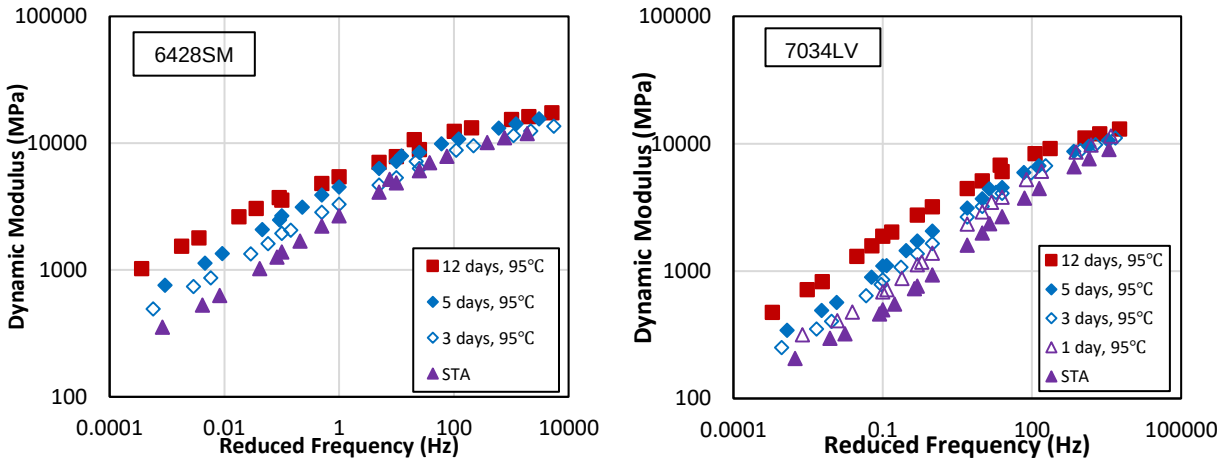

Figure 3.21 Dynamic Modulus Mastercurves for Mixtures used to Validate the Aging Model

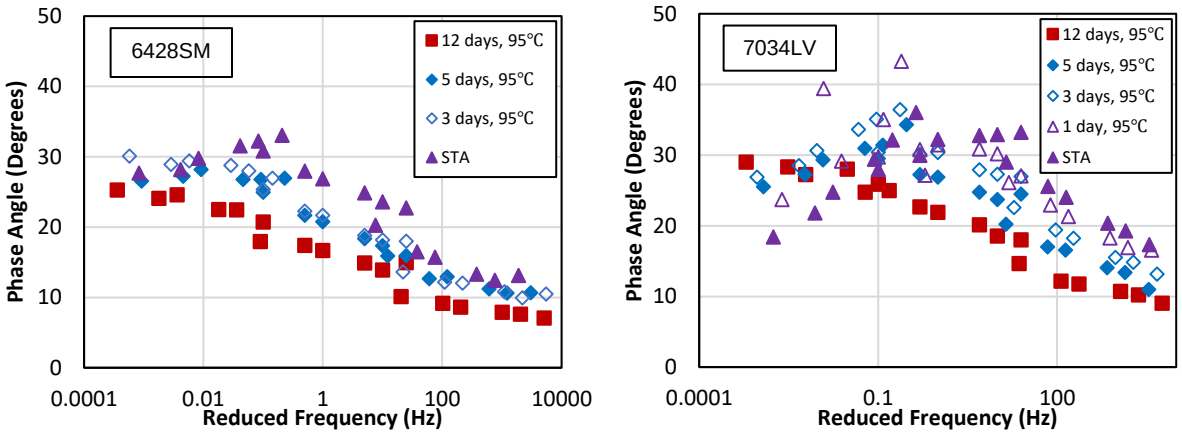

Figure 3.22 Phase Angle Mastercurves for Mixtures used to Validate the Aging Model

The G-R_m parameter were calculated as the AIPs. The model coefficients were determined using only three aging conditions (STA, 5 days and 12 days), and are shown in Table 3.3. Figure 3.20 below shows the aging prediction model with all measured points, not just those used to fit the model, and the corresponding correlation coefficient (R^2) value is also calculated. The high R^2 value shows the high quality of model calibrated by only using three primary aging conditions, indicating three aging conditions are typically sufficient to calibrate the aging model.

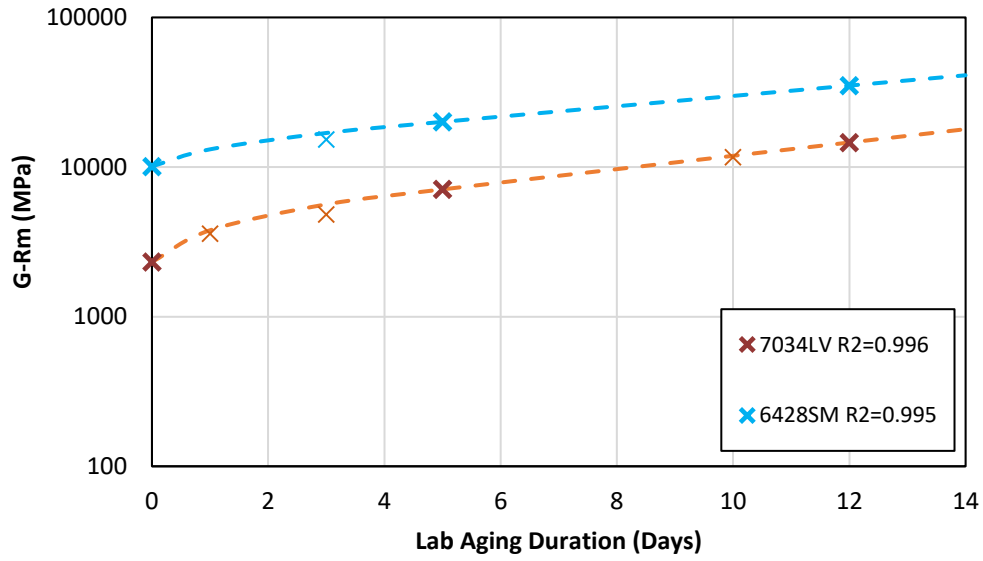

Figure 3.23 Validation of the Mixture Aging Model (bold markers indicate points used to fit the model, non-bold markers indicate validation points)

Table 3.3 Summary of the Model Coefficients for Mixtures used for Validation of the Model

Mix ID	M	R_s	R_l
6428SM	0.126	1.00	0.035
7034LV	0.264	1.05	0.045

Figure 3.22 below shows the calibration of the mixture aging model for nine mixtures included in the aging project. Table 3.3 shows the summary of the three model coefficients. The mixtures with the lower low temperature performance grade (LTPG) generally have higher model coefficients than other mixtures, indicating these mixtures are more susceptible to aging. Mixtures 6428SV and 7628SM generally have higher short-term aging susceptibility (higher M and R_s values), however, they do not show high long-term aging susceptibility (R_l). Figure 3.22 shows the threshold value (19000 MPa) suggested by the NCHRP 09-58 project for LTOA to minimize the material cracking potential.

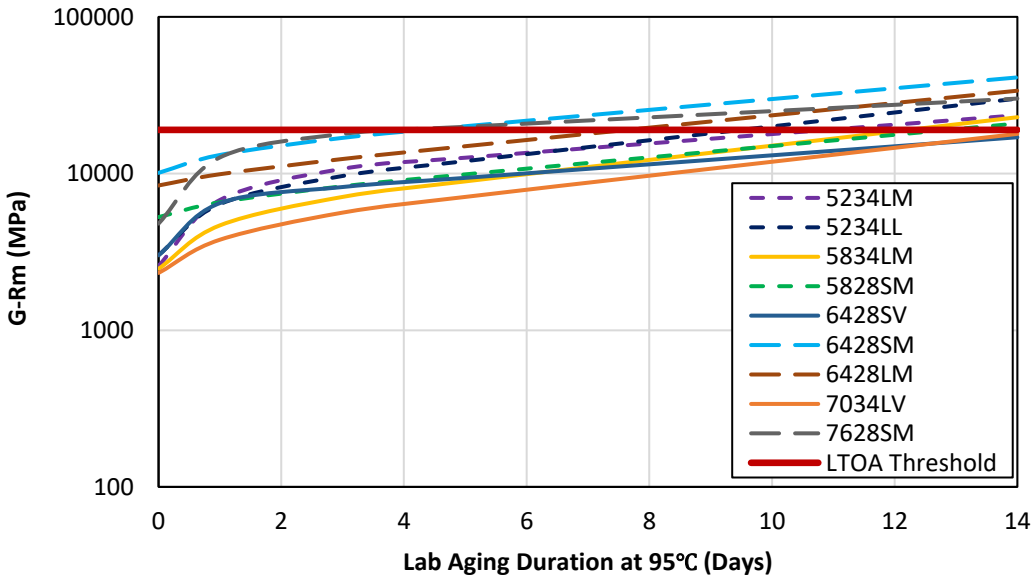

Figure 3.24 Aging Model Calibration for Nine Project Mixtures

Table 3.4 Summary of the Model Coefficients for Nine Project Mixtures

Mix ID	M	R_s	R_l
5234LM	0.541	1.28	0.030
5234LL	0.378	1.35	0.044
5834LM	0.332	1.20	0.045
5828SM	0.093	1.00	0.036
6428SV	0.350	2.03	0.029
6428SM	0.126	1.00	0.035
6428LM	0.055	0.90	0.039
7034LV	0.264	1.05	0.045
7628SM	0.518	1.50	0.020

3.4.2 Combination of the Aging Model from this Study with CAI

As described before, the climatic aging index (CAI) model was developed from the NCHRP 09-54 project to determine laboratory aging durations at 95°C for asphalt mixtures that best reflect the time, climate, and pavement depth for a given pavement location in United States based on the local climate conditions. By employing the CAI model (the detailed calculation process is documented in section 2.2 and 3.1.2), the field aging durations (at the depth of 4.3 mm, as discussed in section 3.1) corresponding with the different lab aging conditions can be found. Figure 3.23 below shows the mixture aging model with the x-axis replaced by field aging duration from the CAI model.

The number of years for each mixture to reach the threshold value (19000 MPa) is calculated based on Figure 3.23, and is listed in Table 3.5 with the associated rankings. Based on the rankings, the mixtures can be divided into three categories as highlighted in Figure 3.23 and Table 3.5: It takes above 10 years for mixture 6428SV, 7034LV and 5834LM to reach the threshold value, while 7.5 to 9.8 years for mixture 5828SM, 5234LM and 5234LL to get to the limit. However, only after 3.4 to 5.5 years, the G-Rm parameter for mixture 6428SM, 6428LM and 7628SM reaches the threshold value, indicating the high cracking susceptibility of these mixtures. Figure 3.23 and Table 3.5 can also be used for the life cycle analysis (LCA) for specific mixtures and projects.

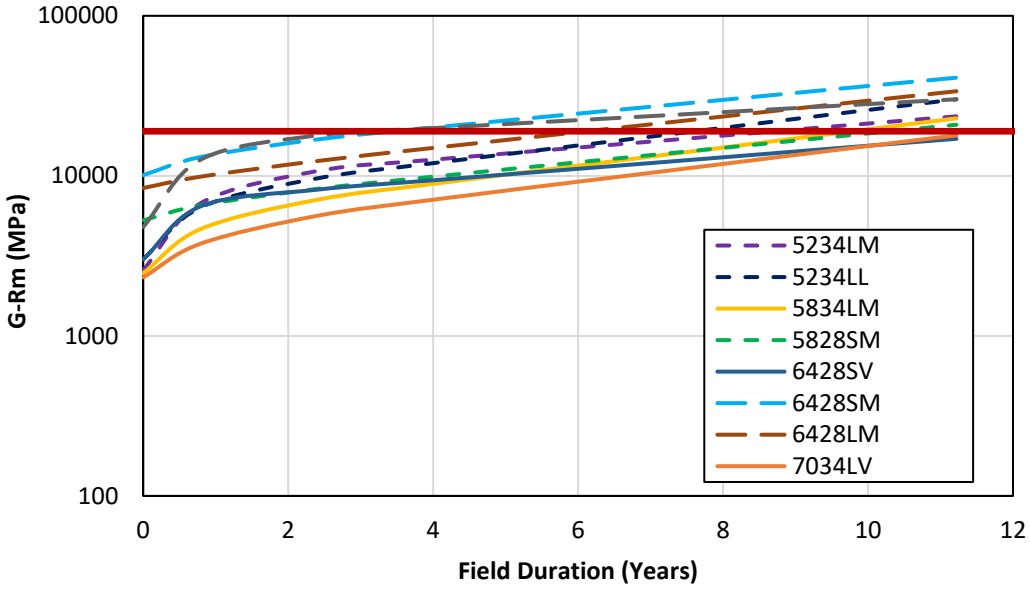

Figure 3.25 Mixture Aging Model (Field Duration)

Table 3.5 Ranking of Mixtures Based on the Years to Threshold (background color of cells indicates mixtures with similar aging characteristics)

Mix ID	5234LM	5234LL	5834LM	5828SM	6428SV	6428SM	6428LM	7034LV	7628SM
Years to Threshold	9.2	7.5	10	9.8	12	3.4	5.5	11.8	3.5
Ranking (Good-Poor)	5	6	3	4	1	9	7	2	8

The mixture aging model described in this section, combined with CAI model, can be used as an effective, simple, and convenient material selection and pavement design approach that can evaluate and track the change of mixture cracking performance over pavement service life. The simplified and experimental mixture aging model takes into account mixture variables and mineralogy and is shown to efficiently capture the two aging reaction periods of asphalt materials. The three model coefficients (M, R_s and R_l) can be used to evaluate and differentiate the aging susceptibility of different asphalt mixtures with various mix variables and the aging model can be used to track and predict the cracking performance (in form of G-R_m parameter) of asphalt mixtures over time, as shown in Figure 3.23. Only three aging conditions (STA, one intermediate aging condition, and another long-term aging condition) with just one mixture test (complex modulus test) are generally needed to calibrate the mixture aging model.

3.5 SUMMARY

The effect of aging on the viscoelastic, fatigue and fracture properties of 11 project mixtures with different mix variables was discussed in this chapter. The simplified and experimental mixture aging model was also developed, and was shown to efficiently capture the two aging reaction periods of asphalt materials.

- As asphalt materials age, the linear viscoelastic characteristics change with an increase of stiffness and decrease in relaxation capability. The linear viscoelastic properties of mixtures with 24 hr. at 135°C and 12 days at 95°C aging are statistically similar.
- The mixtures with the softer binders generally show higher aging susceptibility based on the measured LVE properties and shape parameters.
- The fracture properties, as measured by SCB and DCT testing, become worse as aging level increases. Mixtures after 24hr. at 135°C condition typically show the worst fracture properties, which can be attributed to the disruption of polar molecular associations and thermal decomposition of sulfoxides for the binders with aging temperatures above 100°C.
- Based on D^R fatigue cracking criterion, mixtures are more prone to fatigue cracking with increased aging, and fatigue behavior between two long term aging levels is very similar.
- The two mixtures with the largest difference between PGHT and PGLT show the most impact from aging based on the fracture and fatigue testing results. However, the virgin mixture still has good fracture and fatigue performance after aging.
- Combing the results of the complex modulus testing with the CAI calculation, 5 days at 95°C laboratory aging condition appears to simulate approximately four years of field aging for the surface mixtures in NH, while 12 days at 95°C laboratory aging simulates 9.6 years of field aging. However, the 5 days at 95°C laboratory aging condition may not be sufficient to simulate the fatigue and fracture behavior of the field cores (four years) based on the fatigue and fracture test results.
- The mixture aging model can be used as an effective, simple and convenient material selection and pavement design approach that can evaluate and predict the change of mixture cracking performance, as well as aging susceptibility over pavement service life.

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CHAPTER 4: SUMMARY OF BINDER RESULTS

4.1 COMPARISON WITH BBR DATA

Table 4.1 summarizes the results from the NHDOT BRR tests and UNH 4mm DSR tests for binder samples extracted and recovered from the four Westmoreland mixtures. Statistical analysis (t-test) shows that there is no significant difference between the critical temperature determined by the critical m (m=0.3 for BBR test; m=0.275 for 4mm DSR test) and S(G) (S=300MPa for BBR test; G=143MPa for 4mm DSR test) value and corresponding PGLT measured by the BBR test with the 4mm DSR test. Both BBR test and 4mm DSR test show that all of the binder samples with different aging conditions are m controlled.

Figure 4.1a, 4.1b and 4.1c show the comparison between critical temperature determined by critical m value and S(G) value, and the corresponding PGLT from BBR test with 4mm DSR test, respectively. The R^2 and RMSE show good consistency between the results measured from BBR test and the 4mm DSR test.

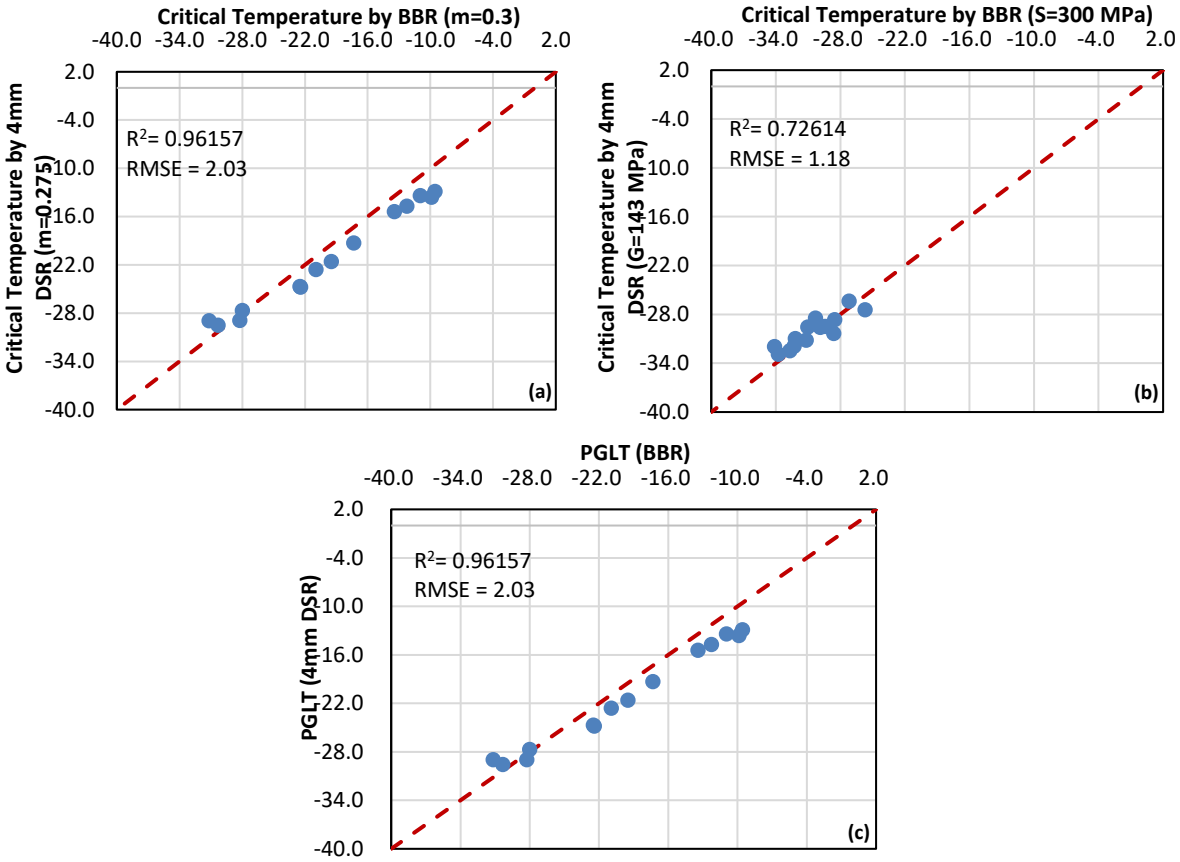


Figure 4.1 Comparison between (a) Critical Temperature Determined by Critical m Value; (b) Critical Temperature Determined by Critical S(G) Value; (c) Performance Grade Low Temperature (PGLT) from BBR Test with 4mm DSR Test

Table 4.1 Comparison between the Results from BBR Test with 4mm DSR Test

Binder/ Mixture ID	Binder PG Grade	%RAP	Aging Levels	Critical Temperature (m=0.3) by BBR (°C)	Critical Temperature (m=0.275) by 4mm DSR (°C)	Critical Temperature (S=300MPa) by BBR (°C)	Critical Temperature (G=143MPa) by 4mm DSR (°C)	PGLT by BBR (°C)	PGLT by 4mm DSR (°C)
5828LL	PG 58-28	30	STA	-28.00	-27.70	-29.87	-29.60	-28.00	-27.70
			12d@95°C	-17.32	-19.30	-27.20	-26.36	-17.32	-19.30
			24hr.@135°C	-19.48	-21.60	-31.03	-29.54	-19.48	-21.60
5828LM	PG 58-28	20	STA	-30.31	-29.54	-32.30	-31.92	-30.31	-29.54
			12d@95°C	-22.40	-24.80	-33.75	-32.90	-22.40	-24.80
			24hr.@135°C	-10.96	-13.40	-28.62	-30.32	-10.96	-13.40
5234LM	PG 52-34	20	STA	-31.17	-28.97	-34.12	-31.96	-31.17	-28.97
			5d@95°C	-22.48	-24.69	-32.68	-32.44	-22.48	-24.69
			12d@95°C	-13.43	-15.40	-28.51	-28.63	-13.43	-15.40
			24hr.@135°C	-9.88	-13.60	-29.42	-29.45	-9.88	-13.60
5234LL	PG 52-34	30	STA	-28.24	-28.94	-32.17	-30.95	-28.24	-28.94
			5d@95°C	-12.26	-14.72	-30.31	-28.45	-12.26	-14.72
			12d@95°C	-20.94	-22.60	-31.16	-31.15	-20.94	-22.60
			24hr.@135°C	-9.57	-12.90	-25.69	-27.43	-9.57	-12.90

4.2 CHANGE OF RHEOLOGICAL PROPERTIES WITH AGING

4.2.1 |G*| and Phase Angle

Complex shear modulus and phase angle mastercurves constructed from the 4mm DSR testing are presented as the average of three replicates for the binder samples extracted from the nine mixtures in Figures 4.2 and 4.3. Generally, complex modulus increases as the aging level increases, while phase angle decreases as materials age. Both the complex modulus and phase angle for the different aging levels collapse together at high frequencies (higher than 10^6Hz). As materials age, both complex modulus and phase angle curves become flatter. Generally, the two higher levels of aging (24 hr. at 135°C and 12days at 95°C) show statistically similar complex modulus and phase angle values, except for 5828LM. The 7034LV has a steeper complex modulus curve than the other four types of binder at each aging condition. The trend from binder test results is similar to those observed from the mixture complex modulus (E*) testing.

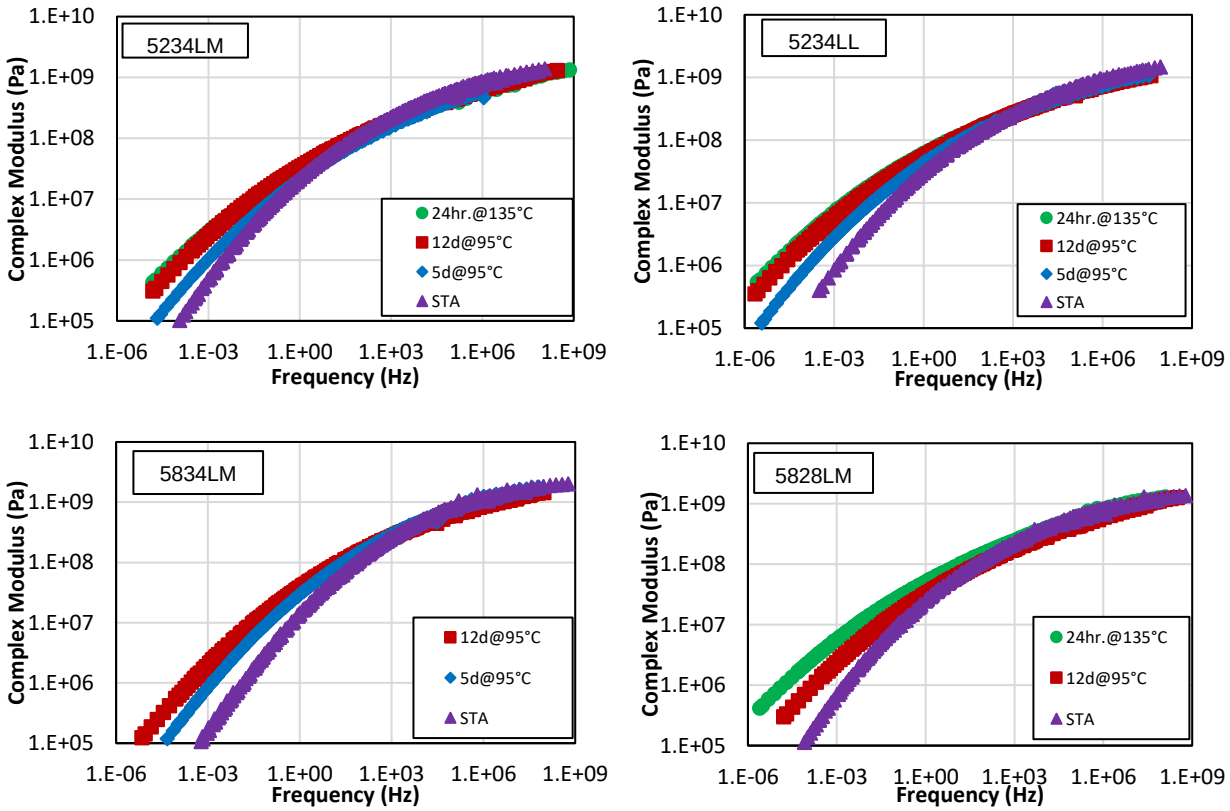


Figure 4.2 Complex Shear Modulus Master Curves for Extracted and Recovered Binder Samples (Reference Temperature: 10°C)

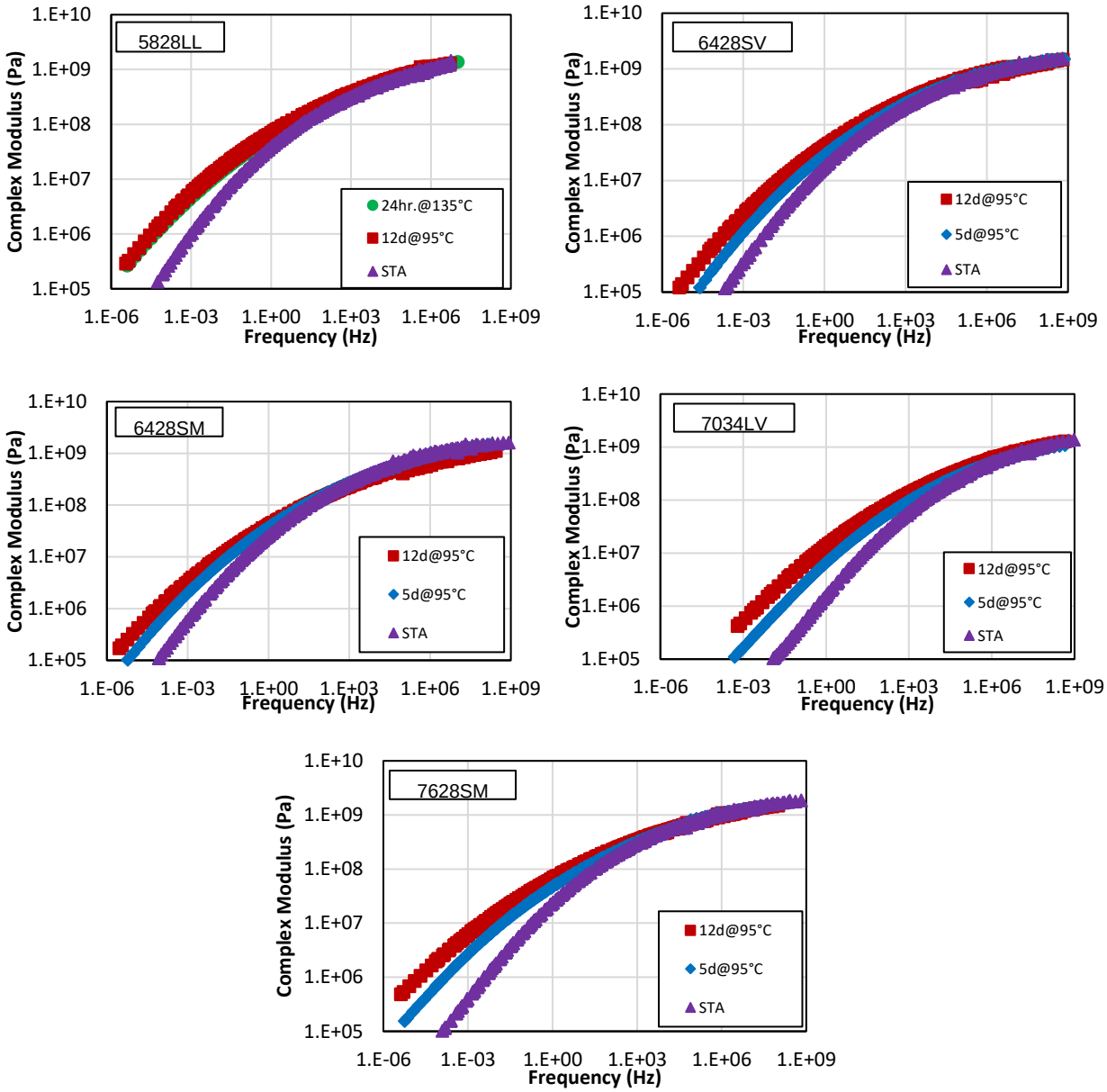


Figure 4.3 Complex Shear Modulus Master Curves for Extracted and Recovered Binder Samples (Reference Temperature: 10°C) (Continued)

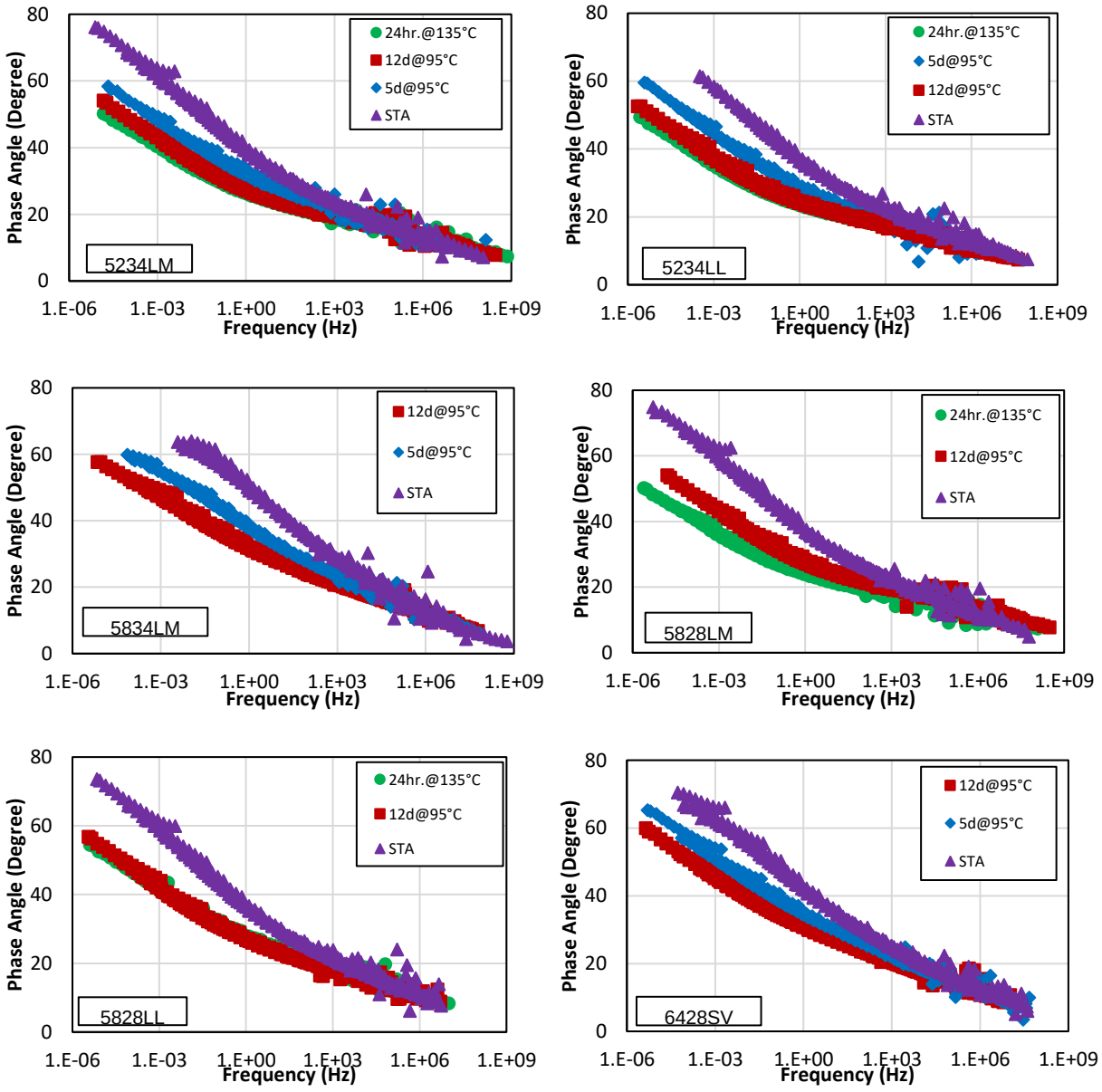


Figure 4.4 Phase Angle Master Curves for Extracted and Recovered Binder Samples (Reference Temperature: 10°C)

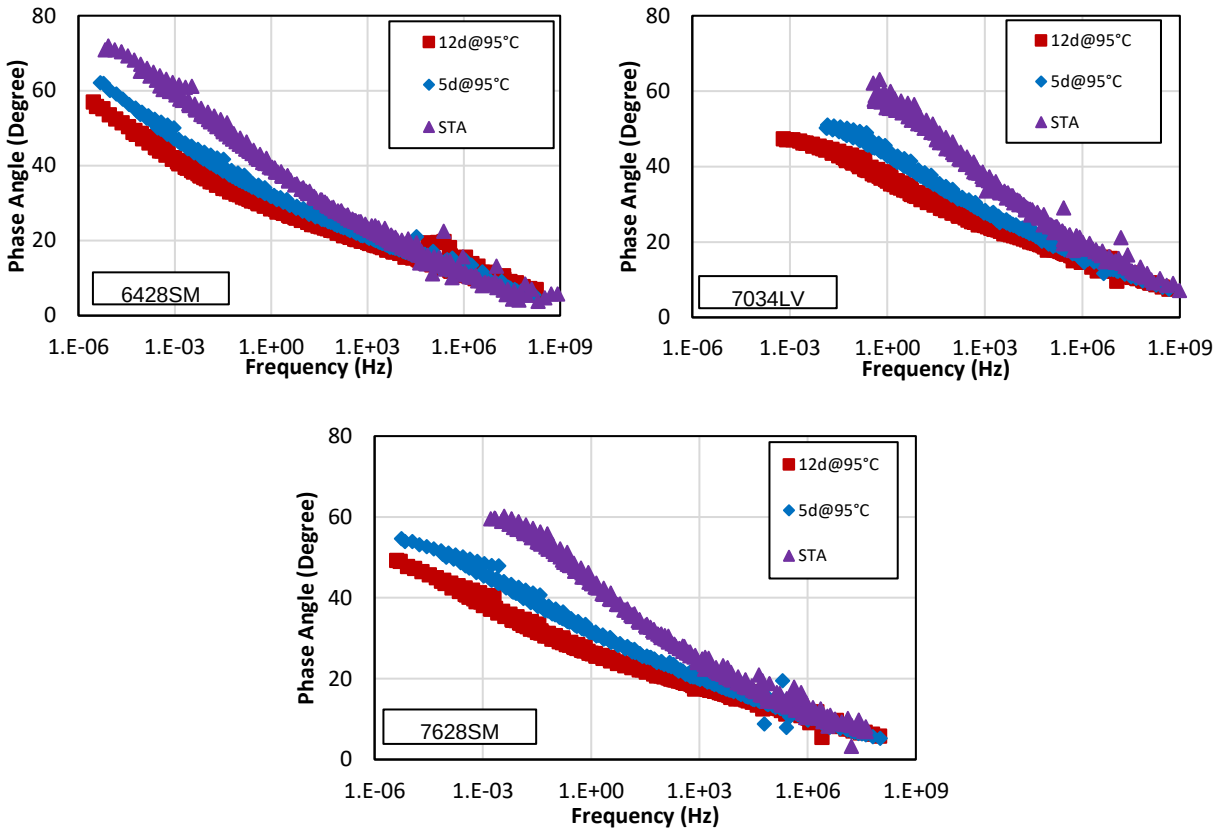


Figure 4.5 Phase Angle Master Curves for Extracted and Recovered Binder Samples (Reference Temperature: 10°C) (Continued)

4.2.2 Low Temperature Performance Grade (PGLT)

Figure 4.4a and 4.4b show the average PGLT and the change of the PGLT (LTOAs minus STA) from 3 replicates determined from the 4mm DSR tests. Error bars show one standard deviation. Generally, PGLT and the change in PGLT from STA increase as aging level increases. There is a statistically significant difference in PGLT between the STA and all other three long-term aging conditions. The PGLT for 5834LM, 6424SV, and 7034LV after each aging condition is typically lower than other materials. Comparing the change of PGLT for these binder samples, 5234LM, 5234LL, and 7628SM clearly shows a larger change than other binders with aging, showing higher aging susceptibility which is consistent with the mixture test results.

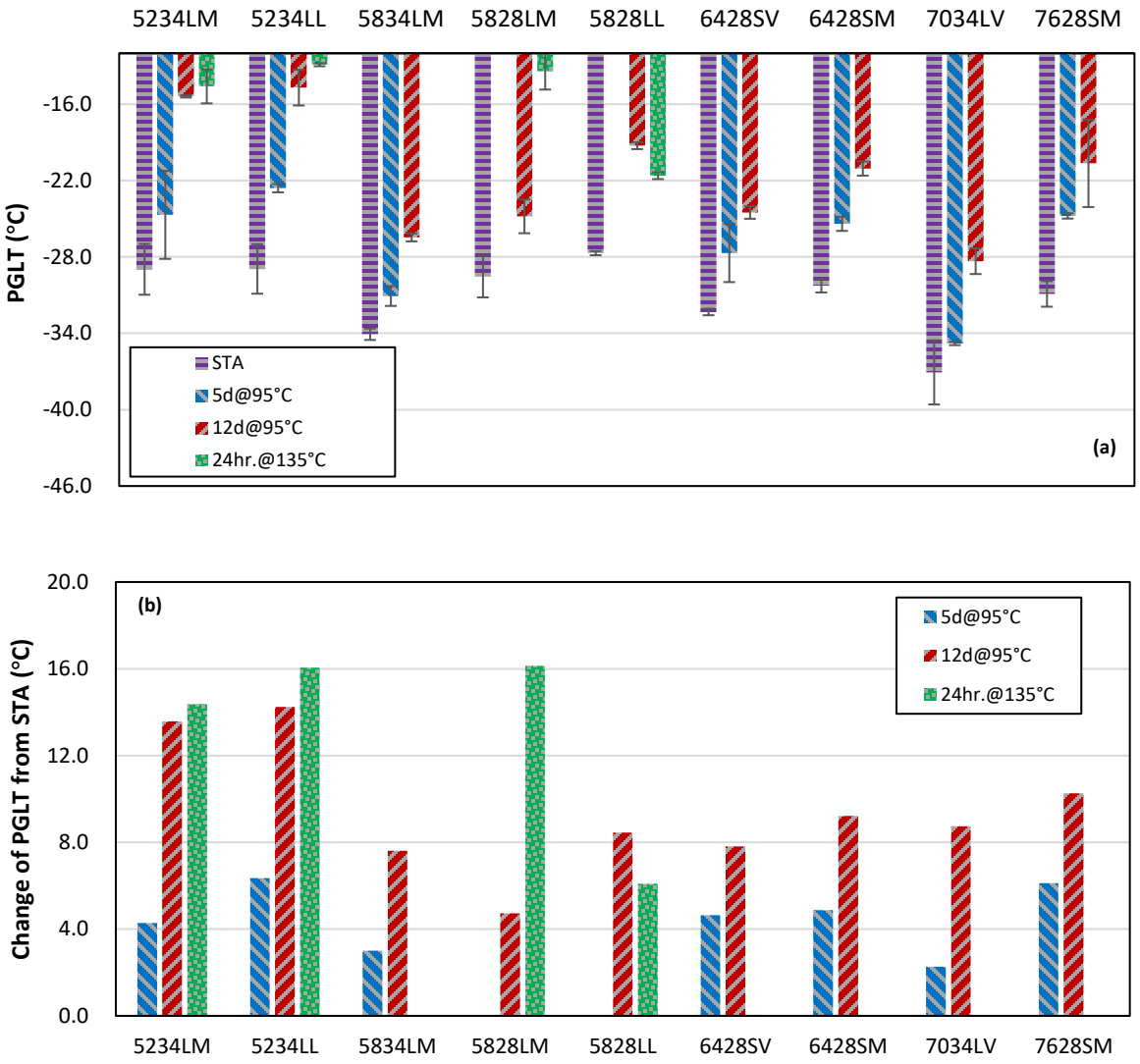


Figure 4.6 (a) PGLT and (b) Change of PGLT for Different Binder Samples from 4mm DSR Tests

4.2.3 Rheological Index (R-value)

Figure 4.5a and 4.5b shows the average R-value and the change of the R-value (LTOAs minus STA). Error bars show one standard deviation. As binder stiffness increases due to aging and oxidation, the R-value increases, resulting in higher cracking susceptibility. Generally, R-value and the change of the R-value from STA increase as aging level increases. There is a statistically significant difference in R-value between the STA and all other three long-term aging conditions. Similar to the PGLT results, 5834LM generally shows lower R value after each aging condition compared with other materials. Binders 5234LM, 5234LL, and 7628SM generally have lower R-value than other binder samples for STA. However, these binders show higher impact from aging on R-value as evaluated by the change of R-value, as shown in Figure 4.4b.

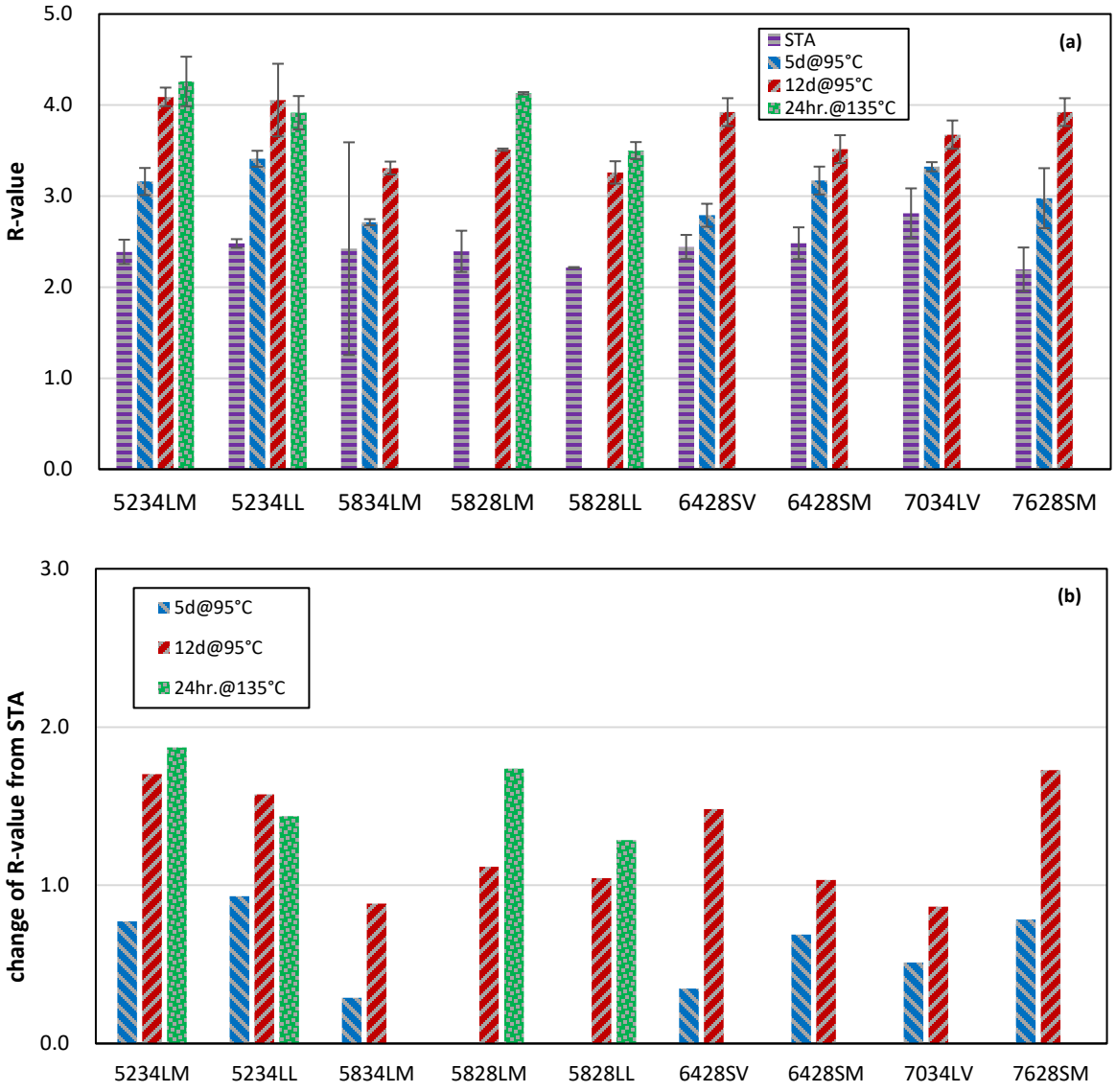


Figure 4.7 (a) R-value and (b) Change of R-value for Different Binder Samples from 4mm DSR Tests

4.2.4 Difference in Critical Cracking Temperatures for Creep Stiffness and Relaxation Parameters (ΔT_c)

Figure 4.6a and 4.6b show the average ΔT_c and the change in the ΔT_c (absolute value of LTOAs minus STA), as well as the cracking warning (-2.5°C) and cracking limit (-5.0°C) values. Error bars show one standard deviation. The magnitude of ΔT_c decreases as aging level increases. There is a statistically significant difference in ΔT_c between the STA and all other three long-term aging conditions. The ΔT_c value for 5834LM, 6428SV, and 7034LV after each aging condition is typically higher than other materials. The ΔT_c value for these three binders with different aging levels is typically within the cracking limit, while other

binders exceed the cracking limit value after 12 days and 24 hours aging condition (5234LM and 5234LL exceed the cracking limit only after 5 days aging condition). The 7628SM binder shows good cracking performance with positive ΔT_c value after STA; however, it exceeds the threshold values after 5 days and 12 days aging conditioning. From Figure 4.6b, 5234LM, 5234LL, and 7628SM shows a greater change in ΔT_c value compared with other materials, indicating higher aging susceptibility.

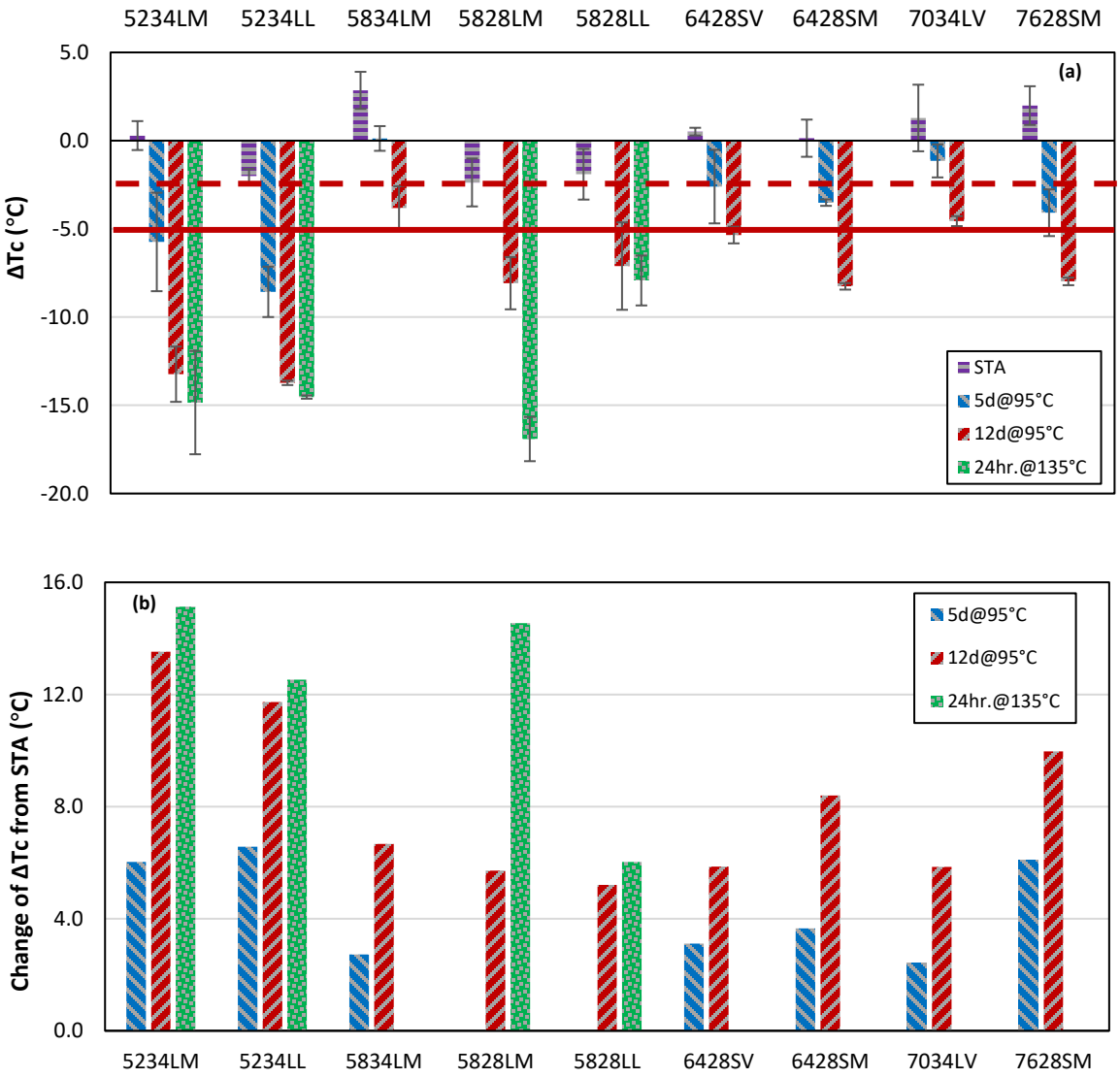


Figure 4.8 (a) ΔTc and (b) Change of ΔTc for Different Binder Samples from 4mm DSR Tests

4.2.5 Glover-Rowe (G-R) Parameter and Black Space

Figure 4.7 shows the average G-R parameter in Black space and on a bar graph, as well as the change of the G-R parameter (LTOAs minus STA). The two threshold values (180kPa for cracking warning; 600kPa for significant cracking limit) are also shown in Figure 4.7. Error bars show one standard deviation. Generally, the G-R parameter and the change of the G-R parameter from STA increase as aging level increases. There

is a statistically significant difference in G-R parameter between the STA and all other three long-term aging conditions. Very similar to the ΔT_c result, G-R parameter for 5834LM, 6428SV, and 7034LV after each aging condition is typically lower than other materials, and the values for these three binders with different aging levels are generally within the significant cracking limit. Others exceed this cracking limit value after 12 days and 24hours aging conditions. The binders 5234LM, 5234LL, and 7628SM show good cracking performance with very small value of G-R parameter after STA, however, after 5 days and 12 days aging conditioning, they show the higher values compared with other materials. Also, from Figure 4.7c, those three binders show a greater change in G-R parameter compared with others, indicating higher aging susceptibility.

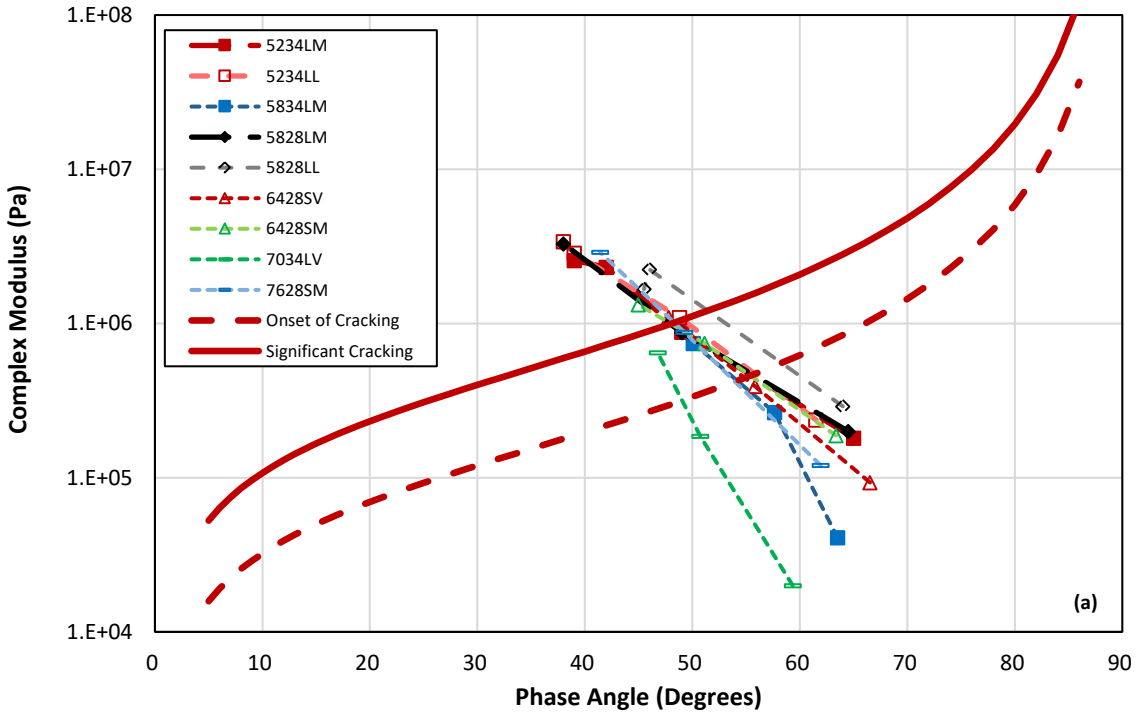


Figure 4.9 (a) Black space; (b) G-R Parameter; and (c) Change of G-R Parameter for Different Binder Samples from 4mm DSR Tests

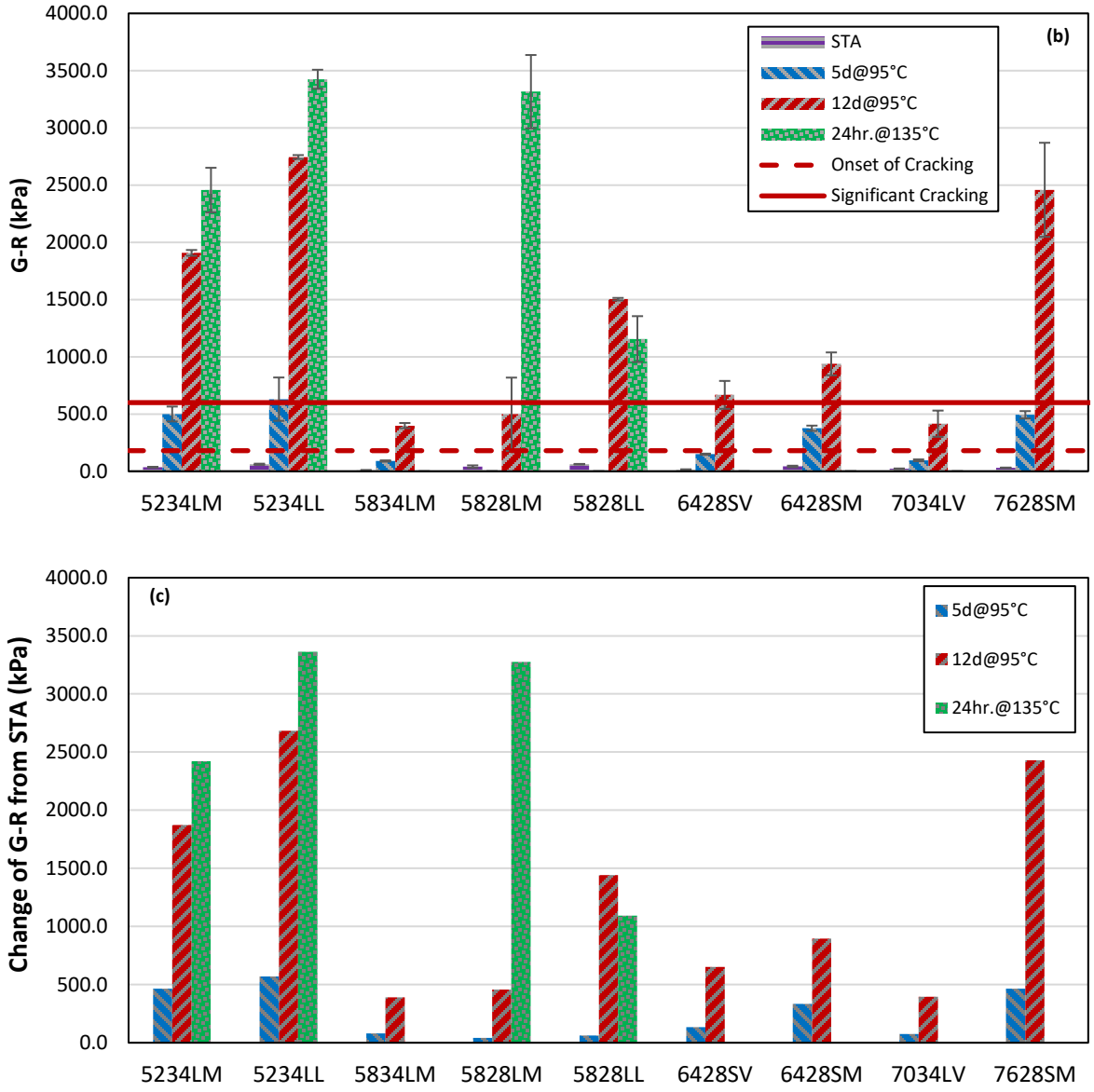


Figure 4.10 (a) Black space; (b) G-R Parameter; and (c) Change of G-R Parameter for Different Binder Samples from 4mm DSR Tests (Continued)

4.2.6 Combination of ΔTc and G-R Parameter

The ΔT_c and G-R parameter evaluate the ability of the binder to resist the thermal cracking and durability (block) cracking, respectively. Figure 4.8 below provides a way to combine these two criteria and evaluate the thermal and durability cracking susceptibility of the binders after different aging conditions together. The two red dashed lines represent the cracking warning values for ΔT_c (-2.5°C) and G-R parameter (180kPa) respectively, while the solid red lines represent the cracking limit values for ΔT_c (-5.0°C) and G-R parameter (600kPa). The area surrounded by the two dashed lines at the bottom right of the plot, labelled as the safe zone, means that the binders have adequate capability under intermediate and cold

temperature to resist cracking, so that generally, no cracking problems should be expected when the ΔT_c and G-R parameter of the binders fall into this area. However, if the points fall into the failure zone surrounded by the two solid lines at the top left of the plot, it indicates that the binders will have a high susceptibility to both thermal and durability (block) cracking since both ΔT_c and G-R parameter values of the binder samples exceed the cracking limit values.

The STA condition binders generally fall into the safe (cracking free) zone, which means that typically no cracking problems are expected. For 5834LM and 7034LV, after 5 days aging, the points are located in the safe zone, even after 12 days aging condition, the ΔT_c value and G-R parameter are still within the cracking limits. However, 5234LM, 5234LL, 5828LM, 5828LL, and 7628SM after 12 days and 24 hours aging condition, fall into the failure zone, which means that there may be significant cracking problems based on the ΔT_c and G-R criteria.

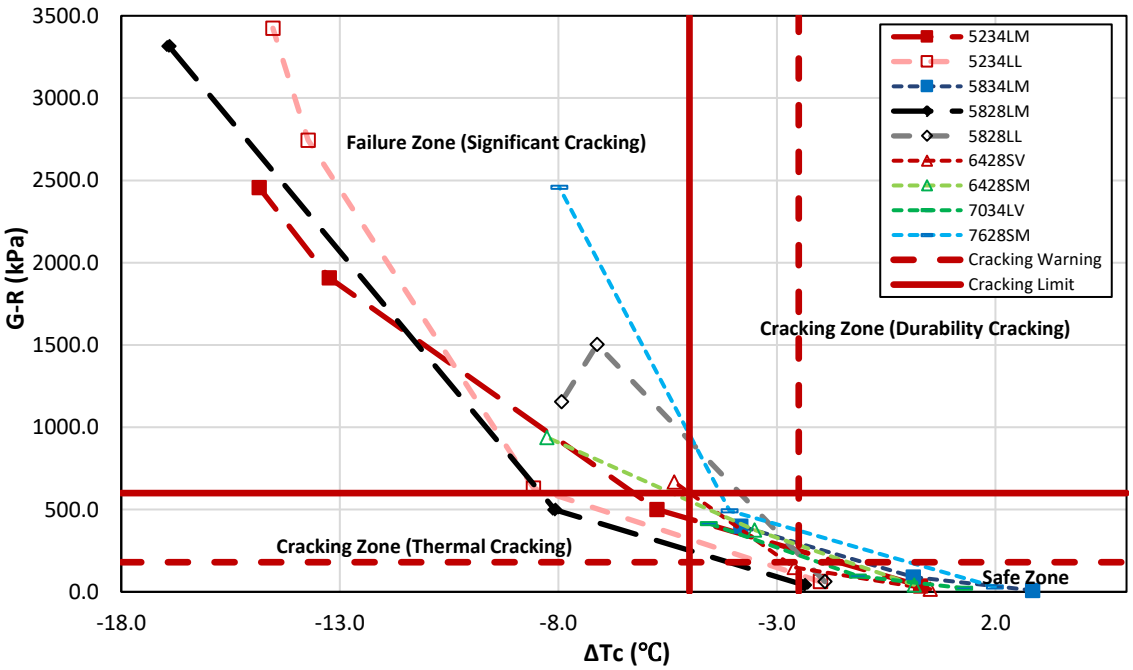


Figure 4.11 Combination of ΔTc and G-R Criteria

4.3 COMPARING MIXTURE AGING WITH BINDER 20 HR. PAV AGING

In this section, the 4mm DSR test results for the binder samples extracted from 5 mixtures (5834LM, 6428SV, 6428SM, 7034LV, and 7628SM) with three aging conditioning levels (STA, 5 days, and 12 days at 95°C) are compared with the results measured on the binders sampled during production and then RTFO and 20 hr. PAV aged. The effect of different aging conditioning methods (3 mixture aging levels, and RTFO/ PAV binder aging) on binder properties can be directly compared and evaluated using the two virgin mixtures (6428SV and 7034LV).

4.3.1 |G*| and Phase Angle

Complex shear modulus and phase angle mastercurves constructed from the 4mm DSR testing are presented as the average of three replicates for the binder samples extracted from the five mixtures, as well as the 20 hr. PAV samples (original without RAP) during production in Figures 4.9 and 4.10. Generally, complex modulus (stiffness) of the 20 hr. PAV samples is higher than the STA and lower than 5 days at 95°C aging level (6428SV after 20 hr. PAV is very close to 5 days aging), as shown in Figure 4.9. The phase angle (relaxation capability) of the 20 hr. PAV samples is generally higher than 5 days at 95°C aging level for binder 6428SV and 7034LV. Comparing with the 5 days aging condition, binder 5834LM, 6428SM, and 7628SM show higher phase angle in the high frequencies (higher than 10^{-2} Hz), however, lower phase angle in the low frequencies (lower than 10^{-2} Hz). One potential explanation is that these three binder samples were mixed with the recycled binders, resulting in the different behavior compared with the two virgin binders 6428SV, and 7034LV. Based on the observations from complex shear modulus and phase angle mastercurves, 20 hr. PAV binder aging condition does not simulate 5 days at 95°C aging on mixtures, thus cannot represent the long-term performance of the asphalt material.

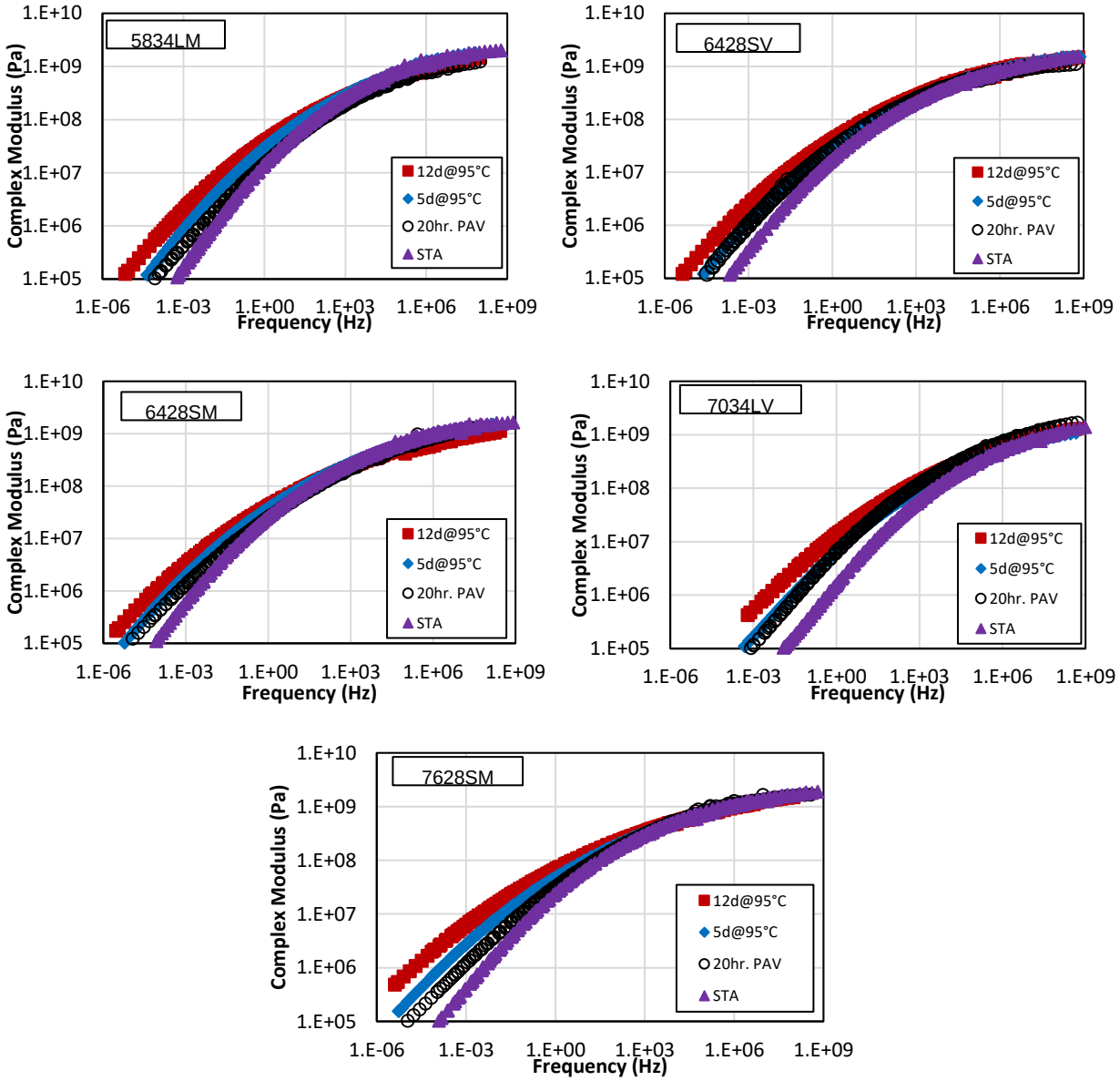


Figure 4.12 Comparison of the Complex Shear Modulus Master Curves between the Mixture Aging Conditions with 20hr. PAV (Reference Temperature: 10°C)

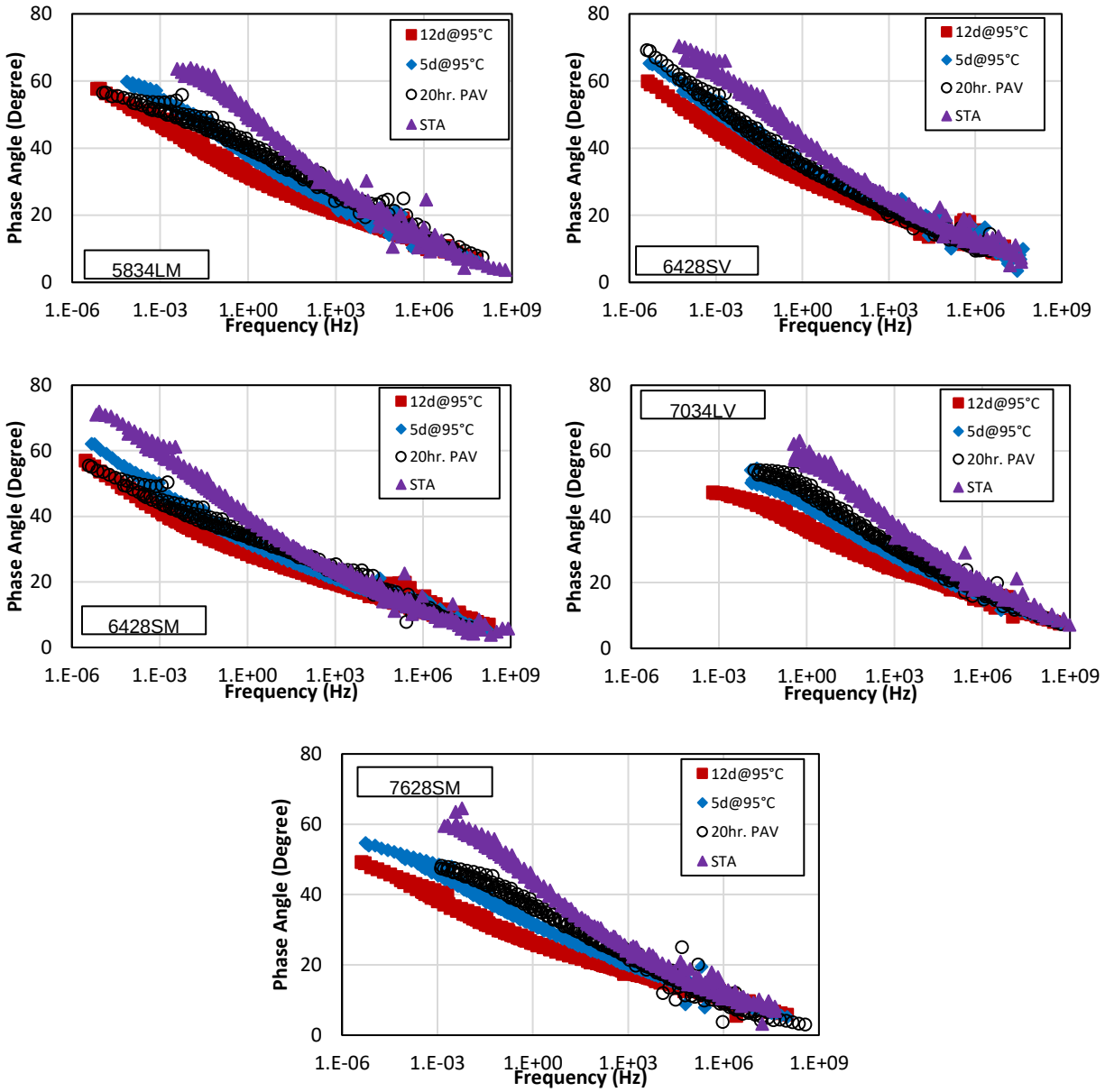


Figure 4.13 Comparison of the Phase Angle Master Curves between the Mixture Aging Conditions with 20hr. PAV (Reference Temperature: 10°C)

4.3.2 R-value

Figure 4.11 shows the average R-value for the binder samples extracted from the five mixtures, as well as the 20 hr. PAV samples. Error bars show one standard deviation. Generally, the R-value of the two virgin binders 6428SV and 7034LV after 20hr. PAV aging is lower than the 5 days at 95°C aging condition on mixture, while the R-value of binder 5834LM, 6428SM, and 7628SM after 5 days at 95°C aging condition is lower than those original binders with 20hr. PAV binder aging, likely due to the RAP in the mixture. Therefore, 20 hr. PAV binder aging condition is insufficient to simulate 5 days at 95°C aging on mixture based on the R-value observations.

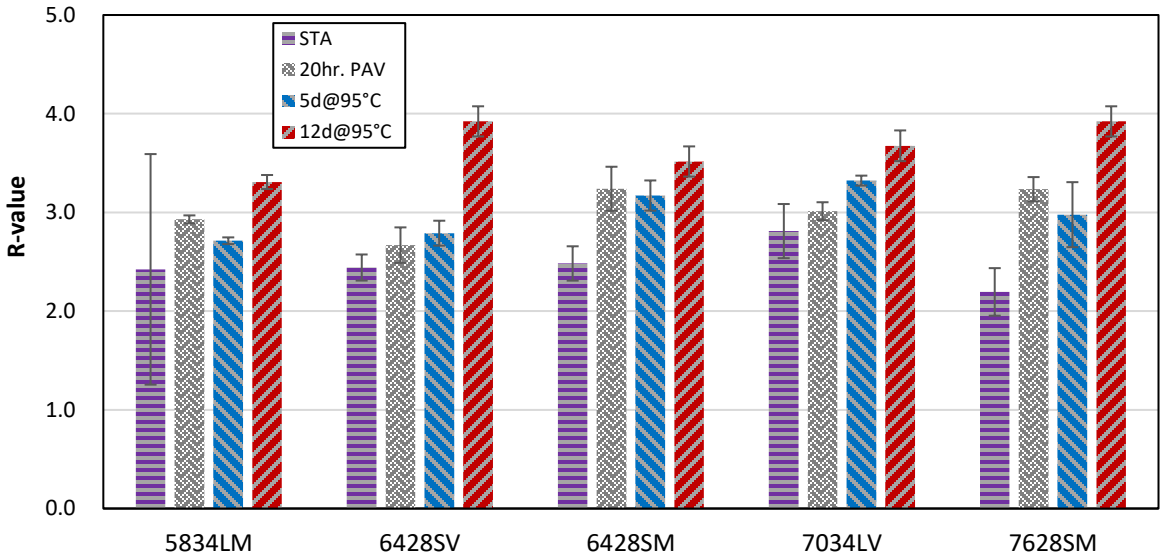


Figure 4.14 Comparison of the R-value between the Mixture Aging Conditions with 20hr. PAV

4.3.3 Different in Critical Cracking Temperatures for Creep Stiffness and Relaxation Parameters (ΔT_c)

Figure 4.12 shows the average ΔT_c for the binder samples extracted from the five mixtures, as well as the 20 hr. PAV samples. Error bars show one standard deviation. Similar to the result from complex shear modulus master curves and the R-value, ΔT_c of the 20 hr. PAV samples is higher than the STA but lower than 5 days at 95°C aging level for all five binders. And the ΔT_c value of the 20 hr. PAV samples is generally within the cracking warning limit (-2.5°C).

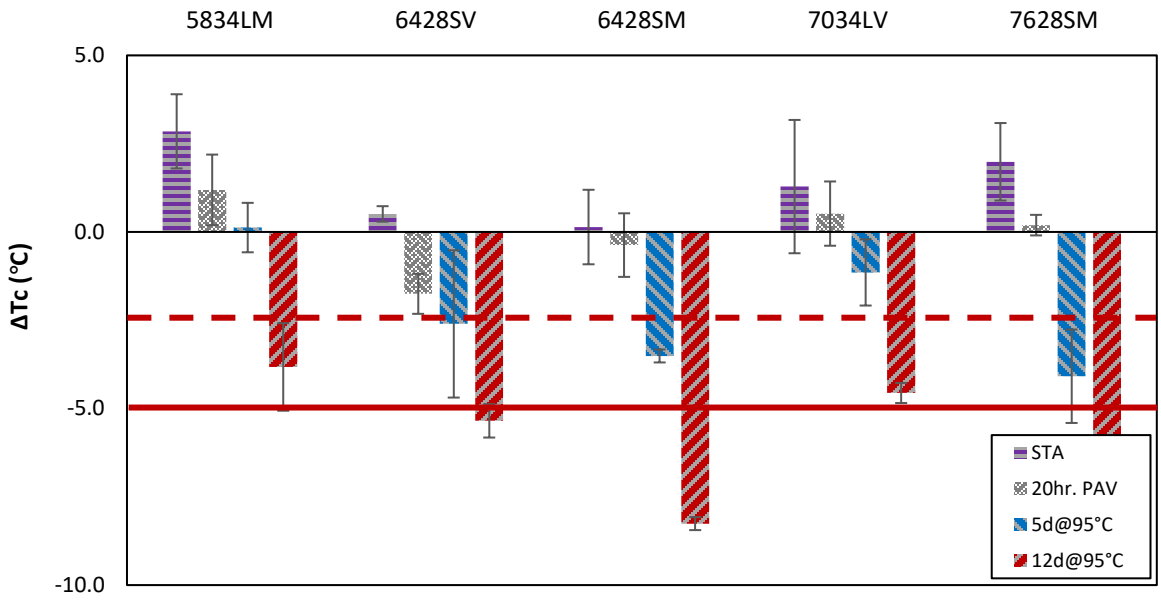


Figure 4.15 Comparison of the ΔTc Parameter between the Mixture Aging Conditions with 20hr. PAV

4.3.4 Glover-Rowe (G-R) Parameter

Figure 4.13 shows the average G-R parameter for the binder samples extracted from the five mixtures, as well as the 20 hr. PAV samples on the bar graph. Error bars show one standard deviation. Similar to the results above, the G-R parameter of the 20 hr. PAV samples is lower than 5 days at 95°C mixture aging conditioning for all binders except for 6428SM, indicating 20 hr. PAV binder aging condition is insufficient to simulate 5 days at 95°C aging on mixture. The G-R parameter for the original binders 6428SM and 7628SM after 20 hr. PAV aging exceeds the cracking warning value (180kPa), but is lower than the significant cracking limit (600kPa).

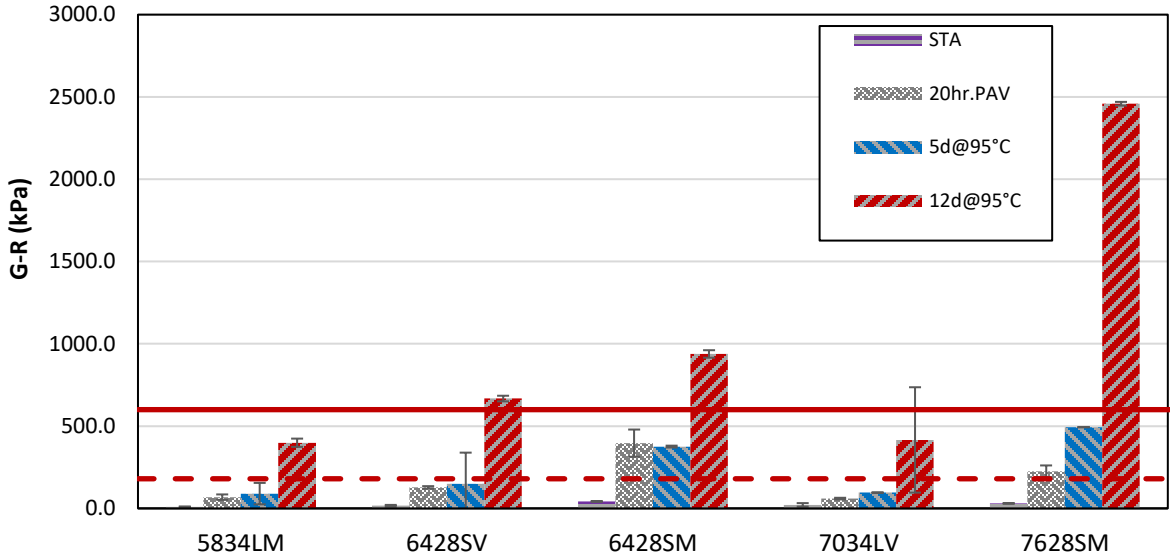


Figure 4.16 Comparison of the G-R Parameter between the Mixture Aging Conditions with 20hr. PAV

4.4 AGING GRADIENT (FIELD CORES)

In this section, the 4mm DSR test results for the binder samples extracted and recovered from the 4 Westmoreland mixtures (5234LM, 5234LL, 5828LM, and 5828LL) are compared with the results measured on binder samples extracted and recovered from corresponding field cores (three layers, as shown in Figure 2.1) from the Westmoreland projects.

4.4.1 |G*| and Phase Angle

Complex shear modulus and phase angle mastercurves constructed from the 4mm DSR testing are presented as the average of three replicates for the binder samples extracted from the four Westmoreland mixtures, as well as the field cores with three layers in Figures 4.14 and 4.15. Generally, complex modulus and phase angle of the binder samples extracted from the bottom layer (layer 3) are similar to the STA condition. The complex modulus of the binder samples extracted from the top layer (layer 1) is clearly higher than the STA condition but lower than 5 days aging, while phase angle is lower than STA but higher than 5 days aging. The complex modulus and phase angle of layer 2 is typically in between layer 1 and layer 3, indicating the aging gradient (not uniform) within the pavement structure in the field.

Another observation is that the difference in complex modulus and phase angle between the three layers are not the same for all four binders (5234LM, 5234LL, 5828LM, and 5828LL). It is well-known that the different factors, such as temperature gradient, air void distribution, and aging process change the aging gradient in field, and sometimes these factors act simultaneously. For example, aging depends on the interconnected air void distribution (Woo et al. 2008). The impact of air voids on aging can be clearly found on Figure 4.14. 5234LM and 5234LL show the relatively similar trend in increase of dynamic

modulus from layer 3 to layer 1, since the air voids of the samples got from the field cores of those two mixtures are comparable (shown in Table 2.3), while 5828LM and 5828LL are different because of the disparity in air voids. The difference observed from the complex modulus and phase angle mastercurves of the three layers reflects the complexity of the aging in field.

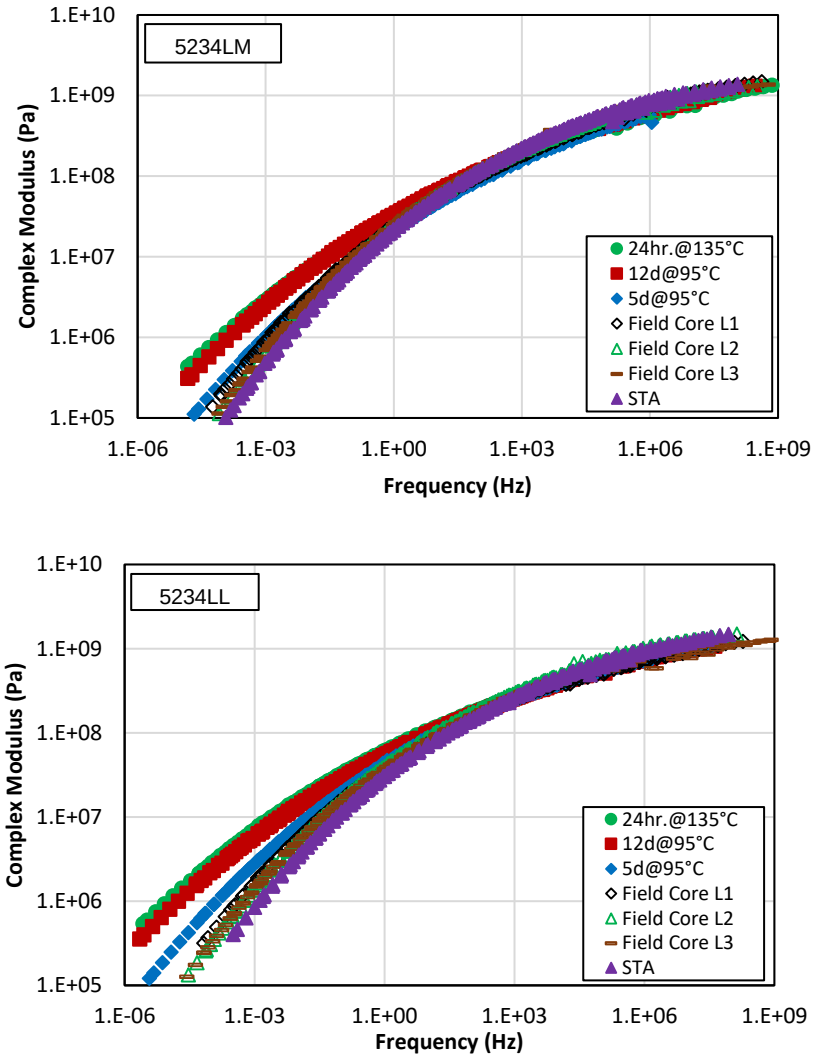
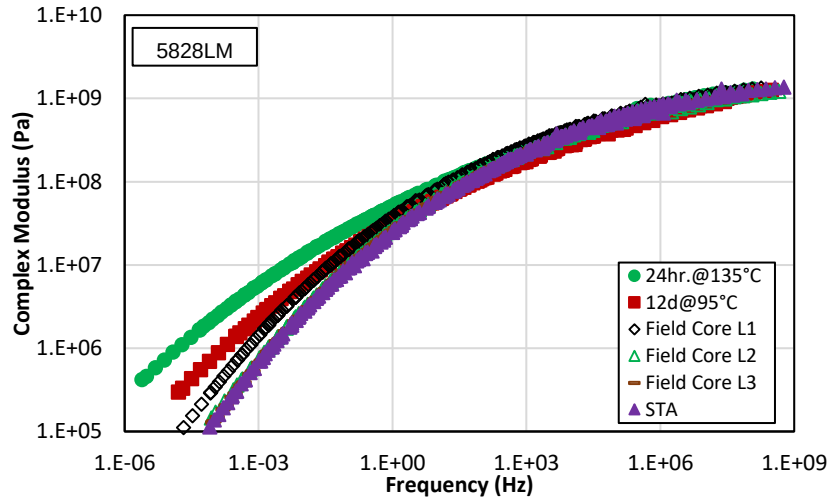


Figure 4.17 Comparison of the Complex Shear Modulus Master Curves between the Mixture Aging Conditions with Field Cores (Reference Temperature: 10°C)



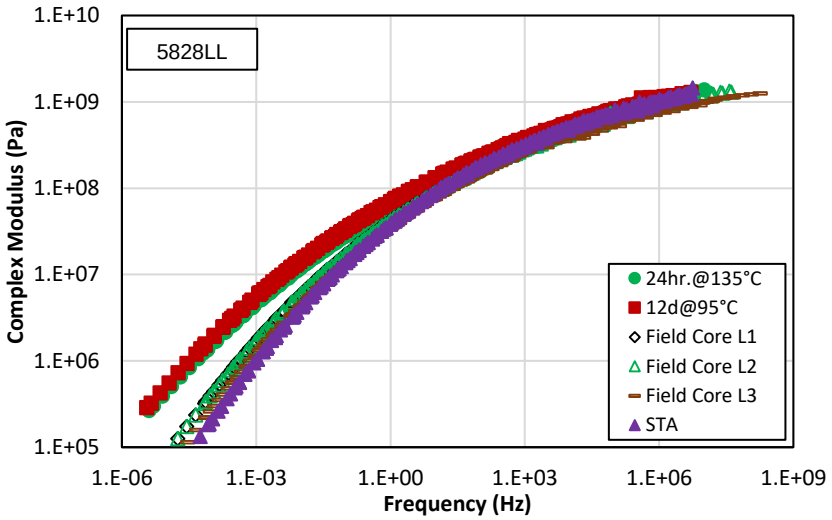


Figure 4.18 Comparison of the Complex Shear Modulus Master Curves between the Mixture Aging Conditions with Field Cores (Reference Temperature: 10°C) (Continued)

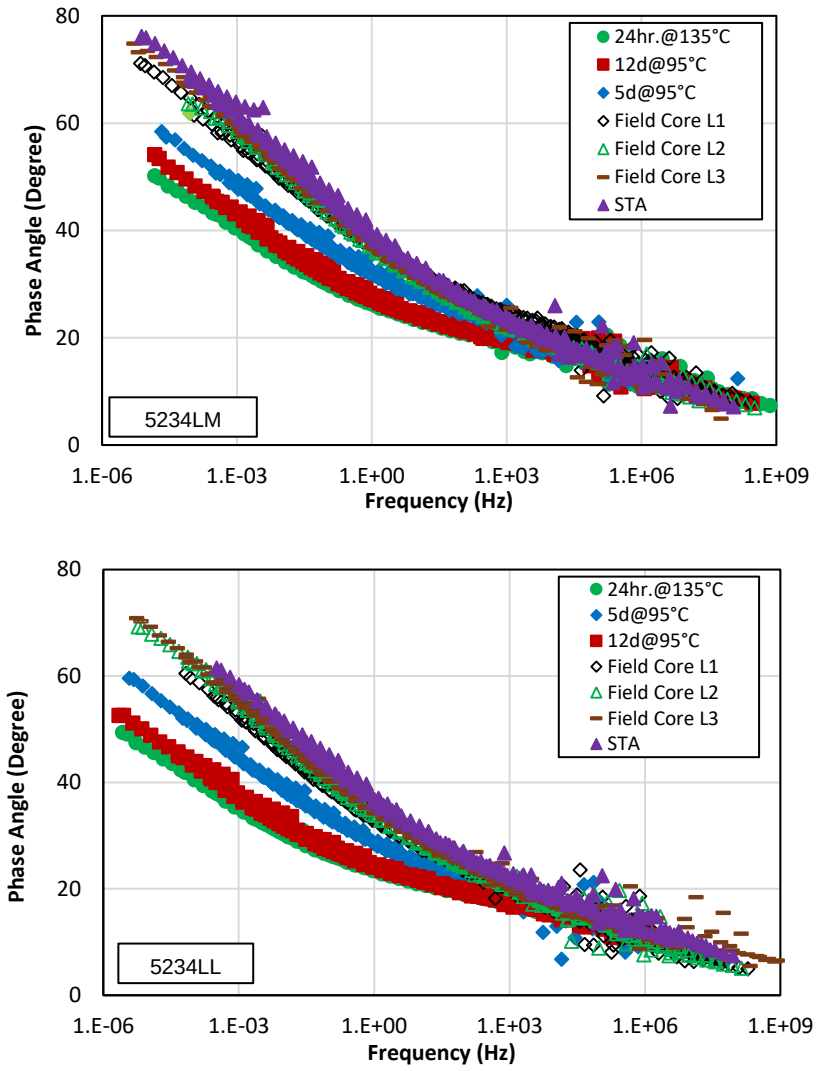


Figure 4.19 Comparison of the Phase Angle Master Curves between the Mixture Aging Conditions with Field Cores (Reference Temperature: 10°C)

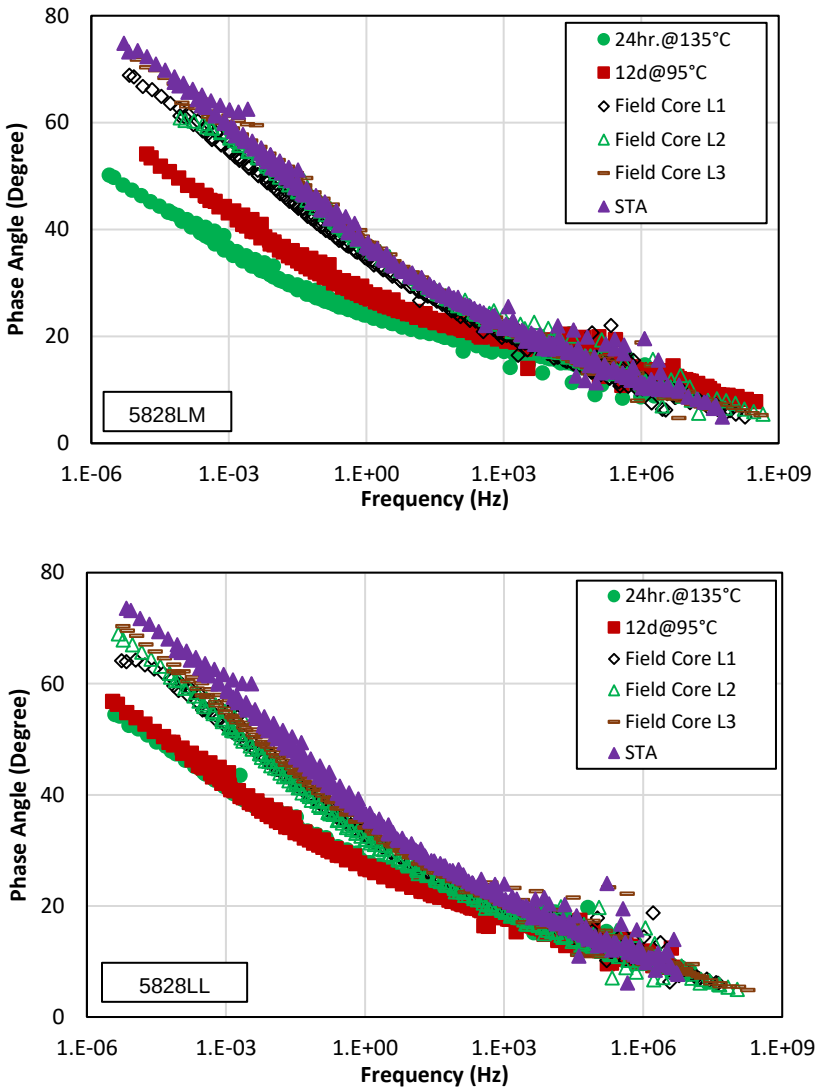


Figure 4.20 Comparison of the Phase Angle Master Curves between the Mixture Aging Conditions with Field Cores (Reference Temperature: 10°C) (Continued)

4.4.2 R-value

Figure 4.16 shows the average R-value for the binder samples extracted and recovered from the four Westmoreland mixtures, as well as the corresponding field cores. Error bars show one standard deviation. Generally, the R-value of the field cores with three layers is in between of STA and 5 days aging condition. And with increase of the pavement depth from layer 1 to layer 3, the R-value decreases, showing the aging gradient within the pavement structure in field.

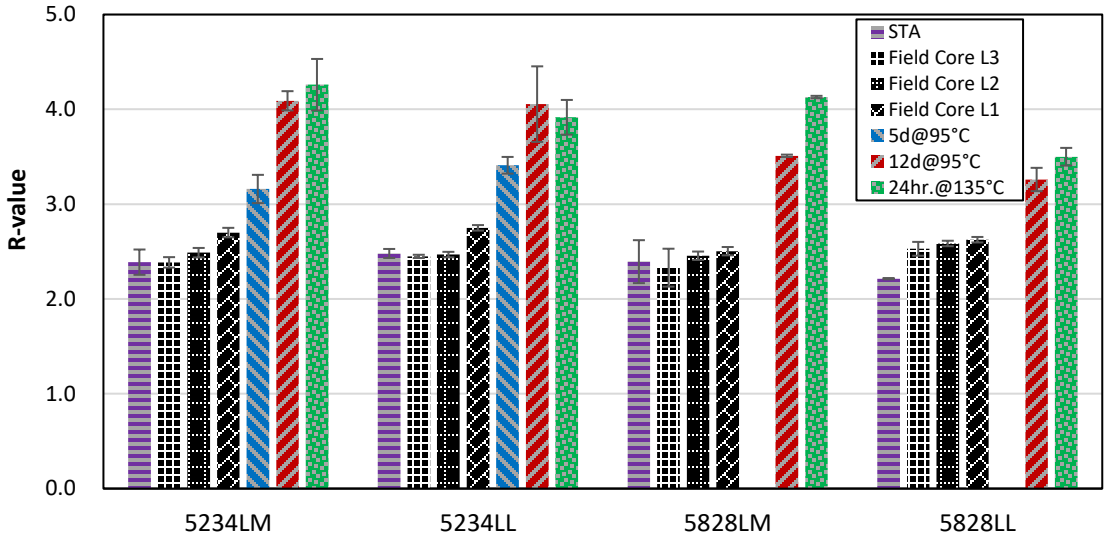


Figure 4.21 Comparison of the R-value between the Mixture Aging Conditions with Field Cores

4.4.3 Different in Critical Cracking Temperatures for Creep Stiffness and Relaxation Parameters (ΔTc)

Figure 4.17 shows the average ΔT_c for the binder samples extracted and recovered from four Westmoreland mixtures, as well as the corresponding field cores. Error bars show one standard deviation. Similar to the R-value results, the ΔT_c of the field cores with three layers is in between the STA and 5 days aging condition. The ΔT_c value for the layer 1 and layer 2 generally exceeds the cracking warning limit (-2.5°C), indicating the thermal cracking potential of the top layers. With increase of the pavement depth from layer 1 to layer 3, ΔT_c increases, showing the aging gradient within the pavement structure in field. The ΔT_c value of the layer 1 for binder 5234LL exceeds the cracking limit (-5.0 °C).

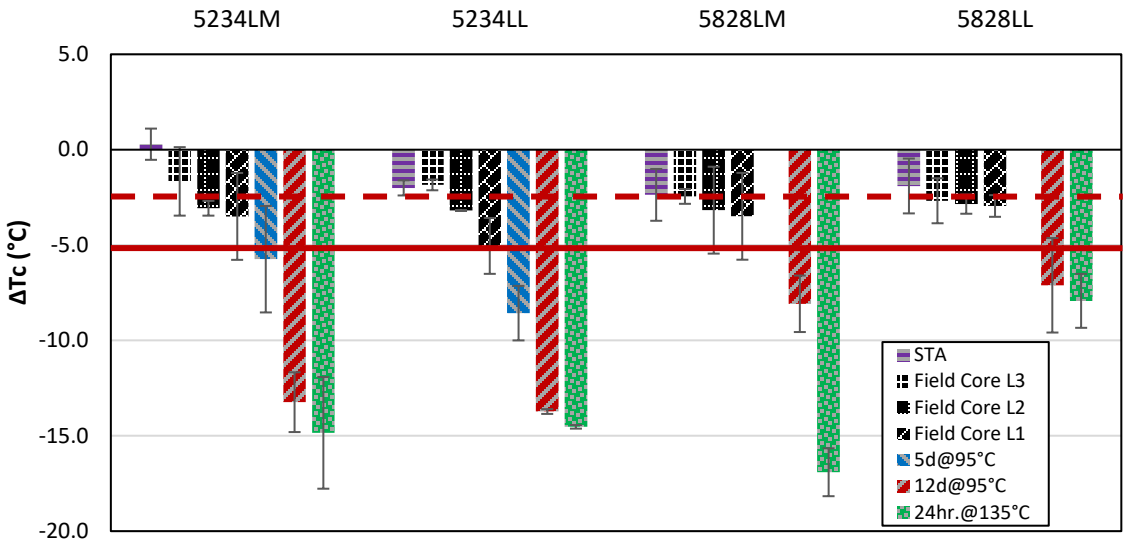


Figure 4.22 Comparison of the ΔTc between the Mixture Aging Conditions with Field Cores

4.4.4 Glover-Rowe (G-R) Parameter

Figure 4.18 shows the average G-R parameter for the binder samples extracted and recovered from four Westmoreland mixtures, as well as the corresponding field cores. Error bars show one standard deviation. The G-R parameter of the field cores with three layers is in between STA and 5 days aging condition. With increase of the pavement depth from layer 1 to layer 3, G-R parameter decreases, showing the aging gradient within the pavement structure in field. The G-R parameter for the top layer of 5234LL and 5828LL exceeds the cracking warning limit (180kPa), indicating durability cracking (non-load associated) potential for the top layer.

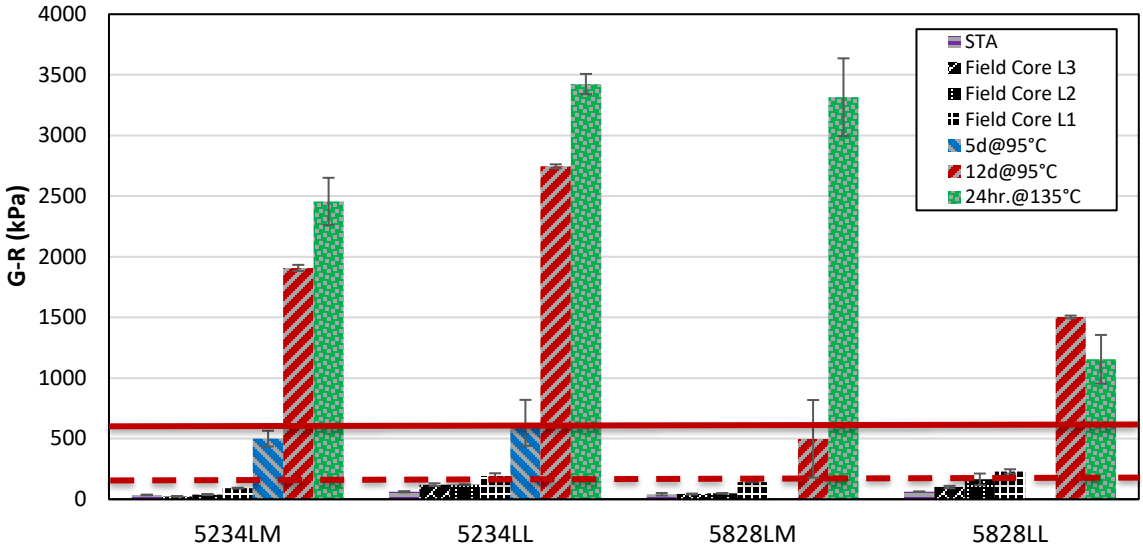


Figure 4.23 Comparison of the G-R Parameter between the Mixture Aging Conditions with Field Cores

4.4.5 Change of Glover-Rowe (G-R) Parameter with Depth

Figure 4.19 below shows how the binder Glover-Rowe (G-R) parameter changes with pavement depth for the binder samples extracted from the field cores (three layers) for the four Westmoreland mixtures. The middle point of each layer (6.35mm for layer 1; 19.05mm for layer 2;31.75mm for layer 3) is selected as the representative depth to reflect the performance of each layer. Previous studies (Luo et al., 2015; Koohi et al., 2012) have shown that below 50mm from the surface, asphalt material does not age significantly. Therefore, 60mm is selected as the representative depth to represent the behavior of asphalt layers below 50mm, indicating there is no aging experienced for the asphalt material below this depth after STA (during production), as shown in Figure 4.19.

The two materials with higher RAP content (5234LL and 5828LL) generally have higher G-R parameter at each depth. And the G-R parameter for the top layer of these two binders exceeds the cracking warning value (180kPa). Comparing the G-R parameter for the three layers, the rate of field aging within the first inch of the pavement is much faster than the layers below it. This conclusion can be used for the future maintenance and rehabilitation of the pavement to address the distresses caused by aging, such as thermal and top-down cracking.

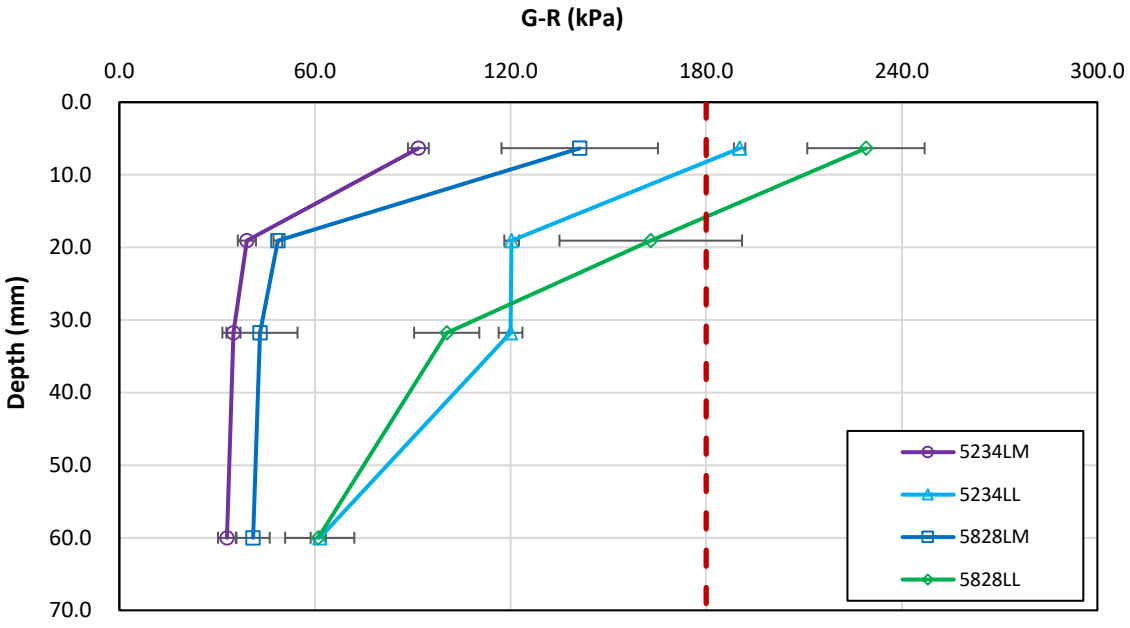


Figure 4.24 Change of Glover-Rowe (G-R) Parameter with Pavement Depth

4.5 SUMMARY

In this chapter, the results of the 4mm DSR testing on binder samples extracted from the aged mixtures and field cores are presented. The rheological properties, including the complex shear modulus (|G*|) and phase angle (δ) mastercurves, critical temperature determined by creep stiffness (S) and relaxation rate (m) value, low temperature performance grade (PGLT), R-value, difference in critical cracking temperatures for creep stiffness and relaxation rate (ΔT_c), and the binder Glover-Rowe (G-R) parameter are evaluated and compared for the binders with different aging conditions. Also, the aging gradient and the comparison between the mixture aging protocols with binder 20hr. PAV aging are evaluated and investigated in this chapter.

- As asphalt binders age, the linear viscoelastic characteristics change with an increase of complex shear modulus and decrease in phase angle. The linear viscoelastic properties of binders with 24 hr. at 135°C and 12 days at 95°C aging are statistically similar.
- With increase of aging condition, the rheological indices of asphalt binders, PGLT, R-value, and G-R parameter increase, while ΔTc decreases. The two virgin mixtures show good cracking performance at each aging condition. The two mixtures with the softer PGLT (5234LM and 5234LL) and that with the largest difference between PGHT and PGLT (7628SM) show higher aging susceptibility.
- The 20 hours PAV binder conditioning protocol generally produces less aging of the asphalt material than 5 days at 95°C mixture conditioning method.
- The binder samples extracted from the field cores illustrate the aging gradient in field, with the top layers (1") aged the most.

Chapter 3 shows that the 5 days at 95°C laboratory aging condition appears to simulate approximately four years of field aging for the surface mixtures in NH, while 12 days at 95°C laboratory aging simulates 9.6 years of field aging, based on the measured linear viscoelastic properties of mixtures from complex modulus testing. However, in this chapter, based on the rheological indices of binders measured from the 4mm DSR test, the 5 days at 95°C laboratory aging condition appears to simulate more than 4 years' field aging. There are some reasons to explain the difference: the extraction process may change the binder characteristics because of the remaining solvent (Huang and Grimes 2010; Molenaar et al. 2010; Lee et al. 2008&2009), the Fourier-transform Infrared Spectroscopy (FTIR) test can be used to detect the chemical composition of the extracted binders; the binder test does not take account the differences in air void of the field cores or damage from traffic that may have occurred. Finally, extracted binders represent fully blended conditions between virgin and recycled binders.

4.6 REFERENCES

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CHAPTER 5: COMPARISON BETWEEN MIXTURE PERFORMANCE INDICES AND BINDER RHEOLOGICAL PARAMETERS

The Pearson correlation factor (matrix) is used to investigate the correlation between the mixture performance indices and binder rheological parameters. The correlation factor shows the strength of linear relationship between each pair of parameters; a correlation factor of 1 indicates a perfect direct linear relationship and a correlation factor of -1 indicates a perfect inverse linear relationship. A value of zero indicates no relationship between two variables. The Pearson correlation factors for the comparison are presented in Table 5.1. Values above an absolute value of 0.7 are shaded green indicating the relatively strong correlation between the two parameters, those between 0.4 and 0.7 are shaded blue showing the moderate correlations, and those below 0.4 (weak correlation) are not shaded with color (Lane, et al., 2003).

FI shows strong correlation with G-R_m and FST while the D_R only has moderate correlations with other mixture performance parameters. The G_f from SCB does not correlate well with other parameters. The binder G-R parameter shows strong correlation with both PGLT and ΔT_c, indicating the possibility of using G-R as a parameter to indicate thermal cracking susceptibility. All four binder rheological indices show moderate to strong correlations with each other and all the shape parameters are strongly correlated.

Comparing the mixture performance indices with the binder rheological parameters, the G-R_m parameter shows moderate to strong correlations with all four binder rheological indices; FI value also correlates well with the binder rheological indices, but the correlations are not strong as the G-R_m parameter. The FST only shows a strong correlation with PGLT while the fatigue performance index D^R generally doesn't correlate well with the binder rheological indices. The mixture mastercurve shape parameters correlate well with the mixture G-R_m parameter and binder R value.

Another interesting observation is that the binder rheological indices G-R parameter, PGLT and ΔTc generally show the moderate to strong correlations with G-R_m, FI, and FST, which are generally used as the cracking performance indices for asphalt mixtures, indicating the possibility of using the binder test to evaluate the mixture performance (cracking), taking aging into account.

In conclusion, the mixture G-R_m parameter has moderate to strong correlations with many of the mixture and binder parameters indicating that it has the potential to be used as a simplified index to evaluate and differentiate the performance of asphalt mixtures with different variables in general, while taking aging into account. The binder G-R parameter shows strong correlation with both PGLT and ΔTc, indicating the possibility of using G-R as a parameter to indicate thermal cracking susceptibility of binders. However, none of the rheological indices measured from the 4mm DSR binder test correlate well with the mixture fatigue performance index D^R, indicating that the 4mm binder test cannot capture the fatigue behavior of different asphalt mixtures over time.

The fairly good correlations between the binder rheological indices and the mixture performance parameters evaluated in this study are building upon the aging of the mixtures on the loose state, which

provides the uniform aging of the mixtures and binders, and takes account of the mineralogy and part of the volumetrics, such as the binder content, percentage of RAP, and the thickness of the binder film.

Table 5.1 Comparisons and Correlations between the Mixture Performance Indices and Binder Rheological Parameters

		Mixture Performance Indices						Binder Rheological Parameters				Shape Parameters of Mixture Mastercurves			
		$G\text{-}R_m$	G_f SCB	FI	G_f DCT	FST	D^R	PGLT	ΔTc	R	G-R	γ	-β/γ	a	c
Mixture Performance Indices	$G\text{-}R_m$	1.000													
	G_f SCB	-0.141	1.000												
	FI	-0.720	0.227	1.000											
	G_f DCT	0.527	0.194	-0.618	1.000										
	FST	-0.530	0.301	0.851	-0.172	1.000									
	D^R	-0.523	-0.216	0.495	-0.582	0.211	1.000								
Binder Rheological Parameters	PGLT	0.727	-0.381	-0.712	0.178	-0.754	-0.012	1.000							
	ΔTc	-0.755	0.494	0.675	-0.222	0.687	-0.082	-0.916	1.000						
	R	0.663	-0.090	-0.530	0.670	-0.316	-0.419	0.561	-0.628	1.000					
	G-R	0.626	-0.323	-0.493	0.124	-0.551	0.052	0.904	-0.839	0.622	1.000				
Shape Parameters of Mixture Mastercurves	γ	0.725	-0.263	-0.664	0.631	-0.409	-0.388	0.507	-0.572	0.693	0.469	1.000			
	-β/γ	-0.661	0.387	0.554	-0.463	0.341	0.258	-0.482	0.563	-0.554	-0.409	-0.903	1.000		
	a	-0.723	0.078	0.587	-0.655	0.285	0.528	-0.560	0.620	-0.802	-0.622	-0.842	0.712	1.000	
	c	-0.723	0.297	0.635	-0.566	0.414	0.272	-0.566	0.674	-0.733	-0.527	-0.916	0.894	0.781	1.000

CHAPTER 6: GUIDANCE FOR MATERIAL SELECTION AND MIX DESIGN AND FUTURE WORK

Based on the testing and evaluation conducted in this study, some mixtures and binders show good cracking performance immediately after production (STA condition), but have a higher impact from aging compared with other mixtures, resulting in greater cracking susceptibility long term (LTOA condition). The presence of RAP and the binders with the large difference between PGHT and PGLT (>100°C) were shown to impact the aging process and the resulting cracking performance of the asphalt binders and mixtures. Therefore, in order to capture the long-term performance of asphalt binders and mixtures and to comprehensively compare the different performance of the asphalt materials, it is important to incorporate the effects of aging into material selection and mixture design (i.e. in an agency's material specifications), which is the primary objective for this project. Based on the findings discussed in previous chapters, Chapter 6 provides suggestions and guidance for NHDOT to quantitatively evaluate the aging and cracking susceptibility of asphalt binders and mixtures during material selection and mixture design.

6.1 GUIDANCE FOR BINDER SELECTION

6.1.1 Binder Aging Protocol

NHDOT presently relies upon the performance grading of the binder to ensure the appropriate selection of materials to resist cracking in the field. However, the result of binder tests evaluated in this study indicates that the standard 20 hr. PAV aging for binders may be not sufficient to simulate even four years of field aging, thus cannot represent the long-term performance of the asphalt materials. Therefore, it is recommended that a more extensive and/or different aging protocol be used to differentiate expected long term cracking performance of binders.

Recent research (e.g. Wright et al. 2011; Erskine et al., 2012) has recommended that 40 hr. PAV be used to capture the aging and long-term cracking susceptibility during material selection and mix design. The EBBR protocol, which accounts for the reduction in the resistance to thermal cracking of asphalt binders due to extended periods of conditioning at test temperatures, also shows promise in distinguishing the performance of NH materials. Four (5828SM, 6428SV, 6428SM, and 6428LM sampled during production) of the seven tested binder samples evaluated in this project do not meet the required PGLT after EBBR conditioning and testing.

6.1.2 Binder Test Methods

Rheological characterization of the binder is important and can be accomplished using different test methods. As discussed in chapter 4, the results measured from 4 mm DSR testing conducted by UNH show good consistency with the BBR testing conducted by NHDOT. The PGLT and ΔT_c parameters measured from those two tests correlate well with mixture low temperature performance indices evaluated in this project, thus, either test can be used for selection of binders with respect to low temperature cracking performance.

Performing DSR testing over a wide range of temperatures (PGLT to intermediate temperature) and frequencies (100 rad/sec to 0.2 rad/sec) and at different aging conditions does have advantages in terms of the analysis that can be performed. Various rheological parameters, including complex shear modulus (|G*|) and phase angle (δ) mastercurves, critical temperature determined by creep stiffness (S) and relaxation rate (m) value, low temperature performance grade (PGLT), R-value, difference in critical cracking temperatures for creep stiffness and relaxation rate (ΔT_c), and the binder Glover-Rowe (G-R) parameter can be measured from only one set of tests using a single piece of equipment.

The G-R parameter is generally used to evaluate the durability performance of asphalt binders. The PGLT and ΔT_c can be used to evaluate the thermal cracking susceptibility of the binders. Higher R-value can also lead to the higher cracking potential. By employing different binder rheological parameters, the aging and cracking susceptibility of different binders can be quantitatively evaluated and investigated. As shown in Chapter 5, the binder rheological parameters correlate well with the mixture performance indices, thus, can be used to reliably screen materials with respect to expected performance of mixtures. Table 6.1 below shows the general threshold values for the typical rheological parameters to control the cracking potential of the asphalt material.

Table 6.1 General Threshold Values for Binder Rheological Indices

Rheological Indices	Cracking Warning	Cracking Limit
Glover-Rowe (G-R)	180kPa	600kPa
ΔTc	-2.5°C	-5.0°C

The binders with low PGLT (-34°C) and those with a large (>100°C) difference between PGHT and PGLT generally had higher susceptibility to aging even though they had good cracking resistance at the STA condition; these materials need to be carefully evaluated and investigated before design of the mix. Multiple aging levels are recommended to fully capture how the performance of those binders change over their designed service life (King et al. 2012; Hanson et al. 2010).

However, the rheological indices measured from the DSR test don't correlate well with the mixture fatigue performance parameter (as discussed in chapter 5), indicating that the binder DSR test cannot capture the fatigue behavior of asphalt mixtures over time. From this perspective, the mixture fatigue testing (direct tension cyclic fatigue test evaluated in this project) should be included to specifically evaluate the fatigue performance of the designed mixtures at this point. The Linear Amplitude Sweep (LAS) test to evaluate the fatigue performance of binders could be investigated for inclusion in material selection, design, and quality assurance in the future.

6.2 GUIDANCE FOR MIXTURE SELECTION AND DESIGN

Research, including that presented in this study, has shown the importance of evaluating mixture properties to include the effect of aggregate structure and mineralogy as well as interactions between recycled binder and virgin binder on cracking performance; this is currently not part of the NHDOT specification.

6.2.1 Laboratory Conditioning Protocol

To capture the long-term performance of the asphalt mixtures and binders, laboratory conditioning methods are used to simulate the physical and chemical changes that occur in the field over the service life of the pavement. Conditioning of loose mixtures at different temperatures and times were evaluated in this study (24hrs @135°C; 1, 3, 5, 8, 10, and 12 days @ 95°C) based on recommendations from recent studies.

For rheological characterization of the mixtures, the 24 hrs @135°C and the 12 days @ 95°C, produced statistically similar results for all of the NH mixtures. Therefore, the shorter conditioning time (24 hrs @135°C) can be used for the fabrication of complex modulus test specimens. However, the two long term aging protocols produce different results for fatigue and fracture tests. The NCHRP 09-54 project proposed an optimal conditioning temperature of 95°C by considering the relationship between binder rheology and chemistry (Kim et al., 2018). Therefore, the 95°C conditioning temperature is recommended for the evaluation of fatigue and fracture properties of mixtures.

The appropriate conditioning time is determined based on the desired equivalent field aging duration using the CAI calculation (described in section 3.1). Table 6.2 below summarizes the lab aging durations corresponding with different field aging durations from the CAI calculation. It should be mentioned that the CAI calculation was based on the comparison of the linear viscoelastic properties between lab aged and fabricated samples with field cores without air void adjustment. Research on air void adjustments for measured properties in future will improve the CAI calculation results.

Table 6.2 Lab Aging Durations Corresponding to Field Aging Durations from CAI Calculation

Field Aging Duration (year)	4	6	8	10	12	14	16	18	20
Lab Aging Duration(hr.@95°C)	120	180	235	295	360	420	475	535	600

6.2.2 Mixture Aging Model

Mixtures with different variables (RAP content, binder grade and range) exhibit disparate aging and cracking susceptibility over time. Therefore, a mixture aging model was developed for use as a screening tool for the selection and design of mixtures (the detailed calibration of the aging model was documented in section 3.4). The salient features of the mixture aging model are:

- The mixture aging model takes into account mixture variables and efficiently captures the two aging (fast and consistent) reaction periods.
- The three model coefficients (M, R_s, and R_l) can be used to quantitatively evaluate and differentiate the aging susceptibility of different asphalt mixtures with respect to a specific performance parameter.
- To calibrate the model, three aging conditions are sufficient: STA, one intermediate aging condition

and another long-term aging condition selected from Table 6.2 based on specific project or desired evaluation periods. The selection of 5 days (intermediate) and 12 days (long-term) at 95°C worked well for the project materials.

By combining the mixture aging model with the CAI model developed from the NCHRP 09-54 project, the cracking performance of the mixtures can be quantitatively evaluated and predicted throughout the service life.

In this study, G-R_m was shown to have moderate to strong correlations with many of the mixture performance indices (as described in Chapter 5), indicating that it has the potential to be used to differentiate the performance of asphalt mixtures with different variables in general. Therefore, the G-R_m parameter was used to develop the mixture aging model. Suggested threshold values to minimize cracking potential from the NCHRP 09-58 project are shown in Table 6.3. Field cores (four years) from Westmoreland project indicates the LTOA threshold value works well, since the G-R_m parameter measured from the field cores is around 9,500-12,000 MPa (below the threshold value of LTOA), and the pavement is in very good condition (few cracks are detected). These threshold values can be further validated/improved for NH materials and conditions.

Table 6.3 Threshold Values Suggested by NCHRP 09-58 Project

Cracking Limit	STA	LTOA
Mixture G-R_m Parameter	8,000MPa	19,000MPa

Although the linear viscoelastic G-R_m parameter shows moderate to strong correlations with fracture indices, it does not actually represent the fracture behavior of the material when cracking initiates and begins to propagate. Therefore, fracture tests are recommended for mixtures that do not meet the G-R_m threshold values, those susceptible to cracking or extensive aging (e.g. high RAP amounts), and for specialty materials.

Rheological characterization is insufficient to capture the fatigue behavior of mixtures. Fatigue performance evaluation needs to include the fatigue characteristics of the mixture as well as the pavement structure, climactic, and traffic conditions. Advanced pavement evaluation models (e.g. FlexPAVE™) are recommended for the evaluation of fatigue performance at this time.

6.3 FUTURE WORK

This section summarizes recommendations for future work to further develop and refine the recommendations presented above based on the testing and analysis conducted in this project.

Asphalt Binder Evaluation

- Appropriate binder aging/conditioning protocols to simulate long term field performance and allow for screening of binders need to be further explored. In particular, longer PAV times and the EBBR

protocols should be explored to quantify the equivalent field aging levels.

- Threshold values for the various rheological parameters need to be developed or verified for NH materials and conditions.
- Additional tests that evaluate the materials beyond the linear viscoelastic response (e.g. the Linear Amplitude Sweep (LAS) test to evaluate the fatigue performance of binders) should be investigated for inclusion in material selection, design, and quality assurance.

Asphalt Mixture Evaluation

- Continued collection of field performance data for the study mixtures to allow for further development, calibration, and verification of threshold values for laboratory measured performance indices.
- Periodic sampling of field cores for study mixtures and additional projects to refine the aging model with time and better define the aging gradient with depth.
- Research on air void adjustments for measured properties to better evaluate and compare the properties between field cores with lab aged and fabricated samples.
- Use of advanced mechanic-based models to predict the performance of asphalt mixtures with respect to various distresses over their service life, considering pavement structure, climate, and traffic conditions.

6.4 REFERENCES

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APPENDIX A MIXTURE TEST RESULTS

COMPLEX MODULUS TEST

Dynamic Modulus and Phase Angle

Table A.1 Dynamic Modulus and Phase Angle Values for Mixture 5234LM

STA			5day@95°C			12days@95°C			24hr.@135°C			Field Core		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
14.126	2356.503	28.980	44.780	6610.884	15.014	68.022	7829.444	12.160	14.285	7217.599	14.158	108.097	7884.496	17.951
70.630	3726.041	25.547	223.899	8232.908	12.609	340.108	9354.323	10.154	71.425	8861.269	12.610	540.483	9857.045	14.778
141.259	4443.779	24.004	447.799	9021.183	11.902	680.217	10015.859	9.661	142.850	9591.239	11.830	1080.965	10698.226	14.173
706.297	6572.610	20.330	2238.994	10870.437	10.818	3401.083	11672.214	9.172	714.250	11631.085	11.004	5404.827	12979.863	13.451
1412.593	7592.780	19.267	4477.989	11815.566	10.204	6802.167	12416.288	9.013	1428.499	12493.545	11.025	10809.653	13952.882	11.437
3531.483	8991.103	17.306	11194.972	12938.602	8.647	17005.416	13555.608	7.934	3571.248	13806.742	8.986	27024.133	16076.545	20.653
0.100	494.766	27.963	0.100	1613.563	26.819	0.100	2402.155	21.824	0.100	2322.283	24.689	0.326	1751.868	29.814
0.500	759.345	29.941	0.500	2452.565	23.450	0.500	3364.669	18.543	0.500	3363.005	21.453	1.632	3407.536	23.706
1.000	930.261	32.221	1.000	2839.331	22.139	1.000	3820.366	17.676	1.000	3861.217	20.782	3.265	3758.258	24.860
5.000	1593.312	32.753	5.000	4064.296	19.550	5.000	5109.873	15.668	5.000	5328.461	18.265	16.323	5409.806	16.760
10.000	1988.794	32.891	10.000	4680.278	18.822	10.000	5705.305	15.035	10.000	6053.792	17.298	32.646	6128.507	18.553
25.000	2665.427	33.213	25.000	5556.447	17.815	25.000	6533.912	13.994	25.000	7123.623	15.636	81.614	7263.918	12.563
0.002	206.050	18.414	0.001	403.986	30.179	0.001	595.832	30.854	0.001	615.981	32.735	0.009	827.176	33.709
0.009	296.408	21.801	0.004	635.746	29.511	0.003	937.284	27.759	0.003	956.545	30.330	0.045	1307.034	27.924
0.017	321.858	24.752	0.009	758.520	30.029	0.006	1120.061	27.173	0.007	1125.921	30.715	0.091	1485.472	28.225
0.087	459.775	29.422	0.043	1223.223	29.668	0.032	1701.378	25.364	0.033	1712.605	28.894	0.455	2187.560	25.596
0.174	550.043	32.100	0.086	1489.542	29.211	0.063	2023.564	24.522	0.066	2050.395	27.870	0.910	2569.492	26.949
0.435	726.250	36.016	0.214	1926.829	26.944	0.158	2514.884	24.050	0.166	2562.104	23.812	2.275	3159.081	26.409

Table A.2 Dynamic Modulus and Phase Angle Values for Mixture 5234LL

STA			5day@95°C			12days@95°C			24hr.@135°C			Field Core		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
0.002	218.646	22.500	56.493	6804.724	15.591	96.080	9643.049	10.805	42.962	7831.164	10.658	99.282	7287.434	17.951
0.008	293.753	25.450	282.465	8548.244	12.644	480.402	11254.961	9.515	214.808	9188.630	9.202	496.412	9126.126	14.778
0.016	338.227	28.850	564.929	9357.118	11.932	960.804	12085.016	8.704	429.616	9782.344	8.577	992.824	9964.849	14.173
0.082	559.676	34.800	2824.646	11407.479	10.789	4804.020	13995.128	8.295	2148.079	11323.466	8.266	4964.121	11989.512	13.451
0.100	605.732	34.850	5649.292	12248.608	10.292	9608.041	14735.120	8.084	4296.158	11957.349	8.030	9928.242	12834.234	11.437
0.164	704.290	35.600	14123.229	13445.910	10.000	24020.102	15939.753	7.500	10740.396	12915.714	7.951	24820.604	13976.874	20.653
0.409	971.878	39.625	0.100	1629.653	27.917	0.100	2884.042	21.137	0.100	2668.169	19.827	0.281	2216.456	29.814
0.500	1045.825	34.650	0.500	2475.419	24.080	0.500	3950.354	17.380	0.500	3606.245	16.928	1.404	3116.023	23.706
1.000	1300.151	35.350	1.000	2930.802	22.891	1.000	4478.002	16.209	1.000	4053.603	16.334	2.809	3515.409	24.860
5.000	2247.840	34.450	5.000	4220.569	20.238	5.000	5854.955	14.440	5.000	5253.389	14.327	14.044	4845.947	16.760
10.000	2764.444	33.600	10.000	4885.949	18.991	10.000	6521.848	14.292	10.000	5823.281	14.012	28.088	5523.423	18.553
18.600	3429.828	31.700	25.000	5850.556	17.816	25.000	7427.819	12.203	25.000	6605.642	12.858	70.221	6508.164	12.563
25.000	3702.367	29.625	0.001	383.732	29.481	0.001	775.010	29.327	0.001	718.234	27.716	0.008	858.304	33.709
93.000	5482.207	26.800	0.004	607.262	29.489	0.003	1195.561	26.240	0.003	1100.005	25.062	0.042	1341.947	27.924
186.001	6235.612	25.800	0.008	734.401	30.176	0.005	1414.607	25.981	0.007	1291.579	24.343	0.083	1480.938	28.225
930.004	8892.791	23.100	0.038	1190.970	29.711	0.025	2108.012	23.310	0.033	1922.075	22.589	0.415	2141.626	25.596
1860.008	9892.460	20.800	0.076	1460.073	29.431	0.050	2467.381	22.620	0.066	2247.556	21.734	0.831	2483.807	26.949
4650.019	11109.701	12.375	0.191	1896.038	28.848	0.125	3037.992	19.907	0.165	2749.034	23.822	2.077	2986.941	26.409

Table A.3 Dynamic Modulus and Phase Angle Values for Mixture 5834LM

STA			1day@95°C			5days@95°C			8days@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
15.765	2886.628	31.827	20.395	6114.632	18.967	43.171	7511.836	18.715	21.878	8711.364	16.280	6.136	7703.462	15.848	27.202	9868.086	12.309
78.823	4727.732	26.565	101.974	8175.614	16.373	215.853	9845.795	15.379	109.391	11445.584	14.113	30.680	9889.829	13.412	136.010	11809.989	10.053
157.647	5687.847	24.135	203.949	9120.878	15.599	431.705	10931.028	14.735	218.782	12740.430	13.875	61.360	10833.502	12.626	272.019	12754.808	9.494
788.234	8400.542	19.940	1019.743	11740.972	13.486	2158.527	13883.908	12.936	1093.909	15649.092	11.614	306.802	13480.272	11.398	1360.097	14985.061	9.010
1576.468	9624.558	18.574	2039.486	12989.206	12.407	4317.053	15151.805	12.368	2187.817	17013.385	10.961	613.604	14635.675	10.782	2720.194	16036.269	8.568
3941.171	11359.039	16.546	5098.714	14576.177	9.476	10792.633	16168.307	13.037	5469.544	19145.052	8.734	1534.011	16161.726	8.994	6800.486	17294.661	8.011
0.100	472.019	31.838	0.100	1253.862	30.533	0.100	1523.654	29.964	0.100	2019.534	28.189	0.100	2978.657	25.877	0.100	3034.617	22.678
0.500	796.565	34.049	0.500	2040.231	28.675	0.500	2455.463	27.400	0.500	3188.887	25.842	0.500	4178.469	22.514	0.500	4225.186	19.207
1.000	1008.811	35.234	1.000	2465.319	28.332	1.000	2938.248	26.914	1.000	3789.683	24.807	1.000	4757.741	22.360	1.000	4781.381	18.283
5.000	1872.779	35.218	5.000	3859.961	25.636	5.000	4494.942	23.885	5.000	5645.432	22.386	5.000	6374.363	19.998	5.000	6411.809	17.050
10.000	2404.704	34.153	10.000	4591.557	24.444	10.000	5294.299	23.369	10.000	6577.933	21.025	10.000	7140.826	19.044	10.000	7218.400	16.251
25.000	3275.805	32.914	25.000	5700.079	22.921	25.000	6470.240	21.012	25.000	7977.230	19.707	25.000	8125.152	20.911	25.000	8381.742	15.927
0.002	207.535	21.120	0.001	289.033	27.154	0.002	429.499	26.792	0.001	493.309	27.995	0.001	745.719	27.185	0.001	938.047	25.658
0.009	254.119	22.159	0.004	429.752	29.792	0.008	666.974	29.118	0.005	772.064	29.369	0.003	1165.545	27.441	0.006	1443.992	24.915
0.018	292.638	24.321	0.008	517.954	31.972	0.016	815.057	30.895	0.010	940.869	30.756	0.006	1405.972	27.845	0.011	1708.747	25.142
0.089	440.599	30.265	0.041	876.221	34.051	0.081	1369.619	31.542	0.050	1563.884	31.172	0.029	2160.475	27.466	0.056	2548.624	24.179
0.178	554.589	33.201	0.083	1106.394	35.258	0.162	1706.086	31.674	0.100	1933.524	31.350	0.058	2572.050	27.227	0.112	3000.618	23.484
0.444	778.407	37.471	0.207	1515.397	37.315	0.406	2259.320	31.954	0.249	2534.308	30.117	0.145	3200.132	26.033	0.280	3672.650	22.324

Table A.4 Dynamic Modulus and Phase Angle Values for Mixture 5828SM

STA			5days@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
25.080	4831.293	22.244	42.448	4299.300	17.900	44.991	5517.690	14.196	36.275	5569.100	13.614
125.398	6763.012	18.123	212.238	5648.739	14.634	224.953	6899.978	11.758	181.373	6833.429	11.240
250.796	7675.287	16.813	424.476	6276.605	14.036	449.906	7538.620	11.814	362.745	7387.109	10.972
1253.979	10009.988	14.432	2122.381	7871.709	12.487	2249.531	9156.678	10.376	1813.725	8924.481	9.752
2507.957	11077.430	13.241	4244.763	8606.323	11.765	4499.062	9862.053	10.250	3627.450	9600.439	9.379
6269.893	12451.162	9.974	10611.907	9605.496	11.619	11247.655	10916.460	8.970	9068.626	10480.098	9.054
0.100	794.091	33.130	0.100	968.399	28.629	0.100	1217.474	27.491	0.100	1442.120	24.717
0.500	1367.927	32.005	0.500	1514.317	26.091	0.500	1862.149	24.087	0.500	2098.362	21.675
1.000	1697.057	31.948	1.000	1787.718	25.017	1.000	2186.646	23.188	1.000	2157.425	22.023
5.000	2807.027	29.213	5.000	2661.597	23.001	5.000	3175.547	21.232	5.000	3383.637	18.435
10.000	3431.807	28.357	10.000	3114.113	21.870	10.000	3668.787	19.423	10.000	3851.987	17.682
25.000	4387.277	26.974	25.000	3810.840	19.148	25.000	4395.680	18.023	25.000	4563.299	17.998
0.001	209.732	22.900	0.001	226.308	28.284	0.001	324.546	29.038	0.001	438.498	27.730
0.005	320.040	25.653	0.003	342.714	28.623	0.004	500.566	28.168	0.004	645.943	26.716
0.011	374.978	28.576	0.006	409.864	30.008	0.008	592.221	29.153	0.007	749.923	26.370
0.054	622.381	32.357	0.029	663.566	30.416	0.040	929.916	28.396	0.036	1129.820	24.886
0.108	795.421	34.107	0.058	815.385	30.804	0.079	1131.542	27.284	0.071	1332.955	25.288
0.269	1107.146	36.320	0.144	1074.603	26.882	0.199	1447.237	26.901	0.179	1650.944	23.116

Table A.5 Dynamic Modulus and Phase Angle Values for Mixture 5828LM

STA			12days@95°C			24hr.@135°C			Field Core		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
14.086	3711.947	27.660	39.543	8855.138	11.779	192.534	8596.909	10.343	82.257	5648.942	17.895
70.432	5398.823	22.447	197.716	10551.520	9.981	962.671	10033.320	9.155	411.284	7238.744	14.561
140.863	6164.108	21.637	395.432	11249.760	9.356	1925.342	10647.170	8.911	822.569	7868.865	13.609
704.316	8281.206	17.764	1977.159	13246.090	8.259	9626.711	12271.470	7.823	4112.843	9745.670	12.341
1408.633	9170.173	16.199	3954.318	14002.850	8.509	19253.420	13014.690	7.702	8225.687	10590.140	11.634
3521.582	10350.210	11.907	9885.796	15152.450	7.819	48133.560	13952.900	7.007	20564.220	11920.580	19.218
0.100	688.939	33.575	0.100	2489.705	23.105	0.100	2778.493	19.446	0.238	1724.420	30.878
0.500	1212.198	32.707	0.500	3551.746	19.404	0.500	3724.044	16.537	1.188	2716.928	22.506
1.000	1555.642	32.638	1.000	4076.383	17.857	1.000	4195.057	15.626	2.375	3032.111	26.650
5.000	2669.232	29.638	5.000	5462.838	16.046	5.000	5352.775	14.166	11.876	4329.353	17.891
10.000	3288.921	28.513	10.000	6111.383	15.469	10.000	5913.282	13.496	23.752	5032.713	13.677
25.000	4230.756	26.989	25.000	7055.246	17.998	25.000	6686.083	11.999	59.380	5916.663	18.221
0.002	263.979	26.473	0.001	638.836	30.336	0.000	755.983	27.594	0.012	676.261	32.446
0.011	345.668	28.535	0.003	987.456	27.969	0.002	1149.834	24.788	0.062	1349.665	30.368
0.022	409.658	30.486	0.005	1169.236	26.773	0.004	1352.458	24.191	0.125	1601.597	32.086
0.108	687.345	34.765	0.025	1785.427	25.366	0.020	1979.773	22.311	0.624	2404.496	22.398
0.215	883.586	36.131	0.050	2109.976	24.698	0.039	2306.779	21.604	1.248	2868.185	19.462
0.538	1242.768	35.960	0.126	2624.338	22.763	0.099	2813.800	17.995	3.120	3463.564	19.140

Table A.6 Dynamic Modulus and Phase Angle Values for Mixture 5828LL

STA			12days@95°C			24hr.@135°C			Field Core		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
0.002	262.062	25.600	43.366	9060.153	11.100	24.326	8933.587	10.087	81.356	7613.860	16.206
0.009	394.405	27.800	216.831	10704.140	9.723	121.628	10347.410	8.519	406.781	9458.253	13.835
0.019	465.380	31.000	433.663	11460.120	9.236	243.255	11009.710	8.504	813.561	10303.460	11.723
0.093	799.909	34.400	2168.313	13350.720	8.194	1216.275	12580.190	7.436	4067.807	12432.490	11.025
0.100	807.526	36.700	4336.625	14098.240	8.191	2432.551	13228.460	7.716	8135.614	13366.790	10.337
0.186	1019.399	36.200	10841.563	15224.990	6.819	6081.376	14125.100	5.497	20339.040	14311.750	9.947
0.465	1392.083	38.000	0.100	2885.706	21.765	0.100	3409.311	17.585	0.226	2059.423	26.689
0.500	1468.998	34.800	0.500	4022.437	18.255	0.500	4471.264	15.435	1.130	2992.474	23.224
1.000	1799.674	33.700	1.000	4595.835	17.213	1.000	4979.408	13.590	2.260	3433.904	23.878
5.000	3003.883	29.400	5.000	6061.526	14.816	5.000	6251.952	12.658	11.300	4798.833	21.003
10.000	3633.405	28.100	10.000	6744.968	13.810	10.000	6864.882	12.194	22.600	5515.451	19.158
25.000	4620.127	27.000	25.000	7698.604	13.368	25.000	7679.635	14.941	56.501	6508.164	17.990
51.453	5545.523	25.900	0.001	656.809	32.611	0.000	884.461	26.785	0.015	941.418	33.788
257.263	8375.614	22.100	0.003	1067.037	29.460	0.002	1346.165	24.578	0.074	1574.438	26.033
514.525	9293.572	20.600	0.006	1291.524	28.147	0.003	1590.757	23.261	0.148	1824.290	27.592
2572.625	12162.910	17.800	0.030	2016.023	25.962	0.016	2343.839	21.371	0.742	2737.131	23.410
5145.251	13079.130	14.700	0.060	2403.332	24.744	0.032	2726.798	20.579	1.484	3208.217	24.643
12863.130	14539.970	11.500	0.150	2987.036	23.796	0.080	3301.212	17.914	3.710	3939.112	21.048

Table A.7 Dynamic Modulus and Phase Angle Values for Mixture 6428SV

STA			1day@95°C			3day@95°C			5days@95°C			8days@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
27.819	3272.004	25.654	31.181	5298.910	17.893	27.662	7358.666	13.797	41.917	5667.020	17.590	22.016	7179.306	13.627	38.243	7099.929	13.519	885.905	8243.692	11.915
139.097	4841.634	20.849	155.904	7350.794	15.515	138.311	9103.223	12.406	209.586	7292.555	14.782	110.082	8824.739	12.171	191.216	8680.797	11.023	4429.526	9812.977	10.051
278.194	5600.766	19.632	311.808	8179.366	14.521	276.623	9937.514	11.848	419.173	8048.330	13.908	220.163	9577.112	12.042	382.432	9402.299	11.019	8859.053	10591.349	9.885
1390.971	7645.913	16.631	1559.040	10249.353	13.176	1383.115	12154.244	10.626	2095.863	10066.633	12.124	1100.817	11515.284	10.794	1912.161	11269.251	9.939	44295.263	12504.721	8.459
2781.943	8630.267	15.415	3118.080	11147.707	12.376	2766.230	13109.055	10.313	4191.726	10914.284	11.963	2201.634	12449.335	9.926	3824.321	12005.758	9.529	88590.527	13363.033	8.553
6954.857	9974.786	15.553	7795.199	12520.552	11.642	6915.575	14449.762	9.007	10479.315	12115.273	9.594	5504.085	13653.756	10.483	9560.803	13099.695	10.086	221476.317	14449.762	9.007
0.100	554.463	33.002	0.100	1092.485	31.449	0.100	1798.249	26.451	0.100	1300.629	29.679	0.100	1947.603	25.355	0.100	1802.360	25.996	0.100	2321.551	22.810
0.500	907.033	32.849	0.500	1760.942	29.010	0.500	2681.529	23.984	0.500	2014.253	26.667	0.500	2852.367	22.249	0.500	2644.617	22.687	0.500	3229.505	19.725
1.000	1115.509	33.890	1.000	2116.530	28.502	1.000	3150.063	22.984	1.000	2383.988	25.598	1.000	3303.528	21.673	1.000	3064.245	21.038	1.000	3681.087	19.026
5.000	1871.963	31.856	5.000	3287.324	25.786	5.000	4500.244	20.690	5.000	3540.056	22.944	5.000	4680.278	18.822	5.000	4297.872	19.152	5.000	4966.387	16.975
10.000	2308.463	30.453	10.000	3903.024	24.201	10.000	5177.577	19.520	10.000	4133.582	21.724	10.000	5356.958	18.164	10.000	4908.055	17.918	10.000	5614.000	16.240
25.000	3023.987	29.956	25.000	4831.998	18.210	25.000	6182.435	17.995	25.000	5037.628	18.039	25.000	6340.544	18.006	25.000	5793.462	17.997	25.000	6534.707	11.654
0.001	194.454	23.437	0.001	299.214	29.655	0.001	471.321	28.371	0.001	372.402	31.665	0.001	492.381	30.074	0.001	507.137	31.221	0.001	715.103	26.626
0.006	251.252	26.952	0.005	427.734	31.574	0.004	700.064	29.032	0.005	580.071	29.501	0.003	741.636	28.926	0.004	778.996	29.563	0.004	1054.947	24.429
0.012	290.389	30.000	0.009	508.805	31.734	0.007	824.793	29.426	0.011	692.347	30.748	0.006	867.286	29.426	0.008	916.035	29.274	0.007	1228.643	23.199
0.060	462.257	32.679	0.047	837.292	33.114	0.035	1311.645	28.902	0.054	1092.449	29.794	0.029	1342.535	28.775	0.038	1411.298	27.427	0.037	1813.728	22.163
0.121	571.033	34.984	0.093	1026.492	33.690	0.070	1576.648	29.219	0.107	1324.692	29.908	0.058	1611.950	27.983	0.077	1683.982	27.778	0.075	2118.571	21.992
0.302	769.400	37.987	0.234	1364.636	35.547	0.175	2023.608	26.998	0.268	1714.633	26.991	0.144	2065.617	26.965	0.192	2117.128	23.876	0.187	2621.866	23.689

Table A.8 Dynamic Modulus and Phase Angle Values for Mixture 6428SM

STA			3day@95°C			5days@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
7.592	5184.363	20.283	22.016	7179.306	13.627	12.163	7914.010	15.893	20.365	10662.990	10.107	405.070	11053.696	9.913
37.959	7034.358	16.501	110.082	8824.739	12.171	60.813	9881.802	12.668	101.824	12421.296	9.158	2025.349	12726.401	8.696
75.918	7895.206	15.692	220.163	9577.112	12.042	121.627	10770.687	12.931	203.648	13258.502	8.621	4050.699	13475.483	8.709
379.590	10113.153	13.295	1100.817	11515.284	10.794	608.134	13148.552	11.220	1018.238	15369.128	7.907	20253.495	15350.826	7.399
759.181	11042.189	12.440	2201.634	12449.335	9.926	1216.268	14196.620	10.599	2036.477	16211.395	7.607	40506.989	16205.852	7.459
1897.952	11939.447	13.101	5504.085	13653.756	10.483	3040.669	15598.037	10.663	5091.192	17363.409	7.064	101267.473	17330.620	6.128
0.100	1385.713	30.822	0.100	1947.603	25.355	0.100	2679.888	24.939	0.100	3560.407	20.726	0.100	4486.469	16.577
0.500	2218.829	27.951	0.500	2852.367	22.249	0.500	3895.895	21.692	0.500	4820.124	17.382	0.500	5777.517	14.638
1.000	2678.843	26.852	1.000	3303.528	21.673	1.000	4513.136	20.764	1.000	5438.538	16.669	1.000	6415.084	14.166
5.000	4111.666	24.882	5.000	4680.278	18.822	5.000	6321.400	18.349	5.000	7077.994	14.900	5.000	8035.123	12.653
10.000	4876.823	23.569	10.000	5356.958	18.164	10.000	7166.952	17.373	10.000	7860.598	13.912	10.000	8792.548	12.013
25.000	6060.008	22.714	25.000	6340.544	18.006	25.000	8435.313	15.964	25.000	8921.569	14.940	25.000	9841.240	9.003
0.001	353.592	27.665	0.001	492.381	30.074	0.001	758.407	26.533	0.000	1024.339	25.283	0.001	1438.053	24.400
0.004	530.711	28.169	0.003	741.636	28.926	0.005	1131.104	27.210	0.002	1538.223	24.067	0.003	2065.884	22.583
0.008	630.797	29.766	0.006	867.286	29.426	0.009	1345.898	28.191	0.004	1795.019	24.587	0.007	2386.094	22.076
0.041	1025.380	31.528	0.029	1342.535	28.775	0.046	2082.978	26.752	0.018	2629.446	22.493	0.033	3335.557	20.136
0.083	1267.480	32.215	0.058	1611.950	27.983	0.092	2487.013	26.761	0.036	3059.423	22.428	0.066	3814.868	19.472
0.207	1687.233	33.064	0.144	2065.617	26.965	0.229	3140.649	26.952	0.090	3730.362	17.928	0.166	4540.600	18.018

Table A.9 Dynamic Modulus and Phase Angle Values for Mixture 6428LM

STA			1day@95°C			5days@95°C			8days@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
17.492	5531.123	19.890	23.275	6062.862	20.837	37.597	8143.187	14.126	14.285	7217.599	14.158	420.022	11877.696	8.909	877.614	10464.218	9.596
87.460	7488.539	15.979	116.375	8344.842	17.700	187.984	10009.670	11.452	71.425	8861.269	12.610	2100.112	13760.770	7.682	4388.071	12072.507	8.307
174.921	8381.830	15.509	232.749	9446.347	16.447	375.968	10888.696	11.310	142.850	9591.239	11.830	4200.224	14491.805	7.208	8776.141	12809.554	7.970
874.604	10650.254	12.905	1163.746	12414.793	13.894	1879.841	12988.229	9.984	714.250	11631.085	11.004	21001.120	16511.105	7.061	43880.705	14607.467	7.485
1749.208	11675.493	12.073	2327.493	13675.527	13.091	3759.682	13929.670	9.391	1428.499	12493.545	11.025	42002.239	17351.964	6.753	87761.410	15443.786	6.999
4373.019	11637.406	8.042	5818.732	15406.836	13.006	9399.206	15159.736	8.017	3571.248	13806.742	8.986	105005.599	18604.379	6.067	219403.525	16438.049	7.948
0.100	1145.024	31.719	0.100	1128.461	30.929	0.100	2070.155	26.664	0.100	2322.283	24.689	0.100	4585.739	17.645	0.100	3311.571	19.584
0.500	1877.142	29.734	0.500	1877.638	29.760	0.500	3055.503	23.125	0.500	3363.005	21.453	0.500	5952.109	14.597	0.500	4736.243	15.680
1.000	2260.199	28.833	1.000	2310.779	29.560	1.000	3544.926	21.861	1.000	3861.217	20.782	1.000	6604.256	13.931	1.000	5327.251	15.236
5.000	3560.000	25.989	5.000	3711.940	26.910	5.000	5003.399	19.377	5.000	5328.461	18.265	5.000	8280.248	12.626	5.000	6781.858	13.299
10.000	4241.568	24.813	10.000	4467.986	25.877	10.000	5720.603	18.657	10.000	6053.792	17.298	10.000	9049.564	12.055	10.000	7451.235	13.346
25.000	5282.850	23.896	25.000	5671.684	25.481	25.000	6720.007	18.031	25.000	7123.623	15.636	25.000	10125.616	9.034	25.000	8433.937	9.004
0.002	358.238	27.447	0.002	396.788	31.105	0.001	577.151	30.317	0.001	615.981	32.735	0.000	988.109	29.076	0.001	875.681	28.620
0.009	544.566	28.977	0.009	601.402	30.328	0.004	871.232	28.994	0.003	956.545	30.330	0.001	1500.734	26.111	0.003	1297.074	25.853
0.018	659.478	30.624	0.019	699.122	31.964	0.007	1014.668	29.346	0.007	1125.921	30.715	0.002	1752.387	25.261	0.005	1506.027	24.853
0.090	1105.826	32.203	0.094	1128.156	31.832	0.037	1558.233	28.719	0.033	1712.605	28.894	0.009	2580.649	23.171	0.027	2202.767	22.787
0.180	1377.248	32.792	0.188	1368.578	32.224	0.074	1867.550	28.466	0.066	2050.395	27.870	0.018	3008.322	22.439	0.053	2592.296	22.152
0.451	1852.991	26.985	0.470	1775.139	31.200	0.185	2359.693	26.771	0.166	2562.104	23.812	0.046	3684.255	20.349	0.133	3174.632	27.025

Table A.10 Dynamic Modulus and Phase Angle Values for Mixture 7034LV

STA			1day@95°C			3day@95°C			5days@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
14.126	2356.503	28.980	15.489	3460.816	26.095	18.969	4132.657	22.563	13.847	4404.879	20.218	23.199	6784.625	14.621	21.741	6574.276	11.220
70.630	3726.041	25.547	77.444	5211.024	22.924	94.844	5851.129	19.417	69.236	5925.642	17.013	115.997	8347.761	12.135	108.706	7824.246	9.488
141.259	4443.779	24.004	154.889	6081.865	21.302	189.688	6689.406	18.235	138.472	6682.980	16.543	231.994	9145.351	11.739	217.411	8382.130	9.510
706.297	6572.610	20.330	774.443	8594.914	18.279	948.441	8820.388	15.502	692.359	8673.919	14.036	1159.969	11082.095	10.720	1087.057	9780.773	8.515
1412.593	7592.780	19.267	1548.885	9768.328	16.925	1896.883	9831.210	14.828	1384.719	9551.434	13.375	2319.937	11923.355	10.214	2174.114	10398.135	8.418
3531.483	8991.103	17.306	3872.213	11469.408	16.547	4742.207	11072.606	13.134	3461.796	10606.917	10.974	5799.843	13059.310	9.035	5435.286	11093.560	7.667
0.100	494.766	27.963	0.100	687.525	29.735	0.100	852.048	30.387	0.100	1092.632	29.498	0.100	1878.430	25.883	0.100	2354.370	19.451
0.500	759.345	29.941	0.500	1120.579	30.753	0.500	1363.912	30.099	0.500	1720.543	27.220	0.500	2752.308	22.652	0.500	3142.245	18.682
1.000	930.261	32.221	1.000	1383.360	31.461	1.000	1645.284	30.337	1.000	2062.577	26.863	1.000	3190.251	21.901	1.000	3510.720	16.277
5.000	1593.312	32.753	5.000	2340.961	30.838	5.000	2648.245	27.920	5.000	3127.571	24.762	5.000	4451.213	20.104	5.000	4531.766	15.355
10.000	1988.794	32.891	10.000	2903.739	30.185	10.000	3206.774	27.284	10.000	3680.666	23.710	10.000	5094.438	18.542	10.000	5020.677	14.534
25.000	2665.427	33.213	25.000	3805.916	27.036	25.000	4083.148	26.942	25.000	4515.418	24.465	25.000	6046.437	18.015	25.000	5767.538	14.253
0.002	206.050	18.414	0.002	316.146	23.718	0.001	249.976	26.857	0.001	341.703	25.498	0.001	474.053	28.977	0.001	626.949	25.845
0.009	296.408	21.801	0.012	406.569	39.412	0.005	349.909	28.511	0.006	489.791	27.210	0.003	713.762	28.337	0.003	1028.698	24.775
0.017	321.858	24.752	0.024	475.804	29.121	0.009	402.490	30.616	0.012	568.076	29.306	0.006	826.346	27.214	0.007	1188.898	23.373
0.087	459.775	29.422	0.122	714.783	34.998	0.047	638.005	33.596	0.060	895.130	30.943	0.030	1301.963	27.994	0.035	1707.458	22.688
0.174	550.043	32.100	0.244	873.414	43.283	0.093	784.831	35.054	0.119	1100.552	31.387	0.061	1579.895	24.720	0.069	1980.495	22.362
0.435	726.250	36.016	0.611	1173.108	27.145	0.233	1068.222	36.402	0.298	1447.169	34.284	0.152	2022.747	24.950	0.174	2396.371	23.824

Table A.11 Dynamic Modulus and Phase Angle Values for Mixture 7628SM

STA			1day@95°C			3day@95°C			5days@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
23.870	4703.559	24.146	22.063	7484.912	16.746	16.035	8340.830	14.459	37.597	8143.187	14.126	176.152	9124.382	11.427	18.446	8018.525	12.332
119.349	6784.098	19.480	110.316	9645.668	14.082	80.174	10468.911	12.717	187.984	10009.670	11.452	880.761	10700.613	9.267	92.229	9815.766	10.487
238.698	7809.377	18.141	220.632	10607.755	13.427	160.347	11442.483	11.673	375.968	10888.696	11.310	1761.522	11354.084	9.269	184.458	10570.520	9.905
1193.489	10407.552	14.530	1103.158	13154.760	11.355	801.736	13867.430	10.453	1879.841	12988.229	9.984	8807.610	13136.924	8.189	922.291	12520.709	8.937
2386.978	11518.137	13.373	2206.316	14216.444	11.017	1603.472	15010.712	9.608	3759.682	13929.670	9.391	17615.220	13892.068	8.401	1844.582	13352.227	8.239
5967.444	13163.724	8.963	5515.789	15734.883	13.047	4008.679	16483.236	9.003	9399.206	15159.736	8.017	44038.050	14771.272	9.017	4611.455	14396.471	7.553
0.100	724.289	34.765	0.100	1625.135	31.206	0.100	2048.055	28.492	0.100	2070.155	26.664	0.100	3459.740	19.063	0.100	2415.367	25.504
0.500	1260.281	33.577	0.500	2648.868	28.403	0.500	3216.364	25.211	0.500	3055.503	23.125	0.500	4769.203	16.193	0.500	3559.803	21.592
1.000	1583.168	34.162	1.000	3215.494	26.804	1.000	3822.787	24.084	1.000	3544.926	21.861	1.000	5340.609	15.754	1.000	4122.572	21.337
5.000	2744.012	30.677	5.000	4850.505	23.447	5.000	5626.171	20.496	5.000	5003.399	19.377	5.000	6846.853	13.772	5.000	5674.399	17.222
10.000	3407.316	29.349	10.000	5650.717	21.707	10.000	6483.903	19.553	10.000	5720.603	18.657	10.000	7526.819	13.132	10.000	6419.354	16.656
25.000	4431.997	26.970	25.000	6836.446	20.821	25.000	7728.816	18.013	25.000	6720.007	18.031	25.000	8486.065	11.005	25.000	7452.684	12.712
0.002	269.504	26.114	0.001	376.321	31.806	0.001	508.442	30.634	0.001	577.151	30.317	0.001	924.126	29.803	0.001	564.309	30.187
0.008	361.287	28.046	0.004	581.333	32.263	0.005	805.292	30.917	0.004	871.232	28.994	0.005	1445.524	26.767	0.004	893.171	29.888
0.017	414.857	30.672	0.009	692.524	34.278	0.010	976.961	31.899	0.007	1014.668	29.346	0.009	1708.351	25.853	0.007	1073.382	29.852
0.083	675.417	34.293	0.044	1206.063	34.290	0.052	1632.253	31.278	0.037	1558.233	28.719	0.046	2547.016	23.030	0.035	1726.078	28.397
0.165	845.983	36.240	0.088	1512.400	34.079	0.103	2008.370	30.685	0.074	1867.550	28.466	0.091	2994.038	21.768	0.071	2101.221	27.722
0.413	1173.833	36.055	0.219	2036.092	31.468	0.258	2661.057	26.931	0.185	2359.693	26.771	0.228	3662.681	26.963	0.177	2686.588	27.108

Shape Parameters of Mastercurves

Table A.12 Shape Parameters of Dynamic Modulus Mastercurve

Mix ID	STA		5days@95°C		12days@95°C		24hr.@135°C		Field Core	
	γ	-β/γ	γ	-β/γ	γ	-β/γ	γ	-β/γ	γ	-β/γ
5234LM	-0.67	0.07	-0.39	-2.24	-0.33	-3.90	-0.32	-3.33	-0.38	-2.25
5234LL	-0.61	0.04	-0.38	-2.37	-0.26	-5.72	-0.33	-3.72	-0.40	-2.39
5834LM	-0.68	0.46	-0.44	-1.44	-0.31	-3.23	-0.34	-2.79	*NA*	*NA*
5828SM	-0.58	-0.40	-0.39	-1.68	-0.31	-3.23	-0.32	-3.33	*NA*	*NA*
5828LM	-0.75	0.45	*NA*	*NA*	-0.34	-2.90	-0.21	-7.42	-0.50	-1.05
5828LL	-0.53	-0.46	*NA*	*NA*	-0.25	-4.52	-0.21	-7.74	-0.33	-1.66
6428SV	-0.55	0.07	-0.40	-1.61	-0.39	-1.85	-0.32	-3.24	*NA*	*NA*
6428SM	-0.56	-0.91	-0.44	-1.88	-0.26	-4.41	-0.34	-3.39	*NA*	*NA*
6428LM	-0.57	-0.72	-0.41	-1.69	-0.42	-2.54	-0.28	-6.23	*NA*	*NA*
7034LV	-0.67	0.70	-0.52	-0.67	-0.42	-1.77	-0.28	-4.63	*NA*	*NA*
7628SM	-0.64	-0.03	-0.43	-2.30	-0.40	-3.57	-0.27	-6.61	*NA*	*NA*

Table A.13 Shape Parameters of Phase Angle Mastercurve

Mix ID	STA		5days@95°C		12days@95°C		24hr.@135°C		Field Core	
	a	c	a	c	a	c	a	c	a	c
5234LM	37.59	0.01	30.54	-2.34	30.85	-3.76	27.58	-3.87	31.74	-2.14
5234LL	36.80	-0.07	30.50	-2.20	31.01	-4.51	27.09	-3.42	31.00	-1.90
5834LM	36.15	0.19	31.02	-1.31	28.32	-3.14	25.66	-2.84	*NA*	*NA*
5828SM	34.17	-0.61	30.12	-1.96	29.45	-3.14	27.23	-3.87	*NA*	*NA*
5828LM	36.83	0.14	*NA*	*NA*	29.51	-3.41	30.00	-5.01	30.11	-1.91
5828LL	35.37	-0.51	*NA*	*NA*	28.42	-3.62	27.69	-4.44	29.02	-2.02
6428SV	35.02	-0.43	31.27	-2.13	30.65	-2.86	27.48	-3.00	*NA*	*NA*
6428SM	31.81	-1.40	27.91	-2.14	24.98	-3.16	24.82	-3.75	*NA*	*NA*
6428LM	31.90	-1.15	30.18	-2.38	29.50	-4.49	28.09	-3.50	*NA*	*NA*
7034LV	33.43	0.28	30.92	-1.11	28.61	-2.53	25.48	-3.00	*NA*	*NA*
7628SM	35.63	-0.62	30.78	-2.35	31.09	-3.99	26.11	-4.15	*NA*	*NA*

Mixture Glover-Rowe (G-R_m) Parameter

Table A.14 Summary of Mixture Glover-Rowe (G-R_m) Parameter

Mix ID	STA	1day@95°C	3days@95°C	5days@95°C	8days@95°C	10day@95°C	12day@95°C	24hr.@135°C	Field Core
5234LM	2576.50	*NA*	*NA*	12285.50	*NA*	*NA*	19129.93	22385.97	11997.19
5234LL	3019.28	*NA*	*NA*	12012.52	*NA*	*NA*	24535.43	22224.10	11037.06
5834LM	2466.25	7845.93	*NA*	8498.01	13322.15	*NA*	17886.21	26706.54	*NA*
5828SM	5272.42	*NA*	*NA*	9889.39	*NA*	*NA*	17655.75	11287.46	*NA*
5828LM	2291.31	*NA*	*NA*	*NA*	*NA*	*NA*	21185.53	23048.22	9428.17
5828LL	4846.16	*NA*	*NA*	*NA*	*NA*	*NA*	24748.62	31360.10	10744.48
6428SV	3005.41	7637.46	*NA*	9194.27	*NA*	13859.92	14182.19	17794.10	*NA*
6428SM	10103.41	*NA*	15280.00	20083.48	*NA*	*NA*	35000.00	42000.00	*NA*
6428LM	8393.43	10754.00	*NA*	15513.18	18428.86	*NA*	28428.86	28962.02	*NA*
7034LV	2321.14	3589.36	4830.20	7121.94	*NA*	11630.51	14586.68	16870.97	*NA*
7628SM	4792.69	12493.57	17437.82	20906.94	*NA*	*NA*	27125.44	35069.00	*NA*

Fracture Energy (G_f), Flexibility Index (FI), and Rate-dependent Cracking Index (RDCI) from SCB Test

Table A.15 Summary of Fracture Energy (G_f), Flexibility Index (FI), and Rate-dependent Cracking Index (RDCI) from SCB Test for Mixture 5234LM

Replicates	5days@95°C			12days@95°C			24hr.@135°C			Field Cores		
	G_f	FI	RDCI	G_f	FI	RDCI	G_f	FI	RDCI	G_f	FI	RDCI
1	1222.66	5.03	12.15	2131.62	5.64	9.45	861.13	0.91	3.06	1664.37	11.25	*NA*
2	1218.39	3.48	8.62	1808.16	4.70	6.49	*NA*	*NA*	4.36	1879.70	12.70	*NA*
3	1222.90	3.76	15.96	1752.37	4.62	8.16	1060.88	1.98	3.36	1616.10	11.38	*NA*
4	1325.29	3.60	7.39	1770.29	3.87	7.49	*NA*	*NA*	5.24	1577.76	15.94	*NA*

Table A.16 Summary of Fracture Energy (G_f), Flexibility Index (FI), and Rate-dependent Cracking Index (RDCI) from SCB Test for Mixture 5234LL

Replicates	5days@95°C			12days@95°C			24hr.@135°C			Field Cores		
	G_f	FI	RDCI	G_f	FI	RDCI	G_f	FI	RDCI	G_f	FI	RDCI
1	1325.72	4.29	10.40	1142.62	2.04	5.11	1358.28	4.40	4.77	1876.68	7.42	*NA*
2	1453.52	4.34	8.44	1125.05	2.10	5.33	*NA*	*NA*	3.59	1773.28	7.48	*NA*
3	1757.02	6.00	14.32	*NA*	*NA*	4.56	1278.33	4.02	7.64	1917.05	8.41	*NA*
4	1458.30	3.84	7.81	*NA*	*NA*	4.35	1461.34	4.31	9.29	1975.04	7.00	*NA*

Table A.17 Summary of Fracture Energy (G_f), Flexibility Index (FI), and Rate-dependent Cracking Index (RDCI) from SCB Test for Mixture 5834LM

Replicates	STA			5days@95°C			12days@95°C			24hr.@135°C		
	G_f	FI	RDCI	G_f	FI	RDCI	G_f	FI	RDCI	G_f	FI	RDCI
1	1082.80	19.33	33.50	1419.44	6.57	16.30	1436.01	5.89	9.91	1405.03	2.81	8.18
2	1210.50	19.21	34.41	1598.12	6.17	11.18	1565.01	5.50	15.33	1084.42	2.78	12.27
3	1245.90	16.61	33.50	1580.71	18.38	14.46	1340.36	5.83	9.81	1534.70	2.50	6.99
4	1166.60	16.67	32.49	1842.01	24.56	13.96	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*

Table A.18 Summary of Fracture Energy (G_f), Flexibility Index (FI), and Rate-dependent Cracking Index (RDCI) from SCB Test for Mixture 5828SM

Replicates	STA			5days@95°C			12days@95°C			24hr.@135°C		
	G_f	FI	RDCI	G_f	FI	RDCI	G_f	FI	RDCI	G_f	FI	RDCI
1	1513.34	13.27	19.67	1422.55	2.85	11.91	2131.62	5.64	10.32	1660.48	1.24	5.11
2	*NA*	*NA*	*NA*	2324.14	5.70	11.57	1808.16	4.70	11.21	1479.37	2.21	4.60
3	1434.84	15.77	21.71	1921.49	5.47	16.18	1752.37	4.62	10.78	1681.18	1.56	5.23
4	1480.51	13.84	26.65	2125.82	6.95	9.92	1770.29	3.87	7.26	*NA*	*NA*	*NA*

Table A.19 Summary of Fracture Energy (G_f), Flexibility Index (FI), and Rate-dependent Cracking Index (RDCI) from SCB Test for Mixture 5828LM

Replicates	12days@95°C			24hr.@135°C			Field Cores		
	G_f	FI	RDCI	G_f	FI	RDCI	G_f	FI	RDCI
1	1390.05	1390.05	8.22	1024.00	1.65	3.06	2062.63	12.43	*NA*
2	1213.97	1213.97	5.14	*NA*	*NA*	4.36	1216.91	7.47	*NA*
3	1455.16	1455.16	5.53	1254.82	2.38	3.36	1366.76	15.02	*NA*
4	1264.57	1264.57	8.75	1401.02	2.57	5.24	1726.77	17.80	*NA*

Table A.20 Summary of Fracture Energy (G_f), Flexibility Index (FI), and Rate-dependent Cracking Index (RDCI) from SCB Test for Mixture 5828LL

Replicates	12days@95°C			24hr.@135°C			Field Cores		
	G_f	FI	RDCI	G_f	FI	RDCI	G_f	FI	RDCI
1	1421.09	4.32	5.78	2070.00	2.85	5.09	1521.16	3.97	*NA*
2	2469.74	3.79	4.68	1840.09	2.33	6.80	1607.30	4.67	*NA*
3	1429.80	1.89	4.44	1219.97	0.93	2.51	949.12	10.89	*NA*
4	1642.80	1.95	5.14	1312.56	1.44	3.51	*NA*	*NA*	*NA*

Table A.21 Summary of Fracture Energy (G_f), Flexibility Index (FI), and Rate-dependent Cracking Index (RDCI) from SCB Test for Mixture 6428SV

Replicates	STA			5days@95°C			12days@95°C			24hr.@135°C		
	G_f	FI	RDCI	G_f	FI	RDCI	G_f	FI	RDCI	G_f	FI	RDCI
1	1207.40	18.29	31.01	1557.20	6.20	12.43	1280.70	4.05	7.53	1225.81	2.06	5.95
2	1150.27	17.70	32.90	1631.07	7.12	12.71	1571.48	7.28	0.00	862.23	1.79	5.06
3	1278.48	20.29	36.60	1648.81	9.16	17.09	1351.67	4.21	9.54	1190.96	2.12	4.31
4	1092.08	22.29	39.86	*NA*	*NA*	*NA*	1610.89	5.25	11.25	1207.10	2.14	5.76

Table A.22 Summary of Fracture Energy (G_f), Flexibility Index (FI), and Rate-dependent Cracking Index (RDCI) from SCB Test for Mixture 6428SM

Replicates	STA			5days@95°C			12days@95°C			24hr.@135°C		
	G_f	FI	RDCI	G_f	FI	RDCI	G_f	FI	RDCI	G_f	FI	RDCI
1	2056.49	15.46	31.59	2307.02	4.51	9.24	1404.70	2.50	4.67	1408.17	1.02	3.80
2	1909.69	12.48	25.86	1964.20	4.03	8.55	1408.34	2.08	5.01	1634.70	2.16	5.85
3	1837.61	13.51	25.24	1768.37	3.65	12.07	2163.79	4.24	4.99	1448.58	1.14	4.31
4	1783.60	12.47	23.27	2030.99	2.73	7.04	2015.96	3.72	6.49	1924.42	1.79	4.03

Table A.23 Summary of Fracture Energy (G_f), Flexibility Index (FI), and Rate-dependent Cracking Index (RDCI) from SCB Test for Mixture 6428LM

Replicates	STA			5days@95°C			12days@95°C			24hr.@135°C		
	G_f	FI	RDCI	G_f	FI	RDCI	G_f	FI	RDCI	G_f	FI	RDCI
1	1536.79	16.01	28.31	*NA*	*NA*	*NA*	1303.78	2.48	5.43	1268.73	1.26	3.84
2	*NA*	*NA*	*NA*	1541.13	4.32	9.26	1259.67	1.74	4.53	1191.96	1.18	6.13
3	1192.66	10.55	21.22	1579.23	4.42	9.49	1732.58	1.82	4.40	1537.36	1.84	4.67
4	1270.02	10.50	21.54	1342.93	3.71	7.32	1350.61	2.77	4.40	1734.23	1.83	5.62

Table A.24 Summary of Fracture Energy (G_f), Flexibility Index (FI), and Rate-dependent Cracking Index (RDCI) from SCB Test for Mixture 7034LV

Replicates	STA			5days@95°C			12days@95°C			24hr.@135°C		
	G_f	FI	RDCI	G_f	FI	RDCI	G_f	FI	RDCI	G_f	FI	RDCI
1	1790.12	38.09	63.81	*NA*	*NA*	*NA*	1497.89	6.29	13.40	1573.94	4.67	7.73
2	1784.93	49.58	69.41	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	1464.19	6.34	7.59
3	1936.17	30.25	63.95	1873.88	8.37	17.99	1723.33	6.48	13.99	1198.13	4.16	5.51
4	*NA*	*NA*	*NA*	1859.36	9.39	24.11	2300.13	7.37	13.24	1359.18	3.82	5.21

Table A.25 Summary of Fracture Energy (G_f), Flexibility Index (FI), and Rate-dependent Cracking Index (RDCI) from SCB Test for Mixture 7628SM

Replicates	STA			5days@95°C			12days@95°C			24hr.@135°C		
	G_f	FI	RDCI	G_f	FI	RDCI	G_f	FI	RDCI	G_f	FI	RDCI
1	2393.14	22.79	29.37	1984.79	5.09	11.30	1570.16	1.19	3.78	1291.74	1.17	2.56
2	2233.92	23.27	41.26	1771.77	2.46	7.85	1602.11	1.59	3.75	1262.99	1.00	2.26
3	1959.10	20.55	36.66	2248.46	4.19	9.47	2917.41	2.66	4.76	1035.79	1.54	3.13
4	1914.11	19.14	36.83	2090.99	4.46	10.65	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*

Fracture Energy (G_f) and Fracture Strain Tolerance (FST) from DCT Test

Table A.26 Summary of Fracture Energy (G_f) and Fracture Strain Tolerance (FST) from DCT Test for Mixture 5234LM

Replicates	5days@95°C		12days@95°C		24hr.@135°C	
	G_f	FST	G_f	FST	G_f	FST
1	632.35	163.71	316.75	87.08	129.06	48.89
2	738.96	181.35	348.92	90.03	300.93	89.87
3	701.65	180.39	238.78	73.22	189.73	62.61

Table A.27 Summary of Fracture Energy (G_f) and Fracture Strain Tolerance (FST) from DCT Test for Mixture 5234LL

Replicates	5days@95°C		12days@95°C		24hr.@135°C	
	G_f	FST	G_f	FST	G_f	FST
1	437.15	117.10	437.01	100.59	295.23	76.31
2	524.75	130.54	471.62	115.07	255.07	73.53
3	573.13	133.57	416.87	97.27	253.02	76.59

Table A.28 Summary of Fracture Energy (G_f) and Fracture Strain Tolerance (FST) from DCT Test for Mixture 5834LM

Replicates	STA		5days@95°C		12days@95°C		24hr.@135°C	
	G_f	FST	G_f	FST	G_f	FST	G_f	FST
1	843.15	157.54	0.00	0.00	769.03	197.79	483.02	109.22
2	801.23	151.46	579.70	147.54	358.59	99.75	714.99	171.86
3	958.98	167.15	639.09	132.58	575.40	145.04	569.38	141.86

Table A.29 Summary of Fracture Energy (G_f) and Fracture Strain Tolerance (FST) from DCT Test for Mixture 5828SM

Replicates	STA		5days@95°C		12days@95°C		24hr.@135°C	
	G_f	FST	G_f	FST	G_f	FST	G_f	FST
1	684.52	136.91	456.20	94.59	410.69	101.84	411.17	92.97
2	442.90	104.64	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
3	649.10	140.36	600.81	124.64	451.84	96.35	620.25	120.64

Table A.30 Summary of Fracture Energy (G_f) and Fracture Strain Tolerance (FST) from DCT Test for Mixture 5828LM

Replicates	12days@95°C		24hr.@135°C	
	G_f	FST	G_f	FST
1	333.12	97.51	291.09	81.57
2	357.15	99.61	293.44	85.79
3	364.62	91.22	192.52	66.60

Table A.31 Summary of Fracture Energy (G_f) and Fracture Strain Tolerance (FST) from DCT Test for Mixture 5828LL

Replicates	12days@95°C		24hr.@135°C	
	G_f	FST	G_f	FST
1	519.79	135.11	257.17	72.16
2	305.53	85.62	255.14	72.39
3	417.06	91.88	329.22	95.28

Table A.32 Summary of Fracture Energy (G_f) and Fracture Strain Tolerance (FST) from DCT Test for Mixture 6428SV

Replicates	STA		5days@95°C		12days@95°C		24hr.@135°C	
	G_f	FST	G_f	FST	G_f	FST	G_f	FST
1	925.70	178.74	619.48	153.27	*NA*	*NA*	*NA*	*NA*
2	719.40	167.93	665.66	150.44	632.38	147.86	572.13	127.00
3	772.60	173.86	685.69	156.84	515.48	130.87	531.50	130.94

Table A.33 Summary of Fracture Energy (G_f) and Fracture Strain Tolerance (FST) from DCT Test for Mixture 6428SM

Replicates	STA		5days@95°C		12days@95°C		24hr.@135°C	
	G_f	FST	G_f	FST	G_f	FST	G_f	FST
1	888.81	167.01	632.62	108.17	639.81	124.94	535.57	104.04
2	653.38	118.85	820.73	152.50	543.19	98.35	689.19	143.66
3	835.01	166.19	678.69	140.41	683.79	118.42	571.66	116.21

Table A.34 Summary of Fracture Energy (G_f) and Fracture Strain Tolerance (FST) from DCT Test for Mixture 6428LM

Replicates	STA		5days@95°C		12days@95°C		24hr.@135°C	
	G_f	FST	G_f	FST	G_f	FST	G_f	FST
1	657.09	146.77	719.01	151.76	534.27	123.22	624.63	123.43
2	664.07	152.91	543.68	132.84	760.96	150.36	511.76	109.41
3	763.02	137.31	678.69	140.41	492.03	109.67	747.37	157.02

Table A.35 Summary of Fracture Energy (G_f) and Fracture Strain Tolerance (FST) from DCT Test for Mixture 7034LV

Replicates	STA		5days@95°C		12days@95°C		24hr.@135°C	
	G_f	FST	G_f	FST	G_f	FST	G_f	FST
1	1663.98	314.13	1015.56	186.17	727.16	153.59	746.30	149.19
2	1710.41	447.37	*NA*	*NA*	720.52	148.67	599.19	133.80
3	1656.79	369.04	885.22	191.46	547.41	113.29	596.26	134.93

Table A.36 Summary of Fracture Energy (G_f) and Fracture Strain Tolerance (FST) from DCT Test for Mixture 7628SM

Replicates	STA		5days@95°C		12days@95°C		24hr.@135°C	
	G_f	FST	G_f	FST	G_f	FST	G_f	FST
1	849.34	166.13	585.50	104.19	529.02	112.12	533.74	114.38
2	891.71	224.04	615.52	130.24	539.93	105.87	506.08	114.46
3	606.00	127.21	717.13	147.48	690.45	136.05	482.04	106.16

Average Reduction in Pseudo Stiffness per Loading Cycle (D^R) from S-VECD Fatigue Test

Table A.37 Summary of D^R Value from S-VECD Fatigue Test for Mixture 5234LM

Replicates	5days@95°C	12days@95°C	24hr.@135°C	Field Cores
1	0.68	0.67	0.67	0.11
2	0.71	0.72	0.62	0.49
3	0.64	0.74	0.64	0.24

Table A.38 Summary of D^R Value from S-VECD Fatigue Test for Mixture 5234LL

Replicates	5days@95°C	12days@95°C	24hr.@135°C	Field Cores
1	0.67	0.60	0.66	0.54
2	0.66	0.28	0.62	0.51
3	0.61	0.64	0.72	0.52

Table A.39 Summary of D^R Value from S-VECD Fatigue Test for Mixture 5834LM

Replicates	STA	5days@95°C	12days@95°C	24hr.@135°C
1	0.67	0.52	0.44	0.44
2	0.66	0.49	0.40	0.40
3	0.61	0.47	0.44	0.44

Table A.40 Summary of D^R Value from S-VECD Fatigue Test for Mixture 5828SM

Replicates	STA	5days@95°C	12days@95°C	24hr.@135°C
1	0.48	0.46	0.39	0.51
2	0.55	0.46	0.47	0.47
3	0.52	0.49	0.42	0.43

Table A.41 Summary of D^R Value from S-VECD Fatigue Test for Mixture 5828LM

Replicates	12days@95°C	24hr.@135°C	Field Cores
1	0.59	0.65	0.47
2	0.59	0.65	0.60
3	0.68	0.64	0.37

Table A.42 Summary of D^R Value from S-VECD Fatigue Test for Mixture 5828LL

Replicates	12days@95°C	24hr.@135°C	Field Cores
1	0.59	0.65	0.47
2	0.59	0.65	0.60
3	0.68	0.64	0.37

Table A.43 Summary of D^R Value from S-VECD Fatigue Test for Mixture 6428SV

Replicates	STA	5days@95°C	12days@95°C	24hr.@135°C
1	0.51	0.52	0.38	0.44
2	0.52	0.49	0.40	0.40
3	0.60	0.47	0.00	0.44

Table A.44 Summary of D^R Value from S-VECD Fatigue Test for Mixture 6428SM

Replicates	STA	5days@95°C	12days@95°C	24hr.@135°C
1	0.54	0.34	0.29	0.24
2	0.48	0.34	0.31	0.20
3	0.53	0.38	0.30	0.38

Table A.45 Summary of D^R Value from S-VECD Fatigue Test for Mixture 6428LM

Replicates	STA	5days@95°C	12days@95°C	24hr.@135°C
1	**0.55**	**0.42**	**0.32**	**0.21**
2	0.44	0.32	0.27	0.24
3	0.28	0.47	0.33	0.38

Table A.46 Summary of D^R Value from S-VECD Fatigue Test for Mixture 7034LV

Replicates	STA	5days@95°C	12days@95°C	24hr.@135°C
1	0.75	0.58	0.48	0.44
2	0.88	0.55	0.44	0.61
3	0.79	0.50	0.46	0.52

Table A.47 Summary of D^R Value from S-VECD Fatigue Test for Mixture 7628SM

Replicates	STA	5days@95°C	12days@95°C	24hr.@135°C
1	0.61	0.52	0.24	0.35
2	0.69	0.32	0.20	0.21
3	0.68	0.38	0.23	0.28

APPENDIX B BINDER TEST RESULTS

Binder Mastercurves

Table B.1 Summary of Complex Modulus and Phase Angle Values for Binder 5234LM with Different Aging Conditions

STA			5day@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
5.15E-06	1.36E+04	7.48E+01	2.13E-05	1.11E+05	5.84E+01	1.49E-05	3.10E+05	5.41E+01	1.49E-05	4.34E+05	5.02E+01
6.47E-06	1.65E+04	7.32E+01	2.67E-05	1.29E+05	5.74E+01	1.87E-05	3.45E+05	5.34E+01	1.87E-05	4.78E+05	4.98E+01
1.02E-05	2.37E+04	7.35E+01	4.24E-05	1.71E+05	5.69E+01	2.96E-05	4.47E+05	5.18E+01	2.97E-05	6.04E+05	4.83E+01
1.62E-05	3.39E+04	7.23E+01	6.72E-05	2.25E+05	5.53E+01	4.69E-05	5.72E+05	5.08E+01	4.70E-05	7.47E+05	4.74E+01
2.57E-05	4.86E+04	7.10E+01	1.06E-04	2.98E+05	5.40E+01	7.44E-05	7.24E+05	4.96E+01	7.45E-05	9.33E+05	4.64E+01
4.08E-05	6.91E+04	6.98E+01	1.69E-04	3.87E+05	5.30E+01	1.18E-04	9.18E+05	4.83E+01	1.18E-04	1.15E+06	4.52E+01
6.43E-05	9.63E+04	6.75E+01	2.67E-04	5.04E+05	5.20E+01	1.87E-04	1.15E+06	4.73E+01	1.87E-04	1.40E+06	4.44E+01
6.47E-05	9.74E+04	6.86E+01	3.41E-04	5.88E+05	5.07E+01	2.85E-04	1.44E+06	4.64E+01	2.88E-04	1.73E+06	4.33E+01
8.07E-05	1.14E+05	6.69E+01	4.24E-04	6.45E+05	5.10E+01	2.96E-04	1.43E+06	4.62E+01	2.97E-04	1.72E+06	4.35E+01
1.02E-04	1.38E+05	6.74E+01	4.29E-04	6.62E+05	5.04E+01	3.58E-04	1.59E+06	4.54E+01	3.62E-04	1.91E+06	4.30E+01
1.28E-04	1.60E+05	6.57E+01	6.72E-04	8.27E+05	5.02E+01	4.69E-04	1.78E+06	4.53E+01	4.70E-04	2.11E+06	4.26E+01
1.62E-04	1.92E+05	6.62E+01	6.79E-04	8.48E+05	4.89E+01	5.67E-04	1.97E+06	4.43E+01	5.73E-04	2.32E+06	4.15E+01
2.03E-04	2.22E+05	6.43E+01	1.06E-03	1.07E+06	4.93E+01	7.44E-04	2.21E+06	4.43E+01	7.45E-04	2.55E+06	4.19E+01
2.50E-04	2.60E+05	6.32E+01	1.08E-03	1.08E+06	4.77E+01	8.98E-04	2.43E+06	4.31E+01	9.08E-04	2.81E+06	4.05E+01
2.57E-04	2.69E+05	6.51E+01	1.60E-03	1.33E+06	4.70E+01	1.18E-03	2.74E+06	4.35E+01	1.18E-03	3.10E+06	4.11E+01
3.14E-04	3.03E+05	6.29E+01	1.69E-03	1.35E+06	4.85E+01	1.42E-03	2.99E+06	4.18E+01	1.44E-03	3.39E+06	3.95E+01
3.21E-04	3.07E+05	6.29E+01	1.71E-03	1.36E+06	4.67E+01	1.48E-03	3.04E+06	4.20E+01	1.51E-03	3.45E+06	3.94E+01
4.08E-04	3.73E+05	6.41E+01	2.01E-03	1.49E+06	4.64E+01	1.86E-03	3.37E+06	4.10E+01	1.87E-03	3.73E+06	4.04E+01
4.98E-04	4.18E+05	6.13E+01	2.67E-03	1.72E+06	4.78E+01	1.87E-03	3.35E+06	4.27E+01	1.89E-03	3.80E+06	3.88E+01
5.09E-04	4.20E+05	6.17E+01	2.70E-03	1.71E+06	4.56E+01	2.26E-03	3.64E+06	4.07E+01	2.28E-03	4.04E+06	3.85E+01
6.47E-04	5.11E+05	6.32E+01	3.19E-03	1.88E+06	4.50E+01	2.95E-03	4.11E+06	3.97E+01	2.97E-03	4.50E+06	3.97E+01
7.89E-04	5.73E+05	5.99E+01	4.24E-03	2.18E+06	4.50E+01	2.96E-03	4.09E+06	4.19E+01	3.00E-03	4.55E+06	3.73E+01

Table B.1 Summary of Complex Modulus and Phase Angle Values for Binder 5234LM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
8.07E-04	5.73E+05	6.04E+01	4.29E-03	2.15E+06	4.46E+01	3.58E-03	4.41E+06	3.96E+01	3.62E-03	4.85E+06	3.75E+01
1.02E-03	7.00E+05	6.24E+01	5.06E-03	2.35E+06	4.38E+01	4.68E-03	4.97E+06	3.85E+01	4.70E-03	5.49E+06	3.88E+01
1.11E-03	7.01E+05	5.91E+01	6.72E-03	2.71E+06	4.38E+01	4.69E-03	5.03E+06	4.10E+01	4.76E-03	5.43E+06	3.62E+01
1.25E-03	7.74E+05	5.84E+01	6.79E-03	2.67E+06	4.36E+01	5.67E-03	5.32E+06	3.86E+01	5.73E-03	5.75E+06	3.67E+01
1.28E-03	7.78E+05	5.91E+01	7.12E-03	2.77E+06	4.37E+01	7.14E-03	5.96E+06	3.80E+01	7.18E-03	6.29E+06	3.60E+01
1.40E-03	8.60E+05	5.76E+01	8.02E-03	2.91E+06	4.26E+01	7.41E-03	6.00E+06	3.73E+01	7.54E-03	6.46E+06	3.52E+01
1.62E-03	9.46E+05	6.20E+01	8.94E-03	3.13E+06	4.24E+01	8.97E-03	6.57E+06	3.71E+01	9.01E-03	6.90E+06	3.55E+01
1.98E-03	1.04E+06	5.71E+01	1.06E-02	3.34E+06	4.24E+01	8.98E-03	6.41E+06	3.77E+01	9.08E-03	6.81E+06	3.59E+01
2.03E-03	1.04E+06	5.78E+01	1.08E-02	3.31E+06	4.27E+01	1.17E-02	7.21E+06	3.62E+01	1.20E-02	7.66E+06	3.41E+01
2.21E-03	1.12E+06	5.65E+01	1.27E-02	3.62E+06	4.15E+01	1.42E-02	7.85E+06	3.58E+01	1.43E-02	8.17E+06	3.41E+01
2.57E-03	1.24E+06	6.25E+01	1.42E-02	3.85E+06	4.13E+01	1.42E-02	7.65E+06	3.68E+01	1.44E-02	8.07E+06	3.51E+01
3.14E-03	1.36E+06	5.57E+01	1.71E-02	4.10E+06	4.19E+01	1.86E-02	8.60E+06	3.51E+01	1.89E-02	8.99E+06	3.32E+01
3.21E-03	1.39E+06	5.65E+01	2.01E-02	4.43E+06	4.04E+01	2.25E-02	9.33E+06	3.47E+01	2.26E-02	9.64E+06	3.31E+01
3.51E-03	1.49E+06	5.51E+01	2.25E-02	4.70E+06	4.01E+01	2.26E-02	9.10E+06	3.61E+01	2.28E-02	9.55E+06	3.44E+01
4.98E-03	1.80E+06	5.43E+01	2.70E-02	5.02E+06	4.11E+01	2.95E-02	1.02E+07	3.42E+01	3.00E-02	1.06E+07	3.23E+01
5.09E-03	1.85E+06	5.52E+01	3.19E-02	5.47E+06	3.94E+01	3.56E-02	1.12E+07	3.39E+01	3.59E-02	1.12E+07	3.22E+01
5.52E-03	1.89E+06	5.38E+01	3.56E-02	5.74E+06	3.89E+01	3.57E-02	1.11E+07	3.37E+01	3.62E-02	1.12E+07	3.38E+01
5.56E-03	2.02E+06	5.34E+01	3.73E-02	5.84E+06	3.94E+01	3.58E-02	1.08E+07	3.53E+01	3.83E-02	1.17E+07	3.26E+01
6.93E-03	2.17E+06	5.27E+01	4.29E-02	6.16E+06	4.03E+01	4.47E-02	1.22E+07	3.31E+01	4.76E-02	1.23E+07	3.16E+01
7.89E-03	2.35E+06	5.30E+01	4.69E-02	6.50E+06	3.83E+01	4.68E-02	1.21E+07	3.33E+01	4.81E-02	1.26E+07	3.16E+01
8.07E-03	2.43E+06	5.40E+01	5.06E-02	6.62E+06	3.86E+01	5.66E-02	1.30E+07	3.27E+01	5.69E-02	1.32E+07	3.11E+01
8.81E-03	2.63E+06	5.16E+01	5.64E-02	7.00E+06	3.79E+01	5.67E-02	1.28E+07	3.46E+01	5.73E-02	1.30E+07	3.32E+01
1.10E-02	2.80E+06	5.13E+01	6.79E-02	7.50E+06	3.97E+01	7.09E-02	1.43E+07	3.21E+01	7.54E-02	1.44E+07	3.09E+01
1.25E-02	3.04E+06	5.17E+01	7.43E-02	7.85E+06	3.72E+01	7.41E-02	1.42E+07	3.25E+01	7.63E-02	1.47E+07	3.06E+01

Table B.1 Summary of Complex Modulus and Phase Angle Values for Binder 5234LM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
1.28E-02	3.17E+06	5.28E+01	8.02E-02	7.97E+06	3.78E+01	8.97E-02	1.53E+07	3.17E+01	9.01E-02	1.54E+07	3.03E+01
1.40E-02	3.33E+06	5.06E+01	8.94E-02	8.48E+06	3.68E+01	8.98E-02	1.52E+07	3.39E+01	1.20E-01	1.68E+07	3.02E+01
1.74E-02	3.63E+06	4.97E+01	1.08E-01	9.11E+06	3.90E+01	1.12E-01	1.67E+07	3.11E+01	1.21E-01	1.71E+07	2.97E+01
1.98E-02	3.98E+06	5.03E+01	1.18E-01	9.41E+06	3.61E+01	1.17E-01	1.67E+07	3.17E+01	1.43E-01	1.78E+07	2.96E+01
2.03E-02	4.13E+06	5.16E+01	1.27E-01	9.59E+06	3.70E+01	1.42E-01	1.79E+07	3.09E+01	1.89E-01	1.93E+07	2.97E+01
2.21E-02	4.23E+06	4.92E+01	1.42E-01	1.01E+07	3.59E+01	1.42E-01	1.78E+07	3.34E+01	1.92E-01	1.98E+07	2.88E+01
2.76E-02	4.68E+06	4.78E+01	1.71E-01	1.09E+07	3.59E+01	1.78E-01	1.94E+07	3.00E+01	1.94E-01	1.99E+07	2.95E+01
3.14E-02	5.10E+06	4.90E+01	1.81E-01	1.14E+07	3.58E+01	1.86E-01	1.95E+07	3.11E+01	2.26E-01	2.06E+07	2.89E+01
3.18E-02	5.13E+06	4.80E+01	1.87E-01	1.13E+07	3.49E+01	1.86E-01	1.98E+07	3.06E+01	2.44E-01	2.14E+07	2.89E+01
3.21E-02	5.27E+06	5.11E+01	2.01E-01	1.16E+07	3.63E+01	2.25E-01	2.07E+07	3.02E+01	3.00E-01	2.22E+07	2.91E+01
3.51E-02	5.43E+06	4.77E+01	2.25E-01	1.20E+07	3.51E+01	2.34E-01	2.13E+07	2.98E+01	3.04E-01	2.27E+07	2.79E+01
4.00E-02	5.85E+06	4.68E+01	2.27E-01	1.24E+07	3.50E+01	2.82E-01	2.26E+07	2.92E+01	3.59E-01	2.35E+07	2.83E+01
4.37E-02	5.94E+06	4.65E+01	2.96E-01	1.35E+07	3.40E+01	2.95E-01	2.27E+07	3.05E+01	3.86E-01	2.46E+07	2.78E+01
4.98E-02	6.56E+06	4.77E+01	3.19E-01	1.39E+07	3.56E+01	3.57E-01	2.39E+07	2.95E+01	4.76E-01	2.57E+07	2.87E+01
5.56E-02	6.68E+06	4.66E+01	3.56E-01	1.44E+07	3.44E+01	3.71E-01	2.44E+07	2.90E+01	4.81E-01	2.60E+07	2.72E+01
6.34E-02	7.35E+06	4.52E+01	3.60E-01	1.47E+07	3.36E+01	4.47E-01	2.59E+07	2.84E+01	5.69E-01	2.70E+07	2.77E+01
6.93E-02	7.40E+06	4.51E+01	4.69E-01	1.61E+07	3.32E+01	4.68E-01	2.64E+07	2.99E+01	6.12E-01	2.81E+07	2.70E+01
7.89E-02	8.41E+06	4.63E+01	5.06E-01	1.65E+07	3.51E+01	5.66E-01	2.75E+07	2.89E+01	7.54E-01	2.96E+07	2.82E+01
8.81E-02	8.09E+06	4.56E+01	5.64E-01	1.70E+07	3.37E+01	5.88E-01	2.80E+07	2.81E+01	7.63E-01	2.97E+07	2.66E+01
1.00E-01	9.18E+06	4.37E+01	5.70E-01	1.75E+07	3.27E+01	7.09E-01	2.97E+07	2.77E+01	9.01E-01	3.11E+07	2.72E+01
1.10E-01	9.34E+06	4.36E+01	7.43E-01	1.90E+07	3.23E+01	7.41E-01	3.07E+07	2.94E+01	9.70E-01	3.21E+07	2.64E+01
1.25E-01	1.07E+07	4.52E+01	8.02E-01	1.97E+07	3.46E+01	8.97E-01	3.15E+07	2.83E+01	1.08E+00	3.28E+07	2.69E+01
1.40E-01	9.81E+06	4.45E+01	8.94E-01	2.01E+07	3.31E+01	9.26E-01	3.25E+07	2.74E+01	1.21E+00	3.38E+07	2.60E+01
1.59E-01	1.12E+07	4.21E+01	9.03E-01	2.06E+07	3.19E+01	9.31E-01	3.23E+07	2.73E+01	1.35E+00	3.49E+07	2.62E+01

Table B.1 Summary of Complex Modulus and Phase Angle Values for Binder 5234LM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
1.74E-01	1.16E+07	4.23E+01	1.04E+00	2.17E+07	3.21E+01	1.12E+00	3.41E+07	2.70E+01	1.43E+00	3.55E+07	2.67E+01
1.99E-01	1.25E+07	4.20E+01	1.18E+00	2.27E+07	3.15E+01	1.16E+00	3.50E+07	2.73E+01	1.54E+00	3.65E+07	2.55E+01
2.21E-01	1.19E+07	4.35E+01	1.30E+00	2.33E+07	3.15E+01	1.42E+00	3.65E+07	2.78E+01	1.92E+00	3.85E+07	2.55E+01
2.50E-01	1.40E+07	4.08E+01	1.42E+00	2.37E+07	3.25E+01	1.48E+00	3.72E+07	2.65E+01	2.15E+00	3.99E+07	2.54E+01
2.52E-01	1.38E+07	4.09E+01	1.43E+00	2.39E+07	3.10E+01	1.78E+00	3.89E+07	2.65E+01	2.26E+00	4.06E+07	2.63E+01
2.76E-01	1.42E+07	4.11E+01	1.87E+00	2.64E+07	3.09E+01	1.84E+00	4.01E+07	2.62E+01	2.44E+00	4.13E+07	2.50E+01
3.51E-01	1.48E+07	4.24E+01	2.07E+00	2.77E+07	3.01E+01	2.25E+00	4.18E+07	2.73E+01	3.04E+00	4.37E+07	2.50E+01
3.96E-01	1.71E+07	3.94E+01	2.25E+00	2.78E+07	3.20E+01	2.34E+00	4.25E+07	2.58E+01	3.40E+00	4.55E+07	2.47E+01
4.00E-01	1.67E+07	3.97E+01	2.27E+00	2.79E+07	3.03E+01	2.82E+00	4.45E+07	2.59E+01	3.59E+00	4.63E+07	2.59E+01
4.37E-01	1.76E+07	3.98E+01	2.96E+00	3.05E+07	3.03E+01	2.92E+00	4.56E+07	2.55E+01	3.86E+00	4.67E+07	2.45E+01
5.56E-01	1.89E+07	4.11E+01	3.28E+00	3.16E+07	2.97E+01	3.57E+00	4.84E+07	2.68E+01	4.81E+00	4.95E+07	2.46E+01
6.27E-01	2.07E+07	3.82E+01	3.53E+00	3.56E+07	2.91E+01	3.71E+00	4.85E+07	2.52E+01	5.39E+00	5.14E+07	2.40E+01
6.34E-01	1.99E+07	3.85E+01	3.56E+00	3.26E+07	3.15E+01	4.47E+00	5.07E+07	2.55E+01	6.12E+00	5.25E+07	2.40E+01
6.93E-01	2.16E+07	3.87E+01	3.60E+00	3.25E+07	2.96E+01	4.63E+00	5.22E+07	2.49E+01	7.26E+00	5.59E+07	2.42E+01
9.94E-01	2.48E+07	3.69E+01	4.43E+00	3.78E+07	2.89E+01	5.88E+00	5.50E+07	2.47E+01	7.63E+00	5.62E+07	2.42E+01
1.00E+00	2.46E+07	3.71E+01	4.69E+00	3.54E+07	2.98E+01	6.11E+00	5.66E+07	2.49E+01	8.54E+00	5.79E+07	2.34E+01
1.10E+00	2.63E+07	3.75E+01	5.19E+00	3.67E+07	2.90E+01	7.09E+00	5.75E+07	2.50E+01	9.12E+00	5.92E+07	2.35E+01
1.14E+00	2.67E+07	3.66E+01	5.70E+00	3.76E+07	2.89E+01	7.34E+00	5.85E+07	2.43E+01	9.70E+00	5.93E+07	2.36E+01
1.43E+00	2.89E+07	3.60E+01	7.02E+00	4.14E+07	2.81E+01	7.67E+00	6.02E+07	2.44E+01	1.21E+01	6.33E+07	2.39E+01
1.58E+00	3.00E+07	3.55E+01	7.43E+00	4.10E+07	2.93E+01	9.31E+00	6.22E+07	2.42E+01	1.35E+01	6.51E+07	2.29E+01
1.59E+00	3.05E+07	3.58E+01	8.23E+00	4.24E+07	2.82E+01	1.12E+01	6.53E+07	2.47E+01	1.44E+01	6.71E+07	2.31E+01
1.74E+00	3.23E+07	3.64E+01	9.03E+00	4.36E+07	2.84E+01	1.16E+01	6.61E+07	2.36E+01	1.54E+01	6.68E+07	2.32E+01
2.27E+00	3.50E+07	3.45E+01	1.11E+01	4.67E+07	2.77E+01	1.22E+01	6.73E+07	2.36E+01	1.92E+01	7.13E+07	2.37E+01
2.50E+00	3.62E+07	3.43E+01	1.18E+01	4.73E+07	2.89E+01	1.48E+01	7.00E+07	2.38E+01	2.15E+01	7.29E+07	2.24E+01

Table B.1 Summary of Complex Modulus and Phase Angle Values for Binder 5234LM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
2.52E+00	3.61E+07	3.48E+01	1.30E+01	4.97E+07	2.74E+01	1.78E+01	7.37E+07	2.43E+01	2.29E+01	7.51E+07	2.24E+01
2.76E+00	3.87E+07	3.54E+01	1.43E+01	5.04E+07	2.78E+01	1.84E+01	7.46E+07	2.31E+01	2.44E+01	7.47E+07	2.28E+01
3.60E+00	4.13E+07	3.34E+01	1.76E+01	5.40E+07	2.70E+01	1.93E+01	7.60E+07	2.32E+01	3.40E+01	8.18E+07	2.20E+01
3.96E+00	4.26E+07	3.32E+01	1.87E+01	5.47E+07	2.85E+01	2.34E+01	7.91E+07	2.34E+01	3.63E+01	8.36E+07	2.18E+01
4.00E+00	4.31E+07	3.38E+01	2.07E+01	5.73E+07	2.68E+01	2.92E+01	8.42E+07	2.26E+01	3.86E+01	8.38E+07	2.25E+01
5.70E+00	4.84E+07	3.25E+01	2.27E+01	5.79E+07	2.74E+01	3.05E+01	8.55E+07	2.26E+01	5.39E+01	9.15E+07	2.17E+01
6.27E+00	5.04E+07	3.22E+01	2.72E+01	6.52E+07	2.63E+01	3.71E+01	8.92E+07	2.30E+01	5.75E+01	9.35E+07	2.14E+01
6.34E+00	5.15E+07	3.28E+01	2.80E+01	6.06E+07	2.62E+01	4.63E+01	9.43E+07	2.22E+01	6.12E+01	9.36E+07	2.23E+01
8.90E+00	5.67E+07	3.16E+01	3.28E+01	6.46E+07	2.63E+01	4.84E+01	9.54E+07	2.21E+01	8.54E+01	1.02E+08	2.13E+01
9.04E+00	5.67E+07	3.12E+01	3.42E+01	6.94E+07	2.59E+01	5.88E+01	1.00E+08	2.27E+01	8.91E+01	1.05E+08	2.12E+01
9.94E+00	5.87E+07	3.12E+01	3.60E+01	6.67E+07	2.69E+01	7.34E+01	1.05E+08	2.19E+01	9.12E+01	1.05E+08	2.09E+01
1.00E+01	6.11E+07	3.19E+01	4.43E+01	7.12E+07	2.56E+01	7.67E+01	1.07E+08	2.16E+01	9.70E+01	1.05E+08	2.20E+01
1.12E+01	6.09E+07	3.11E+01	5.19E+01	7.45E+07	2.58E+01	8.49E+01	1.09E+08	2.23E+01	1.12E+02	1.10E+08	2.09E+01
1.43E+01	6.65E+07	3.02E+01	5.42E+01	7.88E+07	2.51E+01	9.31E+01	1.13E+08	2.23E+01	1.35E+02	1.14E+08	2.10E+01
1.58E+01	6.89E+07	3.03E+01	5.70E+01	7.66E+07	2.65E+01	1.07E+02	1.15E+08	2.14E+01	1.44E+02	1.16E+08	2.05E+01
1.59E+01	7.10E+07	3.10E+01	7.02E+01	7.90E+07	2.52E+01	1.16E+02	1.18E+08	2.15E+01	1.77E+02	1.22E+08	2.07E+01
1.77E+01	7.12E+07	2.99E+01	7.47E+01	8.44E+07	2.58E+01	1.22E+02	1.18E+08	2.11E+01	2.15E+02	1.27E+08	2.08E+01
2.27E+01	7.73E+07	2.92E+01	8.23E+01	8.49E+07	2.54E+01	1.69E+02	1.28E+08	2.13E+01	2.29E+02	1.28E+08	2.02E+01
2.37E+01	7.75E+07	2.97E+01	8.59E+01	8.68E+07	2.45E+01	1.84E+02	1.31E+08	2.12E+01	2.46E+02	1.34E+08	2.08E+01
2.50E+01	8.03E+07	2.94E+01	9.03E+01	8.80E+07	2.61E+01	1.93E+02	1.32E+08	2.07E+01	2.81E+02	1.35E+08	2.00E+01
2.81E+01	8.28E+07	2.86E+01	9.38E+01	9.09E+07	2.45E+01	2.37E+02	1.39E+08	2.14E+01	3.09E+02	1.40E+08	1.98E+01
2.98E+01	8.39E+07	2.92E+01	1.11E+02	9.02E+07	2.46E+01	2.68E+02	1.42E+08	2.02E+01	3.40E+02	1.40E+08	2.05E+01
3.60E+01	9.00E+07	2.83E+01	1.30E+02	9.58E+07	2.50E+01	2.92E+02	1.46E+08	2.10E+01	3.63E+02	1.42E+08	1.99E+01
3.96E+01	9.19E+07	2.87E+01	1.36E+02	9.41E+07	2.45E+01	2.98E+02	1.47E+08	1.99E+01	4.46E+02	1.50E+08	1.97E+01

Table B.1 Summary of Complex Modulus and Phase Angle Values for Binder 5234LM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
4.45E+01	9.64E+07	2.78E+01	1.49E+02	1.03E+08	2.43E+01	3.05E+02	1.46E+08	2.04E+01	4.90E+02	1.54E+08	1.93E+01
4.72E+01	9.86E+07	2.77E+01	1.76E+02	1.03E+08	2.41E+01	4.25E+02	1.58E+08	2.02E+01	5.39E+02	1.56E+08	2.03E+01
5.70E+01	1.03E+08	2.75E+01	1.77E+02	1.06E+08	2.43E+01	4.63E+02	1.63E+08	2.06E+01	5.75E+02	1.57E+08	1.96E+01
6.27E+01	1.04E+08	2.80E+01	2.07E+02	1.09E+08	2.45E+01	4.72E+02	1.61E+08	1.99E+01	7.06E+02	1.65E+08	1.91E+01
7.05E+01	1.10E+08	2.70E+01	2.16E+02	1.05E+08	2.36E+01	4.84E+02	1.62E+08	2.02E+01	7.76E+02	1.69E+08	1.92E+01
7.48E+01	1.10E+08	2.72E+01	2.22E+02	1.07E+08	2.79E+01	6.73E+02	1.75E+08	1.95E+01	7.82E+02	1.70E+08	1.73E+01
8.10E+01	1.14E+08	2.73E+01	2.36E+02	1.12E+08	2.36E+01	7.47E+02	1.78E+08	2.04E+01	9.12E+02	1.73E+08	1.93E+01
9.04E+01	1.18E+08	2.67E+01	2.80E+02	1.16E+08	2.37E+01	7.67E+02	1.79E+08	1.98E+01	9.82E+02	1.73E+08	1.97E+01
9.94E+01	1.19E+08	2.73E+01	3.28E+02	1.23E+08	2.42E+01	9.12E+02	1.81E+08	1.98E+01	1.12E+03	1.81E+08	1.90E+01
1.02E+02	1.21E+08	2.63E+01	3.42E+02	1.19E+08	2.31E+01	1.07E+03	1.92E+08	1.91E+01	1.23E+03	1.86E+08	1.88E+01
1.12E+02	1.27E+08	2.64E+01	3.52E+02	1.20E+08	2.27E+01	1.14E+03	1.95E+08	2.01E+01	1.44E+03	1.91E+08	1.91E+01
1.19E+02	1.24E+08	2.61E+01	3.73E+02	1.26E+08	2.32E+01	1.18E+03	1.96E+08	1.94E+01	1.56E+03	1.97E+08	1.83E+01
1.43E+02	1.35E+08	2.59E+01	4.43E+02	1.34E+08	2.32E+01	1.22E+03	1.98E+08	1.95E+01	1.77E+03	2.00E+08	1.86E+01
1.61E+02	1.39E+08	2.58E+01	5.19E+02	1.40E+08	2.38E+01	1.69E+03	2.13E+08	1.89E+01	1.95E+03	2.03E+08	1.85E+01
1.77E+02	1.43E+08	2.54E+01	5.42E+02	1.33E+08	2.25E+01	1.81E+03	2.10E+08	1.97E+01	2.29E+03	2.11E+08	1.88E+01
1.88E+02	1.45E+08	2.56E+01	5.58E+02	1.39E+08	2.31E+01	1.88E+03	2.17E+08	1.90E+01	2.47E+03	2.09E+08	1.74E+01
2.27E+02	1.53E+08	2.52E+01	5.92E+02	1.40E+08	2.25E+01	1.93E+03	2.18E+08	1.92E+01	2.66E+03	2.17E+08	1.82E+01
2.55E+02	1.60E+08	2.46E+01	6.14E+02	1.42E+08	2.36E+01	2.68E+03	2.36E+08	1.85E+01	2.81E+03	2.19E+08	1.82E+01
2.81E+02	1.63E+08	2.45E+01	7.02E+02	1.49E+08	2.28E+01	2.88E+03	2.33E+08	1.95E+01	3.09E+03	2.23E+08	1.81E+01
2.98E+02	1.65E+08	2.47E+01	7.72E+02	1.54E+08	2.04E+01	2.98E+03	2.37E+08	1.85E+01	3.34E+03	2.19E+08	1.71E+01
3.15E+02	1.69E+08	2.42E+01	8.00E+02	1.48E+08	2.19E+01	3.05E+03	2.40E+08	1.89E+01	3.63E+03	2.30E+08	1.86E+01
3.60E+02	1.74E+08	2.45E+01	8.59E+02	1.49E+08	2.23E+01	3.09E+03	2.34E+08	1.89E+01	3.91E+03	2.36E+08	1.82E+01
3.96E+02	1.86E+08	2.21E+01	8.84E+02	1.50E+08	2.22E+01	3.88E+03	2.42E+08	1.76E+01	4.46E+03	2.40E+08	1.79E+01
4.05E+02	1.81E+08	2.40E+01	9.38E+02	1.54E+08	2.16E+01	4.25E+03	2.57E+08	1.81E+01	4.90E+03	2.44E+08	1.79E+01

Table B.1 Summary of Complex Modulus and Phase Angle Values for Binder 5234LM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
4.45E+02	1.83E+08	2.37E+01	1.01E+03	1.74E+08	2.60E+01	4.56E+03	2.60E+08	1.81E+01	5.29E+03	2.46E+08	2.13E+01
4.72E+02	1.85E+08	2.36E+01	1.11E+03	1.66E+08	2.24E+01	4.72E+03	2.61E+08	1.81E+01	6.19E+03	2.57E+08	1.72E+01
5.70E+02	1.96E+08	2.38E+01	1.22E+03	1.73E+08	2.12E+01	6.15E+03	2.98E+08	1.76E+01	7.06E+03	2.62E+08	1.76E+01
6.27E+02	2.04E+08	2.39E+01	1.36E+03	1.72E+08	2.15E+01	6.73E+03	2.80E+08	1.79E+01	7.76E+03	2.66E+08	1.75E+01
6.42E+02	2.03E+08	2.30E+01	1.40E+03	1.67E+08	2.11E+01	7.22E+03	2.82E+08	1.79E+01	8.38E+03	2.73E+08	1.93E+01
7.05E+02	2.05E+08	2.31E+01	1.49E+03	1.74E+08	2.16E+01	7.47E+03	2.85E+08	1.77E+01	8.43E+03	2.74E+08	1.93E+01
7.48E+02	2.11E+08	2.28E+01	1.59E+03	1.96E+08	1.83E+01	9.03E+03	3.19E+08	1.93E+01	9.82E+03	2.82E+08	1.71E+01
9.94E+02	2.15E+08	2.15E+01	1.76E+03	1.90E+08	2.19E+01	9.75E+03	2.89E+08	1.75E+01	1.06E+04	2.90E+08	1.65E+01
1.02E+03	2.28E+08	2.20E+01	1.94E+03	1.88E+08	2.15E+01	1.07E+04	3.08E+08	1.75E+01	1.12E+04	2.87E+08	1.73E+01
1.12E+03	2.32E+08	2.23E+01	2.16E+03	1.98E+08	2.10E+01	1.13E+04	2.90E+08	1.94E+01	1.23E+04	2.90E+08	1.72E+01
1.19E+03	2.41E+08	2.19E+01	2.22E+03	1.90E+08	2.07E+01	1.14E+04	3.15E+08	1.69E+01	1.33E+04	3.01E+08	1.72E+01
1.25E+03	2.42E+08	2.56E+01	2.31E+03	2.13E+08	1.81E+01	1.18E+04	3.12E+08	1.74E+01	1.56E+04	3.08E+08	1.68E+01
1.57E+03	2.41E+08	2.28E+01	2.36E+03	1.92E+08	2.13E+01	1.54E+04	3.33E+08	1.72E+01	1.68E+04	3.18E+08	1.87E+01
1.58E+03	2.54E+08	2.30E+01	2.52E+03	2.02E+08	2.09E+01	1.69E+04	3.35E+08	1.72E+01	1.77E+04	3.13E+08	1.70E+01
1.61E+03	2.55E+08	2.21E+01	2.90E+03	2.12E+08	2.00E+01	1.80E+04	3.53E+08	1.68E+01	1.95E+04	3.15E+08	1.68E+01
1.77E+03	2.56E+08	2.16E+01	3.07E+03	2.12E+08	2.04E+01	1.81E+04	3.36E+08	1.76E+01	2.10E+04	3.17E+08	1.49E+01
1.88E+03	2.67E+08	2.12E+01	3.42E+03	2.20E+08	2.06E+01	1.88E+04	3.40E+08	1.70E+01	2.47E+04	3.35E+08	1.66E+01
2.35E+03	2.53E+08	2.03E+01	3.52E+03	2.09E+08	2.04E+01	2.45E+04	3.60E+08	2.04E+01	2.66E+04	3.52E+08	1.66E+01
2.49E+03	2.72E+08	2.12E+01	3.73E+03	2.10E+08	2.07E+01	2.68E+04	3.65E+08	1.68E+01	2.81E+04	3.41E+08	1.67E+01
2.50E+03	2.87E+08	2.04E+01	4.00E+03	2.22E+08	2.08E+01	2.85E+04	3.74E+08	1.89E+01	3.09E+04	3.43E+08	1.65E+01
2.55E+03	2.84E+08	2.07E+01	4.60E+03	2.27E+08	1.74E+01	2.88E+04	3.68E+08	1.65E+01	3.34E+04	3.56E+08	1.65E+01
2.81E+03	2.88E+08	2.09E+01	4.79E+03	2.96E+08	2.11E+01	2.98E+04	3.70E+08	1.67E+01	3.77E+04	3.50E+08	1.80E+01
2.95E+03	2.91E+08	1.91E+01	4.87E+03	2.22E+08	2.03E+01	3.88E+04	3.94E+08	1.81E+01	3.91E+04	3.64E+08	1.62E+01
2.98E+03	2.97E+08	2.05E+01	5.42E+03	2.42E+08	2.02E+01	4.25E+04	3.97E+08	1.63E+01	4.21E+04	3.70E+08	1.62E+01

Table B.1 Summary of Complex Modulus and Phase Angle Values for Binder 5234LM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
3.95E+03	3.17E+08	2.06E+01	5.58E+03	2.32E+08	2.00E+01	4.52E+04	4.01E+08	1.65E+01	4.46E+04	3.71E+08	1.64E+01
3.96E+03	3.11E+08	2.00E+01	5.92E+03	2.32E+08	2.03E+01	4.56E+04	4.00E+08	1.63E+01	4.73E+04	3.70E+08	1.84E+01
4.05E+03	3.14E+08	2.00E+01	6.01E+03	2.76E+08	2.03E+01	4.72E+04	4.03E+08	1.63E+01	4.90E+04	3.73E+08	1.62E+01
4.45E+03	3.16E+08	2.02E+01	6.34E+03	2.47E+08	1.74E+01	5.04E+04	4.02E+08	1.98E+01	5.29E+04	3.82E+08	1.60E+01
4.67E+03	3.42E+08	1.85E+01	7.29E+03	2.61E+08	1.77E+01	6.15E+04	4.33E+08	1.59E+01	6.19E+04	3.97E+08	1.58E+01
4.72E+03	3.27E+08	1.99E+01	7.72E+03	2.43E+08	1.91E+01	6.33E+04	3.90E+08	1.71E+01	6.68E+04	4.07E+08	1.66E+01
4.75E+03	3.74E+08	2.01E+01	8.59E+03	2.61E+08	1.98E+01	7.16E+04	4.44E+08	1.48E+01	7.50E+04	3.94E+08	1.65E+01
5.96E+03	3.47E+08	2.02E+01	8.84E+03	2.59E+08	1.92E+01	7.22E+04	4.34E+08	1.57E+01	7.76E+04	4.03E+08	1.59E+01
6.25E+03	3.44E+08	2.03E+01	9.38E+03	2.52E+08	2.00E+01	7.47E+04	4.35E+08	1.60E+01	8.38E+04	4.18E+08	1.57E+01
6.27E+03	3.49E+08	1.93E+01	9.53E+03	2.70E+08	1.91E+01	9.75E+04	4.65E+08	1.54E+01	9.82E+04	4.29E+08	1.55E+01
6.42E+03	3.47E+08	1.93E+01	1.01E+04	2.59E+08	1.77E+01	1.00E+05	4.34E+08	1.85E+01	1.06E+05	4.37E+08	1.50E+01
7.40E+03	3.58E+08	1.78E+01	1.14E+04	3.22E+08	1.77E+01	1.11E+05	4.39E+08	1.99E+01	1.19E+05	4.28E+08	1.86E+01
7.48E+03	3.63E+08	1.91E+01	1.16E+04	2.81E+08	1.85E+01	1.13E+05	4.61E+08	1.25E+01	1.23E+05	4.37E+08	1.55E+01
9.45E+03	3.78E+08	1.76E+01	1.22E+04	2.80E+08	1.87E+01	1.14E+05	4.68E+08	1.54E+01	1.33E+05	4.47E+08	1.51E+01
9.91E+03	3.75E+08	1.89E+01	1.36E+04	2.88E+08	1.94E+01	1.18E+05	4.72E+08	1.55E+01	1.56E+05	4.64E+08	1.51E+01
9.94E+03	3.86E+08	1.83E+01	1.40E+04	2.85E+08	1.87E+01	1.39E+05	4.41E+08	1.60E+01	1.66E+05	3.96E+08	2.05E+01
1.02E+04	3.82E+08	1.86E+01	1.44E+04	3.31E+08	1.58E+01	1.54E+05	4.99E+08	1.51E+01	1.68E+05	4.73E+08	1.51E+01
1.17E+04	4.07E+08	1.87E+01	1.49E+04	2.74E+08	1.95E+01	1.59E+05	4.57E+08	1.66E+01	1.88E+05	4.66E+08	1.14E+01
1.19E+04	3.95E+08	1.85E+01	1.51E+04	3.11E+08	1.84E+01	1.80E+05	5.05E+08	1.55E+01	2.08E+05	4.55E+08	1.49E+01
1.50E+04	4.02E+08	2.20E+01	1.59E+04	3.04E+08	1.85E+01	1.81E+05	5.06E+08	1.50E+01	2.10E+05	4.84E+08	1.48E+01
1.57E+04	3.91E+08	1.98E+01	1.83E+04	3.09E+08	1.79E+01	2.21E+05	6.18E+08	1.58E+01	2.47E+05	5.01E+08	1.47E+01
1.58E+04	4.25E+08	1.77E+01	1.94E+04	3.02E+08	1.79E+01	2.45E+05	5.39E+08	1.50E+01	2.66E+05	5.08E+08	1.46E+01
1.61E+04	4.20E+08	1.78E+01	2.22E+04	3.17E+08	1.82E+01	2.52E+05	4.88E+08	1.94E+01	2.96E+05	4.58E+08	1.41E+01
1.86E+04	4.44E+08	1.84E+01	2.27E+04	4.23E+08	1.70E+01	2.85E+05	5.48E+08	1.50E+01	2.99E+05	5.00E+08	1.44E+01

Table B.1 Summary of Complex Modulus and Phase Angle Values for Binder 5234LM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
2.37E+04	4.48E+08	1.77E+01	2.28E+04	3.84E+08	1.70E+01	2.88E+05	5.44E+08	1.47E+01	3.30E+05	5.32E+08	1.85E+01
2.49E+04	4.47E+08	1.73E+01	2.36E+04	3.13E+08	1.88E+01	3.49E+05	5.37E+08	1.08E+01	3.34E+05	5.20E+08	1.45E+01
2.50E+04	4.57E+08	1.71E+01	2.39E+04	3.42E+08	1.88E+01	3.88E+05	5.79E+08	1.08E+01	3.91E+05	5.41E+08	1.43E+01
2.55E+04	4.61E+08	1.70E+01	2.52E+04	3.21E+08	1.67E+01	4.00E+05	5.30E+08	1.51E+01	4.21E+05	5.47E+08	1.42E+01
2.95E+04	4.74E+08	1.71E+01	2.85E+04	4.17E+08	1.67E+01	4.52E+05	5.89E+08	1.43E+01	4.73E+05	5.57E+08	1.63E+01
3.30E+04	4.56E+08	2.12E+01	2.90E+04	3.33E+08	1.86E+01	4.56E+05	5.87E+08	1.41E+01	5.29E+05	5.58E+08	1.41E+01
3.76E+04	4.83E+08	1.26E+01	3.07E+04	3.29E+08	1.75E+01	5.77E+05	6.61E+08	1.34E+01	5.90E+05	5.36E+08	1.41E+01
3.95E+04	4.76E+08	1.66E+01	3.52E+04	3.49E+08	1.77E+01	6.15E+05	6.26E+08	1.38E+01	6.68E+05	5.88E+08	1.38E+01
3.96E+04	5.01E+08	1.63E+01	3.61E+04	3.43E+08	2.29E+01	6.33E+05	5.62E+08	1.43E+01	7.50E+05	5.88E+08	1.39E+01
4.05E+04	5.05E+08	1.63E+01	3.73E+04	3.47E+08	1.81E+01	7.16E+05	6.35E+08	1.38E+01	8.30E+05	6.48E+08	1.10E+01
4.15E+04	4.49E+08	1.78E+01	3.79E+04	3.55E+08	1.83E+01	7.25E+05	7.38E+08	1.36E+01	8.38E+05	5.98E+08	1.37E+01
4.67E+04	5.38E+08	1.57E+01	4.00E+04	3.48E+08	1.65E+01	8.78E+05	6.40E+08	1.19E+01	1.06E+06	6.32E+08	1.35E+01
5.96E+04	5.28E+08	1.18E+01	4.60E+04	3.57E+08	1.53E+01	9.75E+05	6.71E+08	1.33E+01	1.19E+06	6.33E+08	1.34E+01
6.25E+04	5.10E+08	1.63E+01	4.87E+04	3.59E+08	1.70E+01	1.00E+06	6.26E+08	1.36E+01	1.31E+06	5.79E+08	1.40E+01
6.27E+04	5.36E+08	1.57E+01	5.58E+04	3.84E+08	1.72E+01	1.13E+06	6.82E+08	1.33E+01	1.33E+06	6.40E+08	1.33E+01
6.57E+04	4.87E+08	1.99E+01	5.72E+04	4.35E+08	1.72E+01	1.15E+06	7.90E+08	1.05E+01	1.46E+06	6.72E+08	1.28E+01
7.40E+04	5.76E+08	1.46E+01	6.01E+04	4.05E+08	1.73E+01	1.39E+06	7.45E+08	1.08E+01	1.68E+06	6.76E+08	1.29E+01
9.45E+04	6.14E+08	1.62E+01	6.34E+04	3.82E+08	1.59E+01	1.54E+06	7.13E+08	1.29E+01	1.84E+06	7.84E+08	1.52E+01
9.91E+04	5.53E+08	1.55E+01	7.16E+04	4.54E+08	1.59E+01	1.59E+06	6.60E+08	1.38E+01	1.88E+06	6.85E+08	1.24E+01
9.94E+04	5.84E+08	1.49E+01	7.29E+04	3.84E+08	1.56E+01	1.80E+06	7.32E+08	1.27E+01	2.08E+06	6.72E+08	1.15E+01
1.04E+05	5.09E+08	1.14E+01	7.72E+04	3.91E+08	1.66E+01	2.21E+06	7.33E+08	1.36E+01	2.35E+06	7.66E+08	1.15E+01
1.17E+05	6.18E+08	1.45E+01	8.84E+04	4.23E+08	1.65E+01	2.52E+06	7.06E+08	1.34E+01	2.66E+06	7.20E+08	1.25E+01
1.33E+05	5.58E+08	1.32E+01	9.07E+04	4.32E+08	1.71E+01	2.85E+06	7.81E+08	1.22E+01	2.91E+06	6.41E+08	1.61E+01
1.50E+05	6.40E+08	1.35E+01	9.53E+04	4.25E+08	1.71E+01	2.89E+06	7.59E+08	1.22E+01	2.99E+06	7.28E+08	1.22E+01

Table B.1 Summary of Complex Modulus and Phase Angle Values for Binder 5234LM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
1.57E+05	6.00E+08	1.47E+01	1.00E+05	4.10E+08	1.56E+01	3.49E+06	8.03E+08	1.22E+01	3.30E+06	7.02E+08	1.35E+01
1.58E+05	6.22E+08	1.43E+01	1.14E+05	4.85E+08	2.29E+01	4.00E+06	7.55E+08	1.27E+01	3.72E+06	8.60E+08	1.41E+01
1.65E+05	6.24E+08	1.39E+01	1.16E+05	4.15E+08	1.51E+01	4.52E+06	8.29E+08	1.18E+01	4.21E+06	7.69E+08	1.20E+01
1.67E+05	5.65E+08	1.86E+01	1.22E+05	4.27E+08	1.60E+01	4.57E+06	8.24E+08	1.45E+01	4.61E+06	7.76E+08	1.08E+01
1.86E+05	6.64E+08	1.37E+01	1.44E+05	5.29E+08	1.60E+01	5.54E+06	8.56E+08	1.26E+01	4.73E+06	7.75E+08	1.21E+01
2.37E+05	6.91E+08	1.37E+01	1.51E+05	4.52E+08	1.45E+01	6.33E+06	8.00E+08	1.21E+01	5.23E+06	7.58E+08	1.36E+01
2.49E+05	6.48E+08	1.40E+01	1.59E+05	4.41E+08	1.53E+01	7.25E+06	8.45E+08	1.21E+01	5.90E+06	8.37E+08	1.36E+01
2.62E+05	5.73E+08	1.95E+01	1.80E+05	4.98E+08	1.28E+01	8.78E+06	9.08E+08	1.19E+01	7.31E+06	7.51E+08	1.47E+01
2.65E+05	5.96E+08	1.77E+01	1.83E+05	4.47E+08	1.47E+01	1.00E+07	8.47E+08	1.17E+01	7.50E+06	8.24E+08	1.15E+01
2.95E+05	7.01E+08	1.33E+01	1.94E+05	4.57E+08	1.55E+01	1.15E+07	9.65E+08	1.16E+01	8.30E+06	8.04E+08	1.19E+01
3.76E+05	7.36E+08	1.27E+01	2.28E+05	4.97E+08	1.55E+01	1.39E+07	9.59E+08	1.08E+01	9.35E+06	9.06E+08	1.22E+01
3.95E+05	6.92E+08	1.32E+01	2.39E+05	4.82E+08	1.30E+01	1.59E+07	8.99E+08	1.12E+01	1.16E+07	7.58E+08	1.22E+01
4.15E+05	6.23E+08	1.68E+01	2.52E+05	4.72E+08	1.45E+01	1.82E+07	9.82E+08	1.03E+01	1.19E+07	8.73E+08	1.11E+01
4.19E+05	6.45E+08	1.84E+01	2.85E+05	5.59E+08	1.26E+01	2.21E+07	1.02E+09	1.02E+01	1.31E+07	8.66E+08	1.15E+01
4.67E+05	7.58E+08	1.23E+01	2.90E+05	4.84E+08	1.40E+01	2.52E+07	9.53E+08	1.06E+01	1.48E+07	9.51E+08	1.20E+01
5.96E+05	7.81E+08	1.18E+01	3.07E+05	4.96E+08	1.48E+01	2.89E+07	1.04E+09	1.03E+01	1.84E+07	9.36E+08	1.14E+01
6.25E+05	7.47E+08	1.24E+01	3.61E+05	5.27E+08	1.28E+01	3.49E+07	1.06E+09	9.75E+00	1.88E+07	9.20E+08	1.07E+01
6.57E+05	6.92E+08	1.42E+01	3.79E+05	5.10E+08	1.28E+01	4.57E+07	1.10E+09	9.10E+00	2.08E+07	9.17E+08	1.12E+01
6.64E+05	6.92E+08	1.41E+01	4.00E+05	5.06E+08	1.40E+01	5.54E+07	1.12E+09	8.96E+00	2.35E+07	1.01E+09	1.12E+01
7.40E+05	7.94E+08	1.18E+01	4.52E+05	5.93E+08	1.40E+01	7.25E+07	1.15E+09	9.01E+00	2.91E+07	1.01E+09	1.25E+01
9.45E+05	8.27E+08	1.13E+01	4.60E+05	5.18E+08	1.34E+01	1.15E+08	1.21E+09	8.72E+00	3.30E+07	9.64E+08	1.04E+01
1.04E+06	7.45E+08	1.14E+01	5.72E+05	5.69E+08	1.14E+01	1.82E+08	1.26E+09	8.18E+00	3.72E+07	1.06E+09	1.05E+01
1.05E+06	8.05E+08	1.03E+01	6.01E+05	5.47E+08	1.22E+01	2.89E+08	1.30E+09	7.78E+00	4.61E+07	1.03E+09	9.42E+00

Table B.2 Summary of Complex Modulus and Phase Angle Values for Binder 5234LM (Field Core)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
7.24E-06	3.00E+04	7.11E+01	8.24E-05	1.13E+05	6.36E+01	7.64E-06	1.24E+04	7.61E+01
9.09E-06	3.57E+04	7.07E+01	1.03E-04	1.32E+05	6.35E+01	9.59E-06	1.48E+04	7.59E+01
1.44E-05	5.00E+04	6.95E+01	1.64E-04	1.83E+05	6.28E+01	1.52E-05	2.11E+04	7.49E+01
2.28E-05	7.06E+04	6.85E+01	2.60E-04	2.51E+05	6.22E+01	2.41E-05	3.04E+04	7.34E+01
3.62E-05	9.86E+04	6.70E+01	3.28E-04	2.96E+05	6.09E+01	3.82E-05	4.37E+04	7.22E+01
5.74E-05	1.37E+05	6.57E+01	4.12E-04	3.46E+05	6.10E+01	6.05E-05	6.24E+04	7.07E+01
8.89E-05	1.98E+05	6.18E+01	4.12E-04	3.44E+05	6.12E+01	9.23E-05	8.68E+04	6.85E+01
9.09E-05	1.89E+05	6.47E+01	6.52E-04	4.69E+05	5.96E+01	9.59E-05	8.85E+04	6.95E+01
1.12E-04	2.27E+05	6.15E+01	6.53E-04	4.66E+05	6.03E+01	1.16E-04	1.02E+05	6.78E+01
1.44E-04	2.60E+05	6.35E+01	1.03E-03	6.35E+05	5.85E+01	1.52E-04	1.25E+05	6.83E+01
1.77E-04	3.06E+05	6.08E+01	1.03E-03	6.32E+05	5.91E+01	1.84E-04	1.43E+05	6.66E+01
2.28E-04	3.55E+05	6.23E+01	1.40E-03	7.83E+05	5.75E+01	2.41E-04	1.77E+05	6.70E+01
2.80E-04	4.09E+05	5.98E+01	1.64E-03	8.50E+05	5.73E+01	2.91E-04	2.00E+05	6.52E+01
3.62E-04	4.82E+05	6.13E+01	1.64E-03	8.54E+05	5.79E+01	3.59E-04	2.33E+05	6.40E+01
3.74E-04	5.02E+05	5.82E+01	1.75E-03	9.00E+05	5.66E+01	3.82E-04	2.47E+05	6.59E+01
4.44E-04	5.39E+05	5.87E+01	2.60E-03	1.13E+06	5.59E+01	4.51E-04	2.72E+05	6.35E+01
4.69E-04	5.70E+05	5.82E+01	2.60E-03	1.14E+06	5.67E+01	4.62E-04	2.75E+05	6.38E+01
5.74E-04	6.49E+05	6.02E+01	2.78E-03	1.20E+06	5.55E+01	6.05E-04	3.44E+05	6.48E+01
7.04E-04	7.05E+05	5.78E+01	4.12E-03	1.51E+06	5.46E+01	7.14E-04	3.76E+05	6.22E+01
7.44E-04	7.50E+05	5.69E+01	4.12E-03	1.51E+06	5.55E+01	7.31E-04	3.80E+05	6.26E+01
9.09E-04	8.71E+05	5.92E+01	4.40E-03	1.58E+06	5.41E+01	9.59E-04	4.76E+05	6.39E+01
1.12E-03	9.26E+05	5.66E+01	6.31E-03	1.97E+06	5.28E+01	1.13E-03	5.14E+05	6.08E+01
1.18E-03	9.80E+05	5.58E+01	6.52E-03	1.98E+06	5.33E+01	1.16E-03	5.19E+05	6.13E+01
1.40E-03	1.14E+06	5.49E+01	6.53E-03	1.99E+06	5.42E+01	1.48E-03	6.23E+05	5.98E+01

Table B.2 Summary of Complex Modulus and Phase Angle Values for Binder 5234LM (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
1.44E-03	1.16E+06	5.83E+01	6.98E-03	2.08E+06	5.25E+01	1.52E-03	6.52E+05	6.31E+01
1.76E-03	1.28E+06	5.47E+01	7.93E-03	2.25E+06	5.18E+01	1.79E-03	6.94E+05	5.93E+01
1.77E-03	1.21E+06	5.54E+01	1.03E-02	2.58E+06	5.19E+01	1.84E-03	7.05E+05	6.00E+01
1.87E-03	1.26E+06	5.46E+01	1.03E-02	2.61E+06	5.30E+01	1.86E-03	7.20E+05	5.94E+01
2.28E-03	1.53E+06	5.76E+01	1.11E-02	2.68E+06	5.12E+01	2.41E-03	8.89E+05	6.25E+01
2.78E-03	1.63E+06	5.32E+01	1.26E-02	2.91E+06	5.04E+01	2.84E-03	9.39E+05	5.81E+01
2.80E-03	1.56E+06	5.43E+01	1.64E-02	3.35E+06	5.06E+01	2.91E-03	9.55E+05	5.87E+01
2.96E-03	1.62E+06	5.34E+01	1.64E-02	3.40E+06	5.18E+01	2.95E-03	9.63E+05	5.77E+01
3.62E-03	1.99E+06	5.76E+01	1.75E-02	3.47E+06	4.97E+01	3.82E-03	1.18E+06	6.29E+01
4.41E-03	2.06E+06	5.20E+01	1.99E-02	3.73E+06	4.89E+01	4.51E-03	1.25E+06	5.67E+01
4.44E-03	2.03E+06	5.31E+01	2.60E-02	4.32E+06	4.93E+01	4.62E-03	1.28E+06	5.75E+01
4.69E-03	2.07E+06	5.21E+01	2.60E-02	4.41E+06	5.06E+01	4.67E-03	1.29E+06	5.63E+01
6.98E-03	2.72E+06	5.07E+01	2.78E-02	4.45E+06	4.83E+01	6.57E-03	1.62E+06	5.52E+01
6.99E-03	2.60E+06	5.07E+01	3.16E-02	4.77E+06	4.73E+01	7.14E-03	1.66E+06	5.53E+01
7.04E-03	2.61E+06	5.20E+01	3.18E-02	4.87E+06	4.76E+01	7.31E-03	1.71E+06	5.63E+01
7.44E-03	2.64E+06	5.08E+01	4.00E-02	5.49E+06	4.65E+01	7.41E-03	1.70E+06	5.49E+01
8.76E-03	3.02E+06	4.97E+01	4.12E-02	5.52E+06	4.80E+01	8.25E-03	1.84E+06	5.43E+01
1.11E-02	3.26E+06	4.94E+01	4.12E-02	5.65E+06	4.95E+01	1.13E-02	2.20E+06	5.40E+01
1.12E-02	3.34E+06	5.10E+01	4.40E-02	5.65E+06	4.70E+01	1.16E-02	2.26E+06	5.50E+01
1.18E-02	3.36E+06	4.96E+01	5.00E-02	6.07E+06	4.59E+01	1.17E-02	2.24E+06	5.34E+01
1.39E-02	3.75E+06	4.84E+01	6.34E-02	6.88E+06	4.50E+01	1.31E-02	2.43E+06	5.29E+01
1.76E-02	4.07E+06	4.81E+01	6.52E-02	7.02E+06	4.68E+01	1.79E-02	2.88E+06	5.27E+01
1.77E-02	4.27E+06	5.00E+01	6.98E-02	7.14E+06	4.57E+01	1.84E-02	2.97E+06	5.39E+01
1.87E-02	4.25E+06	4.84E+01	7.93E-02	7.65E+06	4.44E+01	1.86E-02	2.94E+06	5.20E+01

Table B.2 Summary of Complex Modulus and Phase Angle Values for Binder 5234LM (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
2.20E-02	4.62E+06	4.71E+01	1.00E-01	8.61E+06	4.35E+01	2.07E-02	3.15E+06	5.14E+01
2.78E-02	5.08E+06	4.69E+01	1.03E-01	8.85E+06	4.56E+01	2.84E-02	3.76E+06	5.14E+01
2.80E-02	5.48E+06	4.90E+01	1.11E-01	8.91E+06	4.44E+01	2.91E-02	3.88E+06	5.28E+01
2.96E-02	5.31E+06	4.73E+01	1.26E-01	9.49E+06	4.31E+01	2.95E-02	3.81E+06	5.06E+01
3.18E-02	5.81E+06	4.62E+01	1.59E-01	1.07E+07	4.21E+01	3.18E-02	4.06E+06	4.99E+01
3.49E-02	5.72E+06	4.58E+01	1.64E-01	1.10E+07	4.45E+01	3.28E-02	4.07E+06	4.97E+01
4.00E-02	6.37E+06	4.55E+01	1.72E-01	1.12E+07	4.22E+01	4.00E-02	4.58E+06	4.94E+01
4.41E-02	6.23E+06	4.57E+01	1.75E-01	1.12E+07	4.32E+01	4.51E-02	4.86E+06	5.01E+01
4.44E-02	6.89E+06	4.82E+01	1.99E-01	1.18E+07	4.18E+01	4.62E-02	5.01E+06	5.18E+01
4.69E-02	6.67E+06	4.62E+01	2.16E-01	1.24E+07	4.10E+01	4.67E-02	4.88E+06	4.92E+01
5.53E-02	7.00E+06	4.46E+01	2.52E-01	1.32E+07	4.07E+01	5.20E-02	5.21E+06	4.84E+01
6.34E-02	7.76E+06	4.39E+01	2.78E-01	1.38E+07	4.20E+01	6.34E-02	5.83E+06	4.75E+01
6.99E-02	7.70E+06	4.46E+01	3.16E-01	1.45E+07	4.06E+01	7.14E-02	6.23E+06	4.88E+01
7.44E-02	8.32E+06	4.52E+01	3.42E-01	1.52E+07	3.97E+01	7.41E-02	6.32E+06	4.78E+01
8.76E-02	8.59E+06	4.33E+01	4.00E-01	1.61E+07	3.94E+01	8.25E-02	6.65E+06	4.68E+01
1.00E-01	9.31E+06	4.27E+01	4.40E-01	1.69E+07	4.10E+01	1.00E-01	7.38E+06	4.60E+01
1.11E-01	9.50E+06	4.36E+01	5.00E-01	1.78E+07	3.94E+01	1.13E-01	7.95E+06	4.76E+01
1.18E-01	1.04E+07	4.42E+01	5.42E-01	1.85E+07	3.84E+01	1.17E-01	8.01E+06	4.65E+01
1.39E-01	1.05E+07	4.21E+01	6.34E-01	1.96E+07	3.82E+01	1.31E-01	8.39E+06	4.54E+01
1.59E-01	1.12E+07	4.15E+01	6.98E-01	2.08E+07	3.99E+01	1.59E-01	9.29E+06	4.46E+01
1.76E-01	1.17E+07	4.26E+01	7.93E-01	2.16E+07	3.83E+01	1.64E-01	9.55E+06	4.45E+01
1.87E-01	1.28E+07	4.33E+01	8.58E-01	2.24E+07	3.70E+01	1.79E-01	1.01E+07	4.65E+01
2.20E-01	1.27E+07	4.11E+01	1.00E+00	2.41E+07	3.70E+01	1.86E-01	1.01E+07	4.52E+01
2.27E-01	1.33E+07	4.08E+01	1.00E+00	2.37E+07	3.70E+01	2.06E-01	1.07E+07	4.39E+01

Table B.2 Summary of Complex Modulus and Phase Angle Values for Binder 5234LM (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
2.52E-01	1.35E+07	4.02E+01	1.26E+00	2.62E+07	3.72E+01	2.07E-01	1.05E+07	4.41E+01
2.78E-01	1.44E+07	4.16E+01	1.26E+00	2.64E+07	3.60E+01	2.52E-01	1.16E+07	4.30E+01
2.85E-01	1.44E+07	4.02E+01	1.36E+00	2.69E+07	3.58E+01	2.95E-01	1.26E+07	4.41E+01
3.49E-01	1.52E+07	4.01E+01	1.59E+00	2.85E+07	3.59E+01	3.27E-01	1.32E+07	4.21E+01
4.00E-01	1.61E+07	3.90E+01	1.99E+00	3.15E+07	3.62E+01	3.28E-01	1.31E+07	4.27E+01
4.41E-01	1.76E+07	4.07E+01	1.99E+00	3.14E+07	3.49E+01	4.00E-01	1.44E+07	4.17E+01
4.52E-01	1.73E+07	3.90E+01	2.16E+00	3.22E+07	3.47E+01	4.67E-01	1.57E+07	4.29E+01
5.53E-01	1.83E+07	3.91E+01	2.52E+00	3.39E+07	3.49E+01	5.18E-01	1.63E+07	4.07E+01
6.34E-01	1.92E+07	3.79E+01	3.16E+00	3.77E+07	3.52E+01	5.20E-01	1.62E+07	4.15E+01
6.99E-01	2.17E+07	3.97E+01	3.16E+00	3.74E+07	3.37E+01	6.34E-01	1.76E+07	4.04E+01
7.16E-01	2.03E+07	3.79E+01	3.42E+00	3.82E+07	3.36E+01	7.41E-01	1.93E+07	4.19E+01
8.76E-01	2.19E+07	3.82E+01	4.00E+00	4.06E+07	3.39E+01	8.22E-01	2.00E+07	3.94E+01
1.00E+00	2.28E+07	3.69E+01	5.01E+00	4.42E+07	3.25E+01	8.25E-01	1.98E+07	4.04E+01
1.14E+00	2.40E+07	3.67E+01	5.42E+00	4.51E+07	3.26E+01	9.69E-01	2.17E+07	3.93E+01
1.31E+00	2.62E+07	3.65E+01	6.34E+00	4.80E+07	3.29E+01	1.00E+00	2.15E+07	3.92E+01
1.39E+00	2.64E+07	3.74E+01	7.93E+00	5.17E+07	3.15E+01	1.22E+00	2.39E+07	3.84E+01
1.59E+00	2.69E+07	3.59E+01	8.58E+00	5.32E+07	3.16E+01	1.30E+00	2.42E+07	3.79E+01
1.64E+00	2.83E+07	3.57E+01	9.70E+00	5.63E+07	3.12E+01	1.31E+00	2.43E+07	3.92E+01
1.80E+00	2.82E+07	3.56E+01	1.00E+01	5.66E+07	3.21E+01	1.59E+00	2.63E+07	3.80E+01
2.20E+00	3.16E+07	3.66E+01	1.22E+01	6.03E+07	3.06E+01	1.93E+00	2.87E+07	3.68E+01
2.52E+00	3.16E+07	3.51E+01	1.26E+01	6.08E+07	3.05E+01	2.06E+00	2.92E+07	3.68E+01
2.61E+00	3.28E+07	3.43E+01	1.36E+01	6.21E+07	3.07E+01	2.07E+00	2.95E+07	3.82E+01
2.85E+00	3.31E+07	3.45E+01	1.59E+01	6.65E+07	3.12E+01	2.52E+00	3.17E+07	3.69E+01
3.49E+00	3.83E+07	3.57E+01	1.93E+01	7.06E+07	2.94E+01	3.06E+00	3.44E+07	3.57E+01

Table B.2 Summary of Complex Modulus and Phase Angle Values for Binder 5234LM (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
4.00E+00	3.72E+07	3.43E+01	1.99E+01	7.05E+07	2.95E+01	3.27E+00	3.51E+07	3.56E+01
4.13E+00	3.81E+07	3.33E+01	2.16E+01	7.24E+07	2.98E+01	3.28E+00	3.58E+07	3.71E+01
4.52E+00	3.85E+07	3.36E+01	3.06E+01	8.16E+07	2.86E+01	4.00E+00	3.80E+07	3.58E+01
6.34E+00	4.38E+07	3.35E+01	3.12E+01	8.21E+07	2.91E+01	4.85E+00	4.12E+07	3.45E+01
6.54E+00	4.42E+07	3.23E+01	3.16E+01	8.16E+07	2.86E+01	5.18E+00	4.20E+07	3.45E+01
7.16E+00	4.49E+07	3.27E+01	3.42E+01	8.42E+07	2.90E+01	6.34E+00	4.55E+07	3.48E+01
1.00E+01	5.15E+07	3.29E+01	3.92E+01	8.78E+07	2.81E+01	7.68E+00	4.87E+07	3.32E+01
1.04E+01	5.11E+07	3.12E+01	4.85E+01	9.38E+07	2.74E+01	8.22E+00	4.98E+07	3.34E+01
1.14E+01	5.21E+07	3.19E+01	5.01E+01	9.43E+07	2.78E+01	9.19E+00	5.24E+07	3.31E+01
1.59E+01	6.07E+07	3.22E+01	5.42E+01	9.70E+07	2.83E+01	1.00E+01	5.43E+07	3.39E+01
1.64E+01	5.89E+07	3.03E+01	6.21E+01	1.01E+08	2.75E+01	1.15E+01	5.69E+07	3.26E+01
1.80E+01	6.03E+07	3.12E+01	7.68E+01	1.08E+08	2.67E+01	1.22E+01	5.75E+07	3.22E+01
2.29E+01	6.51E+07	3.10E+01	7.93E+01	1.08E+08	2.70E+01	1.30E+01	5.90E+07	3.24E+01
2.61E+01	6.75E+07	2.96E+01	8.58E+01	1.12E+08	2.75E+01	1.59E+01	6.41E+07	3.30E+01
2.85E+01	6.95E+07	3.05E+01	9.82E+01	1.15E+08	2.72E+01	1.83E+01	6.63E+07	3.13E+01
2.87E+01	6.89E+07	3.03E+01	9.85E+01	1.16E+08	2.66E+01	1.93E+01	6.74E+07	3.12E+01
4.13E+01	7.73E+07	2.87E+01	1.22E+02	1.23E+08	2.58E+01	2.06E+01	6.94E+07	3.15E+01
4.52E+01	7.98E+07	2.98E+01	1.23E+02	1.23E+08	2.61E+01	2.90E+01	7.80E+07	3.04E+01
4.55E+01	7.92E+07	2.97E+01	1.26E+02	1.24E+08	2.62E+01	3.06E+01	7.88E+07	3.02E+01
6.54E+01	8.82E+07	2.80E+01	1.56E+02	1.32E+08	2.50E+01	3.13E+01	7.87E+07	3.08E+01
7.16E+01	9.19E+07	2.93E+01	1.93E+02	1.40E+08	2.48E+01	3.27E+01	8.11E+07	3.06E+01
7.21E+01	9.00E+07	2.88E+01	1.96E+02	1.41E+08	2.49E+01	3.94E+01	8.52E+07	3.06E+01
7.51E+01	9.25E+07	2.90E+01	1.99E+02	1.41E+08	2.55E+01	4.59E+01	9.07E+07	2.95E+01
9.44E+01	9.84E+07	2.87E+01	2.47E+02	1.50E+08	2.47E+01	4.85E+01	9.15E+07	2.93E+01

Table B.2 Summary of Complex Modulus and Phase Angle Values for Binder 5234LM (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
1.04E+02	1.00E+08	2.73E+01	3.06E+02	1.59E+08	2.43E+01	5.18E+01	9.45E+07	2.98E+01
1.14E+02	1.06E+08	2.88E+01	3.10E+02	1.60E+08	2.41E+01	6.24E+01	9.95E+07	2.89E+01
1.14E+02	1.02E+08	2.78E+01	3.16E+02	1.61E+08	2.48E+01	7.28E+01	1.04E+08	2.82E+01
1.50E+02	1.10E+08	2.77E+01	3.34E+02	1.61E+08	2.59E+01	7.68E+01	1.06E+08	2.84E+01
1.64E+02	1.14E+08	2.66E+01	3.92E+02	1.70E+08	2.37E+01	8.22E+01	1.10E+08	2.89E+01
1.81E+02	1.16E+08	2.72E+01	4.20E+02	1.70E+08	2.43E+01	9.62E+01	1.14E+08	2.78E+01
2.37E+02	1.25E+08	2.66E+01	4.85E+02	1.80E+08	2.35E+01	9.89E+01	1.14E+08	2.78E+01
2.61E+02	1.30E+08	2.60E+01	4.91E+02	1.80E+08	2.35E+01	1.15E+02	1.20E+08	2.73E+01
2.87E+02	1.31E+08	2.65E+01	5.01E+02	1.82E+08	2.41E+01	1.21E+02	1.22E+08	2.75E+01
3.36E+02	1.38E+08	2.62E+01	6.21E+02	1.91E+08	2.30E+01	1.22E+02	1.22E+08	2.76E+01
3.76E+02	1.41E+08	2.62E+01	6.65E+02	1.93E+08	2.31E+01	1.57E+02	1.32E+08	2.69E+01
4.13E+02	1.46E+08	2.55E+01	7.68E+02	2.02E+08	2.28E+01	1.83E+02	1.38E+08	2.66E+01
4.22E+02	1.46E+08	2.58E+01	7.79E+02	2.01E+08	2.21E+01	1.91E+02	1.40E+08	2.68E+01
4.55E+02	1.46E+08	2.59E+01	9.85E+02	2.15E+08	2.23E+01	1.93E+02	1.40E+08	2.68E+01
5.95E+02	1.58E+08	2.54E+01	1.05E+03	2.16E+08	2.28E+01	2.48E+02	1.51E+08	2.59E+01
6.54E+02	1.66E+08	2.50E+01	1.16E+03	2.16E+08	2.29E+01	2.90E+02	1.57E+08	2.56E+01
6.68E+02	1.67E+08	2.47E+01	1.22E+03	2.26E+08	2.21E+01	3.02E+02	1.60E+08	2.56E+01
7.21E+02	1.65E+08	2.53E+01	1.23E+03	2.26E+08	2.17E+01	3.03E+02	1.58E+08	2.60E+01
9.44E+02	1.78E+08	2.48E+01	1.46E+03	2.26E+08	2.23E+01	3.06E+02	1.60E+08	2.60E+01
1.06E+03	1.84E+08	2.42E+01	1.56E+03	2.40E+08	2.16E+01	3.79E+02	1.69E+08	2.54E+01
1.14E+03	1.85E+08	2.47E+01	1.67E+03	2.41E+08	2.21E+01	3.94E+02	1.72E+08	2.48E+01
1.29E+03	1.88E+08	2.44E+01	1.93E+03	2.53E+08	2.14E+01	4.59E+02	1.78E+08	2.48E+01
1.50E+03	1.97E+08	2.46E+01	1.96E+03	2.53E+08	2.16E+01	4.81E+02	1.82E+08	2.48E+01
1.62E+03	2.04E+08	2.36E+01	2.31E+03	2.57E+08	2.24E+01	4.85E+02	1.83E+08	2.52E+01

Table B.2 Summary of Complex Modulus and Phase Angle Values for Binder 5234LM (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
1.68E+03	2.07E+08	2.39E+01	2.47E+03	2.67E+08	2.09E+01	6.00E+02	1.92E+08	2.51E+01
1.81E+03	2.08E+08	2.41E+01	2.65E+03	2.70E+08	2.09E+01	6.24E+02	1.95E+08	2.42E+01
2.37E+03	2.20E+08	2.38E+01	3.06E+03	2.82E+08	2.07E+01	7.28E+02	2.02E+08	2.40E+01
2.56E+03	2.24E+08	2.31E+01	3.10E+03	2.82E+08	2.06E+01	7.62E+02	2.06E+08	2.37E+01
2.66E+03	2.29E+08	2.30E+01	3.67E+03	2.87E+08	2.03E+01	9.51E+02	2.16E+08	2.40E+01
2.87E+03	2.31E+08	2.36E+01	3.88E+03	2.90E+08	2.18E+01	9.89E+02	2.21E+08	2.33E+01
3.76E+03	2.44E+08	2.32E+01	3.92E+03	2.97E+08	2.03E+01	1.12E+03	2.23E+08	2.35E+01
4.06E+03	2.54E+08	2.27E+01	4.20E+03	2.99E+08	1.97E+01	1.15E+03	2.29E+08	2.32E+01
4.22E+03	2.56E+08	2.18E+01	4.85E+03	3.13E+08	2.01E+01	1.21E+03	2.33E+08	2.33E+01
4.55E+03	2.58E+08	2.31E+01	4.88E+03	2.98E+08	2.10E+01	1.41E+03	2.37E+08	2.30E+01
4.85E+03	2.66E+08	2.36E+01	4.91E+03	3.12E+08	2.00E+01	1.51E+03	2.43E+08	2.21E+01
5.95E+03	2.71E+08	2.27E+01	5.81E+03	3.19E+08	2.01E+01	1.57E+03	2.48E+08	2.26E+01
6.09E+03	2.72E+08	2.22E+01	6.21E+03	3.28E+08	1.96E+01	1.83E+03	2.57E+08	2.25E+01
6.43E+03	2.77E+08	2.08E+01	6.65E+03	3.30E+08	1.94E+01	1.91E+03	2.58E+08	2.24E+01
6.68E+03	2.83E+08	2.15E+01	7.73E+03	3.32E+08	1.93E+01	2.23E+03	2.68E+08	2.14E+01
7.21E+03	2.87E+08	2.26E+01	7.79E+03	3.46E+08	1.91E+01	2.39E+03	2.74E+08	2.23E+01
9.44E+03	3.00E+08	2.21E+01	9.21E+03	3.54E+08	1.95E+01	2.48E+03	2.80E+08	2.18E+01
9.65E+03	3.01E+08	2.11E+01	9.85E+03	3.62E+08	1.89E+01	2.90E+03	2.88E+08	2.17E+01
1.02E+04	3.17E+08	2.08E+01	1.05E+04	3.65E+08	1.90E+01	3.03E+03	2.90E+08	2.15E+01
1.06E+04	3.12E+08	2.09E+01	1.22E+04	3.69E+08	1.98E+01	3.54E+03	3.00E+08	2.23E+01
1.14E+04	3.21E+08	2.20E+01	1.23E+04	3.80E+08	1.85E+01	3.79E+03	3.09E+08	2.14E+01
1.50E+04	3.30E+08	2.16E+01	1.46E+04	3.89E+08	1.86E+01	3.92E+03	3.05E+08	2.13E+01
1.53E+04	3.30E+08	2.15E+01	1.55E+04	3.80E+08	1.87E+01	3.94E+03	3.11E+08	2.11E+01
1.62E+04	3.48E+08	2.01E+01	1.56E+04	3.98E+08	1.82E+01	4.59E+03	3.21E+08	2.10E+01

Table B.2 Summary of Complex Modulus and Phase Angle Values for Binder 5234LM (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
1.68E+04	3.44E+08	2.01E+01	1.67E+04	4.02E+08	1.82E+01	4.81E+03	3.22E+08	2.07E+01
1.69E+04	3.47E+08	2.17E+01	1.94E+04	4.07E+08	1.77E+01	4.92E+03	3.18E+08	2.13E+01
2.13E+04	3.50E+08	2.07E+01	1.94E+04	4.01E+08	1.77E+01	5.61E+03	3.34E+08	2.13E+01
2.37E+04	3.64E+08	2.10E+01	1.96E+04	4.16E+08	1.78E+01	6.00E+03	3.37E+08	1.97E+01
2.42E+04	3.61E+08	2.03E+01	2.31E+04	4.26E+08	1.77E+01	6.24E+03	3.46E+08	2.03E+01
2.56E+04	3.82E+08	2.00E+01	2.65E+04	4.39E+08	1.75E+01	7.62E+03	3.59E+08	2.00E+01
2.66E+04	3.79E+08	1.96E+01	3.08E+04	4.47E+08	1.76E+01	7.79E+03	3.51E+08	2.07E+01
3.37E+04	4.01E+08	1.95E+01	3.08E+04	4.42E+08	1.81E+01	8.89E+03	3.67E+08	1.97E+01
3.76E+04	4.04E+08	2.04E+01	3.10E+04	4.55E+08	1.71E+01	9.51E+03	3.78E+08	1.98E+01
3.84E+04	4.07E+08	1.94E+01	3.67E+04	4.67E+08	1.71E+01	9.89E+03	3.82E+08	1.96E+01
4.06E+04	4.14E+08	1.88E+01	3.79E+04	4.51E+08	1.62E+01	1.19E+04	3.90E+08	2.60E+01
4.22E+04	4.16E+08	1.91E+01	4.20E+04	4.78E+08	1.67E+01	1.21E+04	3.98E+08	1.93E+01
4.55E+04	4.60E+08	1.39E+01	4.75E+04	5.12E+08	1.80E+01	1.24E+04	4.08E+08	2.04E+01
5.34E+04	4.30E+08	1.95E+01	4.88E+04	4.88E+08	1.69E+01	1.41E+04	4.10E+08	1.92E+01
5.72E+04	4.72E+08	1.91E+01	4.88E+04	4.74E+08	1.68E+01	1.49E+04	4.06E+08	1.70E+01
6.09E+04	4.52E+08	1.89E+01	4.91E+04	4.96E+08	1.64E+01	1.51E+04	4.17E+08	1.89E+01
6.43E+04	4.55E+08	1.82E+01	5.81E+04	5.04E+08	1.64E+01	1.57E+04	4.20E+08	1.89E+01
6.68E+04	4.55E+08	1.85E+01	6.65E+04	5.20E+08	1.61E+01	1.91E+04	4.38E+08	1.85E+01
8.47E+04	4.62E+08	1.83E+01	7.54E+04	5.47E+08	1.58E+01	1.96E+04	4.38E+08	2.01E+01
9.07E+04	5.43E+08	1.82E+01	7.73E+04	5.28E+08	1.68E+01	2.23E+04	4.49E+08	1.86E+01
9.65E+04	4.79E+08	1.92E+01	7.74E+04	5.13E+08	1.73E+01	2.37E+04	4.49E+08	1.64E+01
1.02E+05	4.95E+08	1.76E+01	9.21E+04	5.48E+08	1.57E+01	2.39E+04	4.59E+08	1.82E+01
1.06E+05	4.97E+08	1.79E+01	1.05E+05	5.62E+08	1.54E+01	3.03E+04	4.80E+08	1.78E+01
1.34E+05	5.18E+08	1.70E+01	1.22E+05	5.73E+08	1.54E+01	3.10E+04	4.70E+08	1.77E+01

Table B.2 Summary of Complex Modulus and Phase Angle Values for Binder 5234LM (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
1.44E+05	5.79E+08	9.17E+00	1.23E+05	5.70E+08	1.58E+01	3.54E+04	4.92E+08	1.78E+01
1.53E+05	5.28E+08	1.72E+01	1.46E+05	5.94E+08	1.50E+01	3.75E+04	4.90E+08	1.79E+01
1.62E+05	5.40E+08	1.70E+01	1.67E+05	6.07E+08	1.47E+01	3.79E+04	5.01E+08	1.74E+01
1.68E+05	5.43E+08	1.73E+01	1.89E+05	6.43E+08	1.33E+01	4.81E+04	5.22E+08	1.71E+01
2.03E+05	5.65E+08	1.95E+01	1.94E+05	6.20E+08	1.48E+01	4.92E+04	5.22E+08	1.67E+01
2.13E+05	5.54E+08	1.69E+01	1.94E+05	6.13E+08	1.64E+01	5.61E+04	5.37E+08	1.70E+01
2.42E+05	5.72E+08	1.66E+01	2.31E+05	6.41E+08	1.43E+01	5.94E+04	5.48E+08	1.81E+01
2.55E+05	5.17E+08	1.79E+01	3.00E+05	6.67E+08	1.35E+01	6.00E+04	5.48E+08	1.67E+01
2.56E+05	5.88E+08	1.64E+01	3.08E+05	6.67E+08	1.41E+01	7.79E+04	5.65E+08	1.63E+01
3.37E+05	6.08E+08	1.60E+01	3.08E+05	6.75E+08	1.52E+01	8.89E+04	5.85E+08	1.63E+01
3.61E+05	6.70E+08	1.40E+01	3.67E+05	6.86E+08	1.37E+01	9.42E+04	5.90E+08	1.68E+01
3.84E+05	6.20E+08	1.60E+01	4.75E+05	7.52E+08	1.38E+01	9.51E+04	5.93E+08	1.60E+01
4.03E+05	5.93E+08	1.40E+01	4.88E+05	7.17E+08	1.34E+01	1.24E+05	6.16E+08	1.56E+01
4.06E+05	6.38E+08	1.58E+01	4.88E+05	7.17E+08	1.38E+01	1.35E+05	4.73E+08	2.22E+01
5.34E+05	6.59E+08	1.56E+01	5.81E+05	7.34E+08	1.29E+01	1.41E+05	6.35E+08	1.55E+01
5.72E+05	6.65E+08	1.79E+01	7.54E+05	7.93E+08	1.17E+01	1.49E+05	6.28E+08	1.59E+01
6.09E+05	6.69E+08	1.53E+01	7.73E+05	7.65E+08	1.27E+01	1.51E+05	6.43E+08	1.53E+01
6.39E+05	6.86E+08	1.64E+01	7.74E+05	7.62E+08	1.26E+01	1.70E+05	5.37E+08	1.77E+01
6.43E+05	6.87E+08	1.52E+01	8.24E+05	6.22E+08	1.48E+01	1.96E+05	6.68E+08	1.52E+01
8.32E+05	6.56E+08	1.68E+01	1.19E+06	8.47E+08	1.15E+01	2.23E+05	6.57E+08	1.78E+01
8.47E+05	7.05E+08	1.52E+01	1.22E+06	8.14E+08	1.21E+01	2.23E+05	6.89E+08	1.47E+01
9.07E+05	7.03E+08	1.46E+01	1.23E+06	8.07E+08	1.25E+01	2.37E+05	7.09E+08	1.16E+01
9.65E+05	7.23E+08	1.48E+01	1.31E+06	6.57E+08	1.69E+01	2.70E+05	6.74E+08	1.74E+01
1.34E+06	7.60E+08	1.43E+01	1.89E+06	8.98E+08	1.13E+01	2.80E+05	6.15E+08	1.87E+01

Table B.2 Summary of Complex Modulus and Phase Angle Values for Binder 5234LM (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
1.44E+06	8.28E+08	1.49E+01	1.94E+06	8.64E+08	1.13E+01	3.10E+05	7.18E+08	1.45E+01
1.53E+06	7.76E+08	1.42E+01	1.94E+06	8.55E+08	1.20E+01	3.54E+05	7.39E+08	1.40E+01
1.61E+06	8.58E+08	1.58E+01	2.07E+06	7.61E+08	1.36E+01	3.75E+05	7.52E+08	1.37E+01
1.66E+06	7.39E+08	1.72E+01	3.00E+06	9.54E+08	1.09E+01	4.27E+05	6.42E+08	1.29E+01
2.13E+06	8.14E+08	1.39E+01	3.08E+06	9.05E+08	1.11E+01	4.44E+05	7.06E+08	1.24E+01
2.28E+06	8.65E+08	1.29E+01	3.28E+06	7.99E+08	1.44E+01	4.92E+05	7.72E+08	1.38E+01
2.42E+06	8.31E+08	1.35E+01	4.75E+06	1.00E+09	9.83E+00	5.61E+05	7.91E+08	1.33E+01
2.55E+06	9.46E+08	1.21E+01	4.88E+06	9.54E+08	1.05E+01	5.94E+05	8.08E+08	1.34E+01
2.62E+06	7.84E+08	1.00E+01	5.20E+06	8.60E+08	1.17E+01	6.77E+05	6.97E+08	1.91E+01
3.37E+06	8.69E+08	1.33E+01	7.54E+06	1.06E+09	9.55E+00	7.04E+05	7.94E+08	1.48E+01
3.61E+06	9.29E+08	1.21E+01	7.74E+06	1.00E+09	9.86E+00	7.79E+05	8.26E+08	1.30E+01
4.03E+06	9.14E+08	8.83E+00	8.24E+06	8.67E+08	1.30E+01	9.42E+05	8.66E+08	1.28E+01
4.16E+06	8.35E+08	1.62E+01	1.19E+07	1.11E+09	8.97E+00	1.07E+06	7.79E+08	1.49E+01
5.34E+06	9.23E+08	1.26E+01	1.31E+07	9.78E+08	1.17E+01	1.12E+06	8.26E+08	1.08E+01
5.72E+06	9.89E+08	1.19E+01	1.89E+07	1.15E+09	8.29E+00	1.24E+06	8.76E+08	1.24E+01
6.39E+06	9.85E+08	8.68E+00	2.07E+07	1.02E+09	1.13E+01	1.49E+06	9.20E+08	1.17E+01
6.59E+06	9.69E+08	9.52E+00	3.28E+07	1.06E+09	1.04E+01	1.70E+06	8.01E+08	1.52E+01
8.47E+06	9.83E+08	1.19E+01	5.20E+07	1.10E+09	9.34E+00	1.77E+06	9.07E+08	1.46E+01
9.07E+06	1.04E+09	1.14E+01	8.24E+07	1.16E+09	8.49E+00	1.96E+06	9.31E+08	1.16E+01
1.01E+07	1.03E+09	1.26E+01	1.31E+08	1.21E+09	8.23E+00	2.37E+06	9.74E+08	1.13E+01
1.04E+07	1.07E+09	1.02E+01	2.07E+08	1.26E+09	7.56E+00	2.70E+06	8.27E+08	1.53E+01

Table B.3 Summary of Complex Modulus and Phase Angle Values for Binder 5234LL with Different Aging Conditions

STA			5day@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
3.21E-04	4.01E+05	6.15E+01	2.23E-06	3.55E+05	5.26E+01	3.75E-06	1.22E+05	5.96E+01	2.65E-06	5.44E+05	4.94E+01
4.03E-04	4.63E+05	6.11E+01	2.80E-06	3.98E+05	5.26E+01	4.71E-06	1.40E+05	5.94E+01	3.32E-06	5.97E+05	4.91E+01
6.38E-04	6.33E+05	5.98E+01	4.44E-06	5.01E+05	5.12E+01	7.46E-06	1.87E+05	5.82E+01	5.27E-06	7.51E+05	4.75E+01
1.01E-03	8.50E+05	5.84E+01	7.03E-06	6.39E+05	5.01E+01	1.18E-05	2.49E+05	5.67E+01	8.35E-06	9.35E+05	4.67E+01
1.33E-03	1.03E+06	5.75E+01	1.11E-05	8.01E+05	4.89E+01	1.87E-05	3.28E+05	5.54E+01	1.32E-05	1.16E+06	4.56E+01
1.60E-03	1.14E+06	5.69E+01	1.77E-05	9.97E+05	4.76E+01	2.97E-05	4.25E+05	5.42E+01	2.10E-05	1.43E+06	4.44E+01
1.67E-03	1.19E+06	5.70E+01	2.80E-05	1.24E+06	4.67E+01	4.71E-05	5.56E+05	5.31E+01	3.32E-05	1.74E+06	4.36E+01
2.54E-03	1.51E+06	5.56E+01	4.44E-05	1.53E+06	4.57E+01	5.73E-05	6.28E+05	5.21E+01	5.17E-05	2.15E+06	4.24E+01
2.65E-03	1.57E+06	5.53E+01	4.65E-05	1.61E+06	4.50E+01	7.20E-05	7.14E+05	5.16E+01	5.27E-05	2.14E+06	4.27E+01
4.03E-03	1.99E+06	5.42E+01	5.84E-05	1.77E+06	4.47E+01	7.46E-05	7.16E+05	5.20E+01	6.49E-05	2.37E+06	4.19E+01
4.20E-03	2.08E+06	5.38E+01	7.03E-05	1.89E+06	4.48E+01	1.14E-04	9.13E+05	5.02E+01	8.35E-05	2.60E+06	4.18E+01
6.22E-03	2.57E+06	5.27E+01	9.25E-05	2.17E+06	4.33E+01	1.18E-04	9.27E+05	5.09E+01	1.03E-04	2.87E+06	4.05E+01
6.38E-03	2.61E+06	5.29E+01	1.11E-04	2.31E+06	4.40E+01	1.81E-04	1.17E+06	4.90E+01	1.32E-04	3.14E+06	4.10E+01
6.66E-03	2.72E+06	5.24E+01	1.47E-04	2.65E+06	4.22E+01	1.87E-04	1.19E+06	5.00E+01	1.63E-04	3.48E+06	3.95E+01
7.81E-03	2.96E+06	5.19E+01	1.77E-04	2.83E+06	4.32E+01	2.55E-04	1.40E+06	4.80E+01	2.10E-04	3.83E+06	4.03E+01
1.01E-02	3.38E+06	5.16E+01	2.32E-04	3.21E+06	4.10E+01	2.87E-04	1.48E+06	4.78E+01	2.57E-04	4.17E+06	3.84E+01
1.06E-02	3.52E+06	5.10E+01	2.47E-04	3.31E+06	4.07E+01	2.97E-04	1.52E+06	4.90E+01	2.59E-04	4.20E+06	3.85E+01
1.24E-02	3.85E+06	5.00E+01	2.80E-04	3.46E+06	4.24E+01	3.20E-04	1.59E+06	4.76E+01	3.22E-04	4.58E+06	3.79E+01
1.60E-02	4.37E+06	5.02E+01	3.11E-04	3.63E+06	4.01E+01	4.54E-04	1.89E+06	4.66E+01	3.32E-04	4.59E+06	3.96E+01
1.67E-02	4.47E+06	4.96E+01	3.68E-04	3.88E+06	4.00E+01	4.71E-04	1.92E+06	4.82E+01	4.10E-04	5.02E+06	3.74E+01
1.96E-02	4.95E+06	4.84E+01	4.44E-04	4.23E+06	4.16E+01	5.07E-04	1.99E+06	4.61E+01	5.11E-04	5.46E+06	3.65E+01
2.54E-02	5.62E+06	4.89E+01	4.92E-04	4.39E+06	3.86E+01	7.20E-04	2.36E+06	4.55E+01	5.27E-04	5.51E+06	3.89E+01
2.65E-02	5.70E+06	4.83E+01	5.84E-04	4.65E+06	3.90E+01	7.46E-04	2.42E+06	4.73E+01	6.49E-04	5.98E+06	3.65E+01
3.11E-02	6.28E+06	4.71E+01	7.03E-04	5.19E+06	4.06E+01	8.04E-04	2.50E+06	4.48E+01	8.10E-04	6.54E+06	3.54E+01

Table B.3 Summary of Complex Modulus and Phase Angle Values for Binder 5234LL with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
3.18E-02	6.38E+06	4.75E+01	7.81E-04	5.29E+06	3.74E+01	1.14E-03	2.95E+06	4.44E+01	8.35E-04	6.67E+06	3.80E+01
4.00E-02	7.19E+06	4.62E+01	9.25E-04	5.57E+06	3.81E+01	1.14E-03	2.99E+06	4.45E+01	1.03E-03	7.07E+06	3.57E+01
4.03E-02	7.17E+06	4.77E+01	1.22E-03	6.28E+06	3.70E+01	1.18E-03	3.04E+06	4.66E+01	1.23E-03	7.87E+06	3.47E+01
4.20E-02	7.17E+06	4.70E+01	1.24E-03	6.34E+06	3.63E+01	1.27E-03	3.13E+06	4.36E+01	1.28E-03	7.78E+06	3.44E+01
4.93E-02	7.88E+06	4.55E+01	1.47E-03	6.63E+06	3.73E+01	1.44E-03	3.31E+06	4.35E+01	1.55E-03	8.50E+06	3.44E+01
6.34E-02	9.02E+06	4.47E+01	1.53E-03	6.82E+06	3.64E+01	1.81E-03	3.65E+06	4.33E+01	1.63E-03	8.40E+06	3.49E+01
6.38E-02	9.07E+06	4.64E+01	1.96E-03	7.54E+06	3.52E+01	2.02E-03	3.86E+06	4.24E+01	2.03E-03	9.19E+06	3.34E+01
6.66E-02	9.02E+06	4.57E+01	2.32E-03	7.89E+06	3.65E+01	2.28E-03	4.12E+06	4.22E+01	2.45E-03	1.00E+07	3.31E+01
7.81E-02	9.97E+06	4.41E+01	2.42E-03	8.25E+06	3.50E+01	2.87E-03	4.51E+06	4.24E+01	2.59E-03	9.91E+06	3.41E+01
1.00E-01	1.12E+07	4.33E+01	3.11E-03	8.93E+06	3.42E+01	3.20E-03	4.77E+06	4.12E+01	3.22E-03	1.08E+07	3.25E+01
1.01E-01	1.14E+07	4.52E+01	3.68E-03	9.32E+06	3.57E+01	3.61E-03	5.11E+06	4.10E+01	3.89E-03	1.17E+07	3.22E+01
1.06E-01	1.12E+07	4.45E+01	3.84E-03	9.72E+06	3.39E+01	4.54E-03	5.56E+06	4.14E+01	4.10E-03	1.17E+07	3.34E+01
1.24E-01	1.23E+07	4.28E+01	4.92E-03	1.05E+07	3.33E+01	5.07E-03	5.86E+06	4.01E+01	5.11E-03	1.27E+07	3.17E+01
1.59E-01	1.40E+07	4.18E+01	5.84E-03	1.10E+07	3.50E+01	5.72E-03	6.21E+06	3.97E+01	6.15E-03	1.39E+07	3.14E+01
1.60E-01	1.42E+07	4.41E+01	6.08E-03	1.14E+07	3.28E+01	6.01E-03	6.33E+06	4.02E+01	6.16E-03	1.37E+07	3.13E+01
1.67E-01	1.41E+07	4.32E+01	6.15E-03	1.17E+07	3.30E+01	7.20E-03	6.81E+06	4.06E+01	6.49E-03	1.36E+07	3.28E+01
1.88E-01	1.53E+07	4.15E+01	7.72E-03	1.26E+07	3.23E+01	7.55E-03	7.01E+06	3.94E+01	7.72E-03	1.49E+07	3.08E+01
1.96E-01	1.52E+07	4.16E+01	7.81E-03	1.24E+07	3.25E+01	8.04E-03	7.15E+06	3.91E+01	8.10E-03	1.49E+07	3.09E+01
2.36E-01	1.70E+07	4.04E+01	9.25E-03	1.30E+07	3.43E+01	9.07E-03	7.58E+06	3.85E+01	9.76E-03	1.60E+07	3.04E+01
2.52E-01	1.72E+07	4.03E+01	9.64E-03	1.34E+07	3.18E+01	1.14E-02	8.27E+06	3.98E+01	1.03E-02	1.58E+07	3.22E+01
2.65E-01	1.76E+07	4.19E+01	1.22E-02	1.47E+07	3.13E+01	1.20E-02	8.65E+06	3.78E+01	1.22E-02	1.73E+07	2.98E+01
3.11E-01	1.86E+07	4.03E+01	1.24E-02	1.44E+07	3.17E+01	1.27E-02	8.67E+06	3.82E+01	1.28E-02	1.74E+07	3.02E+01
3.75E-01	2.08E+07	3.90E+01	1.47E-02	1.53E+07	3.36E+01	1.44E-02	9.19E+06	3.74E+01	1.55E-02	1.85E+07	2.96E+01
4.00E-01	2.10E+07	3.91E+01	1.53E-02	1.56E+07	3.09E+01	1.81E-02	1.01E+07	3.90E+01	1.63E-02	1.84E+07	3.16E+01

Table B.3 Summary of Complex Modulus and Phase Angle Values for Binder 5234LL with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
4.20E-01	2.16E+07	4.08E+01	1.94E-02	1.71E+07	3.03E+01	1.90E-02	1.04E+07	3.67E+01	1.94E-02	2.01E+07	2.90E+01
4.93E-01	2.27E+07	3.92E+01	1.96E-02	1.68E+07	3.11E+01	2.02E-02	1.05E+07	3.73E+01	2.03E-02	2.02E+07	2.96E+01
5.94E-01	2.51E+07	3.78E+01	2.42E-02	1.81E+07	3.02E+01	2.28E-02	1.10E+07	3.64E+01	2.45E-02	2.13E+07	2.89E+01
6.34E-01	2.54E+07	3.80E+01	3.07E-02	1.98E+07	2.93E+01	2.87E-02	1.21E+07	3.85E+01	2.59E-02	2.15E+07	3.11E+01
6.66E-01	2.67E+07	3.97E+01	3.11E-02	1.96E+07	3.04E+01	3.00E-02	1.25E+07	3.56E+01	3.07E-02	2.31E+07	2.81E+01
7.81E-01	2.75E+07	3.82E+01	3.18E-02	2.02E+07	2.97E+01	3.18E-02	1.26E+07	3.62E+01	3.18E-02	2.34E+07	2.86E+01
9.41E-01	3.03E+07	3.64E+01	3.84E-02	2.10E+07	2.95E+01	3.20E-02	1.27E+07	3.64E+01	3.22E-02	2.33E+07	2.90E+01
1.00E+00	3.04E+07	3.68E+01	4.00E-02	2.16E+07	2.94E+01	3.61E-02	1.32E+07	3.55E+01	3.89E-02	2.45E+07	2.82E+01
1.16E+00	3.29E+07	3.62E+01	4.87E-02	2.29E+07	2.85E+01	4.00E-02	1.39E+07	3.53E+01	4.00E-02	2.50E+07	2.80E+01
1.24E+00	3.31E+07	3.70E+01	4.92E-02	2.27E+07	2.98E+01	4.76E-02	1.48E+07	3.45E+01	4.87E-02	2.66E+07	2.74E+01
1.46E+00	3.59E+07	3.59E+01	6.08E-02	2.42E+07	2.88E+01	5.07E-02	1.52E+07	3.56E+01	5.11E-02	2.70E+07	2.84E+01
1.49E+00	3.59E+07	3.51E+01	6.34E-02	2.49E+07	2.82E+01	5.72E-02	1.57E+07	3.46E+01	6.16E-02	2.81E+07	2.77E+01
1.59E+00	3.63E+07	3.57E+01	7.72E-02	2.63E+07	2.77E+01	6.34E-02	1.65E+07	3.41E+01	6.34E-02	2.86E+07	2.71E+01
1.96E+00	3.99E+07	3.60E+01	7.81E-02	2.63E+07	2.93E+01	7.55E-02	1.77E+07	3.35E+01	7.72E-02	3.04E+07	2.67E+01
2.31E+00	4.24E+07	3.43E+01	9.64E-02	2.78E+07	2.82E+01	8.04E-02	1.80E+07	3.49E+01	8.10E-02	3.12E+07	2.79E+01
2.36E+00	4.25E+07	3.41E+01	1.00E-01	2.86E+07	2.74E+01	9.07E-02	1.87E+07	3.38E+01	9.76E-02	3.22E+07	2.71E+01
2.52E+00	4.32E+07	3.47E+01	1.22E-01	3.01E+07	2.70E+01	1.00E-01	1.96E+07	3.30E+01	1.00E-01	3.27E+07	2.64E+01
3.11E+00	4.78E+07	3.49E+01	1.24E-01	3.04E+07	2.87E+01	1.20E-01	2.07E+07	3.26E+01	1.22E-01	3.45E+07	2.61E+01
3.67E+00	4.99E+07	3.29E+01	1.53E-01	3.19E+07	2.77E+01	1.27E-01	2.14E+07	3.43E+01	1.28E-01	3.59E+07	2.75E+01
3.75E+00	5.00E+07	3.30E+01	1.59E-01	3.27E+07	2.67E+01	1.44E-01	2.21E+07	3.31E+01	1.55E-01	3.66E+07	2.66E+01
4.00E+00	5.15E+07	3.38E+01	1.84E-01	3.44E+07	2.66E+01	1.59E-01	2.32E+07	3.20E+01	1.59E-01	3.74E+07	2.58E+01
5.81E+00	5.90E+07	3.21E+01	1.94E-01	3.43E+07	2.65E+01	1.85E-01	2.44E+07	3.20E+01	1.85E-01	3.91E+07	2.59E+01
5.94E+00	5.84E+07	3.21E+01	2.31E-01	3.68E+07	2.63E+01	1.90E-01	2.44E+07	3.18E+01	1.94E-01	3.92E+07	2.56E+01
6.34E+00	6.10E+07	3.28E+01	2.42E-01	3.65E+07	2.72E+01	2.28E-01	2.62E+07	3.23E+01	2.33E-01	4.17E+07	2.53E+01

Table B.3 Summary of Complex Modulus and Phase Angle Values for Binder 5234LL with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
9.21E+00	6.97E+07	3.10E+01	2.52E-01	3.73E+07	2.59E+01	2.32E-01	2.65E+07	3.16E+01	2.45E-01	4.17E+07	2.62E+01
9.41E+00	6.90E+07	3.11E+01	3.07E-01	3.91E+07	2.59E+01	2.52E-01	2.72E+07	3.10E+01	2.52E-01	4.26E+07	2.50E+01
1.00E+01	7.20E+07	3.18E+01	3.67E-01	4.17E+07	2.53E+01	3.00E-01	2.88E+07	3.10E+01	3.07E-01	4.44E+07	2.51E+01
1.46E+01	7.86E+07	3.02E+01	3.84E-01	4.17E+07	2.67E+01	3.61E-01	3.10E+07	3.16E+01	3.69E-01	4.73E+07	2.46E+01
1.46E+01	7.98E+07	3.00E+01	4.00E-01	4.23E+07	2.54E+01	3.68E-01	3.12E+07	3.04E+01	3.89E-01	4.74E+07	2.58E+01
1.49E+01	8.02E+07	3.02E+01	4.87E-01	4.45E+07	2.54E+01	4.00E-01	3.18E+07	3.02E+01	4.00E-01	4.81E+07	2.45E+01
1.59E+01	8.50E+07	3.08E+01	5.81E-01	4.72E+07	2.46E+01	4.76E-01	3.35E+07	3.03E+01	4.87E-01	5.02E+07	2.47E+01
1.83E+01	8.47E+07	2.97E+01	6.08E-01	4.77E+07	2.62E+01	5.72E-01	3.60E+07	3.10E+01	5.84E-01	5.34E+07	2.40E+01
2.31E+01	9.19E+07	2.92E+01	6.34E-01	4.78E+07	2.48E+01	5.84E-01	3.62E+07	2.94E+01	6.16E-01	5.38E+07	2.54E+01
2.36E+01	9.28E+07	2.94E+01	7.72E-01	5.05E+07	2.49E+01	6.34E-01	3.71E+07	2.94E+01	6.34E-01	5.41E+07	2.40E+01
2.90E+01	9.96E+07	2.87E+01	9.22E-01	5.35E+07	2.41E+01	7.55E-01	3.91E+07	2.96E+01	7.72E-01	5.63E+07	2.42E+01
3.67E+01	1.06E+08	2.83E+01	1.00E+00	5.39E+07	2.42E+01	9.23E-01	4.34E+07	2.88E+01	9.26E-01	6.06E+07	2.34E+01
3.75E+01	1.08E+08	2.86E+01	1.13E+00	5.60E+07	2.43E+01	9.25E-01	4.20E+07	2.86E+01	1.00E+00	6.09E+07	2.35E+01
4.40E+01	1.12E+08	2.82E+01	1.22E+00	5.69E+07	2.45E+01	1.00E+00	4.32E+07	2.86E+01	1.10E+00	6.26E+07	2.36E+01
4.60E+01	1.13E+08	2.82E+01	1.42E+00	5.98E+07	2.39E+01	1.16E+00	4.70E+07	2.80E+01	1.22E+00	6.34E+07	2.39E+01
5.53E+01	1.19E+08	2.77E+01	1.46E+00	5.99E+07	2.34E+01	1.20E+00	4.52E+07	2.90E+01	1.38E+00	6.59E+07	2.32E+01
5.81E+01	1.21E+08	2.74E+01	1.59E+00	6.09E+07	2.38E+01	1.47E+00	4.83E+07	2.78E+01	1.47E+00	6.79E+07	2.28E+01
5.94E+01	1.24E+08	2.77E+01	1.94E+00	6.43E+07	2.42E+01	1.59E+00	4.99E+07	2.79E+01	1.59E+00	6.81E+07	2.31E+01
7.29E+01	1.33E+08	2.65E+01	2.24E+00	6.70E+07	2.33E+01	1.84E+00	5.33E+07	2.71E+01	1.94E+00	7.11E+07	2.36E+01
8.76E+01	1.36E+08	2.67E+01	2.31E+00	6.75E+07	2.29E+01	1.90E+00	5.21E+07	2.85E+01	2.19E+00	7.46E+07	2.26E+01
9.21E+01	1.38E+08	2.68E+01	2.52E+00	6.83E+07	2.34E+01	2.32E+00	5.62E+07	2.70E+01	2.33E+00	7.55E+07	2.24E+01
9.41E+01	1.43E+08	2.70E+01	3.07E+00	7.27E+07	2.38E+01	2.52E+00	5.71E+07	2.73E+01	2.52E+00	7.61E+07	2.27E+01
1.16E+02	1.48E+08	2.58E+01	3.56E+00	7.50E+07	2.27E+01	2.91E+00	6.09E+07	2.64E+01	3.07E+00	7.99E+07	2.33E+01
1.39E+02	1.55E+08	2.58E+01	3.67E+00	7.58E+07	2.25E+01	3.00E+00	6.01E+07	2.80E+01	3.47E+00	8.45E+07	2.20E+01

Table B.3 Summary of Complex Modulus and Phase Angle Values for Binder 5234LL with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
1.46E+02	1.58E+08	2.59E+01	4.00E+00	7.68E+07	2.30E+01	3.68E+00	6.50E+07	2.63E+01	3.69E+00	8.39E+07	2.20E+01
1.52E+02	1.61E+08	2.50E+01	5.64E+00	8.41E+07	2.23E+01	4.00E+00	6.53E+07	2.67E+01	4.00E+00	8.46E+07	2.24E+01
1.83E+02	1.70E+08	2.49E+01	5.81E+00	8.46E+07	2.21E+01	4.61E+00	6.95E+07	2.57E+01	5.49E+00	9.51E+07	2.15E+01
1.91E+02	1.70E+08	2.49E+01	6.34E+00	8.62E+07	2.26E+01	5.84E+00	7.39E+07	2.56E+01	5.84E+00	9.30E+07	2.16E+01
2.20E+02	1.78E+08	2.48E+01	8.93E+00	9.38E+07	2.17E+01	6.34E+00	7.49E+07	2.62E+01	6.34E+00	9.41E+07	2.21E+01
2.31E+02	1.78E+08	2.52E+01	9.22E+00	9.43E+07	2.17E+01	6.94E+00	8.05E+07	2.44E+01	8.71E+00	1.05E+08	2.10E+01
2.90E+02	1.94E+08	2.40E+01	9.71E+00	9.70E+07	2.19E+01	7.31E+00	7.91E+07	2.51E+01	9.26E+00	1.03E+08	2.13E+01
3.03E+02	1.93E+08	2.43E+01	1.00E+01	9.65E+07	2.23E+01	8.72E+00	8.52E+07	2.44E+01	1.00E+01	1.05E+08	2.18E+01
3.49E+02	2.01E+08	2.42E+01	1.22E+01	1.02E+08	2.14E+01	9.25E+00	8.40E+07	2.51E+01	1.25E+01	1.09E+08	2.13E+01
3.67E+02	2.02E+08	2.44E+01	1.42E+01	1.04E+08	2.13E+01	1.00E+01	8.57E+07	2.57E+01	1.38E+01	1.15E+08	2.07E+01
4.60E+02	2.19E+08	2.33E+01	1.46E+01	1.05E+08	2.13E+01	1.16E+01	8.92E+07	2.45E+01	1.47E+01	1.14E+08	2.09E+01
4.80E+02	2.19E+08	2.37E+01	1.59E+01	1.08E+08	2.20E+01	1.38E+01	9.51E+07	2.39E+01	1.57E+01	1.16E+08	2.07E+01
5.53E+02	2.27E+08	2.33E+01	1.93E+01	1.13E+08	2.08E+01	1.47E+01	9.52E+07	2.45E+01	1.59E+01	1.18E+08	2.15E+01
5.81E+02	2.30E+08	2.36E+01	2.24E+01	1.16E+08	2.09E+01	1.59E+01	9.77E+07	2.52E+01	2.19E+01	1.27E+08	2.03E+01
6.02E+02	2.28E+08	2.39E+01	2.31E+01	1.17E+08	2.10E+01	1.84E+01	1.01E+08	2.38E+01	2.33E+01	1.27E+08	2.06E+01
7.29E+02	2.44E+08	2.28E+01	3.06E+01	1.26E+08	2.03E+01	2.19E+01	1.08E+08	2.29E+01	2.49E+01	1.28E+08	2.03E+01
7.55E+02	2.30E+08	2.68E+01	3.31E+01	1.28E+08	2.10E+01	2.32E+01	1.08E+08	2.40E+01	3.47E+01	1.39E+08	2.00E+01
7.61E+02	2.47E+08	2.29E+01	3.56E+01	1.28E+08	2.06E+01	2.64E+01	1.13E+08	2.31E+01	3.69E+01	1.41E+08	2.03E+01
8.76E+02	2.54E+08	2.25E+01	3.67E+01	1.30E+08	2.06E+01	2.91E+01	1.13E+08	2.32E+01	3.94E+01	1.43E+08	1.98E+01
1.16E+03	2.72E+08	2.21E+01	4.16E+01	1.33E+08	2.03E+01	3.32E+01	1.19E+08	2.32E+01	4.19E+01	1.45E+08	2.02E+01
1.20E+03	2.76E+08	2.29E+01	4.86E+01	1.39E+08	1.99E+01	3.47E+01	1.20E+08	2.25E+01	5.27E+01	1.51E+08	1.97E+01
1.21E+03	2.77E+08	2.19E+01	5.64E+01	1.42E+08	2.02E+01	3.68E+01	1.22E+08	2.35E+01	5.49E+01	1.52E+08	1.97E+01
1.39E+03	2.86E+08	2.17E+01	5.81E+01	1.44E+08	2.03E+01	4.61E+01	1.27E+08	2.27E+01	5.84E+01	1.57E+08	2.00E+01
1.63E+03	2.90E+08	2.20E+01	6.59E+01	1.49E+08	2.00E+01	5.26E+01	1.34E+08	2.28E+01	6.25E+01	1.57E+08	1.95E+01

Table B.3 Summary of Complex Modulus and Phase Angle Values for Binder 5234LL with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
1.83E+03	3.03E+08	2.13E+01	7.70E+01	1.54E+08	1.93E+01	5.50E+01	1.36E+08	2.19E+01	8.35E+01	1.68E+08	1.94E+01
1.90E+03	2.99E+08	2.24E+01	8.93E+01	1.57E+08	1.99E+01	5.84E+01	1.37E+08	2.31E+01	8.71E+01	1.66E+08	1.94E+01
1.91E+03	3.10E+08	2.12E+01	9.22E+01	1.60E+08	2.00E+01	7.31E+01	1.42E+08	2.22E+01	9.26E+01	1.77E+08	1.97E+01
2.04E+03	2.99E+08	2.26E+01	1.04E+02	1.63E+08	1.97E+01	7.43E+01	1.51E+08	2.14E+01	9.90E+01	1.74E+08	1.90E+01
2.20E+03	3.22E+08	2.10E+01	1.13E+02	1.66E+08	2.02E+01	8.33E+01	1.47E+08	2.18E+01	1.32E+02	1.84E+08	1.90E+01
2.90E+03	3.36E+08	2.06E+01	1.22E+02	1.69E+08	1.91E+01	8.72E+01	1.52E+08	2.11E+01	1.38E+02	1.82E+08	1.91E+01
3.01E+03	3.38E+08	2.26E+01	1.42E+02	1.73E+08	1.96E+01	9.25E+01	1.54E+08	2.26E+01	1.47E+02	1.88E+08	1.89E+01
3.03E+03	3.45E+08	2.01E+01	1.43E+02	1.73E+08	1.87E+01	9.33E+01	1.54E+08	2.17E+01	1.57E+02	1.91E+08	1.88E+01
3.24E+03	3.46E+08	1.94E+01	1.65E+02	1.79E+08	1.91E+01	1.16E+02	1.58E+08	2.17E+01	1.85E+02	1.95E+08	1.91E+01
3.49E+03	3.55E+08	2.02E+01	1.93E+02	1.87E+08	1.87E+01	1.32E+02	1.63E+08	2.10E+01	2.10E+02	2.02E+08	1.86E+01
4.60E+03	3.72E+08	1.99E+01	2.24E+02	1.89E+08	1.93E+01	1.38E+02	1.66E+08	2.08E+01	2.19E+02	1.99E+08	1.88E+01
4.77E+03	3.76E+08	2.00E+01	2.26E+02	1.91E+08	1.91E+01	1.48E+02	1.67E+08	2.14E+01	2.49E+02	2.09E+08	1.83E+01
4.80E+03	3.85E+08	1.97E+01	2.62E+02	1.97E+08	1.85E+01	1.84E+02	1.78E+08	2.12E+01	2.93E+02	2.15E+08	1.90E+01
5.13E+03	3.90E+08	1.90E+01	3.06E+02	2.05E+08	1.83E+01	2.09E+02	1.81E+08	2.01E+01	3.32E+02	2.21E+08	1.82E+01
5.53E+03	3.93E+08	1.95E+01	3.56E+02	2.09E+08	1.90E+01	2.19E+02	1.84E+08	2.01E+01	3.47E+02	2.19E+08	1.86E+01
7.12E+03	4.07E+08	1.97E+01	3.58E+02	2.10E+08	1.83E+01	2.34E+02	1.84E+08	1.96E+01	3.94E+02	2.29E+08	1.80E+01
7.29E+03	4.10E+08	1.93E+01	3.77E+02	2.11E+08	1.90E+01	2.57E+02	2.03E+08	2.10E+01	4.65E+02	2.35E+08	1.79E+01
7.55E+03	3.99E+08	1.92E+01	4.16E+02	2.17E+08	1.82E+01	2.91E+02	1.97E+08	2.08E+01	5.08E+02	2.41E+08	1.79E+01
7.61E+03	4.24E+08	1.90E+01	4.74E+02	2.20E+08	1.88E+01	3.32E+02	2.01E+08	1.97E+01	5.27E+02	2.43E+08	1.77E+01
8.13E+03	4.26E+08	1.83E+01	4.86E+02	2.24E+08	1.79E+01	3.47E+02	2.03E+08	1.97E+01	5.49E+02	2.43E+08	1.82E+01
8.76E+03	4.32E+08	1.89E+01	5.64E+02	2.31E+08	1.86E+01	3.71E+02	2.03E+08	2.01E+01	6.25E+02	2.52E+08	1.76E+01
8.94E+03	4.24E+08	1.92E+01	5.67E+02	2.29E+08	1.81E+01	4.61E+02	2.18E+08	2.03E+01	6.38E+02	2.53E+08	1.82E+01
1.20E+04	4.44E+08	2.03E+01	6.59E+02	2.37E+08	1.79E+01	5.12E+02	2.24E+08	1.95E+01	7.36E+02	2.59E+08	1.80E+01
1.21E+04	4.62E+08	1.84E+01	7.51E+02	2.46E+08	1.71E+01	5.26E+02	2.22E+08	1.90E+01	8.35E+02	2.65E+08	1.75E+01

Table B.3 Summary of Complex Modulus and Phase Angle Values for Binder 5234LL with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
1.29E+04	4.72E+08	1.87E+01	7.69E+02	2.45E+08	1.76E+01	5.50E+02	2.23E+08	1.92E+01	9.90E+02	2.76E+08	1.73E+01
1.39E+04	4.75E+08	1.82E+01	8.99E+02	2.52E+08	1.77E+01	5.89E+02	2.20E+08	1.94E+01	1.01E+03	2.71E+08	1.77E+01
1.42E+04	4.57E+08	2.11E+01	1.04E+03	2.59E+08	1.74E+01	8.11E+02	2.48E+08	1.93E+01	1.17E+03	2.84E+08	1.77E+01
1.90E+04	4.99E+08	1.71E+01	1.12E+03	2.68E+08	1.70E+01	8.24E+02	2.38E+08	1.89E+01	1.32E+03	2.90E+08	1.71E+01
1.91E+04	5.06E+08	1.78E+01	1.19E+03	2.69E+08	1.66E+01	8.33E+02	2.44E+08	1.86E+01	1.57E+03	2.99E+08	1.71E+01
2.04E+04	5.15E+08	1.76E+01	1.22E+03	2.67E+08	1.72E+01	8.72E+02	2.46E+08	1.87E+01	1.60E+03	3.02E+08	1.75E+01
2.20E+04	5.16E+08	1.76E+01	1.40E+03	2.75E+08	1.70E+01	9.33E+02	2.48E+08	1.85E+01	1.85E+03	3.09E+08	1.67E+01
2.25E+04	5.40E+08	1.77E+01	1.43E+03	2.76E+08	1.70E+01	1.04E+03	2.45E+08	1.75E+01	1.87E+03	2.98E+08	1.84E+01
3.01E+04	5.36E+08	1.85E+01	1.65E+03	2.82E+08	1.70E+01	1.29E+03	2.59E+08	1.73E+01	2.10E+03	3.17E+08	1.67E+01
3.03E+04	5.50E+08	1.70E+01	1.89E+03	2.89E+08	1.75E+01	1.32E+03	2.67E+08	1.81E+01	2.35E+03	3.18E+08	1.69E+01
3.24E+04	5.63E+08	1.70E+01	1.93E+03	2.92E+08	1.69E+01	1.38E+03	2.70E+08	1.83E+01	2.49E+03	3.28E+08	1.67E+01
3.56E+04	5.67E+08	1.78E+01	2.26E+03	3.00E+08	1.67E+01	1.48E+03	2.71E+08	1.80E+01	2.54E+03	3.26E+08	1.65E+01
4.77E+04	5.93E+08	1.64E+01	2.62E+03	3.06E+08	1.67E+01	1.64E+03	2.69E+08	1.82E+01	2.93E+03	3.33E+08	1.66E+01
4.80E+04	5.98E+08	1.63E+01	2.99E+03	3.13E+08	1.65E+01	2.04E+03	2.87E+08	1.57E+01	3.32E+03	3.45E+08	1.64E+01
5.13E+04	6.13E+08	1.63E+01	3.06E+03	3.18E+08	1.65E+01	2.09E+03	2.91E+08	1.76E+01	3.72E+03	3.46E+08	1.58E+01
5.63E+04	4.92E+08	1.78E+01	3.53E+03	3.28E+08	1.69E+01	2.19E+03	2.95E+08	1.78E+01	3.94E+03	3.56E+08	1.64E+01
5.64E+04	6.07E+08	1.70E+01	3.58E+03	3.24E+08	1.62E+01	2.34E+03	2.96E+08	1.74E+01	4.02E+03	3.55E+08	1.62E+01
7.07E+04	5.76E+08	1.89E+01	4.16E+03	3.33E+08	1.63E+01	2.60E+03	2.98E+08	1.82E+01	4.65E+03	3.64E+08	1.59E+01
7.55E+04	6.38E+08	1.58E+01	4.47E+03	3.29E+08	1.73E+01	3.00E+03	2.97E+08	1.67E+01	5.27E+03	3.73E+08	1.60E+01
7.61E+04	6.49E+08	1.56E+01	4.74E+03	3.42E+08	1.62E+01	3.23E+03	3.15E+08	1.68E+01	5.89E+03	3.84E+08	1.52E+01
8.13E+04	6.62E+08	1.57E+01	4.86E+03	3.46E+08	1.61E+01	3.32E+03	3.19E+08	1.71E+01	6.25E+03	3.86E+08	1.61E+01
8.94E+04	6.46E+08	1.36E+01	5.59E+03	3.53E+08	1.53E+01	3.47E+03	3.23E+08	1.73E+01	6.38E+03	3.84E+08	1.58E+01
1.12E+05	6.13E+08	2.25E+01	5.61E+03	3.44E+08	1.65E+01	3.71E+03	3.23E+08	1.69E+01	7.36E+03	3.95E+08	1.57E+01
1.20E+05	6.97E+08	1.51E+01	5.67E+03	3.53E+08	1.58E+01	3.77E+03	3.11E+08	1.86E+01	8.07E+03	3.85E+08	1.70E+01

Table B.3 Summary of Complex Modulus and Phase Angle Values for Binder 5234LL with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
1.29E+05	7.22E+08	1.49E+01	6.59E+03	3.60E+08	1.59E+01	4.12E+03	3.27E+08	1.62E+01	8.35E+03	4.06E+08	1.57E+01
1.42E+05	7.09E+08	1.44E+01	7.51E+03	3.68E+08	1.51E+01	5.12E+03	3.37E+08	1.58E+01	9.34E+03	4.16E+08	1.60E+01
1.77E+05	7.35E+08	1.49E+01	8.86E+03	3.83E+08	1.53E+01	5.26E+03	3.46E+08	1.66E+01	1.01E+04	4.16E+08	1.50E+01
1.78E+05	6.56E+08	1.60E+01	8.89E+03	3.67E+08	1.68E+01	5.53E+03	3.39E+08	1.18E+01	1.01E+04	4.11E+08	1.69E+01
1.90E+05	7.50E+08	1.44E+01	8.99E+03	3.81E+08	1.54E+01	5.89E+03	3.51E+08	1.64E+01	1.17E+04	4.28E+08	1.54E+01
2.04E+05	7.77E+08	1.41E+01	1.04E+04	3.90E+08	1.55E+01	5.98E+03	3.44E+08	1.67E+01	1.32E+04	4.38E+08	1.53E+01
2.22E+05	7.04E+08	1.99E+01	1.16E+04	3.94E+08	1.51E+01	6.53E+03	3.47E+08	1.61E+01	1.48E+04	4.38E+08	1.52E+01
2.25E+05	7.80E+08	1.50E+01	1.19E+04	3.99E+08	1.51E+01	6.94E+03	3.76E+08	1.84E+01	1.60E+04	4.52E+08	1.51E+01
2.82E+05	7.06E+08	1.61E+01	1.40E+04	4.11E+08	1.43E+01	8.11E+03	3.70E+08	1.63E+01	1.61E+04	4.34E+08	1.57E+01
3.01E+05	8.01E+08	1.37E+01	1.41E+04	3.94E+08	1.56E+01	8.33E+03	3.73E+08	1.61E+01	1.85E+04	4.63E+08	1.50E+01
3.24E+05	8.21E+08	1.36E+01	1.43E+04	4.12E+08	1.50E+01	9.33E+03	3.83E+08	1.59E+01	2.10E+04	4.73E+08	1.49E+01
3.52E+05	7.44E+08	1.22E+01	1.65E+04	4.22E+08	1.51E+01	9.48E+03	3.69E+08	1.81E+01	2.35E+04	4.82E+08	1.53E+01
3.56E+05	8.16E+08	1.36E+01	1.89E+04	4.31E+08	1.46E+01	1.04E+04	3.78E+08	1.59E+01	2.54E+04	4.88E+08	1.46E+01
4.46E+05	7.42E+08	1.42E+01	2.23E+04	4.45E+08	1.42E+01	1.10E+04	4.01E+08	1.30E+01	2.55E+04	4.62E+08	1.57E+01
5.13E+05	8.93E+08	1.29E+01	2.23E+04	4.33E+08	1.51E+01	1.29E+04	3.95E+08	1.54E+01	2.93E+04	4.97E+08	1.46E+01
5.58E+05	8.49E+08	1.82E+01	2.26E+04	4.44E+08	1.46E+01	1.32E+04	4.06E+08	1.55E+01	3.66E+04	4.72E+08	1.58E+01
5.64E+05	8.80E+08	1.34E+01	2.99E+04	4.64E+08	1.43E+01	1.41E+04	4.47E+08	6.82E+00	3.72E+04	5.13E+08	1.42E+01
7.07E+05	8.59E+08	1.52E+01	3.53E+04	4.80E+08	1.36E+01	1.48E+04	4.13E+08	1.53E+01	4.02E+04	5.26E+08	1.42E+01
8.13E+05	9.53E+08	1.21E+01	3.54E+04	4.66E+08	1.32E+01	1.50E+04	3.92E+08	1.54E+01	4.03E+04	4.96E+08	1.53E+01
8.84E+05	8.95E+08	1.48E+01	3.58E+04	4.77E+08	1.42E+01	1.64E+04	4.08E+08	1.59E+01	4.65E+04	5.36E+08	1.42E+01
8.94E+05	9.49E+08	1.24E+01	4.62E+04	4.77E+08	1.29E+01	1.74E+04	4.36E+08	1.40E+01	5.89E+04	5.51E+08	1.43E+01
1.12E+06	9.22E+08	1.45E+01	4.74E+04	4.98E+08	1.39E+01	1.77E+04	4.94E+08	1.63E+01	6.38E+04	5.64E+08	1.39E+01
1.40E+06	9.34E+08	1.50E+01	4.88E+04	5.05E+08	1.43E+01	2.04E+04	4.29E+08	1.51E+01	6.39E+04	5.58E+08	1.48E+01
1.42E+06	1.00E+09	1.18E+01	5.59E+04	5.16E+08	1.35E+01	2.34E+04	4.45E+08	1.48E+01	7.29E+04	5.13E+08	1.68E+01

Table B.3 Summary of Complex Modulus and Phase Angle Values for Binder 5234LL with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
1.78E+06	9.60E+08	1.49E+01	5.61E+04	4.97E+08	1.51E+01	2.38E+04	4.25E+08	1.59E+01	7.36E+04	5.76E+08	1.38E+01
2.22E+06	9.78E+08	1.23E+01	5.67E+04	5.12E+08	1.38E+01	2.60E+04	4.44E+08	1.50E+01	9.34E+04	5.94E+08	1.34E+01
2.25E+06	1.06E+09	1.11E+01	7.33E+04	5.35E+08	1.35E+01	2.76E+04	4.84E+08	1.47E+01	1.01E+05	6.04E+08	1.35E+01
2.82E+06	1.01E+09	1.24E+01	7.51E+04	5.34E+08	1.34E+01	2.80E+04	5.62E+08	1.09E+01	1.01E+05	5.74E+08	1.40E+01
3.52E+06	1.07E+09	1.18E+01	8.86E+04	5.51E+08	1.33E+01	3.23E+04	4.63E+08	1.44E+01	1.16E+05	5.69E+08	1.45E+01
3.56E+06	1.11E+09	1.05E+01	8.89E+04	5.41E+08	1.36E+01	3.71E+04	4.77E+08	1.42E+01	1.48E+05	6.36E+08	1.32E+01
4.46E+06	1.08E+09	1.14E+01	1.16E+05	5.84E+08	1.24E+01	3.77E+04	4.58E+08	1.45E+01	1.60E+05	6.46E+08	1.31E+01
5.58E+06	1.12E+09	1.19E+01	1.19E+05	5.71E+08	1.30E+01	4.12E+04	4.77E+08	1.43E+01	1.61E+05	6.25E+08	1.36E+01
7.07E+06	1.13E+09	1.05E+01	1.23E+05	5.13E+08	1.52E+01	4.38E+04	4.98E+08	1.38E+01	1.83E+05	6.20E+08	1.36E+01
8.84E+06	1.17E+09	1.08E+01	1.40E+05	5.89E+08	1.27E+01	4.43E+04	5.83E+08	2.08E+01	2.35E+05	6.79E+08	1.27E+01
1.12E+07	1.18E+09	1.02E+01	1.41E+05	5.73E+08	1.31E+01	5.12E+04	5.00E+08	1.40E+01	2.54E+05	6.90E+08	1.25E+01
1.40E+07	1.25E+09	9.82E+00	1.84E+05	6.27E+08	1.10E+01	5.98E+04	4.98E+08	1.39E+01	2.55E+05	6.70E+08	1.30E+01
1.78E+07	1.25E+09	9.63E+00	1.89E+05	6.09E+08	1.25E+01	6.53E+04	5.10E+08	1.37E+01	2.90E+05	6.62E+08	1.37E+01
2.22E+07	1.31E+09	9.25E+00	2.23E+05	6.30E+08	1.23E+01	6.94E+04	5.41E+08	1.25E+01	3.72E+05	7.23E+08	1.23E+01
2.82E+07	1.30E+09	8.53E+00	2.23E+05	6.09E+08	1.22E+01	7.03E+04	5.48E+08	1.65E+01	4.03E+05	7.12E+08	1.24E+01
3.52E+07	1.36E+09	8.58E+00	2.66E+05	7.13E+08	1.09E+01	7.23E+04	6.11E+08	2.12E+01	4.60E+05	7.18E+08	1.26E+01
5.58E+07	1.43E+09	7.99E+00	2.92E+05	6.64E+08	1.32E+01	8.11E+04	5.30E+08	1.33E+01	5.89E+05	7.68E+08	1.19E+01
8.84E+07	1.47E+09	7.48E+00	3.08E+05	6.23E+08	1.25E+01	9.08E+04	5.31E+08	1.79E+01	6.39E+05	7.59E+08	1.21E+01
1.04E+05	5.09E+08	1.14E+01	3.53E+05	6.69E+08	1.18E+01	9.48E+04	5.29E+08	1.40E+01	7.29E+05	7.55E+08	1.24E+01
1.17E+05	6.18E+08	1.45E+01	3.54E+05	6.51E+08	1.21E+01	1.04E+05	5.47E+08	1.32E+01	9.34E+05	8.15E+08	1.13E+01
1.33E+05	5.58E+08	1.32E+01	4.21E+05	6.45E+08	1.38E+01	1.10E+05	5.88E+08	1.27E+01	1.01E+06	8.04E+08	1.16E+01
1.50E+05	6.40E+08	1.35E+01	4.62E+05	7.06E+08	1.22E+01	1.11E+05	6.39E+08	1.25E+01	1.16E+06	8.04E+08	1.18E+01
1.57E+05	6.00E+08	1.47E+01	5.59E+05	7.08E+08	1.14E+01	1.29E+05	5.67E+08	1.28E+01	1.61E+06	8.55E+08	1.11E+01
1.58E+05	6.22E+08	1.43E+01	5.61E+05	6.91E+08	1.16E+01	1.44E+05	6.40E+08	1.62E+01	1.83E+06	8.53E+08	1.13E+01

Table B.3 Summary of Complex Modulus and Phase Angle Values for Binder 5234LL with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
1.65E+05	6.24E+08	1.39E+01	6.67E+05	7.10E+08	1.06E+01	1.50E+05	5.65E+08	1.31E+01	2.55E+06	9.03E+08	1.06E+01
1.67E+05	5.65E+08	1.86E+01	7.33E+05	7.46E+08	1.09E+01	1.64E+05	5.85E+08	1.26E+01	2.90E+06	9.06E+08	1.09E+01
1.86E+05	6.64E+08	1.37E+01	7.73E+05	7.39E+08	9.99E+00	1.74E+05	6.26E+08	1.23E+01	4.03E+06	9.52E+08	1.01E+01
2.37E+05	6.91E+08	1.37E+01	8.89E+05	7.32E+08	1.12E+01	1.77E+05	6.40E+08	1.09E+01	4.60E+06	9.53E+08	1.03E+01
2.49E+05	6.48E+08	1.40E+01	1.16E+06	7.90E+08	1.04E+01	2.28E+05	6.65E+08	1.39E+01	7.29E+06	1.00E+09	9.84E+00
2.62E+05	5.73E+08	1.95E+01	1.23E+06	7.58E+08	1.15E+01	2.38E+05	5.99E+08	1.25E+01	1.16E+07	1.05E+09	9.30E+00
2.65E+05	5.96E+08	1.77E+01	1.41E+06	7.71E+08	1.06E+01	2.60E+05	6.21E+08	1.20E+01	1.83E+07	1.10E+09	8.88E+00
2.95E+05	7.01E+08	1.33E+01	1.68E+06	8.02E+08	1.01E+01	2.76E+05	6.71E+08	1.18E+01	8.30E+06	8.04E+08	1.19E+01
3.76E+05	7.36E+08	1.27E+01	1.84E+06	8.28E+08	9.80E+00	2.80E+05	7.21E+08	1.02E+01	9.35E+06	9.06E+08	1.22E+01
3.95E+05	6.92E+08	1.32E+01	1.94E+06	8.05E+08	1.03E+01	3.62E+05	7.16E+08	8.14E+00	1.16E+07	7.58E+08	1.22E+01
4.15E+05	6.23E+08	1.68E+01	2.23E+06	8.12E+08	1.02E+01	3.77E+05	6.41E+08	1.19E+01	1.19E+07	8.73E+08	1.11E+01
4.19E+05	6.45E+08	1.84E+01	2.66E+06	8.56E+08	1.09E+01	4.12E+05	6.60E+08	1.15E+01	1.31E+07	8.66E+08	1.15E+01
4.67E+05	7.58E+08	1.23E+01	2.92E+06	8.69E+08	9.44E+00	4.38E+05	7.10E+08	1.10E+01	1.48E+07	9.51E+08	1.20E+01
5.96E+05	7.81E+08	1.18E+01	3.08E+06	8.43E+08	9.85E+00	4.43E+05	7.46E+08	1.02E+01	1.84E+07	9.36E+08	1.14E+01
6.25E+05	7.47E+08	1.24E+01	4.21E+06	8.78E+08	1.01E+01	5.73E+05	7.24E+08	1.43E+01	1.88E+07	9.20E+08	1.07E+01
6.57E+05	6.92E+08	1.42E+01	4.62E+06	9.09E+08	9.02E+00	5.98E+05	6.80E+08	1.13E+01	2.08E+07	9.17E+08	1.12E+01
6.64E+05	6.92E+08	1.41E+01	4.88E+06	8.82E+08	9.50E+00	6.94E+05	7.52E+08	1.05E+01	2.35E+07	1.01E+09	1.12E+01
7.40E+05	7.94E+08	1.18E+01	6.67E+06	9.26E+08	9.43E+00	7.03E+05	7.99E+08	9.17E+00	2.91E+07	1.01E+09	1.25E+01
9.45E+05	8.27E+08	1.13E+01	7.73E+06	9.21E+08	8.82E+00	9.08E+05	7.19E+08	1.41E+01	3.30E+07	9.64E+08	1.04E+01
1.04E+06	7.45E+08	1.14E+01	1.06E+07	9.63E+08	8.72E+00	9.48E+05	7.18E+08	1.08E+01	3.72E+07	1.06E+09	1.05E+01
1.05E+06	8.05E+08	1.03E+01	1.23E+07	9.64E+08	8.28E+00	1.10E+06	7.89E+08	1.00E+01	4.61E+07	1.03E+09	9.42E+00

Table B.4 Summary of Complex Modulus and Phase Angle Values for Binder 5234LL (Field Core)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
6.68E-05	3.19E+05	6.05E+01	5.92E-06	4.12E+04	6.93E+01	5.48E-06	3.85E+04	7.09E+01
8.39E-05	3.67E+05	5.97E+01	7.43E-06	4.85E+04	6.92E+01	6.88E-06	4.54E+04	7.03E+01
1.33E-04	4.92E+05	5.88E+01	1.18E-05	6.80E+04	6.79E+01	1.09E-05	6.43E+04	6.93E+01
2.11E-04	6.57E+05	5.75E+01	1.87E-05	9.57E+04	6.71E+01	1.73E-05	9.09E+04	6.76E+01
2.81E-04	7.90E+05	5.63E+01	2.96E-05	1.34E+05	6.59E+01	2.74E-05	1.27E+05	6.64E+01
3.34E-04	8.71E+05	5.61E+01	4.69E-05	1.86E+05	6.46E+01	4.34E-05	1.76E+05	6.52E+01
3.53E-04	9.09E+05	5.56E+01	7.43E-05	2.57E+05	6.35E+01	6.73E-05	2.45E+05	6.35E+01
5.29E-04	1.15E+06	5.49E+01	7.66E-05	2.66E+05	6.27E+01	6.88E-05	2.43E+05	6.41E+01
5.60E-04	1.19E+06	5.42E+01	9.63E-05	3.08E+05	6.23E+01	8.45E-05	2.83E+05	6.26E+01
8.39E-04	1.49E+06	5.36E+01	1.18E-04	3.53E+05	6.24E+01	1.09E-04	3.35E+05	6.28E+01
8.87E-04	1.55E+06	5.29E+01	1.53E-04	4.22E+05	6.10E+01	1.34E-04	3.87E+05	6.17E+01
1.16E-03	1.89E+06	5.17E+01	1.87E-04	4.81E+05	6.12E+01	1.73E-04	4.57E+05	6.17E+01
1.33E-03	1.93E+06	5.24E+01	2.42E-04	5.73E+05	5.95E+01	2.12E-04	5.24E+05	6.03E+01
1.41E-03	2.01E+06	5.15E+01	2.96E-04	6.58E+05	6.01E+01	2.74E-04	6.22E+05	6.05E+01
1.46E-03	2.12E+06	5.14E+01	3.07E-04	6.76E+05	5.85E+01	2.74E-04	6.24E+05	5.88E+01
2.11E-03	2.50E+06	5.11E+01	3.83E-04	7.64E+05	5.81E+01	3.36E-04	7.05E+05	5.88E+01
2.23E-03	2.58E+06	5.01E+01	3.85E-04	7.73E+05	5.78E+01	3.44E-04	7.21E+05	5.86E+01
2.32E-03	2.71E+06	4.97E+01	4.69E-04	8.86E+05	5.90E+01	4.34E-04	8.36E+05	5.94E+01
3.34E-03	3.20E+06	4.99E+01	6.07E-04	1.02E+06	5.69E+01	5.33E-04	9.40E+05	5.76E+01
3.53E-03	3.30E+06	4.88E+01	6.11E-04	1.04E+06	5.66E+01	5.46E-04	9.58E+05	5.70E+01
3.67E-03	3.41E+06	4.83E+01	7.43E-04	1.18E+06	5.79E+01	6.88E-04	1.12E+06	5.83E+01
5.29E-03	4.08E+06	4.87E+01	9.63E-04	1.36E+06	5.55E+01	8.45E-04	1.24E+06	5.63E+01
5.60E-03	4.19E+06	4.75E+01	9.68E-04	1.37E+06	5.51E+01	8.65E-04	1.27E+06	5.56E+01
5.73E-03	4.31E+06	4.72E+01	1.18E-03	1.58E+06	5.68E+01	1.09E-03	1.49E+06	5.72E+01

Table B.4 Summary of Complex Modulus and Phase Angle Values for Binder 5234LL (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
5.82E-03	4.30E+06	4.70E+01	1.31E-03	1.67E+06	5.41E+01	1.14E-03	1.55E+06	5.50E+01
7.20E-03	4.79E+06	4.62E+01	1.53E-03	1.80E+06	5.42E+01	1.34E-03	1.63E+06	5.50E+01
8.39E-03	5.17E+06	4.75E+01	1.53E-03	1.80E+06	5.36E+01	1.37E-03	1.67E+06	5.43E+01
8.87E-03	5.25E+06	4.62E+01	1.64E-03	1.90E+06	5.36E+01	1.43E-03	1.74E+06	5.40E+01
9.23E-03	5.37E+06	4.56E+01	1.87E-03	2.08E+06	5.59E+01	1.73E-03	1.96E+06	5.62E+01
1.14E-02	5.99E+06	4.48E+01	2.42E-03	2.36E+06	5.29E+01	2.12E-03	2.15E+06	5.37E+01
1.33E-02	6.50E+06	4.64E+01	2.43E-03	2.37E+06	5.22E+01	2.17E-03	2.17E+06	5.29E+01
1.41E-02	6.60E+06	4.49E+01	2.61E-03	2.48E+06	5.17E+01	2.27E-03	2.26E+06	5.26E+01
1.46E-02	6.70E+06	4.43E+01	2.96E-03	2.70E+06	5.53E+01	2.74E-03	2.56E+06	5.58E+01
1.81E-02	7.41E+06	4.35E+01	3.83E-03	3.07E+06	5.16E+01	3.36E-03	2.78E+06	5.24E+01
2.11E-02	8.13E+06	4.53E+01	3.85E-03	3.07E+06	5.08E+01	3.44E-03	2.82E+06	5.15E+01
2.23E-02	8.23E+06	4.37E+01	4.13E-03	3.22E+06	5.03E+01	3.60E-03	2.92E+06	5.12E+01
2.32E-02	8.30E+06	4.30E+01	6.07E-03	3.95E+06	5.03E+01	5.33E-03	3.60E+06	5.11E+01
2.86E-02	9.24E+06	4.20E+01	6.11E-03	3.94E+06	4.94E+01	5.46E-03	3.62E+06	5.01E+01
3.18E-02	9.67E+06	4.21E+01	6.23E-03	4.02E+06	4.91E+01	5.70E-03	3.73E+06	4.97E+01
3.34E-02	1.01E+07	4.45E+01	6.55E-03	4.13E+06	4.89E+01	5.73E-03	3.80E+06	4.97E+01
3.53E-02	1.02E+07	4.26E+01	7.82E-03	4.56E+06	4.84E+01	7.19E-03	4.20E+06	4.91E+01
3.67E-02	1.01E+07	4.18E+01	9.63E-03	5.08E+06	4.90E+01	8.45E-03	4.63E+06	4.99E+01
4.00E-02	1.08E+07	4.13E+01	9.68E-03	5.05E+06	4.80E+01	8.65E-03	4.64E+06	4.88E+01
4.54E-02	1.12E+07	4.06E+01	1.04E-02	5.25E+06	4.73E+01	9.04E-03	4.73E+06	4.81E+01
5.60E-02	1.25E+07	4.15E+01	1.24E-02	5.81E+06	4.66E+01	1.14E-02	5.31E+06	4.75E+01
5.82E-02	1.25E+07	4.07E+01	1.53E-02	6.47E+06	4.78E+01	1.34E-02	5.90E+06	4.87E+01
6.34E-02	1.30E+07	3.99E+01	1.53E-02	6.41E+06	4.67E+01	1.37E-02	5.88E+06	4.74E+01
7.20E-02	1.37E+07	3.95E+01	1.64E-02	6.61E+06	4.59E+01	1.43E-02	5.97E+06	4.68E+01

Table B.4 Summary of Complex Modulus and Phase Angle Values for Binder 5234LL (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
5.82E-03	4.30E+06	4.70E+01	1.31E-03	1.67E+06	5.41E+01	1.14E-03	1.55E+06	5.50E+01
8.87E-02	1.53E+07	4.05E+01	1.96E-02	7.29E+06	4.50E+01	1.81E-02	6.70E+06	4.59E+01
9.23E-02	1.51E+07	3.96E+01	2.42E-02	8.20E+06	4.67E+01	2.12E-02	7.48E+06	4.75E+01
1.00E-01	1.58E+07	3.86E+01	2.43E-02	8.08E+06	4.54E+01	2.17E-02	7.42E+06	4.61E+01
1.14E-01	1.66E+07	3.83E+01	2.61E-02	8.38E+06	4.45E+01	2.27E-02	7.49E+06	4.54E+01
1.41E-01	1.87E+07	3.95E+01	3.11E-02	9.16E+06	4.37E+01	2.86E-02	8.47E+06	4.44E+01
1.46E-01	1.82E+07	3.86E+01	3.18E-02	9.43E+06	4.39E+01	3.18E-02	9.20E+06	4.41E+01
1.59E-01	1.91E+07	3.74E+01	3.83E-02	1.02E+07	4.57E+01	3.36E-02	9.38E+06	4.66E+01
1.81E-01	1.99E+07	3.71E+01	3.85E-02	1.02E+07	4.41E+01	3.44E-02	9.32E+06	4.49E+01
1.82E-01	2.06E+07	3.70E+01	4.00E-02	1.05E+07	4.33E+01	3.60E-02	9.39E+06	4.40E+01
2.29E-01	2.24E+07	3.65E+01	4.13E-02	1.04E+07	4.32E+01	4.00E-02	1.03E+07	4.35E+01
2.32E-01	2.19E+07	3.76E+01	4.94E-02	1.15E+07	4.22E+01	4.54E-02	1.05E+07	4.28E+01
2.52E-01	2.26E+07	3.63E+01	6.11E-02	1.26E+07	4.30E+01	5.46E-02	1.16E+07	4.37E+01
2.86E-01	2.38E+07	3.61E+01	6.34E-02	1.28E+07	4.16E+01	5.70E-02	1.16E+07	4.27E+01
3.62E-01	2.66E+07	3.50E+01	6.55E-02	1.29E+07	4.20E+01	6.34E-02	1.24E+07	4.18E+01
3.67E-01	2.65E+07	3.66E+01	7.82E-02	1.40E+07	4.09E+01	7.19E-02	1.31E+07	4.15E+01
4.00E-01	2.76E+07	3.48E+01	9.68E-02	1.57E+07	4.18E+01	8.65E-02	1.43E+07	4.26E+01
4.54E-01	2.83E+07	3.51E+01	1.00E-01	1.55E+07	4.02E+01	9.04E-02	1.43E+07	4.15E+01
5.74E-01	3.12E+07	3.39E+01	1.04E-01	1.59E+07	4.07E+01	1.00E-01	1.51E+07	4.04E+01
5.82E-01	3.19E+07	3.56E+01	1.24E-01	1.73E+07	3.95E+01	1.14E-01	1.60E+07	4.01E+01
6.34E-01	3.21E+07	3.39E+01	1.53E-01	1.92E+07	4.08E+01	1.37E-01	1.77E+07	4.15E+01
7.20E-01	3.34E+07	3.42E+01	1.59E-01	1.91E+07	3.88E+01	1.43E-01	1.75E+07	4.04E+01
9.10E-01	3.68E+07	3.29E+01	1.64E-01	1.95E+07	3.95E+01	1.59E-01	1.86E+07	3.91E+01
1.00E+00	3.78E+07	3.30E+01	1.77E-01	2.04E+07	3.91E+01	1.81E-01	1.95E+07	3.89E+01

Table B.4 Summary of Complex Modulus and Phase Angle Values for Binder 5234LL (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
5.82E-03	4.30E+06	4.70E+01	1.31E-03	1.67E+06	5.41E+01	1.14E-03	1.55E+06	5.50E+01
1.13E+00	3.93E+07	3.29E+01	1.96E-01	2.11E+07	3.83E+01	1.96E-01	2.02E+07	3.88E+01
1.14E+00	3.95E+07	3.33E+01	2.22E-01	2.23E+07	3.79E+01	2.27E-01	2.14E+07	3.92E+01
1.42E+00	4.37E+07	3.24E+01	2.52E-01	2.38E+07	3.72E+01	2.46E-01	2.19E+07	3.83E+01
1.44E+00	4.29E+07	3.19E+01	2.61E-01	2.37E+07	3.84E+01	2.52E-01	2.17E+07	3.79E+01
1.59E+00	4.41E+07	3.21E+01	3.11E-01	2.54E+07	3.71E+01	2.86E-01	2.35E+07	3.77E+01
1.81E+00	4.66E+07	3.24E+01	3.52E-01	2.68E+07	3.68E+01	3.60E-01	2.59E+07	3.82E+01
2.26E+00	5.04E+07	3.09E+01	4.00E-01	2.88E+07	3.60E+01	3.91E-01	2.61E+07	3.68E+01
2.29E+00	4.98E+07	3.09E+01	4.13E-01	2.87E+07	3.74E+01	4.00E-01	2.64E+07	3.65E+01
2.52E+00	5.14E+07	3.12E+01	4.94E-01	3.05E+07	3.60E+01	4.54E-01	2.79E+07	3.67E+01
2.86E+00	5.46E+07	3.15E+01	5.58E-01	3.19E+07	3.54E+01	5.70E-01	3.12E+07	3.71E+01
3.57E+00	5.88E+07	2.99E+01	6.34E-01	3.38E+07	3.50E+01	6.19E-01	3.13E+07	3.55E+01
3.62E+00	5.78E+07	2.99E+01	6.55E-01	3.46E+07	3.63E+01	6.34E-01	3.19E+07	3.53E+01
4.00E+00	6.01E+07	3.03E+01	7.82E-01	3.65E+07	3.50E+01	7.19E-01	3.35E+07	3.56E+01
5.67E+00	6.65E+07	2.93E+01	8.84E-01	3.82E+07	3.42E+01	9.81E-01	3.69E+07	3.43E+01
5.74E+00	6.67E+07	2.90E+01	1.00E+00	3.96E+07	3.39E+01	1.00E+00	3.75E+07	3.42E+01
6.34E+00	6.90E+07	2.95E+01	1.17E+00	4.26E+07	3.39E+01	1.14E+00	3.94E+07	3.47E+01
8.98E+00	7.73E+07	2.82E+01	1.24E+00	4.33E+07	3.40E+01	1.37E+00	4.19E+07	3.42E+01
9.10E+00	7.66E+07	2.82E+01	1.40E+00	4.53E+07	3.29E+01	1.56E+00	4.35E+07	3.32E+01
1.00E+01	7.98E+07	2.87E+01	1.46E+00	4.61E+07	3.30E+01	1.59E+00	4.40E+07	3.32E+01
1.17E+01	8.41E+07	2.72E+01	1.59E+00	4.68E+07	3.29E+01	1.72E+00	4.59E+07	3.31E+01
1.42E+01	8.79E+07	2.73E+01	1.96E+00	5.12E+07	3.30E+01	1.81E+00	4.65E+07	3.37E+01
1.44E+01	8.80E+07	2.74E+01	2.22E+00	5.33E+07	3.17E+01	2.46E+00	5.12E+07	3.20E+01
1.47E+01	8.82E+07	2.73E+01	2.32E+00	5.51E+07	3.20E+01	2.52E+00	5.14E+07	3.23E+01

Table B.4 Summary of Complex Modulus and Phase Angle Values for Binder 5234LL (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
5.82E-03	4.30E+06	4.70E+01	1.31E-03	1.67E+06	5.41E+01	1.14E-03	1.55E+06	5.50E+01
1.59E+01	9.21E+07	2.79E+01	2.52E+00	5.50E+07	3.19E+01	2.73E+00	5.33E+07	3.20E+01
2.26E+01	9.92E+07	2.64E+01	3.11E+00	6.05E+07	3.21E+01	2.86E+00	5.50E+07	3.29E+01
2.29E+01	1.01E+08	2.66E+01	3.52E+00	6.23E+07	3.07E+01	3.91E+00	5.97E+07	3.10E+01
2.33E+01	9.94E+07	2.63E+01	3.68E+00	6.38E+07	3.08E+01	4.00E+00	6.00E+07	3.13E+01
3.57E+01	1.12E+08	2.57E+01	4.00E+00	6.46E+07	3.09E+01	4.32E+00	6.30E+07	3.07E+01
3.62E+01	1.15E+08	2.59E+01	5.58E+00	7.24E+07	2.98E+01	6.19E+00	6.97E+07	3.00E+01
3.67E+01	1.14E+08	2.56E+01	5.83E+00	7.42E+07	2.97E+01	6.34E+00	6.95E+07	3.05E+01
3.69E+01	1.13E+08	2.58E+01	6.34E+00	7.59E+07	3.00E+01	6.85E+00	7.36E+07	2.95E+01
4.61E+01	1.20E+08	2.56E+01	8.84E+00	8.42E+07	2.88E+01	9.81E+00	8.04E+07	2.91E+01
5.67E+01	1.26E+08	2.50E+01	9.24E+00	8.55E+07	2.86E+01	1.00E+01	8.06E+07	2.96E+01
5.74E+01	1.30E+08	2.51E+01	1.00E+01	8.82E+07	2.91E+01	1.09E+01	8.27E+07	2.87E+01
5.84E+01	1.28E+08	2.48E+01	1.36E+01	9.72E+07	2.89E+01	1.40E+01	8.42E+07	2.94E+01
7.31E+01	1.33E+08	2.47E+01	1.40E+01	9.75E+07	2.79E+01	1.56E+01	9.33E+07	2.82E+01
8.98E+01	1.42E+08	2.42E+01	1.46E+01	9.84E+07	2.77E+01	1.59E+01	9.35E+07	2.88E+01
9.10E+01	1.47E+08	2.44E+01	1.59E+01	1.02E+08	2.83E+01	1.72E+01	9.61E+07	2.75E+01
9.26E+01	1.45E+08	2.35E+01	1.70E+01	1.02E+08	2.77E+01	1.76E+01	9.36E+07	2.80E+01
1.16E+02	1.51E+08	2.40E+01	2.22E+01	1.12E+08	2.71E+01	2.46E+01	1.07E+08	2.73E+01
1.33E+02	1.53E+08	2.28E+01	2.32E+01	1.13E+08	2.68E+01	2.73E+01	1.11E+08	2.67E+01
1.42E+02	1.58E+08	2.36E+01	2.70E+01	1.17E+08	2.66E+01	2.79E+01	1.09E+08	2.63E+01
1.47E+02	1.62E+08	2.30E+01	3.52E+01	1.29E+08	2.62E+01	3.91E+01	1.23E+08	2.65E+01
1.67E+02	1.66E+08	2.38E+01	3.68E+01	1.29E+08	2.58E+01	4.32E+01	1.24E+08	2.59E+01
1.84E+02	1.68E+08	2.28E+01	3.74E+01	1.25E+08	2.69E+01	4.41E+01	1.27E+08	2.60E+01
2.26E+02	1.76E+08	2.29E+01	4.28E+01	1.34E+08	2.60E+01	4.75E+01	1.26E+08	2.63E+01

Table B.4 Summary of Complex Modulus and Phase Angle Values for Binder 5234LL (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
5.82E-03	4.30E+06	4.70E+01	1.31E-03	1.67E+06	5.41E+01	1.14E-03	1.55E+06	5.50E+01
2.33E+02	1.80E+08	2.24E+01	4.70E+01	1.37E+08	2.64E+01	5.96E+01	1.37E+08	2.53E+01
2.65E+02	1.87E+08	2.13E+01	5.58E+01	1.47E+08	2.55E+01	6.19E+01	1.40E+08	2.57E+01
2.91E+02	1.88E+08	2.28E+01	5.83E+01	1.47E+08	2.50E+01	6.85E+01	1.42E+08	2.50E+01
3.57E+02	1.96E+08	2.22E+01	6.78E+01	1.52E+08	2.52E+01	7.00E+01	1.44E+08	2.50E+01
3.69E+02	1.99E+08	2.17E+01	7.45E+01	1.55E+08	2.47E+01	9.45E+01	1.54E+08	2.53E+01
4.21E+02	2.09E+08	2.18E+01	8.84E+01	1.67E+08	2.47E+01	9.81E+01	1.60E+08	2.49E+01
4.61E+02	2.07E+08	2.19E+01	9.24E+01	1.65E+08	2.43E+01	1.09E+02	1.60E+08	2.42E+01
4.82E+02	2.15E+08	1.82E+01	1.07E+02	1.73E+08	2.41E+01	1.11E+02	1.62E+08	2.41E+01
5.67E+02	2.20E+08	2.14E+01	1.18E+02	1.74E+08	2.43E+01	1.50E+02	1.73E+08	2.45E+01
5.84E+02	2.20E+08	2.10E+01	1.46E+02	1.87E+08	2.35E+01	1.72E+02	1.79E+08	2.35E+01
6.05E+02	2.24E+08	2.07E+01	1.60E+02	1.90E+08	2.43E+01	1.76E+02	1.86E+08	2.31E+01
6.67E+02	2.32E+08	2.05E+01	1.70E+02	1.94E+08	2.27E+01	1.78E+02	1.76E+08	2.69E+01
7.31E+02	2.29E+08	2.08E+01	1.87E+02	1.97E+08	2.34E+01	2.23E+02	1.98E+08	2.37E+01
9.26E+02	2.45E+08	2.02E+01	2.01E+02	1.99E+08	2.35E+01	2.37E+02	2.01E+08	2.28E+01
9.59E+02	2.51E+08	2.10E+01	2.32E+02	2.11E+08	2.28E+01	2.73E+02	2.00E+08	2.28E+01
1.06E+03	2.54E+08	1.99E+01	2.70E+02	2.17E+08	2.24E+01	2.79E+02	2.05E+08	2.25E+01
1.16E+03	2.55E+08	2.00E+01	2.97E+02	2.21E+08	2.25E+01	3.53E+02	2.25E+08	2.07E+01
1.47E+03	2.69E+08	1.96E+01	3.19E+02	2.28E+08	2.38E+01	3.76E+02	2.23E+08	2.22E+01
1.52E+03	2.76E+08	1.86E+01	3.68E+02	2.36E+08	2.20E+01	4.32E+02	2.23E+08	2.21E+01
1.67E+03	2.76E+08	1.91E+01	4.28E+02	2.45E+08	2.16E+01	4.41E+02	2.33E+08	2.17E+01
1.79E+03	2.79E+08	1.91E+01	4.70E+02	2.46E+08	2.19E+01	5.44E+02	2.30E+08	2.47E+01
1.84E+03	2.78E+08	1.94E+01	5.05E+02	2.51E+08	2.20E+01	5.60E+02	2.52E+08	2.09E+01
2.25E+03	2.87E+08	1.86E+01	5.83E+02	2.63E+08	2.13E+01	5.96E+02	2.49E+08	2.14E+01

Table B.4 Summary of Complex Modulus and Phase Angle Values for Binder 5234LL (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
5.82E-03	4.30E+06	4.70E+01	1.31E-03	1.67E+06	5.41E+01	1.14E-03	1.55E+06	5.50E+01
2.33E+03	2.94E+08	1.90E+01	6.78E+02	2.73E+08	2.09E+01	6.83E+02	2.38E+08	2.48E+01
2.41E+03	3.05E+08	1.84E+01	7.31E+02	2.59E+08	2.23E+01	6.85E+02	2.49E+08	2.14E+01
2.65E+03	3.06E+08	1.87E+01	7.45E+02	2.80E+08	2.09E+01	7.00E+02	2.59E+08	2.09E+01
2.91E+03	3.07E+08	1.87E+01	8.01E+02	2.79E+08	2.19E+01	8.88E+02	2.73E+08	2.05E+01
3.57E+03	3.34E+08	1.90E+01	9.18E+02	2.88E+08	2.21E+01	9.45E+02	2.75E+08	2.04E+01
3.69E+03	3.23E+08	1.82E+01	1.07E+03	3.02E+08	2.01E+01	1.08E+03	2.69E+08	1.99E+01
3.82E+03	3.32E+08	1.79E+01	1.18E+03	3.10E+08	2.00E+01	1.11E+03	2.84E+08	2.03E+01
4.21E+03	3.34E+08	1.77E+01	1.27E+03	3.12E+08	2.07E+01	1.41E+03	3.06E+08	1.90E+01
4.61E+03	3.37E+08	1.80E+01	1.45E+03	3.06E+08	2.24E+01	1.50E+03	3.06E+08	1.96E+01
5.66E+03	3.52E+08	1.70E+01	1.63E+03	3.19E+08	1.95E+01	1.72E+03	3.13E+08	2.14E+01
5.84E+03	3.51E+08	1.76E+01	1.70E+03	3.33E+08	1.95E+01	1.76E+03	3.17E+08	1.95E+01
6.05E+03	3.66E+08	1.66E+01	1.87E+03	3.40E+08	1.93E+01	2.23E+03	3.28E+08	1.82E+01
6.67E+03	3.61E+08	1.70E+01	2.01E+03	3.37E+08	1.86E+01	2.37E+03	3.36E+08	1.91E+01
7.31E+03	3.63E+08	1.74E+01	2.04E+03	3.29E+08	2.03E+01	2.41E+03	3.12E+08	1.98E+01
8.96E+03	3.91E+08	1.62E+01	2.31E+03	3.43E+08	2.04E+01	2.72E+03	3.25E+08	1.78E+01
9.59E+03	3.98E+08	1.59E+01	2.70E+03	3.67E+08	1.88E+01	2.79E+03	3.50E+08	1.87E+01
1.06E+04	3.92E+08	1.65E+01	2.97E+03	3.75E+08	1.86E+01	3.03E+03	3.27E+08	2.19E+01
1.16E+04	3.95E+08	1.67E+01	3.19E+03	3.78E+08	1.90E+01	3.53E+03	3.63E+08	1.90E+01
1.42E+04	4.24E+08	1.72E+01	3.24E+03	3.69E+08	1.71E+01	3.76E+03	3.70E+08	1.82E+01
1.52E+04	4.29E+08	1.57E+01	3.65E+03	3.77E+08	1.86E+01	4.31E+03	3.78E+08	1.99E+01
1.55E+04	3.78E+08	2.05E+01	4.28E+03	4.02E+08	1.81E+01	4.41E+03	3.79E+08	1.81E+01
1.67E+04	4.23E+08	1.58E+01	4.70E+03	4.17E+08	1.78E+01	4.80E+03	3.52E+08	1.92E+01
1.84E+04	4.29E+08	1.59E+01	5.05E+03	4.07E+08	1.82E+01	5.60E+03	3.98E+08	1.80E+01

Table B.4 Summary of Complex Modulus and Phase Angle Values for Binder 5234LL (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
5.82E-03	4.30E+06	4.70E+01	1.31E-03	1.67E+06	5.41E+01	1.14E-03	1.55E+06	5.50E+01
1.95E+04	3.83E+08	1.77E+01	5.13E+03	4.21E+08	1.69E+01	5.96E+03	4.03E+08	1.76E+01
2.25E+04	4.47E+08	1.60E+01	5.79E+03	4.18E+08	1.96E+01	6.83E+03	3.92E+08	1.76E+01
2.41E+04	4.71E+08	1.49E+01	6.78E+03	4.38E+08	1.74E+01	7.00E+03	4.16E+08	1.74E+01
2.65E+04	4.55E+08	1.52E+01	7.45E+03	4.55E+08	1.71E+01	7.61E+03	3.96E+08	1.83E+01
3.09E+04	4.34E+08	1.89E+01	8.01E+03	4.46E+08	1.74E+01	8.88E+03	4.23E+08	1.71E+01
3.57E+04	4.91E+08	1.39E+01	8.13E+03	4.57E+08	1.76E+01	9.45E+03	4.39E+08	1.69E+01
3.63E+04	4.56E+08	2.36E+01	8.86E+03	4.39E+08	1.68E+01	9.58E+03	4.07E+08	1.91E+01
3.82E+04	5.00E+08	1.43E+01	9.18E+03	4.50E+08	1.75E+01	1.08E+04	4.47E+08	1.65E+01
4.21E+04	4.91E+08	1.45E+01	1.11E+04	4.41E+08	1.81E+01	1.20E+04	4.18E+08	1.95E+01
4.56E+04	4.87E+08	9.54E+00	1.18E+04	4.93E+08	1.64E+01	1.21E+04	4.24E+08	2.01E+01
4.89E+04	4.58E+08	1.56E+01	1.27E+04	4.85E+08	1.67E+01	1.41E+04	4.63E+08	1.65E+01
5.66E+04	5.20E+08	1.42E+01	1.29E+04	4.92E+08	1.63E+01	1.50E+04	4.77E+08	1.62E+01
6.05E+04	5.39E+08	1.35E+01	1.45E+04	4.85E+08	1.55E+01	1.72E+04	4.75E+08	1.63E+01
6.67E+04	5.27E+08	1.38E+01	1.76E+04	5.09E+08	1.68E+01	1.91E+04	4.35E+08	1.49E+01
7.23E+04	6.04E+08	9.43E+00	1.87E+04	5.41E+08	1.57E+01	1.91E+04	4.68E+08	1.80E+01
7.75E+04	4.85E+08	1.62E+01	1.88E+04	5.47E+08	1.42E+01	2.23E+04	5.04E+08	1.57E+01
8.96E+04	5.65E+08	1.34E+01	2.01E+04	5.27E+08	1.60E+01	2.37E+04	5.16E+08	1.55E+01
9.59E+04	5.79E+08	1.29E+01	2.04E+04	5.34E+08	1.44E+01	2.72E+04	5.17E+08	1.56E+01
1.15E+05	5.00E+08	1.85E+01	2.31E+04	5.33E+08	1.61E+01	3.02E+04	5.36E+08	1.58E+01
1.23E+05	5.34E+08	1.12E+01	2.36E+04	6.61E+08	1.02E+01	3.03E+04	5.21E+08	1.47E+01
1.26E+05	5.23E+08	1.38E+01	2.79E+04	5.63E+08	1.61E+01	3.53E+04	5.39E+08	1.51E+01
1.42E+05	6.03E+08	1.27E+01	3.19E+04	5.68E+08	1.53E+01	4.31E+04	5.66E+08	1.48E+01
1.52E+05	6.13E+08	1.23E+01	3.24E+04	5.85E+08	1.58E+01	4.79E+04	5.70E+08	1.53E+01

Table B.4 Summary of Complex Modulus and Phase Angle Values for Binder 5234LL (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
5.82E-03	4.30E+06	4.70E+01	1.31E-03	1.67E+06	5.41E+01	1.14E-03	1.55E+06	5.50E+01
1.82E+05	6.42E+08	8.12E+00	3.65E+04	5.77E+08	1.48E+01	4.80E+04	5.48E+08	1.58E+01
1.95E+05	5.70E+08	1.41E+01	3.75E+04	7.00E+08	1.45E+01	5.60E+04	5.81E+08	1.44E+01
2.00E+05	6.37E+08	9.45E+00	4.43E+04	5.82E+08	1.83E+01	6.83E+04	6.01E+08	1.42E+01
2.25E+05	6.37E+08	1.20E+01	5.05E+04	6.12E+08	1.46E+01	7.59E+04	5.97E+08	1.64E+01
2.41E+05	6.50E+08	1.16E+01	5.13E+04	6.34E+08	1.47E+01	7.61E+04	6.03E+08	1.39E+01
2.88E+05	5.94E+08	1.35E+01	5.79E+04	6.20E+08	1.46E+01	8.88E+04	6.22E+08	1.37E+01
3.09E+05	6.13E+08	1.35E+01	5.94E+04	6.67E+08	1.47E+01	1.08E+05	6.51E+08	1.34E+01
3.16E+05	6.55E+08	1.06E+01	7.02E+04	6.33E+08	1.61E+01	1.20E+05	6.35E+08	1.68E+01
3.57E+05	6.79E+08	1.13E+01	7.48E+04	6.99E+08	1.90E+01	1.20E+05	6.48E+08	1.39E+01
3.79E+05	6.27E+08	1.67E+01	8.01E+04	6.55E+08	1.40E+01	1.21E+05	6.39E+08	1.36E+01
4.56E+05	6.96E+08	1.09E+01	8.13E+04	6.75E+08	1.40E+01	1.72E+05	6.87E+08	1.29E+01
4.76E+05	6.25E+08	1.12E+01	9.18E+04	6.68E+08	1.39E+01	1.90E+05	5.57E+08	1.69E+01
4.89E+05	6.56E+08	1.17E+01	9.39E+04	6.79E+08	8.92E+00	1.91E+05	6.74E+08	1.39E+01
5.01E+05	7.40E+08	1.42E+01	9.41E+04	7.30E+08	1.39E+01	1.91E+05	6.88E+08	1.32E+01
5.66E+05	7.16E+08	1.07E+01	1.11E+05	7.03E+08	1.42E+01	2.72E+05	7.39E+08	1.21E+01
7.23E+05	7.54E+08	1.28E+01	1.29E+05	7.39E+08	1.33E+01	3.02E+05	7.33E+08	1.25E+01
7.54E+05	6.91E+08	1.86E+01	1.45E+05	7.13E+08	1.33E+01	3.03E+05	7.30E+08	1.24E+01
7.75E+05	6.94E+08	1.16E+01	1.49E+05	7.41E+08	1.76E+01	4.77E+05	6.32E+08	2.05E+01
7.94E+05	7.43E+08	1.11E+01	1.49E+05	7.19E+08	1.38E+01	4.79E+05	7.81E+08	1.23E+01
8.96E+05	7.57E+08	1.01E+01	1.76E+05	7.24E+08	1.32E+01	4.80E+05	7.81E+08	1.17E+01
1.15E+06	7.53E+08	1.21E+01	2.04E+05	7.78E+08	1.27E+01	7.55E+05	7.11E+08	8.74E+00
1.19E+06	7.12E+08	1.44E+01	2.31E+05	7.62E+08	1.26E+01	7.59E+05	8.25E+08	1.11E+01
1.23E+06	7.29E+08	1.08E+01	2.36E+05	8.02E+08	1.16E+01	7.61E+05	8.23E+08	1.11E+01

Table B.4 Summary of Complex Modulus and Phase Angle Values for Binder 5234LL (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
5.82E-03	4.30E+06	4.70E+01	1.31E-03	1.67E+06	5.41E+01	1.14E-03	1.55E+06	5.50E+01
1.26E+06	8.17E+08	1.26E+01	2.36E+05	8.73E+08	1.22E+01	1.20E+06	8.00E+08	1.53E+01
1.82E+06	7.94E+08	1.01E+01	2.73E+05	7.45E+08	1.97E+01	1.20E+06	8.69E+08	1.07E+01
1.89E+06	9.05E+08	9.12E+00	2.79E+05	7.81E+08	1.32E+01	1.21E+06	8.69E+08	1.05E+01
1.95E+06	7.67E+08	1.02E+01	3.24E+05	8.25E+08	1.19E+01	1.49E+06	5.85E+08	1.23E+01
2.00E+06	8.24E+08	7.94E+00	3.43E+05	8.25E+08	1.24E+01	1.87E+06	5.86E+08	1.45E+01
2.88E+06	8.33E+08	9.10E+00	3.65E+05	8.12E+08	1.19E+01	1.90E+06	8.85E+08	1.05E+01
3.00E+06	9.27E+08	9.76E+00	3.74E+05	8.91E+08	9.70E+00	1.91E+06	9.17E+08	9.94E+00
3.09E+06	8.00E+08	9.62E+00	3.75E+05	8.10E+08	1.35E+01	3.01E+06	8.82E+08	1.00E+01
3.16E+06	8.82E+08	9.19E+00	4.43E+05	8.29E+08	1.22E+01	3.02E+06	9.60E+08	9.39E+00
4.56E+06	8.71E+08	9.12E+00	5.13E+05	8.76E+08	1.12E+01	4.71E+06	7.58E+08	1.18E+01
4.76E+06	9.81E+08	8.21E+00	5.44E+05	9.20E+08	1.22E+01	4.77E+06	9.10E+08	1.01E+01
4.89E+06	8.34E+08	9.12E+00	5.92E+05	8.76E+08	1.06E+01	4.79E+06	1.00E+09	8.87E+00
5.01E+06	9.12E+08	7.27E+00	5.94E+05	9.26E+08	1.20E+01	7.46E+06	8.02E+08	1.44E+01
7.23E+06	9.10E+08	8.25E+00	7.02E+05	8.82E+08	1.15E+01	7.55E+06	9.64E+08	9.89E+00
7.54E+06	9.77E+08	6.52E+00	8.13E+05	9.33E+08	1.05E+01	8.49E+06	8.75E+08	1.28E+01
7.75E+06	8.73E+08	8.56E+00	8.63E+05	9.41E+08	1.73E+01	1.18E+07	7.74E+08	9.99E+00
7.94E+06	9.62E+08	8.30E+00	9.39E+05	1.00E+09	7.61E+00	1.20E+07	1.01E+09	9.68E+00
1.15E+07	9.49E+08	7.80E+00	9.41E+05	9.71E+08	1.04E+01	1.35E+07	8.95E+08	1.85E+01
1.19E+07	1.01E+09	6.37E+00	1.11E+06	9.28E+08	1.07E+01	1.90E+07	1.04E+09	8.39E+00
1.26E+07	9.97E+08	7.59E+00	1.37E+06	1.04E+09	8.51E+00	2.13E+07	8.98E+08	1.11E+01
1.82E+07	9.83E+08	7.25E+00	1.49E+06	1.07E+09	1.13E+01	2.97E+07	8.56E+08	1.20E+01
1.89E+07	1.03E+09	6.70E+00	1.49E+06	1.03E+09	9.63E+00	3.01E+07	1.09E+09	8.01E+00
2.00E+07	1.03E+09	6.93E+00	1.76E+06	9.79E+08	1.02E+01	4.71E+07	9.83E+08	9.99E+00

Table B.4 Summary of Complex Modulus and Phase Angle Values for Binder 5234LL (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
5.82E-03	4.30E+06	4.70E+01	1.31E-03	1.67E+06	5.41E+01	1.14E-03	1.55E+06	5.50E+01
3.00E+07	1.08E+09	6.72E+00	2.17E+06	1.07E+09	1.48E+01	4.77E+07	1.12E+09	7.55E+00
3.16E+07	1.06E+09	6.48E+00	2.36E+06	1.11E+09	9.32E+00	5.36E+07	1.12E+09	1.55E+01
4.76E+07	1.12E+09	6.45E+00	2.36E+06	1.09E+09	9.25E+00	7.46E+07	1.06E+09	9.25E+00
5.01E+07	1.09E+09	6.05E+00	2.79E+06	1.02E+09	9.64E+00	8.49E+07	1.04E+09	8.42E+00
7.54E+07	1.15E+09	5.79E+00	3.43E+06	1.13E+09	7.47E+00	1.18E+08	1.10E+09	7.96E+00
1.19E+08	1.19E+09	5.21E+00	3.74E+06	1.14E+09	7.98E+00	1.35E+08	1.18E+09	1.16E+01
1.89E+08	1.22E+09	4.97E+00	3.75E+06	1.13E+09	8.63E+00	1.87E+08	1.13E+09	7.71E+00

Table B.5 Summary of Complex Modulus and Phase Angle Values for Binder 5834LM with Different Aging Conditions

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
1.33E-05	8.38E+03	5.68E+01	9.28E-06	4.16E+04	6.00E+01	7.03E-06	3.10E+05	5.41E+01	1.12E-05	3.02E+04	5.65E+01
1.67E-05	9.22E+03	5.71E+01	1.17E-05	4.78E+04	6.01E+01	8.83E-06	3.45E+05	5.34E+01	1.41E-05	3.42E+04	5.66E+01
2.64E-05	1.19E+04	6.42E+01	1.85E-05	6.54E+04	6.04E+01	1.40E-05	4.47E+05	5.18E+01	2.23E-05	4.54E+04	5.54E+01
4.19E-05	1.62E+04	6.51E+01	2.93E-05	8.82E+04	6.06E+01	2.22E-05	5.72E+05	5.08E+01	3.54E-05	5.96E+04	5.55E+01
6.64E-05	2.25E+04	6.67E+01	4.64E-05	1.20E+05	6.03E+01	3.51E-05	7.24E+05	4.96E+01	5.61E-05	7.86E+04	5.50E+01
1.05E-04	3.15E+04	6.83E+01	7.35E-05	1.63E+05	5.99E+01	5.57E-05	9.18E+05	4.83E+01	8.89E-05	1.04E+05	5.46E+01
1.40E-04	3.95E+04	5.63E+01	1.06E-04	2.07E+05	5.86E+01	8.83E-05	1.15E+06	4.73E+01	1.21E-04	1.25E+05	5.34E+01
1.67E-04	4.46E+04	6.87E+01	1.17E-04	2.20E+05	5.94E+01	8.99E-05	1.44E+06	4.64E+01	1.41E-04	1.35E+05	5.43E+01
1.76E-04	4.55E+04	5.83E+01	1.33E-04	2.39E+05	5.81E+01	1.13E-04	1.43E+06	4.62E+01	1.53E-04	1.42E+05	5.33E+01
2.64E-04	6.35E+04	6.82E+01	1.85E-04	2.97E+05	5.89E+01	1.40E-04	1.59E+06	4.54E+01	2.23E-04	1.78E+05	5.40E+01
2.78E-04	6.17E+04	6.09E+01	2.11E-04	3.21E+05	5.78E+01	1.79E-04	1.78E+06	4.53E+01	2.42E-04	1.86E+05	5.28E+01
4.19E-04	9.00E+04	6.86E+01	2.93E-04	3.99E+05	5.83E+01	2.22E-04	1.97E+06	4.43E+01	3.54E-04	2.32E+05	5.38E+01
4.41E-04	8.53E+04	6.29E+01	3.35E-04	4.29E+05	5.70E+01	2.84E-04	2.21E+06	4.43E+01	3.83E-04	2.44E+05	5.22E+01
4.75E-04	9.28E+04	5.98E+01	4.06E-04	4.86E+05	5.61E+01	3.51E-04	2.43E+06	4.31E+01	4.42E-04	2.67E+05	5.17E+01
5.96E-04	1.07E+05	6.10E+01	4.64E-04	5.35E+05	5.77E+01	3.79E-04	2.74E+06	4.35E+01	5.55E-04	3.04E+05	5.13E+01
6.64E-04	1.28E+05	6.88E+01	5.10E-04	5.60E+05	5.60E+01	4.50E-04	2.99E+06	4.18E+01	5.61E-04	3.04E+05	5.37E+01
6.99E-04	1.18E+05	6.42E+01	5.31E-04	5.73E+05	5.60E+01	4.76E-04	3.04E+06	4.20E+01	6.07E-04	3.15E+05	5.18E+01
9.45E-04	1.47E+05	6.24E+01	7.35E-04	7.11E+05	5.71E+01	5.57E-04	3.37E+06	4.10E+01	8.79E-04	3.93E+05	5.10E+01
1.05E-03	1.81E+05	6.88E+01	8.09E-04	7.43E+05	5.49E+01	7.13E-04	3.35E+06	4.27E+01	8.89E-04	3.98E+05	5.36E+01
1.11E-03	1.64E+05	6.49E+01	8.41E-04	7.61E+05	5.53E+01	7.54E-04	3.64E+06	4.07E+01	9.63E-04	4.10E+05	5.15E+01
1.50E-03	2.03E+05	6.33E+01	1.28E-03	9.85E+05	5.40E+01	8.83E-04	4.11E+06	3.97E+01	1.39E-03	5.08E+05	5.05E+01
1.67E-03	2.56E+05	6.90E+01	1.33E-03	1.00E+06	5.44E+01	1.13E-03	4.09E+06	4.19E+01	1.41E-03	5.19E+05	5.37E+01
1.72E-03	2.26E+05	6.25E+01	1.58E-03	1.13E+06	5.38E+01	1.20E-03	4.41E+06	3.96E+01	1.53E-03	5.30E+05	5.11E+01
1.76E-03	2.29E+05	6.52E+01	1.98E-03	1.28E+06	5.31E+01	1.40E-03	4.97E+06	3.85E+01	1.71E-03	5.73E+05	4.99E+01

Table B.5 Summary of Complex Modulus and Phase Angle Values for Binder 5834LM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
2.15E-03	2.65E+05	6.29E+01	2.03E-03	1.30E+06	5.31E+01	1.50E-03	5.03E+06	4.10E+01	2.15E-03	6.53E+05	4.99E+01
2.37E-03	2.82E+05	6.34E+01	2.11E-03	1.32E+06	5.36E+01	1.79E-03	5.32E+06	3.86E+01	2.21E-03	6.57E+05	4.99E+01
2.64E-03	3.62E+05	6.91E+01	3.14E-03	1.68E+06	5.22E+01	1.89E-03	5.96E+06	3.80E+01	2.23E-03	6.77E+05	5.38E+01
2.78E-03	3.20E+05	6.51E+01	3.22E-03	1.70E+06	5.22E+01	1.89E-03	6.00E+06	3.73E+01	2.42E-03	6.89E+05	5.08E+01
3.42E-03	3.66E+05	6.28E+01	3.35E-03	1.72E+06	5.28E+01	2.22E-03	6.57E+06	3.71E+01	3.40E-03	8.39E+05	4.92E+01
3.76E-03	3.90E+05	6.36E+01	4.97E-03	2.17E+06	5.12E+01	2.84E-03	6.41E+06	3.77E+01	3.50E-03	8.47E+05	4.96E+01
4.19E-03	5.06E+05	6.95E+01	5.10E-03	2.21E+06	5.11E+01	2.99E-03	7.21E+06	3.62E+01	3.54E-03	8.78E+05	5.43E+01
4.41E-03	4.48E+05	6.48E+01	5.31E-03	2.25E+06	5.19E+01	3.00E-03	7.85E+06	3.58E+01	3.83E-03	8.89E+05	5.05E+01
5.41E-03	5.07E+05	6.26E+01	6.83E-03	2.63E+06	5.05E+01	3.51E-03	7.65E+06	3.68E+01	5.39E-03	1.08E+06	4.86E+01
5.96E-03	5.39E+05	6.34E+01	7.88E-03	2.82E+06	4.99E+01	4.50E-03	8.60E+06	3.51E+01	5.55E-03	1.09E+06	4.92E+01
6.64E-03	6.95E+05	7.14E+01	8.09E-03	2.85E+06	5.02E+01	4.74E-03	9.33E+06	3.47E+01	5.61E-03	1.11E+06	5.59E+01
6.87E-03	6.15E+05	6.15E+01	8.41E-03	2.92E+06	5.10E+01	4.76E-03	9.10E+06	3.61E+01	6.07E-03	1.15E+06	5.02E+01
6.99E-03	6.22E+05	6.44E+01	8.58E-03	2.98E+06	4.96E+01	6.69E-03	1.02E+07	3.42E+01	7.31E-03	1.31E+06	4.78E+01
8.58E-03	6.99E+05	6.23E+01	1.25E-02	3.62E+06	4.89E+01	7.13E-03	1.12E+07	3.39E+01	8.55E-03	1.38E+06	4.81E+01
8.63E-03	7.13E+05	6.16E+01	1.28E-02	3.65E+06	4.93E+01	7.51E-03	1.11E+07	3.37E+01	8.79E-03	1.39E+06	4.87E+01
9.45E-03	7.45E+05	6.30E+01	1.33E-02	3.78E+06	5.02E+01	7.54E-03	1.08E+07	3.53E+01	9.18E-03	1.46E+06	4.77E+01
1.11E-02	8.66E+05	6.39E+01	1.36E-02	3.81E+06	4.85E+01	8.40E-03	1.22E+07	3.31E+01	9.63E-03	1.48E+06	4.99E+01
1.36E-02	9.54E+05	6.16E+01	1.98E-02	4.62E+06	4.78E+01	1.13E-02	1.21E+07	3.33E+01	1.35E-02	1.76E+06	4.76E+01
1.37E-02	9.64E+05	6.08E+01	2.03E-02	4.68E+06	4.83E+01	1.19E-02	1.30E+07	3.27E+01	1.39E-02	1.79E+06	4.83E+01
1.50E-02	1.03E+06	6.24E+01	2.11E-02	4.84E+06	4.94E+01	1.20E-02	1.28E+07	3.46E+01	1.45E-02	1.85E+06	4.71E+01
1.76E-02	1.20E+06	6.33E+01	2.16E-02	4.85E+06	4.73E+01	1.33E-02	1.43E+07	3.21E+01	1.53E-02	1.90E+06	4.96E+01
2.15E-02	1.31E+06	6.11E+01	3.14E-02	5.88E+06	4.67E+01	1.79E-02	1.42E+07	3.25E+01	2.15E-02	2.25E+06	4.70E+01
2.17E-02	1.32E+06	6.02E+01	3.18E-02	6.00E+06	4.67E+01	1.89E-02	1.53E+07	3.17E+01	2.21E-02	2.29E+06	4.79E+01
2.37E-02	1.42E+06	6.16E+01	3.22E-02	5.96E+06	4.73E+01	1.89E-02	1.52E+07	3.39E+01	2.31E-02	2.36E+06	4.64E+01

Table B.5 Summary of Complex Modulus and Phase Angle Values for Binder 5834LM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
2.78E-02	1.65E+06	6.26E+01	3.35E-02	6.20E+06	4.86E+01	2.11E-02	1.67E+07	3.11E+01	2.42E-02	2.44E+06	4.93E+01
3.18E-02	1.80E+06	5.94E+01	3.42E-02	6.18E+06	4.62E+01	2.84E-02	1.67E+07	3.17E+01	3.18E-02	2.76E+06	4.61E+01
3.42E-02	1.79E+06	6.02E+01	4.00E-02	6.75E+06	4.58E+01	2.99E-02	1.79E+07	3.09E+01	3.40E-02	2.86E+06	4.65E+01
3.44E-02	1.79E+06	5.94E+01	4.97E-02	7.43E+06	4.57E+01	3.00E-02	1.78E+07	3.34E+01	3.50E-02	2.91E+06	4.75E+01
3.76E-02	1.94E+06	6.08E+01	5.10E-02	7.55E+06	4.64E+01	3.18E-02	1.94E+07	3.00E+01	3.65E-02	3.04E+06	4.56E+01
4.00E-02	2.06E+06	5.87E+01	5.31E-02	7.82E+06	4.80E+01	3.35E-02	1.95E+07	3.11E+01	3.83E-02	3.12E+06	4.92E+01
4.41E-02	2.26E+06	6.19E+01	5.41E-02	7.77E+06	4.50E+01	4.00E-02	1.98E+07	3.06E+01	4.00E-02	3.11E+06	4.53E+01
5.41E-02	2.43E+06	5.92E+01	6.34E-02	8.46E+06	4.45E+01	4.74E-02	2.07E+07	3.02E+01	5.39E-02	3.63E+06	4.60E+01
5.45E-02	2.43E+06	5.84E+01	7.88E-02	9.33E+06	4.47E+01	4.76E-02	2.13E+07	2.98E+01	5.55E-02	3.70E+06	4.70E+01
5.96E-02	2.64E+06	5.99E+01	8.09E-02	9.53E+06	4.54E+01	5.30E-02	2.26E+07	2.92E+01	5.79E-02	3.79E+06	4.50E+01
6.34E-02	2.73E+06	5.76E+01	8.58E-02	9.78E+06	4.39E+01	6.34E-02	2.27E+07	3.05E+01	6.07E-02	3.95E+06	4.91E+01
6.99E-02	3.06E+06	6.15E+01	1.00E-01	1.06E+07	4.33E+01	7.51E-02	2.39E+07	2.95E+01	6.34E-02	3.95E+06	4.47E+01
8.58E-02	3.29E+06	5.82E+01	1.25E-01	1.17E+07	4.36E+01	7.54E-02	2.44E+07	2.90E+01	8.55E-02	4.58E+06	4.54E+01
8.63E-02	3.27E+06	5.74E+01	1.28E-01	1.19E+07	4.45E+01	8.40E-02	2.59E+07	2.84E+01	8.79E-02	4.70E+06	4.66E+01
9.45E-02	3.58E+06	5.90E+01	1.36E-01	1.21E+07	4.28E+01	1.00E-01	2.64E+07	2.99E+01	9.18E-02	4.71E+06	4.44E+01
1.00E-01	3.64E+06	5.64E+01	1.59E-01	1.31E+07	4.22E+01	1.19E-01	2.75E+07	2.89E+01	1.00E-01	4.98E+06	4.40E+01
1.36E-01	4.41E+06	5.71E+01	1.71E-01	1.37E+07	4.24E+01	1.20E-01	2.80E+07	2.81E+01	1.35E-01	5.78E+06	4.49E+01
1.37E-01	4.37E+06	5.62E+01	1.98E-01	1.45E+07	4.27E+01	1.33E-01	2.97E+07	2.77E+01	1.39E-01	5.95E+06	4.62E+01
1.50E-01	4.84E+06	5.80E+01	2.03E-01	1.49E+07	4.37E+01	1.59E-01	3.07E+07	2.94E+01	1.45E-01	5.89E+06	4.38E+01
1.59E-01	4.73E+06	5.55E+01	2.15E-01	1.52E+07	4.14E+01	1.68E-01	3.15E+07	2.83E+01	1.50E-01	6.25E+06	4.37E+01
1.76E-01	5.36E+06	5.48E+01	2.16E-01	1.50E+07	4.17E+01	1.89E-01	3.25E+07	2.74E+01	1.59E-01	6.20E+06	4.32E+01
2.15E-01	5.87E+06	5.60E+01	2.52E-01	1.62E+07	4.10E+01	1.89E-01	3.23E+07	2.73E+01	1.89E-01	7.06E+06	4.23E+01
2.17E-01	5.78E+06	5.50E+01	3.14E-01	1.79E+07	4.17E+01	2.11E-01	3.41E+07	2.70E+01	2.15E-01	7.21E+06	4.44E+01
2.21E-01	6.07E+06	5.41E+01	3.41E-01	1.86E+07	4.02E+01	2.11E-01	3.50E+07	2.73E+01	2.21E-01	7.47E+06	4.59E+01

Table B.5 Summary of Complex Modulus and Phase Angle Values for Binder 5834LM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
2.37E-01	6.49E+06	5.70E+01	3.42E-01	1.85E+07	4.07E+01	2.52E-01	3.65E+07	2.78E+01	2.31E-01	7.40E+06	4.32E+01
2.52E-01	6.19E+06	5.42E+01	4.00E-01	1.99E+07	3.99E+01	2.99E-01	3.72E+07	2.65E+01	2.52E-01	7.74E+06	4.25E+01
3.42E-01	7.78E+06	5.48E+01	4.97E-01	2.21E+07	4.07E+01	3.34E-01	3.89E+07	2.65E+01	3.00E-01	8.71E+06	4.18E+01
3.44E-01	7.63E+06	5.38E+01	5.41E-01	2.28E+07	3.90E+01	3.35E-01	4.01E+07	2.62E+01	3.40E-01	8.99E+06	4.39E+01
3.50E-01	7.64E+06	5.28E+01	5.41E-01	2.27E+07	3.96E+01	4.00E-01	4.18E+07	2.73E+01	3.65E-01	9.20E+06	4.26E+01
4.00E-01	8.23E+06	5.27E+01	6.34E-01	2.43E+07	3.88E+01	4.74E-01	4.25E+07	2.58E+01	4.00E-01	9.60E+06	4.17E+01
5.41E-01	1.03E+07	5.35E+01	7.88E-01	2.71E+07	3.99E+01	5.30E-01	4.45E+07	2.59E+01	4.75E-01	1.06E+07	4.11E+01
5.45E-01	1.01E+07	5.25E+01	8.57E-01	2.77E+07	3.78E+01	5.30E-01	4.56E+07	2.55E+01	5.39E-01	1.14E+07	4.32E+01
5.55E-01	9.94E+06	5.16E+01	8.58E-01	2.77E+07	3.87E+01	6.34E-01	4.84E+07	2.68E+01	5.79E-01	1.14E+07	4.20E+01
6.34E-01	1.07E+07	5.14E+01	9.79E-01	2.97E+07	3.77E+01	7.51E-01	4.85E+07	2.52E+01	6.34E-01	1.19E+07	4.10E+01
8.58E-01	1.34E+07	5.23E+01	1.00E+00	2.95E+07	3.77E+01	8.39E-01	5.07E+07	2.55E+01	7.52E-01	1.30E+07	4.03E+01
8.63E-01	1.31E+07	5.12E+01	1.23E+00	3.26E+07	3.72E+01	8.40E-01	5.22E+07	2.49E+01	8.09E-01	1.32E+07	4.01E+01
8.79E-01	1.29E+07	5.01E+01	1.36E+00	3.35E+07	3.68E+01	9.60E-01	5.50E+07	2.47E+01	8.55E-01	1.39E+07	4.29E+01
1.00E+00	1.39E+07	5.00E+01	1.36E+00	3.36E+07	3.77E+01	1.00E+00	5.66E+07	2.49E+01	9.18E-01	1.39E+07	4.16E+01
1.00E+00	1.45E+07	4.90E+01	1.59E+00	3.56E+07	3.67E+01	1.21E+00	5.75E+07	2.50E+01	1.00E+00	1.47E+07	4.03E+01
1.26E+00	1.63E+07	4.91E+01	1.95E+00	3.90E+07	3.57E+01	1.33E+00	5.85E+07	2.43E+01	1.02E+00	1.50E+07	3.98E+01
1.37E+00	1.68E+07	4.99E+01	2.15E+00	4.04E+07	3.56E+01	1.33E+00	6.02E+07	2.44E+01	1.19E+00	1.60E+07	3.93E+01
1.39E+00	1.66E+07	4.83E+01	2.16E+00	4.06E+07	3.68E+01	1.59E+00	6.22E+07	2.42E+01	1.45E+00	1.73E+07	4.09E+01
1.59E+00	1.79E+07	4.87E+01	2.52E+00	4.28E+07	3.58E+01	1.91E+00	6.53E+07	2.47E+01	1.59E+00	1.80E+07	3.96E+01
2.00E+00	1.97E+07	4.70E+01	3.09E+00	4.67E+07	3.48E+01	2.11E+00	6.61E+07	2.36E+01	1.61E+00	1.82E+07	3.88E+01
2.17E+00	2.15E+07	4.86E+01	3.41E+00	4.82E+07	3.46E+01	2.11E+00	6.73E+07	2.36E+01	1.89E+00	1.95E+07	3.87E+01
2.21E+00	2.11E+07	4.71E+01	3.42E+00	4.87E+07	3.60E+01	2.52E+00	7.00E+07	2.38E+01	2.31E+00	2.12E+07	4.01E+01
2.52E+00	2.28E+07	4.73E+01	4.00E+00	5.12E+07	3.48E+01	3.03E+00	7.37E+07	2.43E+01	2.52E+00	2.23E+07	3.90E+01
3.17E+00	2.52E+07	4.55E+01	4.89E+00	5.56E+07	3.37E+01	3.34E+00	7.46E+07	2.31E+01	2.55E+00	2.20E+07	3.80E+01

Table B.5 Summary of Complex Modulus and Phase Angle Values for Binder 5834LM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
3.44E+00	2.76E+07	4.72E+01	5.41E+00	5.72E+07	3.37E+01	3.35E+00	7.60E+07	2.32E+01	3.00E+00	2.36E+07	3.80E+01
3.50E+00	2.67E+07	4.56E+01	6.34E+00	6.10E+07	3.39E+01	4.00E+00	7.91E+07	2.34E+01	3.65E+00	2.60E+07	3.95E+01
4.00E+00	2.90E+07	4.58E+01	7.76E+00	6.56E+07	3.27E+01	4.80E+00	8.42E+07	2.26E+01	4.00E+00	2.71E+07	3.83E+01
5.02E+00	3.12E+07	4.43E+01	8.57E+00	6.78E+07	3.27E+01	5.30E+00	8.55E+07	2.26E+01	4.04E+00	2.65E+07	3.72E+01
5.55E+00	3.31E+07	4.43E+01	9.42E+00	7.06E+07	3.26E+01	6.34E+00	8.92E+07	2.30E+01	4.75E+00	2.85E+07	3.73E+01
6.34E+00	3.64E+07	4.45E+01	1.00E+01	7.22E+07	3.31E+01	7.61E+00	9.43E+07	2.22E+01	6.34E+00	3.31E+07	3.76E+01
7.96E+00	3.87E+07	4.27E+01	1.18E+01	7.63E+07	3.17E+01	8.39E+00	9.54E+07	2.21E+01	6.41E+00	3.23E+07	3.61E+01
8.79E+00	4.11E+07	4.29E+01	1.23E+01	7.72E+07	3.17E+01	9.48E+00	1.00E+08	2.27E+01	6.69E+00	3.39E+07	3.64E+01
9.03E+00	4.03E+07	4.27E+01	1.36E+01	7.98E+07	3.18E+01	1.00E+01	1.05E+08	2.19E+01	7.52E+00	3.45E+07	3.66E+01
1.00E+01	4.53E+07	4.31E+01	1.59E+01	8.51E+07	3.23E+01	1.19E+01	1.07E+08	2.16E+01	8.41E+00	3.76E+07	3.54E+01
1.13E+01	4.56E+07	4.20E+01	1.88E+01	8.99E+07	3.09E+01	1.21E+01	1.09E+08	2.23E+01	1.00E+01	4.00E+07	3.69E+01
1.26E+01	4.82E+07	4.14E+01	1.95E+01	9.04E+07	3.07E+01	1.33E+01	1.13E+08	2.23E+01	1.02E+01	3.89E+07	3.55E+01
1.39E+01	5.07E+07	4.16E+01	2.15E+01	9.39E+07	3.10E+01	1.59E+01	1.15E+08	2.14E+01	1.19E+01	4.12E+07	3.58E+01
1.59E+01	5.60E+07	4.18E+01	2.90E+01	1.03E+08	3.02E+01	1.89E+01	1.18E+08	2.15E+01	1.33E+01	4.48E+07	3.43E+01
1.80E+01	5.70E+07	3.98E+01	2.97E+01	1.05E+08	3.00E+01	1.91E+01	1.18E+08	2.11E+01	1.59E+01	4.83E+07	3.62E+01
2.00E+01	5.92E+07	4.00E+01	3.09E+01	1.05E+08	2.99E+01	2.11E+01	1.28E+08	2.13E+01	1.61E+01	4.77E+07	3.47E+01
2.21E+01	6.13E+07	4.03E+01	3.41E+01	1.10E+08	3.01E+01	2.99E+01	1.31E+08	2.12E+01	1.89E+01	4.93E+07	3.51E+01
2.55E+01	6.24E+07	3.99E+01	3.64E+01	1.12E+08	2.95E+01	3.02E+01	1.32E+08	2.07E+01	1.91E+01	5.14E+07	3.43E+01
2.85E+01	6.98E+07	3.84E+01	4.71E+01	1.21E+08	2.88E+01	3.03E+01	1.39E+08	2.14E+01	2.11E+01	5.25E+07	3.35E+01
3.17E+01	7.17E+07	3.86E+01	4.89E+01	1.22E+08	2.90E+01	3.34E+01	1.42E+08	2.02E+01	2.40E+01	5.56E+07	3.39E+01
3.20E+01	7.05E+07	3.85E+01	5.41E+01	1.27E+08	2.93E+01	3.79E+01	1.46E+08	2.10E+01	2.55E+01	5.58E+07	3.39E+01
3.50E+01	7.50E+07	3.90E+01	5.77E+01	1.29E+08	2.89E+01	4.74E+01	1.47E+08	1.99E+01	3.00E+01	5.91E+07	3.44E+01
4.52E+01	8.35E+07	3.72E+01	7.46E+01	1.40E+08	2.80E+01	4.80E+01	1.46E+08	2.04E+01	3.35E+01	6.16E+07	3.33E+01
5.02E+01	8.72E+07	3.73E+01	7.76E+01	1.41E+08	2.81E+01	5.30E+01	1.58E+08	2.02E+01	3.80E+01	6.62E+07	3.30E+01

Table B.5 Summary of Complex Modulus and Phase Angle Values for Binder 5834LM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
5.07E+01	8.70E+07	3.69E+01	8.57E+01	1.47E+08	2.86E+01	6.01E+01	1.63E+08	2.06E+01	4.04E+01	6.74E+07	3.30E+01
5.55E+01	9.17E+07	3.76E+01	9.15E+01	1.48E+08	2.79E+01	7.51E+01	1.61E+08	1.99E+01	4.75E+01	7.06E+07	3.36E+01
7.16E+01	1.02E+08	3.59E+01	9.71E+01	1.51E+08	2.85E+01	7.61E+01	1.62E+08	2.02E+01	5.30E+01	7.29E+07	3.20E+01
7.20E+01	9.66E+07	3.68E+01	1.18E+02	1.61E+08	2.73E+01	8.39E+01	1.75E+08	1.95E+01	6.02E+01	7.84E+07	3.20E+01
7.96E+01	1.05E+08	3.60E+01	1.22E+02	1.61E+08	2.70E+01	9.52E+01	1.78E+08	2.04E+01	6.18E+01	8.14E+07	3.23E+01
8.03E+01	1.06E+08	3.57E+01	1.23E+02	1.63E+08	2.73E+01	9.98E+01	1.79E+08	1.98E+01	6.41E+01	7.98E+07	3.23E+01
8.79E+01	1.11E+08	3.64E+01	1.45E+02	1.70E+08	2.71E+01	1.19E+02	1.81E+08	1.98E+01	7.52E+01	8.36E+07	3.28E+01
9.04E+01	1.11E+08	3.53E+01	1.88E+02	1.84E+08	2.62E+01	1.21E+02	1.92E+08	1.91E+01	7.76E+01	8.86E+07	3.07E+01
1.13E+02	1.19E+08	3.46E+01	1.93E+02	1.84E+08	2.63E+01	1.25E+02	1.95E+08	2.01E+01	8.41E+01	8.67E+07	3.13E+01
1.26E+02	1.24E+08	3.48E+01	1.95E+02	1.87E+08	2.65E+01	1.51E+02	1.96E+08	1.94E+01	9.55E+01	9.24E+07	3.14E+01
1.27E+02	1.27E+08	3.43E+01	2.30E+02	1.95E+08	2.59E+01	1.89E+02	1.98E+08	1.95E+01	1.02E+02	9.50E+07	3.14E+01
1.43E+02	1.35E+08	3.41E+01	2.97E+02	2.10E+08	2.54E+01	1.91E+02	2.13E+08	1.89E+01	1.23E+02	1.01E+08	3.25E+01
1.80E+02	1.42E+08	3.32E+01	3.06E+02	2.12E+08	2.60E+01	1.99E+02	2.10E+08	1.97E+01	1.33E+02	1.02E+08	3.04E+01
1.82E+02	1.38E+08	3.25E+01	3.09E+02	2.13E+08	2.57E+01	2.39E+02	2.17E+08	1.90E+01	1.51E+02	1.08E+08	2.99E+01
2.00E+02	1.46E+08	3.36E+01	3.48E+02	2.21E+08	2.53E+01	2.99E+02	2.18E+08	1.92E+01	1.61E+02	1.09E+08	3.08E+01
2.02E+02	1.49E+08	3.30E+01	3.64E+02	2.22E+08	2.53E+01	3.03E+02	2.36E+08	1.85E+01	1.95E+02	1.16E+08	2.91E+01
2.27E+02	1.58E+08	3.37E+01	4.37E+02	2.28E+08	2.50E+01	3.15E+02	2.33E+08	1.95E+01	2.11E+02	1.19E+08	2.97E+01
2.28E+02	1.56E+08	2.98E+01	4.71E+02	2.38E+08	2.46E+01	3.53E+02	2.37E+08	1.85E+01	2.30E+02	1.19E+08	2.84E+01
2.85E+02	1.66E+08	3.20E+01	4.86E+02	2.40E+08	2.56E+01	3.79E+02	2.40E+08	1.89E+01	2.40E+02	1.25E+08	2.92E+01
3.17E+02	1.74E+08	3.23E+01	4.89E+02	2.42E+08	2.50E+01	4.43E+02	2.34E+08	1.89E+01	2.55E+02	1.28E+08	3.01E+01
3.20E+02	1.75E+08	3.15E+01	5.77E+02	2.52E+08	2.42E+01	4.74E+02	2.42E+08	1.76E+01	2.89E+02	1.32E+08	3.26E+01
3.60E+02	1.86E+08	3.16E+01	6.92E+02	2.61E+08	2.51E+01	4.80E+02	2.57E+08	1.81E+01	3.09E+02	1.32E+08	2.99E+01
3.61E+02	1.85E+08	3.15E+01	7.46E+02	2.69E+08	2.38E+01	4.99E+02	2.60E+08	1.81E+01	3.35E+02	1.40E+08	2.87E+01
4.52E+02	1.96E+08	3.08E+01	7.70E+02	2.71E+08	2.34E+01	6.01E+02	2.61E+08	1.81E+01	3.80E+02	1.44E+08	2.86E+01

Table B.5 Summary of Complex Modulus and Phase Angle Values for Binder 5834LM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
5.02E+02	2.04E+08	3.11E+01	9.15E+02	2.84E+08	2.34E+01	7.02E+02	2.98E+08	1.76E+01	4.04E+02	1.46E+08	2.92E+01
5.07E+02	2.07E+08	3.03E+01	1.10E+03	3.03E+08	2.31E+01	7.51E+02	2.80E+08	1.79E+01	4.58E+02	1.51E+08	2.82E+01
5.70E+02	2.14E+08	2.99E+01	1.18E+03	2.94E+08	2.14E+01	7.91E+02	2.82E+08	1.79E+01	4.90E+02	1.55E+08	2.81E+01
5.73E+02	2.19E+08	3.14E+01	1.18E+03	3.04E+08	2.30E+01	9.52E+02	2.85E+08	1.77E+01	5.30E+02	1.61E+08	2.80E+01
7.08E+02	2.42E+08	2.89E+01	1.22E+03	3.05E+08	2.29E+01	1.11E+03	3.19E+08	1.93E+01	6.02E+02	1.65E+08	2.79E+01
7.16E+02	2.27E+08	2.96E+01	1.45E+03	3.19E+08	2.26E+01	1.19E+03	2.89E+08	1.75E+01	7.24E+02	1.79E+08	2.77E+01
8.03E+02	2.38E+08	2.91E+01	1.48E+03	3.20E+08	2.45E+01	1.25E+03	3.08E+08	1.75E+01	7.26E+02	1.68E+08	2.73E+01
8.89E+02	2.49E+08	2.87E+01	1.74E+03	3.36E+08	2.36E+01	1.27E+03	2.90E+08	1.94E+01	7.76E+02	1.75E+08	2.73E+01
9.04E+02	2.45E+08	2.84E+01	1.88E+03	3.42E+08	2.22E+01	1.51E+03	3.15E+08	1.69E+01	8.41E+02	1.86E+08	2.71E+01
9.08E+02	2.51E+08	2.87E+01	1.93E+03	3.43E+08	2.22E+01	1.59E+03	3.12E+08	1.74E+01	9.10E+02	1.81E+08	2.42E+01
1.13E+03	2.64E+08	2.84E+01	2.30E+03	3.58E+08	2.18E+01	1.76E+03	3.33E+08	1.72E+01	9.55E+02	1.89E+08	2.68E+01
1.27E+03	2.78E+08	2.79E+01	2.35E+03	3.67E+08	2.05E+01	1.89E+03	3.35E+08	1.72E+01	1.15E+03	1.97E+08	2.80E+01
1.41E+03	2.88E+08	2.87E+01	2.76E+03	3.66E+08	2.22E+01	1.99E+03	3.53E+08	1.68E+01	1.23E+03	2.01E+08	2.61E+01
1.43E+03	2.85E+08	2.77E+01	2.97E+03	3.80E+08	2.15E+01	2.39E+03	3.36E+08	1.76E+01	1.33E+03	2.14E+08	2.61E+01
1.44E+03	2.80E+08	2.79E+01	3.06E+03	3.83E+08	2.15E+01	2.52E+03	3.40E+08	1.70E+01	1.44E+03	2.13E+08	2.48E+01
1.80E+03	3.02E+08	2.73E+01	3.64E+03	4.00E+08	2.10E+01	2.79E+03	3.60E+08	2.04E+01	1.51E+03	2.14E+08	2.61E+01
2.02E+03	3.20E+08	2.68E+01	3.72E+03	4.15E+08	2.22E+01	2.99E+03	3.65E+08	1.68E+01	1.82E+03	2.19E+08	2.64E+01
2.23E+03	3.27E+08	2.77E+01	4.21E+03	3.91E+08	2.34E+01	3.15E+03	3.74E+08	1.89E+01	1.95E+03	2.27E+08	2.54E+01
2.27E+03	3.27E+08	2.67E+01	4.37E+03	4.18E+08	1.95E+01	3.79E+03	3.68E+08	1.65E+01	2.00E+03	2.34E+08	2.55E+01
2.28E+03	3.34E+08	2.62E+01	4.71E+03	4.22E+08	2.07E+01	4.00E+03	3.70E+08	1.67E+01	2.11E+03	2.44E+08	2.53E+01
2.44E+03	3.30E+08	2.91E+01	4.86E+03	4.24E+08	2.07E+01	4.43E+03	3.94E+08	1.81E+01	2.29E+03	2.49E+08	2.41E+01
2.85E+03	3.45E+08	2.61E+01	5.28E+03	4.35E+08	2.28E+01	4.74E+03	3.97E+08	1.63E+01	2.40E+03	2.43E+08	2.52E+01
3.06E+03	3.54E+08	2.48E+01	5.77E+03	4.44E+08	2.02E+01	4.86E+03	4.01E+08	1.65E+01	2.51E+03	2.54E+08	2.56E+01
3.20E+03	3.64E+08	2.56E+01	5.89E+03	4.48E+08	2.05E+01	4.99E+03	4.00E+08	1.63E+01	3.09E+03	2.60E+08	2.45E+01

Table B.5 Summary of Complex Modulus and Phase Angle Values for Binder 5834LM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
3.54E+03	3.78E+08	2.56E+01	6.92E+03	4.59E+08	2.06E+01	6.01E+03	4.03E+08	1.63E+01	3.35E+03	2.78E+08	2.44E+01
3.60E+03	3.72E+08	2.56E+01	7.70E+03	4.71E+08	1.98E+01	6.10E+03	4.02E+08	1.98E+01	3.62E+03	2.72E+08	2.52E+01
3.61E+03	3.83E+08	2.57E+01	8.37E+03	4.70E+08	1.87E+01	6.33E+03	4.33E+08	1.59E+01	3.80E+03	2.76E+08	2.42E+01
4.52E+03	3.89E+08	2.51E+01	9.15E+03	4.91E+08	1.94E+01	7.02E+03	3.90E+08	1.71E+01	3.98E+03	2.74E+08	2.35E+01
4.86E+03	3.93E+08	2.60E+01	9.34E+03	4.72E+08	1.90E+01	7.91E+03	4.44E+08	1.48E+01	4.58E+03	2.85E+08	2.37E+01
5.07E+03	4.13E+08	2.45E+01	1.10E+04	5.00E+08	1.92E+01	9.52E+03	4.34E+08	1.57E+01	4.90E+03	2.92E+08	2.37E+01
5.61E+03	4.13E+08	2.52E+01	1.22E+04	5.20E+08	1.90E+01	9.67E+03	4.35E+08	1.60E+01	5.74E+03	3.13E+08	2.29E+01
5.70E+03	4.24E+08	2.43E+01	1.33E+04	5.22E+08	1.90E+01	1.00E+04	4.65E+08	1.54E+01	6.02E+03	3.12E+08	2.34E+01
5.73E+03	4.30E+08	2.43E+01	1.45E+04	5.41E+08	1.86E+01	1.11E+04	4.34E+08	1.85E+01	6.30E+03	3.20E+08	2.07E+01
7.70E+03	4.48E+08	2.50E+01	1.48E+04	5.36E+08	1.64E+01	1.25E+04	4.39E+08	1.99E+01	7.26E+03	3.31E+08	2.25E+01
8.03E+03	4.63E+08	2.34E+01	1.74E+04	5.55E+08	1.86E+01	1.51E+04	4.61E+08	1.25E+01	7.76E+03	3.30E+08	2.29E+01
8.59E+03	4.67E+08	2.11E+01	1.93E+04	5.72E+08	1.82E+01	1.53E+04	4.68E+08	1.54E+01	7.87E+03	3.19E+08	2.42E+01
8.89E+03	4.74E+08	2.29E+01	2.10E+04	5.82E+08	1.85E+01	1.59E+04	4.72E+08	1.55E+01	9.10E+03	3.36E+08	2.22E+01
9.04E+03	4.75E+08	2.33E+01	2.35E+04	5.99E+08	2.04E+01	1.76E+04	4.41E+08	1.60E+01	9.55E+03	3.50E+08	2.24E+01
9.08E+03	4.91E+08	2.23E+01	2.42E+04	4.94E+08	2.11E+01	1.99E+04	4.99E+08	1.51E+01	9.89E+03	3.49E+08	1.94E+01
1.08E+04	5.29E+08	3.02E+01	2.76E+04	6.07E+08	1.77E+01	2.43E+04	4.57E+08	1.66E+01	9.99E+03	3.60E+08	2.19E+01
1.22E+04	5.29E+08	2.44E+01	3.04E+04	4.70E+08	2.21E+01	2.52E+04	5.05E+08	1.55E+01	1.15E+04	3.68E+08	2.18E+01
1.27E+04	5.18E+08	2.24E+01	3.06E+04	6.26E+08	1.74E+01	2.79E+04	5.06E+08	1.50E+01	1.23E+04	3.71E+08	2.19E+01
1.41E+04	5.41E+08	2.16E+01	3.33E+04	6.25E+08	1.63E+01	2.99E+04	6.18E+08	1.58E+01	1.44E+04	3.95E+08	2.11E+01
1.43E+04	5.33E+08	2.21E+01	3.72E+04	6.48E+08	1.75E+01	3.15E+04	5.39E+08	1.50E+01	1.57E+04	3.60E+08	2.34E+01
1.44E+04	5.50E+08	2.16E+01	4.37E+04	6.64E+08	1.69E+01	3.85E+04	4.88E+08	1.94E+01	1.58E+04	3.96E+08	2.19E+01
1.71E+04	4.93E+08	2.19E+01	4.82E+04	5.88E+08	1.93E+01	4.00E+04	5.48E+08	1.50E+01	1.82E+04	4.10E+08	2.08E+01
1.93E+04	5.74E+08	2.10E+01	4.86E+04	6.81E+08	1.66E+01	4.43E+04	5.44E+08	1.47E+01	1.95E+04	4.11E+08	2.09E+01
2.23E+04	5.99E+08	2.10E+01	5.23E+04	6.26E+08	1.69E+01	4.74E+04	5.37E+08	1.08E+01	2.29E+04	4.24E+08	2.06E+01

Table B.5 Summary of Complex Modulus and Phase Angle Values for Binder 5834LM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
2.27E+04	5.88E+08	2.11E+01	5.28E+04	6.58E+08	1.76E+01	4.99E+04	5.79E+08	1.08E+01	2.48E+04	4.45E+08	2.33E+01
2.28E+04	6.01E+08	2.07E+01	5.89E+04	7.01E+08	1.66E+01	6.10E+04	5.30E+08	1.51E+01	2.51E+04	4.36E+08	2.05E+01
2.71E+04	5.40E+08	2.19E+01	6.57E+04	7.29E+08	1.40E+01	6.33E+04	5.89E+08	1.43E+01	2.89E+04	4.52E+08	2.01E+01
2.73E+04	6.21E+08	1.67E+01	6.92E+04	7.22E+08	1.62E+01	6.40E+04	5.87E+08	1.41E+01	2.95E+04	4.17E+08	2.32E+01
3.06E+04	6.23E+08	1.92E+01	7.63E+04	7.33E+08	1.93E+01	7.02E+04	6.61E+08	1.34E+01	3.09E+04	4.60E+08	1.99E+01
3.42E+04	6.90E+08	2.24E+01	8.37E+04	7.60E+08	1.55E+01	7.51E+04	6.26E+08	1.38E+01	3.62E+04	4.81E+08	1.94E+01
3.54E+04	6.53E+08	1.98E+01	9.34E+04	7.63E+08	1.57E+01	8.03E+04	5.62E+08	1.43E+01	3.94E+04	4.33E+08	2.42E+01
3.60E+04	6.52E+08	2.01E+01	1.04E+05	7.65E+08	2.12E+01	9.67E+04	6.35E+08	1.38E+01	3.98E+04	4.79E+08	1.96E+01
3.61E+04	6.69E+08	1.95E+01	1.10E+05	7.80E+08	1.54E+01	1.00E+05	7.38E+08	1.36E+01	4.58E+04	4.94E+08	1.91E+01
4.30E+04	7.06E+08	1.91E+01	1.21E+05	7.51E+08	1.88E+01	1.11E+05	6.40E+08	1.19E+01	5.74E+04	5.21E+08	1.87E+01
4.86E+04	7.27E+08	1.84E+01	1.30E+05	7.28E+08	1.48E+01	1.19E+05	6.71E+08	1.33E+01	5.88E+04	5.06E+08	2.47E+01
5.43E+04	7.56E+08	2.07E+01	1.33E+05	8.09E+08	1.59E+01	1.27E+05	6.26E+08	1.36E+01	6.24E+04	5.20E+08	2.03E+01
5.61E+04	7.17E+08	1.87E+01	1.48E+05	8.27E+08	1.51E+01	1.53E+05	6.82E+08	1.33E+01	6.30E+04	5.30E+08	1.83E+01
5.73E+04	7.37E+08	1.84E+01	1.63E+05	8.28E+08	1.75E+01	1.59E+05	7.90E+08	1.05E+01	7.26E+04	5.41E+08	1.82E+01
6.81E+04	7.52E+08	1.90E+01	1.65E+05	7.97E+08	2.03E+01	1.76E+05	7.45E+08	1.08E+01	9.10E+04	5.69E+08	1.77E+01
7.70E+04	7.65E+08	1.79E+01	1.74E+05	8.41E+08	1.47E+01	1.89E+05	7.13E+08	1.29E+01	9.32E+04	5.27E+08	1.83E+01
8.60E+04	8.11E+08	1.05E+01	1.92E+05	7.71E+08	1.57E+01	1.90E+05	6.60E+08	1.38E+01	9.89E+04	5.80E+08	2.13E+01
8.89E+04	7.85E+08	1.75E+01	2.10E+05	8.63E+08	1.45E+01	2.02E+05	7.32E+08	1.27E+01	9.99E+04	5.80E+08	1.75E+01
9.08E+04	8.11E+08	1.73E+01	2.35E+05	8.89E+08	1.43E+01	2.39E+05	7.33E+08	1.36E+01	1.15E+05	5.99E+08	1.72E+01
1.08E+05	7.87E+08	1.84E+01	2.59E+05	9.95E+08	1.61E+01	2.43E+05	7.06E+08	1.34E+01	1.44E+05	6.25E+08	1.67E+01
1.22E+05	8.25E+08	1.68E+01	2.62E+05	9.06E+08	1.42E+01	2.52E+05	7.81E+08	1.22E+01	1.48E+05	6.46E+08	1.67E+01
1.26E+05	8.63E+08	1.45E+01	3.04E+05	8.90E+08	1.66E+01	2.99E+05	7.59E+08	1.22E+01	1.57E+05	6.29E+08	1.51E+01
1.36E+05	8.40E+08	1.65E+01	3.33E+05	9.30E+08	1.38E+01	3.20E+05	8.03E+08	1.22E+01	1.58E+05	6.33E+08	1.65E+01
1.41E+05	8.57E+08	1.66E+01	3.72E+05	9.54E+08	1.35E+01	3.79E+05	7.55E+08	1.27E+01	1.99E+05	5.82E+08	2.50E+01

Table B.5 Summary of Complex Modulus and Phase Angle Values for Binder 5834LM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
1.58E+05	1.05E+09	2.02E+01	4.10E+05	1.11E+09	1.03E+01	3.85E+05	8.29E+08	1.18E+01	2.29E+05	6.77E+08	1.58E+01
1.71E+05	9.10E+08	1.36E+01	4.15E+05	9.38E+08	1.48E+01	4.00E+05	8.24E+08	1.45E+01	2.34E+05	6.20E+08	1.67E+01
1.93E+05	8.94E+08	1.60E+01	4.82E+05	9.63E+08	1.54E+01	4.74E+05	8.56E+08	1.26E+01	2.48E+05	6.61E+08	1.55E+01
2.16E+05	9.23E+08	1.69E+01	5.28E+05	9.99E+08	1.31E+01	5.07E+05	8.00E+08	1.21E+01	2.50E+05	6.35E+08	2.00E+01
2.23E+05	9.32E+08	1.55E+01	5.89E+05	1.02E+09	1.27E+01	6.01E+05	8.45E+08	1.21E+01	2.51E+05	6.79E+08	1.57E+01
2.50E+05	9.29E+08	1.65E+01	6.50E+05	1.05E+09	1.21E+01	6.10E+05	9.08E+08	1.19E+01	3.62E+05	7.21E+08	1.50E+01
2.71E+05	9.33E+08	1.47E+01	6.57E+05	1.07E+09	1.27E+01	6.33E+05	8.47E+08	1.17E+01	3.71E+05	7.10E+08	1.73E+01
3.06E+05	9.67E+08	1.50E+01	7.63E+05	9.99E+08	1.42E+01	7.51E+05	9.65E+08	1.16E+01	3.94E+05	7.11E+08	1.53E+01
3.42E+05	1.02E+09	1.36E+01	8.37E+05	1.07E+09	1.24E+01	8.03E+05	9.59E+08	1.08E+01	3.96E+05	7.19E+08	1.56E+01
3.54E+05	1.00E+09	1.46E+01	1.03E+06	1.25E+09	1.19E+01	9.67E+05	8.99E+08	1.12E+01	3.98E+05	7.33E+08	1.48E+01
3.96E+05	9.82E+08	1.73E+01	1.21E+06	1.06E+09	1.20E+01	1.19E+06	9.82E+08	1.03E+01	5.88E+05	7.64E+08	1.73E+01
4.30E+05	9.94E+08	1.43E+01	1.33E+06	1.13E+09	1.18E+01	1.27E+06	1.02E+09	1.02E+01	6.24E+05	7.66E+08	1.41E+01
4.86E+05	1.03E+09	1.41E+01	1.63E+06	1.28E+09	1.17E+01	1.51E+06	9.53E+08	1.06E+01	6.30E+05	7.90E+08	1.39E+01
5.43E+05	1.12E+09	1.47E+01	1.65E+06	1.19E+09	1.20E+01	1.53E+06	1.04E+09	1.03E+01	9.32E+05	7.89E+08	1.44E+01
6.28E+05	1.32E+09	1.04E+01	1.92E+06	1.13E+09	1.19E+01	1.89E+06	1.06E+09	9.75E+00	9.89E+05	8.12E+08	1.33E+01
6.81E+05	1.07E+09	1.33E+01	2.10E+06	1.20E+09	1.11E+01	2.02E+06	1.10E+09	9.10E+00	9.94E+05	7.55E+08	1.64E+01
7.70E+05	1.10E+09	1.32E+01	2.59E+06	1.37E+09	1.12E+01	2.39E+06	1.12E+09	8.96E+00	9.99E+05	8.42E+08	1.31E+01
8.60E+05	1.15E+09	1.29E+01	2.62E+06	1.26E+09	1.13E+01	2.43E+06	1.15E+09	9.01E+00	1.48E+06	8.49E+08	1.25E+01
9.95E+05	1.05E+09	1.63E+01	3.04E+06	1.20E+09	1.13E+01	2.99E+06	1.21E+09	8.72E+00	1.57E+06	8.68E+08	1.25E+01
1.08E+06	1.14E+09	1.24E+01	4.10E+06	1.38E+09	1.05E+01	3.20E+06	1.26E+09	8.18E+00	1.58E+06	7.79E+08	1.31E+01
1.18E+06	1.17E+09	2.47E+01	4.15E+06	1.33E+09	1.05E+01	3.79E+06	1.30E+09	7.78E+00	2.34E+06	9.01E+08	1.22E+01

Table B.6 Summary of Complex Modulus and Phase Angle Values for Binder 5828LM with Different Aging Conditions

STA			5day@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
5.15E-06	1.36E+04	7.48E+01	3.75E-06	1.07E+05	5.84E+01	2.54E-06	2.99E+05	5.41E+01	2.44E-06	4.18E+05	5.02E+01
6.47E-06	1.65E+04	7.32E+01	4.71E-06	1.25E+05	5.74E+01	3.19E-06	3.32E+05	5.34E+01	3.07E-06	4.61E+05	4.98E+01
1.02E-05	2.37E+04	7.35E+01	7.47E-06	1.65E+05	5.69E+01	5.06E-06	4.31E+05	5.18E+01	4.87E-06	5.82E+05	4.83E+01
1.62E-05	3.39E+04	7.23E+01	1.18E-05	2.17E+05	5.53E+01	8.02E-06	5.52E+05	5.08E+01	7.71E-06	7.20E+05	4.74E+01
2.57E-05	4.86E+04	7.10E+01	1.88E-05	2.88E+05	5.40E+01	1.27E-05	6.99E+05	4.96E+01	1.22E-05	8.99E+05	4.64E+01
4.08E-05	6.91E+04	6.98E+01	2.97E-05	3.73E+05	5.30E+01	2.01E-05	8.85E+05	4.83E+01	1.94E-05	1.11E+06	4.52E+01
6.43E-05	9.63E+04	6.75E+01	4.71E-05	4.86E+05	5.20E+01	3.19E-05	1.11E+06	4.73E+01	3.07E-05	1.35E+06	4.44E+01
6.47E-05	9.74E+04	6.86E+01	6.01E-05	5.67E+05	5.07E+01	4.87E-05	1.39E+06	4.64E+01	4.72E-05	1.67E+06	4.33E+01
8.07E-05	1.14E+05	6.69E+01	7.47E-05	6.22E+05	5.10E+01	5.06E-05	1.38E+06	4.62E+01	4.87E-05	1.66E+06	4.35E+01
1.02E-04	1.38E+05	6.74E+01	7.55E-05	6.39E+05	5.04E+01	6.11E-05	1.54E+06	4.54E+01	5.93E-05	1.84E+06	4.30E+01
1.28E-04	1.60E+05	6.57E+01	1.18E-04	7.97E+05	5.02E+01	8.02E-05	1.71E+06	4.53E+01	7.71E-05	2.03E+06	4.26E+01
1.62E-04	1.92E+05	6.62E+01	1.20E-04	8.18E+05	4.89E+01	9.69E-05	1.90E+06	4.43E+01	9.40E-05	2.24E+06	4.15E+01
2.03E-04	2.22E+05	6.43E+01	1.88E-04	1.03E+06	4.93E+01	1.27E-04	2.13E+06	4.43E+01	1.22E-04	2.46E+06	4.19E+01
2.50E-04	2.60E+05	6.32E+01	1.90E-04	1.04E+06	4.77E+01	1.54E-04	2.34E+06	4.31E+01	1.49E-04	2.71E+06	4.05E+01
2.57E-04	2.69E+05	6.51E+01	2.83E-04	1.28E+06	4.70E+01	2.01E-04	2.64E+06	4.35E+01	1.94E-04	2.99E+06	4.11E+01
3.14E-04	3.03E+05	6.29E+01	2.97E-04	1.31E+06	4.85E+01	2.43E-04	2.88E+06	4.18E+01	2.36E-04	3.27E+06	3.95E+01
3.21E-04	3.07E+05	6.29E+01	3.01E-04	1.31E+06	4.67E+01	2.53E-04	2.93E+06	4.20E+01	2.47E-04	3.33E+06	3.94E+01
4.08E-04	3.73E+05	6.41E+01	3.55E-04	1.44E+06	4.64E+01	3.18E-04	3.25E+06	4.10E+01	3.07E-04	3.60E+06	4.04E+01
4.98E-04	4.18E+05	6.13E+01	4.71E-04	1.66E+06	4.78E+01	3.19E-04	3.23E+06	4.27E+01	3.11E-04	3.66E+06	3.88E+01
5.09E-04	4.20E+05	6.17E+01	4.77E-04	1.65E+06	4.56E+01	3.86E-04	3.51E+06	4.07E+01	3.74E-04	3.90E+06	3.85E+01
6.47E-04	5.11E+05	6.32E+01	5.62E-04	1.81E+06	4.50E+01	5.04E-04	3.96E+06	3.97E+01	4.87E-04	4.34E+06	3.97E+01
7.89E-04	5.73E+05	5.99E+01	7.47E-04	2.10E+06	4.71E+01	5.06E-04	3.95E+06	4.19E+01	4.93E-04	4.39E+06	3.73E+01
8.07E-04	5.73E+05	6.04E+01	7.55E-04	2.07E+06	4.46E+01	6.11E-04	4.25E+06	3.96E+01	5.93E-04	4.67E+06	3.75E+01
1.02E-03	7.00E+05	6.24E+01	8.91E-04	2.26E+06	4.38E+01	7.99E-04	4.79E+06	3.85E+01	7.71E-04	5.29E+06	3.88E+01

Table B.6 Summary of Complex Modulus and Phase Angle Values for Binder 5828LM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
1.11E-03	7.01E+05	5.91E+01	1.18E-03	2.62E+06	4.67E+01	8.02E-04	4.85E+06	4.10E+01	7.81E-04	5.24E+06	3.62E+01
1.25E-03	7.74E+05	5.84E+01	1.20E-03	2.58E+06	4.36E+01	9.69E-04	5.13E+06	3.86E+01	9.40E-04	5.55E+06	3.67E+01
1.28E-03	7.78E+05	5.91E+01	1.25E-03	2.67E+06	4.37E+01	1.22E-03	5.75E+06	3.80E+01	1.18E-03	6.06E+06	3.60E+01
1.40E-03	8.60E+05	5.76E+01	1.41E-03	2.81E+06	4.26E+01	1.27E-03	5.79E+06	3.73E+01	1.24E-03	6.23E+06	3.52E+01
1.62E-03	9.46E+05	6.20E+01	1.58E-03	3.02E+06	4.24E+01	1.53E-03	6.34E+06	3.71E+01	1.48E-03	6.65E+06	3.55E+01
1.98E-03	1.04E+06	5.71E+01	1.88E-03	3.22E+06	4.68E+01	1.54E-03	6.19E+06	3.77E+01	1.49E-03	6.57E+06	3.59E+01
2.03E-03	1.04E+06	5.78E+01	1.90E-03	3.19E+06	4.27E+01	2.01E-03	6.95E+06	3.62E+01	1.96E-03	7.38E+06	3.41E+01
2.21E-03	1.12E+06	5.65E+01	2.24E-03	3.49E+06	4.15E+01	2.43E-03	7.57E+06	3.58E+01	2.34E-03	7.88E+06	3.41E+01
2.57E-03	1.24E+06	6.25E+01	2.50E-03	3.71E+06	4.13E+01	2.43E-03	7.38E+06	3.68E+01	2.36E-03	7.78E+06	3.51E+01
3.14E-03	1.36E+06	5.57E+01	3.01E-03	3.95E+06	4.19E+01	3.18E-03	8.29E+06	3.51E+01	3.11E-03	8.67E+06	3.32E+01
3.21E-03	1.39E+06	5.65E+01	3.55E-03	4.28E+06	4.04E+01	3.85E-03	9.00E+06	3.47E+01	3.72E-03	9.30E+06	3.31E+01
3.51E-03	1.49E+06	5.51E+01	3.96E-03	4.53E+06	4.01E+01	3.86E-03	8.78E+06	3.61E+01	3.74E-03	9.21E+06	3.44E+01
4.98E-03	1.80E+06	5.43E+01	4.77E-03	4.85E+06	4.11E+01	5.04E-03	9.83E+06	3.42E+01	4.93E-03	1.02E+07	3.23E+01
5.09E-03	1.85E+06	5.52E+01	5.62E-03	5.27E+06	3.94E+01	6.09E-03	1.08E+07	3.39E+01	5.89E-03	1.08E+07	3.22E+01
5.52E-03	1.89E+06	5.38E+01	6.27E-03	5.53E+06	3.89E+01	6.10E-03	1.07E+07	3.37E+01	5.93E-03	1.08E+07	3.38E+01
5.56E-03	2.02E+06	5.34E+01	6.58E-03	5.63E+06	3.94E+01	6.11E-03	1.04E+07	3.53E+01	6.29E-03	1.13E+07	3.26E+01
6.93E-03	2.17E+06	5.27E+01	7.55E-03	5.94E+06	4.03E+01	7.65E-03	1.17E+07	3.31E+01	7.81E-03	1.19E+07	3.16E+01
7.89E-03	2.35E+06	5.30E+01	8.26E-03	6.27E+06	3.83E+01	7.99E-03	1.17E+07	3.33E+01	7.89E-03	1.22E+07	3.16E+01
8.07E-03	2.43E+06	5.40E+01	8.91E-03	6.38E+06	3.86E+01	9.67E-03	1.25E+07	3.27E+01	9.33E-03	1.27E+07	3.11E+01
8.81E-03	2.63E+06	5.16E+01	9.94E-03	6.75E+06	3.79E+01	9.69E-03	1.24E+07	3.46E+01	9.40E-03	1.26E+07	3.32E+01
1.10E-02	2.80E+06	5.13E+01	1.20E-02	7.24E+06	3.97E+01	1.21E-02	1.38E+07	3.21E+01	1.24E-02	1.39E+07	3.09E+01
1.25E-02	3.04E+06	5.17E+01	1.31E-02	7.57E+06	3.72E+01	1.27E-02	1.37E+07	3.25E+01	1.25E-02	1.42E+07	3.06E+01
1.28E-02	3.17E+06	5.28E+01	1.41E-02	7.69E+06	3.78E+01	1.53E-02	1.48E+07	3.17E+01	1.48E-02	1.48E+07	3.03E+01
1.40E-02	3.33E+06	5.06E+01	1.58E-02	8.18E+06	3.68E+01	1.54E-02	1.47E+07	3.39E+01	1.96E-02	1.62E+07	3.02E+01

Table B.6 Summary of Complex Modulus and Phase Angle Values for Binder 5828LM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
1.74E-02	3.63E+06	4.97E+01	1.90E-02	8.79E+06	3.90E+01	1.92E-02	1.61E+07	3.11E+01	1.98E-02	1.65E+07	2.97E+01
1.98E-02	3.98E+06	5.03E+01	2.08E-02	9.07E+06	3.61E+01	2.01E-02	1.61E+07	3.17E+01	2.34E-02	1.72E+07	2.96E+01
2.03E-02	4.13E+06	5.16E+01	2.24E-02	9.25E+06	3.70E+01	2.43E-02	1.72E+07	3.09E+01	3.11E-02	1.86E+07	2.97E+01
2.21E-02	4.23E+06	4.92E+01	2.50E-02	9.74E+06	3.59E+01	2.43E-02	1.71E+07	3.34E+01	3.14E-02	1.91E+07	2.88E+01
2.76E-02	4.68E+06	4.78E+01	3.01E-02	1.05E+07	3.86E+01	3.04E-02	1.87E+07	3.00E+01	3.18E-02	1.92E+07	2.95E+01
3.14E-02	5.10E+06	4.90E+01	3.18E-02	1.09E+07	3.58E+01	3.18E-02	1.88E+07	3.11E+01	3.72E-02	1.99E+07	2.89E+01
3.18E-02	5.13E+06	4.80E+01	3.29E-02	1.09E+07	3.49E+01	3.18E-02	1.90E+07	3.06E+01	4.00E-02	2.06E+07	2.89E+01
3.21E-02	5.27E+06	5.11E+01	3.55E-02	1.12E+07	3.63E+01	3.85E-02	2.00E+07	3.02E+01	4.93E-02	2.15E+07	2.91E+01
3.51E-02	5.43E+06	4.77E+01	3.96E-02	1.16E+07	3.51E+01	4.00E-02	2.05E+07	2.98E+01	4.98E-02	2.19E+07	2.79E+01
4.00E-02	5.85E+06	4.68E+01	4.00E-02	1.20E+07	3.50E+01	4.82E-02	2.18E+07	2.92E+01	5.89E-02	2.27E+07	2.83E+01
4.37E-02	5.94E+06	4.65E+01	5.21E-02	1.30E+07	3.40E+01	5.04E-02	2.19E+07	3.05E+01	6.34E-02	2.37E+07	2.78E+01
4.98E-02	6.56E+06	4.77E+01	5.62E-02	1.34E+07	3.56E+01	6.10E-02	2.31E+07	2.95E+01	7.81E-02	2.48E+07	2.87E+01
5.56E-02	6.68E+06	4.66E+01	6.27E-02	1.38E+07	3.44E+01	6.34E-02	2.35E+07	2.90E+01	7.89E-02	2.51E+07	2.72E+01
6.34E-02	7.35E+06	4.52E+01	6.34E-02	1.42E+07	3.36E+01	7.65E-02	2.50E+07	2.84E+01	9.33E-02	2.60E+07	2.77E+01
6.93E-02	7.40E+06	4.51E+01	8.26E-02	1.55E+07	3.32E+01	7.99E-02	2.55E+07	2.99E+01	1.00E-01	2.71E+07	2.70E+01
7.89E-02	8.41E+06	4.63E+01	8.91E-02	1.59E+07	3.51E+01	9.67E-02	2.65E+07	2.89E+01	1.24E-01	2.85E+07	2.82E+01
8.81E-02	8.09E+06	4.56E+01	9.94E-02	1.64E+07	3.37E+01	1.00E-01	2.70E+07	2.81E+01	1.25E-01	2.86E+07	2.66E+01
1.00E-01	9.18E+06	4.37E+01	1.00E-01	1.69E+07	3.27E+01	1.21E-01	2.86E+07	2.77E+01	1.48E-01	3.00E+07	2.72E+01
1.10E-01	9.34E+06	4.36E+01	1.31E-01	1.83E+07	3.23E+01	1.27E-01	2.96E+07	2.94E+01	1.59E-01	3.10E+07	2.64E+01
1.25E-01	1.07E+07	4.52E+01	1.41E-01	1.90E+07	3.46E+01	1.53E-01	3.04E+07	2.83E+01	1.77E-01	3.16E+07	2.69E+01
1.40E-01	9.81E+06	4.45E+01	1.58E-01	1.94E+07	3.31E+01	1.58E-01	3.14E+07	2.74E+01	1.98E-01	3.26E+07	2.60E+01
1.59E-01	1.12E+07	4.21E+01	1.59E-01	1.99E+07	3.19E+01	1.59E-01	3.12E+07	2.73E+01	2.22E-01	3.37E+07	2.62E+01
1.74E-01	1.16E+07	4.23E+01	1.83E-01	2.09E+07	3.21E+01	1.92E-01	3.29E+07	2.70E+01	2.34E-01	3.42E+07	2.67E+01
1.99E-01	1.25E+07	4.20E+01	2.08E-01	2.19E+07	3.15E+01	1.99E-01	3.37E+07	2.73E+01	2.52E-01	3.52E+07	2.55E+01

Table B.6 Summary of Complex Modulus and Phase Angle Values for Binder 5828LM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
2.21E-01	1.19E+07	4.35E+01	2.30E-01	2.24E+07	3.15E+01	2.43E-01	3.52E+07	2.78E+01	3.14E-01	3.72E+07	2.55E+01
2.50E-01	1.40E+07	4.08E+01	2.50E-01	2.28E+07	3.25E+01	2.52E-01	3.59E+07	2.65E+01	3.52E-01	3.85E+07	2.54E+01
2.52E-01	1.38E+07	4.09E+01	2.52E-01	2.31E+07	3.10E+01	3.04E-01	3.75E+07	2.65E+01	3.72E-01	3.91E+07	2.63E+01
2.76E-01	1.42E+07	4.11E+01	3.29E-01	2.55E+07	3.09E+01	3.15E-01	3.87E+07	2.62E+01	4.00E-01	3.99E+07	2.50E+01
3.51E-01	1.48E+07	4.24E+01	3.64E-01	2.67E+07	3.01E+01	3.85E-01	4.03E+07	2.73E+01	4.98E-01	4.22E+07	2.50E+01
3.96E-01	1.71E+07	3.94E+01	3.96E-01	2.68E+07	3.20E+01	4.00E-01	4.10E+07	2.58E+01	5.58E-01	4.39E+07	2.47E+01
4.00E-01	1.67E+07	3.97E+01	4.00E-01	2.69E+07	3.03E+01	4.82E-01	4.29E+07	2.59E+01	5.89E-01	4.46E+07	2.59E+01
4.37E-01	1.76E+07	3.98E+01	5.21E-01	2.94E+07	3.03E+01	4.99E-01	4.39E+07	2.55E+01	6.34E-01	4.50E+07	2.45E+01
5.56E-01	1.89E+07	4.11E+01	5.77E-01	3.05E+07	2.97E+01	6.10E-01	4.67E+07	2.68E+01	7.89E-01	4.77E+07	2.46E+01
6.27E-01	2.07E+07	3.82E+01	6.22E-01	3.43E+07	2.91E+01	6.34E-01	4.67E+07	2.52E+01	8.84E-01	4.96E+07	2.40E+01
6.34E-01	1.99E+07	3.85E+01	6.27E-01	3.15E+07	3.15E+01	7.65E-01	4.89E+07	2.55E+01	1.00E+00	5.07E+07	2.40E+01
6.93E-01	2.16E+07	3.87E+01	6.34E-01	3.13E+07	2.96E+01	7.91E-01	5.03E+07	2.49E+01	1.19E+00	5.39E+07	2.42E+01
9.94E-01	2.48E+07	3.69E+01	7.81E-01	3.64E+07	2.89E+01	1.00E+00	5.30E+07	2.47E+01	1.25E+00	5.42E+07	2.42E+01
1.00E+00	2.46E+07	3.71E+01	8.26E-01	3.41E+07	2.98E+01	1.04E+00	5.46E+07	2.49E+01	1.40E+00	5.59E+07	2.34E+01
1.10E+00	2.63E+07	3.75E+01	9.15E-01	3.54E+07	2.90E+01	1.21E+00	5.54E+07	2.50E+01	1.50E+00	5.70E+07	2.35E+01
1.14E+00	2.67E+07	3.66E+01	1.00E+00	3.63E+07	2.89E+01	1.25E+00	5.64E+07	2.43E+01	1.59E+00	5.72E+07	2.36E+01
1.43E+00	2.89E+07	3.60E+01	1.24E+00	3.99E+07	2.81E+01	1.31E+00	5.81E+07	2.44E+01	1.98E+00	6.11E+07	2.39E+01
1.58E+00	3.00E+07	3.55E+01	1.31E+00	3.96E+07	2.93E+01	1.59E+00	6.00E+07	2.42E+01	2.22E+00	6.28E+07	2.29E+01
1.59E+00	3.05E+07	3.58E+01	1.45E+00	4.09E+07	2.82E+01	1.92E+00	6.30E+07	2.47E+01	2.37E+00	6.47E+07	2.31E+01
1.74E+00	3.23E+07	3.64E+01	1.59E+00	4.20E+07	2.84E+01	1.99E+00	6.37E+07	2.36E+01	2.52E+00	6.44E+07	2.32E+01
2.27E+00	3.50E+07	3.45E+01	1.96E+00	4.51E+07	2.77E+01	2.08E+00	6.49E+07	2.36E+01	3.14E+00	6.88E+07	2.37E+01
2.50E+00	3.62E+07	3.43E+01	2.08E+00	4.56E+07	2.89E+01	2.52E+00	6.76E+07	2.38E+01	3.52E+00	7.03E+07	2.24E+01
2.52E+00	3.61E+07	3.48E+01	2.30E+00	4.79E+07	2.74E+01	3.04E+00	7.11E+07	2.43E+01	3.76E+00	7.24E+07	2.24E+01
2.76E+00	3.87E+07	3.54E+01	2.52E+00	4.86E+07	2.78E+01	3.15E+00	7.19E+07	2.31E+01	4.00E+00	7.20E+07	2.28E+01

Table B.6 Summary of Complex Modulus and Phase Angle Values for Binder 5828LM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
3.60E+00	4.13E+07	3.34E+01	3.11E+00	5.21E+07	2.70E+01	3.29E+00	7.33E+07	2.32E+01	5.58E+00	7.88E+07	2.20E+01
3.96E+00	4.26E+07	3.32E+01	3.29E+00	5.27E+07	2.85E+01	4.00E+00	7.63E+07	2.34E+01	5.96E+00	8.07E+07	2.18E+01
4.00E+00	4.31E+07	3.38E+01	3.64E+00	5.53E+07	2.68E+01	4.99E+00	8.12E+07	2.26E+01	6.34E+00	8.09E+07	2.25E+01
5.70E+00	4.84E+07	3.25E+01	4.00E+00	5.59E+07	2.74E+01	5.22E+00	8.25E+07	2.26E+01	8.84E+00	8.83E+07	2.17E+01
6.27E+00	5.04E+07	3.22E+01	4.80E+00	6.28E+07	2.63E+01	6.34E+00	8.60E+07	2.30E+01	9.44E+00	9.02E+07	2.14E+01
6.34E+00	5.15E+07	3.28E+01	4.93E+00	5.85E+07	2.62E+01	7.91E+00	9.09E+07	2.22E+01	1.00E+01	9.03E+07	2.23E+01
8.90E+00	5.67E+07	3.16E+01	5.77E+00	6.23E+07	2.63E+01	8.27E+00	9.20E+07	2.21E+01	1.40E+01	9.87E+07	2.13E+01
9.04E+00	5.67E+07	3.12E+01	6.02E+00	6.70E+07	2.59E+01	1.00E+01	9.68E+07	2.27E+01	1.46E+01	1.01E+08	2.12E+01
9.94E+00	5.87E+07	3.12E+01	6.34E+00	6.43E+07	2.69E+01	1.25E+01	1.01E+08	2.19E+01	1.50E+01	1.01E+08	2.09E+01
1.00E+01	6.11E+07	3.19E+01	7.81E+00	6.87E+07	2.56E+01	1.31E+01	1.03E+08	2.16E+01	1.59E+01	1.01E+08	2.20E+01
1.12E+01	6.09E+07	3.11E+01	9.15E+00	7.18E+07	2.58E+01	1.45E+01	1.05E+08	2.23E+01	1.84E+01	1.06E+08	2.09E+01
1.43E+01	6.65E+07	3.02E+01	9.55E+00	7.60E+07	2.51E+01	1.59E+01	1.09E+08	2.23E+01	2.22E+01	1.10E+08	2.10E+01
1.58E+01	6.89E+07	3.03E+01	1.00E+01	7.39E+07	2.65E+01	1.82E+01	1.11E+08	2.14E+01	2.37E+01	1.12E+08	2.05E+01
1.59E+01	7.10E+07	3.10E+01	1.24E+01	7.62E+07	2.52E+01	1.99E+01	1.14E+08	2.15E+01	2.91E+01	1.17E+08	2.07E+01
1.77E+01	7.12E+07	2.99E+01	1.32E+01	8.14E+07	2.58E+01	2.08E+01	1.14E+08	2.11E+01	3.52E+01	1.22E+08	2.08E+01
2.27E+01	7.73E+07	2.92E+01	1.45E+01	8.18E+07	2.54E+01	2.89E+01	1.24E+08	2.13E+01	3.76E+01	1.23E+08	2.02E+01
2.37E+01	7.75E+07	2.97E+01	1.51E+01	8.38E+07	2.45E+01	3.15E+01	1.27E+08	2.12E+01	4.04E+01	1.29E+08	2.08E+01
2.50E+01	8.03E+07	2.94E+01	1.59E+01	8.48E+07	2.61E+01	3.29E+01	1.27E+08	2.07E+01	4.61E+01	1.30E+08	2.00E+01
2.81E+01	8.28E+07	2.86E+01	1.65E+01	8.76E+07	2.45E+01	4.05E+01	1.34E+08	2.14E+01	5.07E+01	1.35E+08	1.98E+01
2.98E+01	8.39E+07	2.92E+01	1.96E+01	8.69E+07	2.46E+01	4.58E+01	1.37E+08	2.02E+01	5.58E+01	1.35E+08	2.05E+01
3.60E+01	9.00E+07	2.83E+01	2.30E+01	9.24E+07	2.50E+01	4.99E+01	1.40E+08	2.10E+01	5.96E+01	1.37E+08	1.99E+01
3.96E+01	9.19E+07	2.87E+01	2.40E+01	9.08E+07	2.45E+01	5.08E+01	1.42E+08	1.99E+01	7.31E+01	1.44E+08	1.97E+01
4.45E+01	9.64E+07	2.78E+01	2.62E+01	9.92E+07	2.43E+01	5.22E+01	1.41E+08	2.04E+01	8.04E+01	1.48E+08	1.93E+01
4.72E+01	9.86E+07	2.77E+01	3.11E+01	9.89E+07	2.41E+01	7.26E+01	1.52E+08	2.02E+01	8.84E+01	1.50E+08	2.03E+01

Table B.6 Summary of Complex Modulus and Phase Angle Values for Binder 5828LM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
5.70E+01	1.03E+08	2.75E+01	3.12E+01	1.02E+08	2.43E+01	7.91E+01	1.57E+08	2.06E+01	9.44E+01	1.52E+08	1.96E+01
6.27E+01	1.04E+08	2.80E+01	3.64E+01	1.05E+08	2.45E+01	8.06E+01	1.56E+08	1.99E+01	1.16E+02	1.59E+08	1.91E+01
7.05E+01	1.10E+08	2.70E+01	3.80E+01	1.01E+08	2.36E+01	8.27E+01	1.56E+08	2.02E+01	1.27E+02	1.63E+08	1.92E+01
7.48E+01	1.10E+08	2.72E+01	3.91E+01	1.03E+08	2.79E+01	1.15E+02	1.69E+08	1.95E+01	1.28E+02	1.64E+08	1.73E+01
8.10E+01	1.14E+08	2.73E+01	4.15E+01	1.08E+08	2.36E+01	1.28E+02	1.72E+08	2.04E+01	1.50E+02	1.67E+08	1.93E+01
9.04E+01	1.18E+08	2.67E+01	4.93E+01	1.12E+08	2.37E+01	1.31E+02	1.73E+08	1.98E+01	1.61E+02	1.67E+08	1.97E+01
9.94E+01	1.19E+08	2.73E+01	5.77E+01	1.19E+08	2.42E+01	1.56E+02	1.74E+08	1.98E+01	1.84E+02	1.75E+08	1.90E+01
1.02E+02	1.21E+08	2.63E+01	6.02E+01	1.15E+08	2.31E+01	1.82E+02	1.86E+08	1.91E+01	2.02E+02	1.79E+08	1.88E+01
1.12E+02	1.27E+08	2.64E+01	6.20E+01	1.16E+08	2.27E+01	1.96E+02	1.88E+08	2.01E+01	2.37E+02	1.84E+08	1.91E+01
1.19E+02	1.24E+08	2.61E+01	6.58E+01	1.21E+08	2.32E+01	2.02E+02	1.89E+08	1.94E+01	2.55E+02	1.90E+08	1.83E+01
1.43E+02	1.35E+08	2.59E+01	7.81E+01	1.29E+08	2.32E+01	2.08E+02	1.91E+08	1.95E+01	2.91E+02	1.93E+08	1.86E+01
1.61E+02	1.39E+08	2.58E+01	9.15E+01	1.35E+08	2.38E+01	2.89E+02	2.06E+08	1.89E+01	3.20E+02	1.96E+08	1.85E+01
1.77E+02	1.43E+08	2.54E+01	9.55E+01	1.28E+08	2.25E+01	3.10E+02	2.03E+08	1.97E+01	3.76E+02	2.03E+08	1.88E+01
1.88E+02	1.45E+08	2.56E+01	9.83E+01	1.34E+08	2.31E+01	3.21E+02	2.09E+08	1.90E+01	4.05E+02	2.02E+08	1.74E+01
2.27E+02	1.53E+08	2.52E+01	1.04E+02	1.35E+08	2.25E+01	3.29E+02	2.10E+08	1.92E+01	4.36E+02	2.09E+08	1.82E+01
2.55E+02	1.60E+08	2.46E+01	1.08E+02	1.37E+08	2.36E+01	4.58E+02	2.27E+08	1.85E+01	4.61E+02	2.11E+08	1.82E+01
2.81E+02	1.63E+08	2.45E+01	1.24E+02	1.44E+08	2.28E+01	4.92E+02	2.24E+08	1.95E+01	5.07E+02	2.15E+08	1.81E+01
2.98E+02	1.65E+08	2.47E+01	1.36E+02	1.48E+08	2.04E+01	5.08E+02	2.29E+08	1.85E+01	5.47E+02	2.12E+08	1.71E+01
3.15E+02	1.69E+08	2.42E+01	1.41E+02	1.43E+08	2.19E+01	5.22E+02	2.32E+08	1.89E+01	5.96E+02	2.22E+08	1.86E+01
3.60E+02	1.74E+08	2.45E+01	1.51E+02	1.44E+08	2.23E+01	5.28E+02	2.26E+08	1.40E+01	6.41E+02	2.28E+08	1.82E+01
3.96E+02	1.86E+08	2.21E+01	1.56E+02	1.44E+08	2.22E+01	6.63E+02	2.34E+08	1.76E+01	7.31E+02	2.32E+08	1.79E+01
4.05E+02	1.81E+08	2.40E+01	1.65E+02	1.49E+08	2.16E+01	7.26E+02	2.48E+08	1.81E+01	8.04E+02	2.35E+08	1.79E+01
4.45E+02	1.83E+08	2.37E+01	1.77E+02	1.67E+08	2.60E+01	7.79E+02	2.51E+08	1.81E+01	8.67E+02	2.37E+08	2.13E+01
4.72E+02	1.85E+08	2.36E+01	1.96E+02	1.60E+08	2.24E+01	8.06E+02	2.52E+08	1.81E+01	1.02E+03	2.48E+08	1.72E+01

Table B.6 Summary of Complex Modulus and Phase Angle Values for Binder 5828LM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
5.70E+02	1.96E+08	2.38E+01	2.16E+02	1.67E+08	2.12E+01	1.05E+03	2.87E+08	1.76E+01	1.16E+03	2.53E+08	1.76E+01
6.27E+02	2.04E+08	2.39E+01	2.40E+02	1.66E+08	2.15E+01	1.15E+03	2.70E+08	1.79E+01	1.27E+03	2.56E+08	1.75E+01
6.42E+02	2.03E+08	2.30E+01	2.47E+02	1.61E+08	2.11E+01	1.23E+03	2.72E+08	1.79E+01	1.37E+03	2.63E+08	1.93E+01
7.05E+02	2.05E+08	2.31E+01	2.62E+02	1.68E+08	2.16E+01	1.28E+03	2.75E+08	1.77E+01	1.38E+03	2.64E+08	1.42E+01
7.48E+02	2.11E+08	2.28E+01	2.81E+02	1.89E+08	1.83E+01	1.54E+03	3.07E+08	1.93E+01	1.61E+03	2.72E+08	1.71E+01
9.94E+02	2.15E+08	2.15E+01	3.11E+02	1.83E+08	2.19E+01	1.67E+03	2.79E+08	1.75E+01	1.74E+03	2.79E+08	1.65E+01
1.02E+03	2.28E+08	2.20E+01	3.42E+02	1.82E+08	2.15E+01	1.82E+03	2.97E+08	1.75E+01	1.84E+03	2.77E+08	1.73E+01
1.12E+03	2.32E+08	2.23E+01	3.80E+02	1.91E+08	2.10E+01	1.94E+03	2.80E+08	1.94E+01	2.02E+03	2.79E+08	1.72E+01
1.19E+03	2.41E+08	2.19E+01	3.91E+02	1.83E+08	2.07E+01	1.96E+03	3.03E+08	1.69E+01	2.18E+03	2.91E+08	1.69E+01
1.25E+03	2.42E+08	2.56E+01	4.07E+02	2.06E+08	1.81E+01	2.02E+03	3.01E+08	1.74E+01	2.55E+03	2.97E+08	1.68E+01
1.57E+03	2.41E+08	2.28E+01	4.15E+02	1.85E+08	2.13E+01	2.64E+03	3.21E+08	1.72E+01	2.75E+03	3.06E+08	1.87E+01
1.58E+03	2.54E+08	2.30E+01	4.45E+02	1.95E+08	2.09E+01	2.89E+03	3.23E+08	1.72E+01	2.91E+03	3.02E+08	1.70E+01
1.61E+03	2.55E+08	2.21E+01	5.12E+02	2.05E+08	2.00E+01	3.07E+03	3.40E+08	1.68E+01	3.20E+03	3.04E+08	1.68E+01
1.77E+03	2.56E+08	2.16E+01	5.41E+02	2.05E+08	2.04E+01	3.10E+03	3.24E+08	1.76E+01	3.45E+03	3.06E+08	1.49E+01
1.88E+03	2.67E+08	2.12E+01	6.02E+02	2.12E+08	2.06E+01	3.21E+03	3.28E+08	1.70E+01	4.05E+03	3.23E+08	1.66E+01
2.35E+03	2.53E+08	2.03E+01	6.20E+02	2.01E+08	2.04E+01	4.18E+03	3.47E+08	2.04E+01	4.36E+03	3.39E+08	1.66E+01
2.49E+03	2.72E+08	2.12E+01	6.58E+02	2.03E+08	2.07E+01	4.58E+03	3.52E+08	1.68E+01	4.61E+03	3.29E+08	1.67E+01
2.50E+03	2.87E+08	2.04E+01	7.05E+02	2.14E+08	2.08E+01	4.87E+03	3.60E+08	1.89E+01	5.07E+03	3.31E+08	1.65E+01
2.55E+03	2.84E+08	2.07E+01	8.11E+02	2.19E+08	1.74E+01	4.92E+03	3.55E+08	1.65E+01	5.47E+03	3.43E+08	1.65E+01
2.81E+03	2.88E+08	2.09E+01	8.44E+02	2.86E+08	2.11E+01	5.08E+03	3.57E+08	1.67E+01	6.18E+03	3.37E+08	1.80E+01
2.95E+03	2.91E+08	1.91E+01	8.58E+02	2.14E+08	2.03E+01	6.63E+03	3.80E+08	1.81E+01	6.41E+03	3.51E+08	1.62E+01
2.98E+03	2.97E+08	2.05E+01	9.55E+02	2.33E+08	2.02E+01	7.26E+03	3.83E+08	1.63E+01	6.91E+03	3.57E+08	1.32E+01
3.95E+03	3.17E+08	2.06E+01	9.83E+02	2.24E+08	2.00E+01	7.72E+03	3.87E+08	1.65E+01	7.31E+03	3.57E+08	1.64E+01
3.96E+03	3.11E+08	2.00E+01	1.04E+03	2.24E+08	2.03E+01	7.79E+03	3.86E+08	1.63E+01	7.77E+03	3.57E+08	1.84E+01

Table B.6 Summary of Complex Modulus and Phase Angle Values for Binder 5828LM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
4.05E+03	3.14E+08	2.00E+01	1.06E+03	2.66E+08	9.26E+00	8.06E+03	3.88E+08	1.63E+01	8.04E+03	3.59E+08	1.62E+01
4.45E+03	3.16E+08	2.02E+01	1.12E+03	2.38E+08	1.74E+01	8.62E+03	3.88E+08	1.98E+01	8.67E+03	3.68E+08	1.60E+01
4.67E+03	3.42E+08	1.85E+01	1.29E+03	2.52E+08	1.77E+01	1.05E+04	4.18E+08	1.59E+01	1.02E+04	3.82E+08	1.58E+01
4.72E+03	3.27E+08	1.99E+01	1.36E+03	2.34E+08	1.91E+01	1.08E+04	3.76E+08	1.71E+01	1.10E+04	3.92E+08	1.66E+01
4.75E+03	3.74E+08	2.01E+01	1.51E+03	2.52E+08	1.98E+01	1.22E+04	4.28E+08	1.48E+01	1.23E+04	3.80E+08	1.65E+01
5.96E+03	3.47E+08	2.02E+01	1.56E+03	2.49E+08	1.92E+01	1.23E+04	4.18E+08	1.57E+01	1.27E+04	3.89E+08	1.59E+01
6.25E+03	3.44E+08	2.03E+01	1.65E+03	2.43E+08	2.00E+01	1.28E+04	4.20E+08	1.60E+01	1.37E+04	4.03E+08	1.57E+01
6.27E+03	3.49E+08	1.93E+01	1.68E+03	2.60E+08	1.91E+01	1.67E+04	4.48E+08	1.54E+01	1.61E+04	4.14E+08	1.55E+01
6.42E+03	3.47E+08	1.93E+01	1.77E+03	2.50E+08	1.77E+01	1.72E+04	4.19E+08	1.85E+01	1.74E+04	4.21E+08	1.50E+01
7.40E+03	3.58E+08	1.78E+01	2.02E+03	3.11E+08	1.04E+01	1.89E+04	4.24E+08	1.99E+01	1.95E+04	4.13E+08	1.86E+01
7.48E+03	3.63E+08	1.91E+01	2.04E+03	2.71E+08	1.85E+01	1.94E+04	4.44E+08	1.25E+01	2.02E+04	4.21E+08	1.55E+01
9.45E+03	3.78E+08	1.76E+01	2.16E+03	2.70E+08	1.87E+01	1.96E+04	4.51E+08	1.54E+01	2.18E+04	4.31E+08	1.51E+01
9.91E+03	3.75E+08	1.89E+01	2.40E+03	2.78E+08	1.94E+01	2.02E+04	4.55E+08	1.55E+01	2.55E+04	4.48E+08	1.51E+01
9.94E+03	3.86E+08	1.83E+01	2.47E+03	2.75E+08	1.87E+01	2.38E+04	4.25E+08	1.60E+01	2.72E+04	3.82E+08	2.05E+01
1.02E+04	3.82E+08	1.86E+01	2.53E+03	3.19E+08	1.58E+01	2.64E+04	4.82E+08	1.51E+01	2.75E+04	4.56E+08	1.51E+01
1.17E+04	4.07E+08	1.87E+01	2.62E+03	2.65E+08	1.95E+01	2.72E+04	4.40E+08	1.66E+01	3.09E+04	4.49E+08	1.14E+01
1.19E+04	3.95E+08	1.85E+01	2.66E+03	3.00E+08	1.84E+01	3.07E+04	4.87E+08	1.55E+01	3.42E+04	4.38E+08	1.49E+01
1.50E+04	4.02E+08	2.20E+01	2.81E+03	2.93E+08	1.85E+01	3.10E+04	4.88E+08	1.50E+01	3.45E+04	4.66E+08	1.48E+01
1.57E+04	3.91E+08	1.98E+01	3.23E+03	2.98E+08	1.79E+01	3.77E+04	5.96E+08	1.58E+01	4.05E+04	4.83E+08	1.47E+01
1.58E+04	4.25E+08	1.77E+01	3.42E+03	2.92E+08	1.79E+01	4.18E+04	5.20E+08	1.50E+01	4.36E+04	4.90E+08	1.46E+01
1.61E+04	4.20E+08	1.78E+01	3.91E+03	3.05E+08	1.82E+01	4.31E+04	4.71E+08	1.94E+01	4.86E+04	4.42E+08	1.41E+01
1.86E+04	4.44E+08	1.84E+01	4.00E+03	4.08E+08	1.70E+01	4.87E+04	5.29E+08	1.50E+01	4.90E+04	4.82E+08	1.44E+01
2.37E+04	4.48E+08	1.77E+01	4.01E+03	3.71E+08	1.26E+01	4.92E+04	5.24E+08	1.47E+01	5.42E+04	5.13E+08	1.85E+01
2.49E+04	4.47E+08	1.73E+01	4.15E+03	3.01E+08	1.88E+01	5.97E+04	5.18E+08	1.08E+01	5.47E+04	5.01E+08	1.45E+01

Table B.6 Summary of Complex Modulus and Phase Angle Values for Binder 5828LM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
2.50E+04	4.57E+08	1.71E+01	4.22E+03	3.30E+08	1.86E+01	6.63E+04	5.59E+08	1.43E+01	6.41E+04	5.22E+08	1.43E+01
2.55E+04	4.61E+08	1.70E+01	4.45E+03	3.10E+08	1.67E+01	6.83E+04	5.11E+08	1.51E+01	6.91E+04	5.27E+08	1.42E+01
2.95E+04	4.74E+08	1.71E+01	5.03E+03	4.02E+08	1.88E+01	7.72E+04	5.68E+08	1.43E+01	7.77E+04	5.37E+08	1.63E+01
3.30E+04	4.56E+08	2.12E+01	5.12E+03	3.21E+08	1.86E+01	7.79E+04	5.67E+08	1.41E+01	8.67E+04	5.38E+08	1.41E+01
3.76E+04	4.83E+08	1.26E+01	5.41E+03	3.17E+08	1.75E+01	9.86E+04	6.37E+08	1.34E+01	9.68E+04	5.17E+08	9.13E+00
3.95E+04	4.76E+08	1.66E+01	6.20E+03	3.36E+08	1.77E+01	1.05E+05	6.04E+08	1.38E+01	1.10E+05	5.67E+08	1.38E+01
3.96E+04	5.01E+08	1.63E+01	6.36E+03	3.31E+08	2.29E+01	1.08E+05	5.42E+08	1.43E+01	1.23E+05	5.67E+08	1.39E+01
4.05E+04	5.05E+08	1.63E+01	6.58E+03	3.34E+08	1.81E+01	1.22E+05	6.12E+08	1.38E+01	1.36E+05	6.25E+08	1.10E+01
4.15E+04	4.49E+08	1.78E+01	6.69E+03	3.43E+08	1.83E+01	1.24E+05	7.12E+08	1.36E+01	1.37E+05	5.77E+08	1.37E+01
4.67E+04	5.38E+08	1.57E+01	7.05E+03	3.36E+08	1.65E+01	1.50E+05	6.17E+08	1.19E+01	1.74E+05	6.09E+08	1.35E+01
5.96E+04	5.28E+08	1.18E+01	8.11E+03	3.45E+08	1.53E+01	1.67E+05	6.47E+08	1.33E+01	1.95E+05	6.10E+08	1.34E+01
6.25E+04	5.10E+08	1.63E+01	8.58E+03	3.47E+08	1.70E+01	1.72E+05	6.04E+08	1.36E+01	2.16E+05	5.59E+08	1.40E+01
6.27E+04	5.36E+08	1.57E+01	9.83E+03	3.70E+08	1.72E+01	1.94E+05	6.58E+08	1.33E+01	2.18E+05	6.18E+08	1.33E+01
6.57E+04	4.87E+08	1.99E+01	1.01E+04	4.19E+08	1.28E+01	1.96E+05	7.62E+08	1.05E+01	2.40E+05	6.48E+08	1.28E+01
7.40E+04	5.76E+08	1.46E+01	1.06E+04	3.91E+08	1.73E+01	2.38E+05	7.18E+08	1.08E+01	2.75E+05	6.52E+08	1.29E+01
9.45E+04	6.14E+08	1.62E+01	1.12E+04	3.68E+08	1.59E+01	2.64E+05	6.88E+08	1.29E+01	3.01E+05	7.56E+08	1.52E+01
9.91E+04	5.53E+08	1.55E+01	1.26E+04	4.37E+08	1.56E+01	2.72E+05	6.37E+08	1.38E+01	3.09E+05	6.61E+08	1.24E+01
9.94E+04	5.84E+08	1.49E+01	1.29E+04	3.71E+08	1.56E+01	3.07E+05	7.06E+08	1.27E+01	3.42E+05	6.48E+08	1.15E+01
1.04E+05	5.09E+08	1.14E+01	1.36E+04	3.77E+08	1.66E+01	3.77E+05	7.07E+08	1.36E+01	3.85E+05	7.39E+08	8.46E+00
1.17E+05	6.18E+08	1.45E+01	1.56E+04	4.08E+08	1.65E+01	4.31E+05	6.81E+08	1.34E+01	4.36E+05	6.94E+08	1.25E+01
1.33E+05	5.58E+08	1.32E+01	1.60E+04	4.16E+08	1.71E+01	4.87E+05	7.53E+08	1.22E+01	4.77E+05	6.18E+08	1.61E+01
1.50E+05	6.40E+08	1.35E+01	1.68E+04	4.10E+08	1.28E+01	4.93E+05	7.32E+08	1.03E+01	4.90E+05	7.02E+08	1.22E+01
1.57E+05	6.00E+08	1.47E+01	1.77E+04	3.96E+08	1.56E+01	5.97E+05	7.75E+08	1.22E+01	5.42E+05	6.77E+08	1.35E+01
1.58E+05	6.22E+08	1.43E+01	2.00E+04	4.68E+08	2.29E+01	6.83E+05	7.29E+08	1.27E+01	6.11E+05	8.29E+08	1.41E+01

Table B.6 Summary of Complex Modulus and Phase Angle Values for Binder 5828LM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
1.65E+05	6.24E+08	1.39E+01	2.04E+04	4.01E+08	1.51E+01	7.72E+05	7.99E+08	1.18E+01	6.91E+05	7.41E+08	1.20E+01
1.67E+05	5.65E+08	1.86E+01	2.16E+04	4.12E+08	1.60E+01	7.82E+05	7.95E+08	1.45E+01	7.56E+05	7.48E+08	1.08E+01
1.86E+05	6.64E+08	1.37E+01	2.53E+04	5.10E+08	1.60E+01	9.47E+05	8.26E+08	1.26E+01	7.77E+05	7.48E+08	1.21E+01
2.37E+05	6.91E+08	1.37E+01	2.66E+04	4.36E+08	1.45E+01	1.08E+06	7.72E+08	1.21E+01	8.59E+05	7.31E+08	1.36E+01
2.49E+05	6.48E+08	1.40E+01	2.81E+04	4.25E+08	1.53E+01	1.24E+06	8.15E+08	9.03E+00	9.68E+05	8.07E+08	8.69E+00
2.62E+05	5.73E+08	1.95E+01	3.17E+04	4.80E+08	1.28E+01	1.50E+06	8.76E+08	1.19E+01	1.20E+06	7.24E+08	1.47E+01
2.65E+05	5.96E+08	1.77E+01	3.23E+04	4.31E+08	1.47E+01	1.72E+06	8.17E+08	1.17E+01	1.23E+06	7.95E+08	1.15E+01
2.95E+05	7.01E+08	1.33E+01	3.42E+04	4.41E+08	1.55E+01	1.96E+06	9.30E+08	1.16E+01	1.36E+06	7.75E+08	1.19E+01
3.76E+05	7.36E+08	1.27E+01	4.01E+04	4.79E+08	1.55E+01	2.38E+06	9.25E+08	1.08E+01	1.53E+06	8.74E+08	1.22E+01
3.95E+05	6.92E+08	1.32E+01	4.22E+04	4.65E+08	1.30E+01	2.72E+06	8.67E+08	1.12E+01	1.90E+06	7.31E+08	8.88E+00
4.15E+05	6.23E+08	1.68E+01	4.45E+04	4.55E+08	1.45E+01	3.11E+06	9.47E+08	1.03E+01	1.95E+06	8.42E+08	1.11E+01
4.19E+05	6.45E+08	1.84E+01	5.03E+04	5.39E+08	1.26E+01	3.77E+06	9.79E+08	1.02E+01	2.16E+06	8.35E+08	1.15E+01
4.67E+05	7.58E+08	1.23E+01	5.12E+04	4.67E+08	1.40E+01	4.31E+06	9.19E+08	1.06E+01	2.43E+06	9.18E+08	1.20E+01
5.96E+05	7.81E+08	1.18E+01	5.41E+04	4.78E+08	1.48E+01	4.93E+06	1.01E+09	1.03E+01	3.01E+06	9.03E+08	1.14E+01
6.25E+05	7.47E+08	1.24E+01	6.36E+04	5.08E+08	1.28E+01	5.97E+06	1.03E+09	9.75E+00	3.09E+06	8.88E+08	1.07E+01
6.57E+05	6.92E+08	1.42E+01	6.69E+04	4.92E+08	1.28E+01	7.82E+06	1.06E+09	9.10E+00	3.42E+06	8.84E+08	1.12E+01
6.64E+05	6.92E+08	1.41E+01	7.05E+04	4.88E+08	1.40E+01	9.47E+06	1.08E+09	8.96E+00	3.85E+06	9.70E+08	9.87E+00
7.40E+05	7.94E+08	1.18E+01	7.97E+04	5.72E+08	1.40E+01	1.24E+07	1.11E+09	9.01E+00	4.77E+06	9.76E+08	1.25E+01
9.45E+05	8.27E+08	1.13E+01	8.11E+04	5.00E+08	1.34E+01	1.96E+07	1.17E+09	8.72E+00	5.42E+06	9.30E+08	1.04E+01
1.04E+06	7.45E+08	1.14E+01	1.01E+05	5.49E+08	1.14E+01	3.11E+07	1.21E+09	8.18E+00	6.11E+06	1.02E+09	1.05E+01
1.05E+06	8.05E+08	1.03E+01	1.06E+05	5.28E+08	1.22E+01	4.93E+07	1.26E+09	7.78E+00	7.56E+06	9.95E+08	9.42E+00

Table B.7 Summary of Complex Modulus and Phase Angle Values for Binder 5828LM (Field Core)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
6.68E-06	4.89E+04	6.89E+01	8.73E-05	1.45E+05	6.09E+01	8.00E-06	2.04E+04	7.26E+01
8.39E-06	5.72E+04	6.86E+01	1.10E-04	1.70E+05	6.04E+01	1.01E-05	2.39E+04	7.18E+01
1.33E-05	7.98E+04	6.68E+01	1.74E-04	2.32E+05	6.03E+01	1.59E-05	3.39E+04	7.04E+01
2.11E-05	1.11E+05	6.62E+01	2.75E-04	3.16E+05	5.98E+01	2.52E-05	4.80E+04	6.98E+01
3.34E-05	1.54E+05	6.49E+01	3.31E-04	3.61E+05	5.92E+01	4.00E-05	6.76E+04	6.84E+01
5.29E-05	2.12E+05	6.36E+01	4.16E-04	4.15E+05	5.90E+01	6.34E-05	9.55E+04	6.73E+01
8.39E-05	2.90E+05	6.26E+01	4.36E-04	4.28E+05	5.90E+01	9.46E-05	1.28E+05	6.37E+01
8.47E-05	2.96E+05	6.12E+01	6.59E-04	5.64E+05	5.82E+01	1.01E-04	1.33E+05	6.64E+01
1.06E-04	3.43E+05	6.11E+01	6.92E-04	5.77E+05	5.83E+01	1.19E-04	1.50E+05	6.31E+01
1.33E-04	3.95E+05	6.14E+01	1.05E-03	7.57E+05	5.71E+01	1.59E-04	1.85E+05	6.53E+01
1.69E-04	4.63E+05	5.96E+01	1.10E-03	7.76E+05	5.74E+01	1.88E-04	2.06E+05	6.28E+01
2.11E-04	5.36E+05	6.03E+01	1.34E-03	8.88E+05	5.67E+01	2.52E-04	2.57E+05	6.43E+01
2.67E-04	6.21E+05	5.85E+01	1.66E-03	1.01E+06	5.59E+01	2.98E-04	2.84E+05	6.20E+01
3.34E-04	7.22E+05	5.92E+01	1.69E-03	1.03E+06	5.57E+01	3.61E-04	3.26E+05	6.12E+01
3.39E-04	7.27E+05	5.78E+01	1.74E-03	1.04E+06	5.64E+01	4.00E-04	3.56E+05	6.32E+01
4.23E-04	8.31E+05	5.73E+01	2.62E-03	1.34E+06	5.48E+01	4.53E-04	3.76E+05	6.06E+01
4.26E-04	8.37E+05	5.69E+01	2.67E-03	1.36E+06	5.46E+01	4.73E-04	3.88E+05	6.09E+01
5.29E-04	9.67E+05	5.81E+01	2.75E-03	1.38E+06	5.53E+01	6.34E-04	4.88E+05	6.22E+01
6.71E-04	1.10E+06	5.60E+01	4.16E-03	1.75E+06	5.36E+01	7.18E-04	5.11E+05	5.99E+01
6.75E-04	1.11E+06	5.58E+01	4.24E-03	1.78E+06	5.34E+01	7.50E-04	5.27E+05	6.00E+01
8.39E-04	1.28E+06	5.71E+01	4.36E-03	1.82E+06	5.42E+01	1.01E-03	6.65E+05	6.13E+01
1.06E-03	1.45E+06	5.48E+01	6.36E-03	2.27E+06	5.23E+01	1.14E-03	6.95E+05	5.88E+01
1.07E-03	1.46E+06	5.45E+01	6.59E-03	2.29E+06	5.24E+01	1.19E-03	7.13E+05	5.89E+01
1.33E-03	1.70E+06	5.61E+01	6.72E-03	2.35E+06	5.19E+01	1.44E-03	8.23E+05	5.78E+01

Table B.7 Summary of Complex Modulus and Phase Angle Values for Binder 5828LM (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
1.39E-03	1.73E+06	5.36E+01	6.92E-03	2.37E+06	5.31E+01	1.59E-03	9.04E+05	6.03E+01
1.69E-03	1.90E+06	5.35E+01	7.99E-03	2.59E+06	5.15E+01	1.80E-03	9.34E+05	5.74E+01
1.70E-03	1.91E+06	5.30E+01	1.05E-02	2.98E+06	5.11E+01	1.81E-03	9.45E+05	5.74E+01
1.74E-03	1.99E+06	5.31E+01	1.06E-02	3.03E+06	5.06E+01	1.88E-03	9.66E+05	5.78E+01
2.11E-03	2.22E+06	5.53E+01	1.10E-02	3.10E+06	5.20E+01	2.52E-03	1.22E+06	5.97E+01
2.67E-03	2.47E+06	5.23E+01	1.27E-02	3.35E+06	4.98E+01	2.86E-03	1.25E+06	5.64E+01
2.69E-03	2.48E+06	5.17E+01	1.66E-02	3.87E+06	4.98E+01	2.86E-03	1.27E+06	5.60E+01
2.76E-03	2.56E+06	5.15E+01	1.69E-02	3.90E+06	4.92E+01	2.98E-03	1.29E+06	5.66E+01
3.34E-03	2.86E+06	5.50E+01	1.74E-02	4.02E+06	5.08E+01	4.00E-03	1.60E+06	5.96E+01
4.23E-03	3.18E+06	5.11E+01	2.01E-02	4.33E+06	4.84E+01	4.53E-03	1.66E+06	5.49E+01
4.26E-03	3.19E+06	5.03E+01	2.62E-02	4.98E+06	4.86E+01	4.54E-03	1.67E+06	5.47E+01
4.38E-03	3.28E+06	5.01E+01	2.67E-02	5.00E+06	4.78E+01	4.73E-03	1.71E+06	5.55E+01
6.59E-03	4.09E+06	4.92E+01	2.75E-02	5.17E+06	4.97E+01	6.49E-03	2.10E+06	5.38E+01
6.71E-03	4.07E+06	4.99E+01	3.18E-02	5.50E+06	4.71E+01	7.18E-03	2.19E+06	5.36E+01
6.75E-03	4.08E+06	4.90E+01	3.18E-02	5.62E+06	4.72E+01	7.19E-03	2.21E+06	5.32E+01
6.94E-03	4.16E+06	4.88E+01	4.00E-02	6.28E+06	4.66E+01	7.50E-03	2.26E+06	5.42E+01
8.27E-03	4.61E+06	4.84E+01	4.16E-02	6.34E+06	4.73E+01	8.15E-03	2.38E+06	5.30E+01
1.06E-02	5.20E+06	4.86E+01	4.24E-02	6.37E+06	4.65E+01	1.14E-02	2.89E+06	5.22E+01
1.07E-02	5.20E+06	4.77E+01	4.36E-02	6.53E+06	4.91E+01	1.14E-02	2.87E+06	5.18E+01
1.10E-02	5.26E+06	4.74E+01	5.04E-02	6.98E+06	4.55E+01	1.19E-02	2.98E+06	5.30E+01
1.31E-02	5.81E+06	4.67E+01	6.34E-02	7.89E+06	4.49E+01	1.29E-02	3.09E+06	5.15E+01
1.69E-02	6.61E+06	4.75E+01	6.59E-02	8.01E+06	4.61E+01	1.80E-02	3.74E+06	5.09E+01
1.70E-02	6.55E+06	4.64E+01	6.72E-02	7.99E+06	4.52E+01	1.81E-02	3.73E+06	5.04E+01
1.74E-02	6.65E+06	4.59E+01	7.99E-02	8.78E+06	4.41E+01	1.88E-02	3.87E+06	5.18E+01

Table B.7 Summary of Complex Modulus and Phase Angle Values for Binder 5828LM (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
2.08E-02	7.28E+06	4.53E+01	1.00E-01	9.82E+06	4.35E+01	2.05E-02	4.01E+06	5.00E+01
2.67E-02	8.31E+06	4.63E+01	1.05E-01	1.01E+07	4.50E+01	2.86E-02	4.84E+06	4.96E+01
2.69E-02	8.23E+06	4.51E+01	1.06E-01	1.01E+07	4.39E+01	2.86E-02	4.81E+06	4.89E+01
2.76E-02	8.27E+06	4.46E+01	1.27E-01	1.09E+07	4.28E+01	2.98E-02	5.00E+06	5.05E+01
3.18E-02	9.14E+06	4.42E+01	1.59E-01	1.23E+07	4.20E+01	3.18E-02	5.13E+06	4.87E+01
3.29E-02	9.04E+06	4.40E+01	1.66E-01	1.26E+07	4.39E+01	3.24E-02	5.14E+06	4.84E+01
4.00E-02	1.00E+07	4.38E+01	1.69E-01	1.25E+07	4.27E+01	4.00E-02	5.78E+06	4.81E+01
4.23E-02	1.04E+07	4.54E+01	1.73E-01	1.28E+07	4.24E+01	4.53E-02	6.19E+06	4.83E+01
4.26E-02	1.03E+07	4.39E+01	2.01E-01	1.35E+07	4.15E+01	4.54E-02	6.13E+06	4.76E+01
4.38E-02	1.03E+07	4.33E+01	2.17E-01	1.40E+07	4.13E+01	4.73E-02	6.39E+06	4.96E+01
5.22E-02	1.12E+07	4.25E+01	2.52E-01	1.50E+07	4.05E+01	5.14E-02	6.60E+06	4.69E+01
6.34E-02	1.25E+07	4.20E+01	2.67E-01	1.55E+07	4.15E+01	6.34E-02	7.36E+06	4.62E+01
6.75E-02	1.27E+07	4.27E+01	3.18E-01	1.67E+07	4.02E+01	7.18E-02	7.87E+06	4.70E+01
6.94E-02	1.27E+07	4.21E+01	3.45E-01	1.73E+07	3.98E+01	7.19E-02	7.76E+06	4.62E+01
8.27E-02	1.37E+07	4.11E+01	4.00E-01	1.84E+07	3.93E+01	8.15E-02	8.30E+06	4.53E+01
1.00E-01	1.53E+07	4.06E+01	4.24E-01	1.90E+07	4.04E+01	1.00E-01	9.25E+06	4.47E+01
1.07E-01	1.57E+07	4.16E+01	5.04E-01	2.04E+07	3.90E+01	1.14E-01	9.95E+06	4.57E+01
1.10E-01	1.55E+07	4.09E+01	5.46E-01	2.09E+07	3.85E+01	1.14E-01	9.78E+06	4.48E+01
1.31E-01	1.68E+07	3.98E+01	6.34E-01	2.23E+07	3.80E+01	1.29E-01	1.03E+07	4.40E+01
1.59E-01	1.84E+07	3.95E+01	6.72E-01	2.33E+07	3.93E+01	1.59E-01	1.16E+07	4.33E+01
1.70E-01	1.92E+07	4.06E+01	7.99E-01	2.47E+07	3.79E+01	1.80E-01	1.24E+07	4.47E+01
1.74E-01	1.89E+07	3.97E+01	8.65E-01	2.53E+07	3.71E+01	1.81E-01	1.22E+07	4.35E+01
1.85E-01	1.97E+07	3.94E+01	1.00E+00	2.68E+07	3.68E+01	1.86E-01	1.24E+07	4.30E+01
2.08E-01	2.03E+07	3.86E+01	1.11E+00	2.86E+07	3.67E+01	2.05E-01	1.29E+07	4.26E+01

Table B.7 Summary of Complex Modulus and Phase Angle Values for Binder 5828LM (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
2.32E-01	2.16E+07	3.85E+01	1.27E+00	2.97E+07	3.68E+01	2.33E-01	1.38E+07	4.25E+01
2.52E-01	2.21E+07	3.80E+01	1.37E+00	3.05E+07	3.60E+01	2.52E-01	1.43E+07	4.17E+01
2.76E-01	2.29E+07	3.86E+01	1.39E+00	3.12E+07	3.58E+01	2.86E-01	1.52E+07	4.23E+01
3.29E-01	2.46E+07	3.75E+01	1.59E+00	3.22E+07	3.57E+01	3.24E-01	1.61E+07	4.12E+01
3.68E-01	2.57E+07	3.71E+01	2.01E+00	3.56E+07	3.58E+01	3.70E-01	1.70E+07	4.06E+01
4.00E-01	2.63E+07	3.69E+01	2.17E+00	3.65E+07	3.45E+01	4.00E-01	1.76E+07	4.03E+01
4.38E-01	2.77E+07	3.76E+01	2.20E+00	3.69E+07	3.47E+01	4.54E-01	1.86E+07	4.11E+01
5.22E-01	2.95E+07	3.63E+01	2.52E+00	3.83E+07	3.46E+01	5.14E-01	1.97E+07	3.99E+01
5.83E-01	3.06E+07	3.59E+01	3.18E+00	4.25E+07	3.49E+01	5.86E-01	2.08E+07	3.92E+01
6.34E-01	3.15E+07	3.57E+01	3.45E+00	4.33E+07	3.34E+01	6.34E-01	2.15E+07	3.89E+01
6.94E-01	3.36E+07	3.65E+01	3.49E+00	4.34E+07	3.35E+01	7.19E-01	2.29E+07	3.99E+01
8.27E-01	3.52E+07	3.53E+01	4.00E+00	4.57E+07	3.35E+01	8.15E-01	2.40E+07	3.87E+01
9.24E-01	3.63E+07	3.47E+01	5.46E+00	5.09E+07	3.24E+01	9.29E-01	2.54E+07	3.78E+01
1.00E+00	3.74E+07	3.46E+01	5.53E+00	5.13E+07	3.23E+01	1.00E+00	2.60E+07	3.76E+01
1.09E+00	3.93E+07	3.44E+01	6.34E+00	5.38E+07	3.26E+01	1.14E+00	2.77E+07	3.75E+01
1.31E+00	4.19E+07	3.43E+01	8.65E+00	5.98E+07	3.14E+01	1.29E+00	2.90E+07	3.75E+01
1.37E+00	4.28E+07	3.42E+01	8.76E+00	6.01E+07	3.13E+01	1.43E+00	3.04E+07	3.68E+01
1.46E+00	4.29E+07	3.34E+01	1.00E+01	6.24E+07	3.17E+01	1.47E+00	3.06E+07	3.64E+01
1.59E+00	4.40E+07	3.36E+01	1.24E+01	6.96E+07	3.09E+01	1.59E+00	3.15E+07	3.64E+01
2.08E+00	4.98E+07	3.32E+01	1.37E+01	6.99E+07	3.04E+01	2.05E+00	3.48E+07	3.64E+01
2.17E+00	5.00E+07	3.27E+01	1.39E+01	7.04E+07	2.99E+01	2.27E+00	3.64E+07	3.51E+01
2.32E+00	5.03E+07	3.24E+01	1.55E+01	7.40E+07	3.00E+01	2.33E+00	3.66E+07	3.51E+01
2.52E+00	5.16E+07	3.26E+01	1.59E+01	7.33E+07	3.08E+01	2.52E+00	3.77E+07	3.52E+01
3.29E+00	5.90E+07	3.23E+01	2.17E+01	8.18E+07	2.94E+01	3.24E+00	4.18E+07	3.53E+01

Table B.7 Summary of Complex Modulus and Phase Angle Values for Binder 5828LM (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
3.44E+00	5.82E+07	3.16E+01	2.20E+01	8.19E+07	2.91E+01	3.60E+00	4.34E+07	3.39E+01
3.68E+00	5.88E+07	3.12E+01	2.46E+01	8.50E+07	2.89E+01	3.70E+00	4.35E+07	3.39E+01
4.00E+00	6.04E+07	3.16E+01	3.05E+01	9.35E+07	2.90E+01	4.00E+00	4.49E+07	3.41E+01
5.45E+00	6.71E+07	3.05E+01	3.45E+01	9.52E+07	2.84E+01	5.70E+00	5.14E+07	3.27E+01
5.83E+00	6.84E+07	3.03E+01	3.49E+01	9.40E+07	2.81E+01	5.86E+00	5.18E+07	3.27E+01
6.34E+00	7.02E+07	3.07E+01	3.84E+01	9.68E+07	2.80E+01	6.34E+00	5.32E+07	3.30E+01
8.64E+00	7.73E+07	2.94E+01	3.90E+01	9.80E+07	2.81E+01	9.03E+00	6.04E+07	3.14E+01
9.24E+00	7.95E+07	2.94E+01	5.46E+01	1.10E+08	2.76E+01	9.29E+00	6.06E+07	3.16E+01
1.00E+01	8.14E+07	2.98E+01	5.53E+01	1.08E+08	2.72E+01	1.00E+01	6.24E+07	3.20E+01
1.37E+01	8.91E+07	2.84E+01	6.08E+01	1.12E+08	2.72E+01	1.06E+01	6.37E+07	3.13E+01
1.44E+01	9.19E+07	2.67E+01	6.18E+01	1.11E+08	2.70E+01	1.33E+01	6.87E+07	3.11E+01
1.46E+01	9.18E+07	2.84E+01	8.65E+01	1.26E+08	2.68E+01	1.43E+01	7.07E+07	3.03E+01
1.59E+01	9.50E+07	2.89E+01	8.76E+01	1.24E+08	2.63E+01	1.47E+01	7.10E+07	3.05E+01
1.81E+01	9.89E+07	2.80E+01	9.64E+01	1.27E+08	2.63E+01	1.59E+01	7.33E+07	3.10E+01
2.17E+01	1.02E+08	2.76E+01	9.80E+01	1.25E+08	2.58E+01	2.10E+01	8.03E+07	2.93E+01
2.32E+01	1.05E+08	2.76E+01	1.39E+02	1.41E+08	2.54E+01	2.27E+01	8.19E+07	2.92E+01
2.87E+01	1.12E+08	2.71E+01	1.42E+02	1.38E+08	2.68E+01	2.33E+01	8.28E+07	2.95E+01
3.44E+01	1.17E+08	2.66E+01	1.53E+02	1.42E+08	2.53E+01	3.33E+01	9.29E+07	2.83E+01
3.68E+01	1.21E+08	2.67E+01	1.55E+02	1.43E+08	2.53E+01	3.34E+01	9.35E+07	2.86E+01
4.55E+01	1.27E+08	2.60E+01	1.78E+02	1.44E+08	2.58E+01	3.60E+01	9.47E+07	2.82E+01
4.81E+01	1.30E+08	2.70E+01	2.20E+02	1.60E+08	2.46E+01	3.70E+01	9.57E+07	2.86E+01
5.45E+01	1.32E+08	2.58E+01	2.42E+02	1.60E+08	2.43E+01	4.20E+01	9.97E+07	2.85E+01
5.83E+01	1.38E+08	2.59E+01	2.46E+02	1.63E+08	2.42E+01	5.28E+01	1.07E+08	2.72E+01
6.04E+01	1.36E+08	2.54E+01	2.82E+02	1.65E+08	2.42E+01	5.70E+01	1.09E+08	2.72E+01

Table B.7 Summary of Complex Modulus and Phase Angle Values for Binder 5828LM (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
7.21E+01	1.44E+08	2.48E+01	3.49E+02	1.81E+08	2.38E+01	5.86E+01	1.10E+08	2.77E+01
8.64E+01	1.50E+08	2.50E+01	3.84E+02	1.80E+08	2.38E+01	6.65E+01	1.14E+08	2.69E+01
9.24E+01	1.57E+08	2.51E+01	3.90E+02	1.83E+08	2.32E+01	8.37E+01	1.23E+08	2.62E+01
9.57E+01	1.56E+08	2.43E+01	4.47E+02	1.86E+08	2.37E+01	9.03E+01	1.24E+08	2.63E+01
1.14E+02	1.63E+08	2.37E+01	4.82E+02	1.85E+08	2.43E+01	9.29E+01	1.27E+08	2.68E+01
1.37E+02	1.69E+08	2.42E+01	5.53E+02	2.04E+08	2.30E+01	9.94E+01	1.27E+08	2.60E+01
1.52E+02	1.74E+08	2.39E+01	6.05E+02	1.98E+08	2.48E+01	1.05E+02	1.31E+08	2.58E+01
1.80E+02	1.85E+08	2.31E+01	6.08E+02	2.01E+08	2.28E+01	1.25E+02	1.37E+08	2.51E+01
1.81E+02	1.83E+08	2.30E+01	6.18E+02	2.06E+08	2.25E+01	1.33E+02	1.40E+08	2.52E+01
2.17E+02	1.90E+08	2.34E+01	7.09E+02	2.09E+08	2.23E+01	1.43E+02	1.42E+08	2.54E+01
2.26E+02	1.95E+08	2.36E+01	9.59E+02	2.17E+08	2.38E+01	1.67E+02	1.48E+08	2.49E+01
2.40E+02	1.95E+08	2.29E+01	9.64E+02	2.26E+08	2.18E+01	1.98E+02	1.53E+08	2.46E+01
2.87E+02	2.04E+08	2.26E+01	9.80E+02	2.30E+08	2.17E+01	2.10E+02	1.58E+08	2.42E+01
3.44E+02	2.13E+08	2.26E+01	1.12E+03	2.34E+08	2.21E+01	2.27E+02	1.62E+08	2.45E+01
3.58E+02	2.16E+08	2.09E+01	1.52E+03	2.47E+08	2.10E+01	2.65E+02	1.68E+08	2.38E+01
3.81E+02	2.19E+08	2.20E+01	1.53E+03	2.51E+08	2.10E+01	3.14E+02	1.74E+08	2.37E+01
4.55E+02	2.29E+08	2.17E+01	1.55E+03	2.56E+08	2.09E+01	3.30E+02	1.77E+08	2.41E+01
5.45E+02	2.40E+08	2.18E+01	1.78E+03	2.59E+08	2.11E+01	3.33E+02	1.78E+08	2.33E+01
5.68E+02	2.39E+08	2.18E+01	2.29E+03	2.51E+08	2.23E+01	3.60E+02	1.82E+08	2.36E+01
6.04E+02	2.43E+08	2.13E+01	2.41E+03	2.81E+08	2.05E+01	4.14E+02	1.87E+08	2.32E+01
6.26E+02	2.36E+08	2.27E+01	2.42E+03	2.78E+08	2.03E+01	4.20E+02	1.89E+08	2.31E+01
7.21E+02	2.54E+08	2.09E+01	2.46E+03	2.84E+08	2.01E+01	4.97E+02	1.97E+08	2.33E+01
7.87E+02	2.51E+08	2.06E+01	2.82E+03	2.87E+08	2.03E+01	5.28E+02	2.00E+08	2.25E+01
9.00E+02	2.67E+08	1.98E+01	2.88E+03	2.63E+08	2.15E+01	5.70E+02	2.05E+08	2.28E+01

Table B.7 Summary of Complex Modulus and Phase Angle Values for Binder 5828LM (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
9.57E+02	2.68E+08	2.05E+01	3.82E+03	3.12E+08	2.04E+01	6.57E+02	2.10E+08	2.36E+01
1.14E+03	2.83E+08	2.02E+01	3.84E+03	3.09E+08	1.95E+01	6.65E+02	2.12E+08	2.21E+01
1.25E+03	2.77E+08	2.21E+01	3.90E+03	3.13E+08	1.94E+01	7.88E+02	2.18E+08	2.22E+01
1.43E+03	2.95E+08	2.04E+01	4.47E+03	3.16E+08	1.93E+01	8.37E+02	2.24E+08	2.16E+01
1.52E+03	2.97E+08	1.98E+01	4.56E+03	2.95E+08	2.26E+01	1.04E+03	2.29E+08	2.07E+01
1.63E+03	2.94E+08	1.99E+01	6.05E+03	3.37E+08	1.74E+01	1.05E+03	2.36E+08	2.12E+01
1.81E+03	3.10E+08	1.95E+01	6.08E+03	3.41E+08	1.86E+01	1.25E+03	2.47E+08	2.10E+01
1.98E+03	3.05E+08	2.12E+01	6.18E+03	3.44E+08	1.86E+01	1.31E+03	2.39E+08	2.26E+01
2.05E+03	3.14E+08	1.65E+01	7.09E+03	3.49E+08	1.86E+01	1.33E+03	2.49E+08	2.08E+01
2.26E+03	3.21E+08	1.87E+01	7.23E+03	3.35E+08	2.00E+01	1.64E+03	2.58E+08	2.15E+01
2.40E+03	3.27E+08	1.91E+01	7.41E+03	3.41E+08	1.87E+01	1.65E+03	2.58E+08	2.18E+01
2.87E+03	3.41E+08	1.87E+01	9.31E+03	3.42E+08	2.15E+01	1.67E+03	2.63E+08	2.04E+01
3.13E+03	3.32E+08	1.90E+01	9.59E+03	3.62E+08	1.72E+01	1.98E+03	2.74E+08	2.03E+01
3.25E+03	3.56E+08	1.75E+01	9.64E+03	3.75E+08	1.78E+01	2.10E+03	2.78E+08	2.00E+01
3.58E+03	3.52E+08	1.85E+01	1.12E+04	3.81E+08	1.78E+01	2.60E+03	2.78E+08	2.06E+01
3.81E+03	3.57E+08	1.83E+01	1.15E+04	3.67E+08	1.99E+01	2.61E+03	2.86E+08	1.95E+01
4.55E+03	3.72E+08	1.80E+01	1.48E+04	3.78E+08	1.97E+01	2.65E+03	2.90E+08	1.96E+01
4.96E+03	3.70E+08	1.79E+01	1.52E+04	4.09E+08	1.74E+01	3.14E+03	3.01E+08	1.94E+01
5.16E+03	3.83E+08	1.78E+01	1.53E+04	4.10E+08	1.71E+01	3.33E+03	3.07E+08	1.92E+01
5.68E+03	3.86E+08	1.76E+01	1.78E+04	4.16E+08	1.70E+01	4.13E+03	3.08E+08	2.04E+01
6.04E+03	3.89E+08	1.76E+01	1.82E+04	3.98E+08	1.89E+01	4.14E+03	3.16E+08	2.00E+01
7.21E+03	4.08E+08	1.72E+01	2.34E+04	4.15E+08	1.73E+01	4.20E+03	3.20E+08	1.88E+01
7.87E+03	4.06E+08	1.74E+01	2.41E+04	4.40E+08	1.67E+01	4.85E+03	3.05E+08	2.00E+01
8.17E+03	4.19E+08	1.73E+01	2.48E+04	3.93E+08	1.62E+01	4.97E+03	3.30E+08	1.86E+01

Table B.7 Summary of Complex Modulus and Phase Angle Values for Binder 5828LM (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
9.01E+03	4.19E+08	1.68E+01	2.82E+04	4.51E+08	1.62E+01	5.28E+03	3.38E+08	1.84E+01
9.57E+03	4.24E+08	1.69E+01	2.88E+04	4.33E+08	1.65E+01	6.09E+03	3.24E+08	2.03E+01
1.16E+04	4.23E+08	1.77E+01	3.11E+04	4.16E+08	2.01E+01	6.54E+03	3.43E+08	1.89E+01
1.25E+04	4.38E+08	1.59E+01	3.71E+04	4.59E+08	1.68E+01	6.57E+03	3.41E+08	1.85E+01
1.30E+04	4.61E+08	1.66E+01	3.82E+04	4.73E+08	1.59E+01	6.65E+03	3.52E+08	1.79E+01
1.43E+04	4.55E+08	1.62E+01	4.47E+04	4.89E+08	1.55E+01	7.88E+03	3.61E+08	1.78E+01
1.46E+04	4.41E+08	1.93E+01	4.56E+04	4.77E+08	1.70E+01	9.65E+03	3.58E+08	1.79E+01
1.52E+04	4.61E+08	1.61E+01	4.93E+04	4.75E+08	1.54E+01	1.04E+04	3.68E+08	1.76E+01
1.98E+04	4.77E+08	1.56E+01	5.87E+04	4.85E+08	1.63E+01	1.04E+04	3.83E+08	1.75E+01
2.05E+04	4.84E+08	1.57E+01	6.05E+04	5.10E+08	1.51E+01	1.05E+04	3.84E+08	1.72E+01
2.26E+04	4.93E+08	1.54E+01	7.09E+04	5.28E+08	1.47E+01	1.25E+04	3.95E+08	1.70E+01
2.31E+04	4.57E+08	1.67E+01	7.23E+04	5.09E+08	1.57E+01	1.53E+04	3.98E+08	1.82E+01
2.40E+04	5.01E+08	1.53E+01	7.82E+04	5.51E+08	1.64E+01	1.64E+04	4.07E+08	1.64E+01
3.13E+04	5.14E+08	1.51E+01	9.31E+04	5.38E+08	1.50E+01	1.65E+04	4.16E+08	1.66E+01
3.25E+04	5.33E+08	1.50E+01	9.59E+04	5.50E+08	1.44E+01	1.67E+04	4.20E+08	1.64E+01
3.58E+04	5.31E+08	1.47E+01	1.15E+05	5.44E+08	1.48E+01	1.98E+04	4.29E+08	1.63E+01
3.67E+04	4.99E+08	1.69E+01	1.24E+05	5.54E+08	1.62E+01	2.20E+04	4.16E+08	1.82E+01
4.96E+04	5.57E+08	1.44E+01	1.36E+05	5.24E+08	1.94E+01	2.42E+04	4.26E+08	1.68E+01
5.16E+04	5.71E+08	1.43E+01	1.48E+05	5.83E+08	1.41E+01	2.60E+04	4.44E+08	1.64E+01
5.68E+04	5.69E+08	1.40E+01	1.52E+05	5.89E+08	1.37E+01	2.61E+04	4.51E+08	1.58E+01
5.81E+04	5.32E+08	1.48E+01	1.71E+05	6.16E+08	1.84E+01	2.76E+04	4.21E+08	1.76E+01
7.87E+04	5.97E+08	1.36E+01	1.82E+05	5.84E+08	1.39E+01	3.14E+04	4.65E+08	1.54E+01
8.17E+04	6.15E+08	1.33E+01	1.96E+05	6.49E+08	1.33E+01	3.84E+04	4.69E+08	1.53E+01
8.41E+04	4.93E+08	2.06E+01	2.34E+05	6.11E+08	1.36E+01	4.13E+04	4.77E+08	1.59E+01

Table B.7 Summary of Complex Modulus and Phase Angle Values for Binder 5828LM (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
9.00E+04	6.08E+08	1.33E+01	2.41E+05	6.27E+08	1.31E+01	4.14E+04	4.88E+08	1.50E+01
9.21E+04	5.76E+08	1.50E+01	2.71E+05	6.16E+08	1.41E+01	4.37E+04	4.83E+08	1.66E+01
1.06E+05	5.81E+08	1.61E+01	2.88E+05	6.24E+08	1.34E+01	4.97E+04	5.00E+08	1.46E+01
1.25E+05	6.43E+08	1.29E+01	3.11E+05	7.07E+08	1.33E+01	6.09E+04	5.09E+08	1.52E+01
1.30E+05	6.60E+08	1.28E+01	3.71E+05	6.53E+08	1.31E+01	6.32E+04	5.10E+08	1.67E+01
1.46E+05	6.29E+08	1.47E+01	4.30E+05	6.57E+08	1.52E+01	6.54E+04	5.14E+08	1.51E+01
1.67E+05	5.41E+08	1.72E+01	4.56E+05	6.66E+08	1.26E+01	6.57E+04	5.24E+08	1.43E+01
1.72E+05	6.75E+08	1.38E+01	4.93E+05	6.90E+08	1.31E+01	6.93E+04	5.20E+08	1.31E+01
1.98E+05	6.84E+08	1.22E+01	5.87E+05	6.98E+08	1.23E+01	7.94E+04	5.25E+08	1.30E+01
2.05E+05	7.02E+08	1.22E+01	6.81E+05	6.66E+08	1.22E+01	9.65E+04	5.46E+08	1.48E+01
2.16E+05	6.32E+08	2.20E+01	7.23E+05	7.08E+08	1.19E+01	1.04E+05	5.53E+08	1.40E+01
2.31E+05	6.52E+08	1.46E+01	7.82E+05	7.37E+08	1.25E+01	1.04E+05	5.63E+08	1.35E+01
3.13E+05	7.28E+08	1.15E+01	8.98E+05	6.96E+08	1.22E+01	1.10E+05	5.56E+08	1.46E+01
3.25E+05	7.46E+08	1.15E+01	9.31E+05	7.41E+08	1.17E+01	1.26E+05	5.77E+08	1.44E+01
3.42E+05	6.62E+08	1.07E+01	1.08E+06	7.49E+08	1.19E+01	1.53E+05	5.85E+08	1.37E+01
3.66E+05	7.82E+08	1.36E+01	1.15E+06	7.50E+08	1.12E+01	1.64E+05	5.91E+08	1.32E+01
3.67E+05	6.99E+08	1.27E+01	1.24E+06	7.76E+08	1.17E+01	1.65E+05	6.02E+08	1.28E+01
4.20E+05	6.80E+08	1.70E+01	1.48E+06	7.81E+08	1.09E+01	1.74E+05	5.49E+08	1.63E+01
4.60E+05	8.51E+08	1.24E+01	1.71E+06	8.00E+08	1.11E+01	1.99E+05	6.39E+08	1.53E+01
5.16E+05	7.96E+08	1.07E+01	1.79E+06	6.89E+08	1.57E+01	2.42E+05	6.30E+08	1.27E+01
5.42E+05	7.19E+08	1.53E+01	1.96E+06	8.31E+08	1.05E+01	2.60E+05	6.31E+08	1.25E+01
5.81E+05	7.44E+08	1.20E+01	2.34E+06	8.26E+08	1.03E+01	2.76E+05	5.95E+08	1.40E+01
6.66E+05	6.76E+08	1.55E+01	2.71E+06	8.87E+08	1.12E+01	3.16E+05	6.63E+08	1.33E+01
7.29E+05	7.88E+08	1.31E+01	2.83E+06	7.57E+08	6.99E+00	3.84E+05	6.68E+08	1.21E+01

Table B.7 Summary of Complex Modulus and Phase Angle Values for Binder 5828LM (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
8.17E+05	8.32E+08	1.01E+01	3.11E+06	8.69E+08	9.95E+00	4.13E+05	6.69E+08	1.18E+01
8.59E+05	7.46E+08	1.18E+01	3.71E+06	8.63E+08	9.65E+00	4.37E+05	6.55E+08	1.20E+01
9.21E+05	7.90E+08	1.12E+01	4.30E+06	8.81E+08	1.06E+01	5.01E+05	7.10E+08	1.34E+01
1.06E+06	7.42E+08	1.02E+01	4.49E+06	7.93E+08	1.19E+01	6.09E+05	7.09E+08	1.14E+01
1.16E+06	8.54E+08	1.21E+01	4.93E+06	9.07E+08	9.59E+00	6.54E+05	7.09E+08	1.11E+01
1.36E+06	8.38E+08	1.12E+01	6.81E+06	9.35E+08	1.02E+01	6.93E+05	7.15E+08	1.27E+01
1.46E+06	8.31E+08	1.04E+01	7.11E+06	8.44E+08	1.27E+01	7.94E+05	7.54E+08	1.32E+01
1.67E+06	8.26E+08	7.56E+00	7.82E+06	9.52E+08	8.83E+00	8.24E+05	7.52E+08	7.97E+00
1.83E+06	8.76E+08	1.04E+01	1.08E+07	9.71E+08	8.84E+00	9.65E+05	7.50E+08	1.07E+01
2.16E+06	8.90E+08	1.12E+01	1.13E+07	8.91E+08	1.06E+01	1.04E+06	6.46E+08	1.89E+01
2.31E+06	8.75E+08	9.86E+00	1.24E+07	9.90E+08	8.07E+00	1.10E+06	7.50E+08	9.92E+00
2.65E+06	8.24E+08	1.20E+01	1.71E+07	1.02E+09	8.23E+00	1.26E+06	8.21E+08	1.04E+01
2.90E+06	9.69E+08	6.35E+00	1.79E+07	9.66E+08	5.65E+00	1.53E+06	7.91E+08	9.96E+00
3.42E+06	9.63E+08	6.22E+00	2.71E+07	1.05E+09	7.50E+00	1.64E+06	6.93E+08	1.46E+01
3.67E+06	9.16E+08	9.26E+00	2.83E+07	9.86E+08	8.05E+00	1.74E+06	7.90E+08	1.04E+01
4.20E+06	8.78E+08	1.03E+01	4.30E+07	1.09E+09	7.07E+00	1.99E+06	8.51E+08	9.63E+00
4.60E+06	1.01E+09	1.03E+01	4.49E+07	1.05E+09	8.34E+00	2.42E+06	8.30E+08	9.31E+00
5.42E+06	9.61E+08	8.58E+00	6.81E+07	1.13E+09	6.57E+00	2.60E+06	7.63E+08	9.44E+00
5.81E+06	9.56E+08	8.71E+00	7.11E+07	1.08E+09	7.98E+00	2.76E+06	8.36E+08	9.44E+00
6.66E+06	9.21E+08	9.60E+00	1.13E+08	1.11E+09	7.48E+00	3.16E+06	8.96E+08	8.44E+00
7.29E+06	1.06E+09	1.02E+01	1.79E+08	1.15E+09	6.44E+00	4.12E+06	8.15E+08	8.86E+00
8.59E+06	1.02E+09	8.93E+00	2.83E+08	1.19E+09	5.96E+00	4.37E+06	8.75E+08	8.82E+00
1.06E+07	9.70E+08	8.73E+00	4.49E+08	1.22E+09	5.45E+00	5.01E+06	9.25E+08	8.40E+00

Table B.8 Summary of Complex Modulus and Phase Angle Values for Binder 5828LL with Different Aging Conditions

STA			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
7.06E-06	2.75E+04	7.36E+01	3.60E-06	2.87E+05	5.68E+01	4.03E-06	2.66E+05	5.45E+01
8.87E-06	3.27E+04	7.32E+01	4.52E-06	3.24E+05	5.63E+01	5.06E-06	3.00E+05	5.42E+01
1.41E-05	4.66E+04	7.17E+01	7.17E-06	4.28E+05	5.48E+01	8.02E-06	3.90E+05	5.25E+01
2.23E-05	6.66E+04	7.07E+01	1.14E-05	5.56E+05	5.39E+01	1.27E-05	5.06E+05	5.18E+01
3.53E-05	9.48E+04	6.94E+01	1.80E-05	7.28E+05	5.27E+01	2.01E-05	6.54E+05	5.07E+01
5.60E-05	1.34E+05	6.80E+01	2.85E-05	9.38E+05	5.14E+01	3.19E-05	8.37E+05	4.95E+01
8.54E-05	1.83E+05	6.59E+01	4.52E-05	1.20E+06	5.05E+01	5.06E-05	1.06E+06	4.87E+01
8.87E-05	1.88E+05	6.70E+01	5.85E-05	1.39E+06	4.94E+01	6.62E-05	1.24E+06	4.79E+01
1.07E-04	2.15E+05	6.56E+01	7.17E-05	1.53E+06	4.94E+01	8.02E-05	1.33E+06	4.78E+01
1.41E-04	2.63E+05	6.58E+01	7.35E-05	1.57E+06	4.90E+01	8.31E-05	1.39E+06	4.73E+01
1.70E-04	2.99E+05	6.42E+01	1.14E-04	1.94E+06	4.84E+01	1.27E-04	1.69E+06	4.70E+01
2.23E-04	3.65E+05	6.47E+01	1.16E-04	1.98E+06	4.74E+01	1.32E-04	1.74E+06	4.62E+01
2.69E-04	4.16E+05	6.28E+01	1.80E-04	2.45E+06	4.75E+01	2.01E-04	2.14E+06	4.62E+01
3.37E-04	4.90E+05	6.17E+01	1.85E-04	2.50E+06	4.62E+01	2.09E-04	2.19E+06	4.51E+01
3.53E-04	5.09E+05	6.36E+01	2.55E-04	2.96E+06	4.53E+01	2.89E-04	2.57E+06	4.45E+01
4.24E-04	5.65E+05	6.14E+01	2.85E-04	3.08E+06	4.66E+01	3.19E-04	2.66E+06	4.55E+01
4.27E-04	5.66E+05	6.15E+01	2.93E-04	3.13E+06	4.51E+01	3.31E-04	2.72E+06	4.39E+01
5.60E-04	7.02E+05	6.25E+01	3.20E-04	3.31E+06	4.48E+01	3.63E-04	2.85E+06	4.37E+01
6.72E-04	7.71E+05	5.99E+01	4.52E-04	3.86E+06	4.57E+01	5.06E-04	3.33E+06	4.47E+01
6.77E-04	7.74E+05	6.03E+01	4.64E-04	3.88E+06	4.39E+01	5.24E-04	3.37E+06	4.29E+01
8.87E-04	9.51E+05	6.16E+01	5.08E-04	4.10E+06	4.32E+01	5.75E-04	3.53E+06	4.26E+01
1.06E-03	1.04E+06	5.86E+01	7.17E-04	4.79E+06	4.49E+01	8.02E-04	4.11E+06	4.41E+01
1.07E-03	1.05E+06	5.91E+01	7.35E-04	4.79E+06	4.28E+01	8.31E-04	4.16E+06	4.19E+01
1.41E-03	1.29E+06	6.07E+01	8.05E-04	5.07E+06	4.20E+01	9.12E-04	4.38E+06	4.15E+01

Table B.8 Summary of Complex Modulus and Phase Angle Values for Binder 5828LL with Different Aging Conditions (Continued)

STA			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
1.43E-03	1.28E+06	5.76E+01	1.14E-03	5.94E+06	4.40E+01	1.27E-03	5.12E+06	4.34E+01
1.69E-03	1.41E+06	5.72E+01	1.16E-03	5.90E+06	4.17E+01	1.30E-03	5.18E+06	4.09E+01
1.70E-03	1.41E+06	5.78E+01	1.18E-03	6.11E+06	4.15E+01	1.32E-03	5.14E+06	4.10E+01
1.80E-03	1.47E+06	5.66E+01	1.28E-03	6.19E+06	4.09E+01	1.45E-03	5.39E+06	4.02E+01
2.23E-03	1.72E+06	6.00E+01	1.48E-03	6.70E+06	4.07E+01	1.63E-03	5.73E+06	4.04E+01
2.67E-03	1.87E+06	5.58E+01	1.85E-03	7.23E+06	4.07E+01	2.01E-03	6.16E+06	4.35E+01
2.69E-03	1.88E+06	5.66E+01	2.02E-03	7.53E+06	3.97E+01	2.09E-03	6.25E+06	4.02E+01
2.85E-03	1.97E+06	5.52E+01	2.35E-03	8.21E+06	3.95E+01	2.29E-03	6.56E+06	3.92E+01
3.53E-03	2.28E+06	5.99E+01	2.93E-03	8.82E+06	3.98E+01	2.58E-03	6.94E+06	3.90E+01
4.24E-03	2.47E+06	5.44E+01	3.20E-03	9.20E+06	3.86E+01	3.31E-03	7.59E+06	3.93E+01
4.27E-03	2.51E+06	5.53E+01	3.72E-03	9.87E+06	3.83E+01	3.63E-03	7.95E+06	3.82E+01
4.52E-03	2.59E+06	5.38E+01	4.64E-03	1.07E+07	3.89E+01	4.10E-03	8.45E+06	3.79E+01
6.41E-03	3.21E+06	5.25E+01	5.08E-03	1.11E+07	3.75E+01	5.24E-03	9.17E+06	3.86E+01
6.72E-03	3.26E+06	5.31E+01	5.90E-03	1.19E+07	3.71E+01	5.75E-03	9.61E+06	3.73E+01
6.77E-03	3.30E+06	5.41E+01	6.14E-03	1.22E+07	3.74E+01	6.36E-03	1.02E+07	3.74E+01
7.16E-03	3.40E+06	5.22E+01	7.35E-03	1.29E+07	3.81E+01	6.49E-03	1.02E+07	3.70E+01
8.05E-03	3.66E+06	5.16E+01	7.71E-03	1.34E+07	3.65E+01	7.99E-03	1.11E+07	3.65E+01
1.06E-02	4.24E+06	5.17E+01	8.05E-03	1.34E+07	3.66E+01	8.31E-03	1.11E+07	3.78E+01
1.07E-02	4.31E+06	5.28E+01	9.35E-03	1.42E+07	3.61E+01	9.12E-03	1.16E+07	3.64E+01
1.13E-02	4.43E+06	5.08E+01	1.16E-02	1.55E+07	3.73E+01	1.03E-02	1.21E+07	3.58E+01
1.28E-02	4.75E+06	5.00E+01	1.22E-02	1.58E+07	3.53E+01	1.27E-02	1.33E+07	3.55E+01
1.69E-02	5.50E+06	5.04E+01	1.28E-02	1.59E+07	3.57E+01	1.32E-02	1.34E+07	3.71E+01
1.70E-02	5.63E+06	5.16E+01	1.48E-02	1.69E+07	3.50E+01	1.45E-02	1.38E+07	3.56E+01
1.80E-02	5.72E+06	4.93E+01	1.85E-02	1.85E+07	3.65E+01	1.63E-02	1.46E+07	3.50E+01

Table B.8 Summary of Complex Modulus and Phase Angle Values for Binder 5828LL with Different Aging Conditions (Continued)

STA			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
2.02E-02	6.22E+06	4.84E+01	1.94E-02	1.89E+07	3.42E+01	2.01E-02	1.58E+07	3.45E+01
2.67E-02	7.07E+06	4.90E+01	2.02E-02	1.91E+07	3.48E+01	2.09E-02	1.59E+07	3.65E+01
2.69E-02	7.24E+06	5.04E+01	2.35E-02	2.01E+07	3.41E+01	2.29E-02	1.64E+07	3.48E+01
2.85E-02	7.34E+06	4.79E+01	2.93E-02	2.20E+07	3.58E+01	2.58E-02	1.72E+07	3.41E+01
3.18E-02	7.87E+06	4.68E+01	3.07E-02	2.24E+07	3.32E+01	3.18E-02	1.88E+07	3.35E+01
3.21E-02	7.86E+06	4.69E+01	3.18E-02	2.29E+07	3.35E+01	3.18E-02	1.89E+07	3.39E+01
4.00E-02	8.80E+06	4.62E+01	3.20E-02	2.27E+07	3.40E+01	3.31E-02	1.89E+07	3.60E+01
4.24E-02	9.06E+06	4.77E+01	3.72E-02	2.37E+07	3.33E+01	3.63E-02	1.95E+07	3.41E+01
4.27E-02	9.21E+06	4.94E+01	4.00E-02	2.46E+07	3.29E+01	4.00E-02	2.06E+07	3.36E+01
4.52E-02	9.27E+06	4.66E+01	4.87E-02	2.62E+07	3.22E+01	4.10E-02	2.04E+07	3.33E+01
5.08E-02	9.91E+06	4.54E+01	5.08E-02	2.68E+07	3.33E+01	5.04E-02	2.21E+07	3.25E+01
6.34E-02	1.11E+07	4.46E+01	5.90E-02	2.77E+07	3.25E+01	5.75E-02	2.31E+07	3.35E+01
6.72E-02	1.15E+07	4.64E+01	6.34E-02	2.91E+07	3.19E+01	6.34E-02	2.42E+07	3.22E+01
7.16E-02	1.17E+07	4.52E+01	7.71E-02	3.08E+07	3.13E+01	6.49E-02	2.40E+07	3.26E+01
8.05E-02	1.24E+07	4.41E+01	8.05E-02	3.15E+07	3.26E+01	7.99E-02	2.61E+07	3.17E+01
1.00E-01	1.38E+07	4.32E+01	9.35E-02	3.25E+07	3.17E+01	9.12E-02	2.74E+07	3.28E+01
1.06E-01	1.45E+07	4.52E+01	1.00E-01	3.38E+07	3.09E+01	1.00E-01	2.82E+07	3.13E+01
1.13E-01	1.46E+07	4.40E+01	1.22E-01	3.60E+07	3.05E+01	1.03E-01	2.82E+07	3.19E+01
1.28E-01	1.54E+07	4.27E+01	1.28E-01	3.71E+07	3.18E+01	1.27E-01	3.05E+07	3.09E+01
1.57E-01	1.72E+07	4.18E+01	1.48E-01	3.81E+07	3.10E+01	1.45E-01	3.21E+07	3.22E+01
1.59E-01	1.72E+07	4.17E+01	1.59E-01	3.94E+07	3.00E+01	1.59E-01	3.30E+07	3.06E+01
1.69E-01	1.81E+07	4.40E+01	1.94E-01	4.19E+07	2.97E+01	1.63E-01	3.31E+07	3.12E+01
1.80E-01	1.81E+07	4.27E+01	2.04E-01	4.31E+07	2.99E+01	1.91E-01	3.52E+07	3.06E+01
1.98E-01	1.91E+07	4.13E+01	2.35E-01	4.45E+07	3.03E+01	2.01E-01	3.55E+07	3.02E+01

Table B.8 Summary of Complex Modulus and Phase Angle Values for Binder 5828LL with Different Aging Conditions (Continued)

STA			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
2.02E-01	1.91E+07	4.14E+01	2.52E-01	4.56E+07	2.91E+01	2.40E-01	3.80E+07	3.03E+01
2.52E-01	2.12E+07	4.02E+01	2.56E-01	4.61E+07	2.91E+01	2.52E-01	3.82E+07	2.97E+01
2.85E-01	2.24E+07	4.15E+01	3.07E-01	4.84E+07	2.90E+01	2.58E-01	3.86E+07	3.06E+01
3.13E-01	2.35E+07	3.93E+01	3.72E-01	5.19E+07	2.96E+01	3.18E-01	4.10E+07	2.96E+01
3.21E-01	2.35E+07	4.01E+01	4.00E-01	5.27E+07	2.83E+01	3.81E-01	4.40E+07	2.91E+01
4.00E-01	2.59E+07	3.89E+01	4.05E-01	5.33E+07	2.84E+01	4.00E-01	4.45E+07	2.89E+01
4.52E-01	2.77E+07	4.03E+01	4.87E-01	5.58E+07	2.83E+01	4.10E-01	4.49E+07	3.01E+01
4.96E-01	2.87E+07	3.81E+01	5.90E-01	5.99E+07	2.90E+01	5.04E-01	4.77E+07	2.89E+01
5.08E-01	2.87E+07	3.89E+01	6.34E-01	6.06E+07	2.76E+01	6.04E-01	5.10E+07	2.83E+01
6.34E-01	3.17E+07	3.76E+01	6.42E-01	6.12E+07	2.76E+01	6.34E-01	5.15E+07	2.83E+01
7.16E-01	3.38E+07	3.92E+01	7.71E-01	6.44E+07	2.77E+01	6.49E-01	5.21E+07	2.95E+01
7.86E-01	3.47E+07	3.68E+01	1.00E+00	6.94E+07	2.69E+01	7.99E-01	5.52E+07	2.84E+01
8.05E-01	3.47E+07	3.78E+01	1.02E+00	7.02E+07	2.67E+01	9.57E-01	5.82E+07	2.77E+01
1.00E+00	3.84E+07	3.64E+01	1.22E+00	7.39E+07	2.71E+01	1.00E+00	5.90E+07	2.76E+01
1.04E+00	3.96E+07	3.65E+01	1.28E+00	7.64E+07	2.65E+01	1.19E+00	6.22E+07	2.77E+01
1.25E+00	4.18E+07	3.54E+01	1.59E+00	7.92E+07	2.63E+01	1.27E+00	6.40E+07	2.78E+01
1.28E+00	4.21E+07	3.66E+01	1.61E+00	8.14E+07	2.62E+01	1.50E+00	6.66E+07	2.73E+01
1.30E+00	4.34E+07	3.53E+01	1.61E+00	8.00E+07	2.60E+01	1.52E+00	6.69E+07	2.69E+01
1.59E+00	4.58E+07	3.53E+01	1.94E+00	8.43E+07	2.66E+01	1.59E+00	6.80E+07	2.70E+01
1.98E+00	5.01E+07	3.42E+01	2.52E+00	9.05E+07	2.57E+01	2.01E+00	7.34E+07	2.73E+01
2.02E+00	5.03E+07	3.56E+01	2.55E+00	9.22E+07	2.52E+01	2.38E+00	7.68E+07	2.64E+01
2.07E+00	5.15E+07	3.42E+01	2.56E+00	9.15E+07	2.53E+01	2.40E+00	7.69E+07	2.62E+01
2.52E+00	5.44E+07	3.42E+01	3.07E+00	9.60E+07	2.60E+01	2.52E+00	7.76E+07	2.65E+01
3.13E+00	5.94E+07	3.31E+01	4.00E+00	1.03E+08	2.51E+01	3.18E+00	8.36E+07	2.69E+01

Table B.8 Summary of Complex Modulus and Phase Angle Values for Binder 5828LL with Different Aging Conditions (Continued)

STA			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
3.21E+00	6.00E+07	3.46E+01	4.05E+00	1.04E+08	2.46E+01	3.77E+00	8.71E+07	2.58E+01
3.28E+00	6.11E+07	3.30E+01	4.05E+00	1.03E+08	2.46E+01	3.81E+00	8.77E+07	2.56E+01
4.00E+00	6.47E+07	3.32E+01	6.34E+00	1.17E+08	2.46E+01	4.00E+00	8.83E+07	2.60E+01
4.96E+00	7.03E+07	3.20E+01	6.42E+00	1.17E+08	2.40E+01	5.97E+00	9.96E+07	2.51E+01
5.19E+00	7.17E+07	3.18E+01	6.42E+00	1.17E+08	2.40E+01	6.04E+00	9.91E+07	2.51E+01
6.34E+00	7.67E+07	3.22E+01	1.00E+01	1.31E+08	2.41E+01	6.34E+00	1.01E+08	2.55E+01
7.86E+00	8.23E+07	3.10E+01	1.02E+01	1.32E+08	2.33E+01	9.47E+00	1.13E+08	2.44E+01
8.23E+00	8.42E+07	3.07E+01	1.02E+01	1.32E+08	2.34E+01	9.57E+00	1.12E+08	2.45E+01
1.00E+01	9.07E+07	3.11E+01	1.49E+01	1.46E+08	2.33E+01	1.00E+01	1.14E+08	2.51E+01
1.25E+01	9.67E+07	3.00E+01	1.59E+01	1.48E+08	2.36E+01	1.44E+01	1.27E+08	2.36E+01
1.30E+01	9.81E+07	2.96E+01	1.61E+01	1.48E+08	2.27E+01	1.50E+01	1.28E+08	2.37E+01
1.35E+01	1.02E+08	2.97E+01	1.61E+01	1.48E+08	2.29E+01	1.52E+01	1.28E+08	2.40E+01
1.59E+01	1.06E+08	3.02E+01	1.87E+01	1.55E+08	2.26E+01	1.59E+01	1.29E+08	2.46E+01
1.70E+01	1.09E+08	2.92E+01	2.55E+01	1.66E+08	2.21E+01	1.81E+01	1.36E+08	2.35E+01
1.98E+01	1.13E+08	2.90E+01	2.56E+01	1.66E+08	2.24E+01	2.38E+01	1.45E+08	2.32E+01
2.07E+01	1.14E+08	2.86E+01	2.96E+01	1.71E+08	2.18E+01	2.40E+01	1.44E+08	2.35E+01
2.69E+01	1.25E+08	2.81E+01	4.05E+01	1.85E+08	2.15E+01	2.87E+01	1.53E+08	2.30E+01
3.13E+01	1.31E+08	2.81E+01	4.05E+01	1.86E+08	2.19E+01	3.77E+01	1.62E+08	2.27E+01
3.28E+01	1.31E+08	2.76E+01	4.05E+01	1.85E+08	2.19E+01	3.81E+01	1.63E+08	2.30E+01
4.24E+01	1.40E+08	2.76E+01	4.69E+01	1.92E+08	2.17E+01	4.49E+01	1.72E+08	2.27E+01
4.26E+01	1.43E+08	2.69E+01	5.09E+01	1.95E+08	2.16E+01	4.55E+01	1.71E+08	2.23E+01
4.96E+01	1.52E+08	2.72E+01	6.42E+01	2.06E+08	2.10E+01	5.64E+01	1.81E+08	2.23E+01
5.19E+01	1.50E+08	2.67E+01	6.42E+01	2.07E+08	2.14E+01	5.97E+01	1.82E+08	2.22E+01
5.32E+01	1.47E+08	2.72E+01	7.43E+01	2.13E+08	2.08E+01	6.04E+01	1.82E+08	2.26E+01

Table B.8 Summary of Complex Modulus and Phase Angle Values for Binder 5828LL with Different Aging Conditions (Continued)

STA			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
6.76E+01	1.62E+08	2.63E+01	8.07E+01	2.17E+08	2.09E+01	7.21E+01	1.91E+08	2.20E+01
7.86E+01	1.73E+08	2.63E+01	1.02E+02	2.29E+08	2.05E+01	8.94E+01	2.00E+08	2.19E+01
8.23E+01	1.71E+08	2.59E+01	1.02E+02	2.30E+08	2.10E+01	9.47E+01	2.04E+08	2.16E+01
8.44E+01	1.70E+08	2.57E+01	1.18E+02	2.36E+08	2.03E+01	9.57E+01	2.04E+08	2.21E+01
1.04E+02	1.87E+08	2.65E+01	1.28E+02	2.38E+08	2.05E+01	1.14E+02	2.14E+08	2.16E+01
1.07E+02	1.83E+08	2.53E+01	1.28E+02	2.33E+08	2.02E+01	1.25E+02	2.12E+08	2.15E+01
1.30E+02	1.95E+08	2.50E+01	1.61E+02	2.54E+08	2.00E+01	1.42E+02	2.25E+08	2.11E+01
1.31E+02	1.98E+08	2.56E+01	1.61E+02	2.48E+08	2.09E+01	1.50E+02	2.27E+08	2.12E+01
1.34E+02	1.92E+08	2.51E+01	1.87E+02	2.60E+08	1.98E+01	1.56E+02	2.24E+08	2.14E+01
1.70E+02	2.06E+08	2.44E+01	2.03E+02	2.65E+08	1.96E+01	1.81E+02	2.36E+08	2.08E+01
2.07E+02	2.21E+08	2.42E+01	2.55E+02	2.81E+08	1.95E+01	2.25E+02	2.48E+08	2.03E+01
2.08E+02	2.20E+08	2.40E+01	2.56E+02	2.69E+08	2.03E+01	2.38E+02	2.52E+08	2.07E+01
2.12E+02	2.17E+08	2.40E+01	2.96E+02	2.88E+08	1.92E+01	2.48E+02	2.50E+08	2.08E+01
2.69E+02	2.31E+08	2.35E+01	3.21E+02	2.95E+08	1.91E+01	2.87E+02	2.63E+08	2.02E+01
3.22E+02	2.39E+08	2.48E+01	3.64E+02	3.02E+08	1.64E+01	3.56E+02	2.77E+08	2.04E+01
3.28E+02	2.49E+08	2.34E+01	4.05E+02	3.09E+08	1.91E+01	3.77E+02	2.81E+08	2.02E+01
3.30E+02	2.42E+08	2.35E+01	4.05E+02	3.12E+08	1.96E+01	3.93E+02	2.82E+08	2.06E+01
3.36E+02	2.45E+08	2.32E+01	4.57E+02	3.29E+08	1.63E+01	4.31E+02	2.83E+08	1.90E+01
4.05E+02	2.44E+08	2.32E+01	4.69E+02	3.16E+08	1.85E+01	4.55E+02	2.91E+08	1.97E+01
4.26E+02	2.61E+08	2.27E+01	5.09E+02	3.21E+08	1.86E+01	5.42E+02	2.92E+08	2.08E+01
5.19E+02	2.79E+08	2.25E+01	6.42E+02	3.40E+08	1.86E+01	5.64E+02	3.03E+08	2.00E+01
5.22E+02	2.69E+08	2.31E+01	6.42E+02	3.33E+08	1.79E+01	5.97E+02	3.11E+08	1.98E+01
5.32E+02	2.75E+08	2.25E+01	7.24E+02	3.59E+08	1.88E+01	6.23E+02	3.12E+08	1.97E+01
6.42E+02	2.80E+08	2.38E+01	7.43E+02	3.47E+08	1.82E+01	7.21E+02	3.23E+08	1.91E+01

Table B.8 Summary of Complex Modulus and Phase Angle Values for Binder 5828LL with Different Aging Conditions (Continued)

STA			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
6.76E+02	2.90E+08	2.20E+01	8.07E+02	3.54E+08	1.80E+01	8.58E+02	3.30E+08	1.93E+01
8.28E+02	2.97E+08	2.14E+01	1.02E+03	3.70E+08	1.85E+01	8.94E+02	3.34E+08	1.90E+01
8.44E+02	3.07E+08	2.17E+01	1.15E+03	3.87E+08	1.83E+01	9.87E+02	3.43E+08	1.91E+01
1.02E+03	3.05E+08	2.39E+01	1.18E+03	3.81E+08	1.76E+01	1.14E+03	3.55E+08	1.86E+01
1.07E+03	3.23E+08	2.11E+01	1.28E+03	3.86E+08	1.75E+01	1.36E+03	3.69E+08	1.87E+01
1.31E+03	3.32E+08	2.07E+01	1.61E+03	4.04E+08	1.81E+01	1.39E+03	3.69E+08	1.91E+01
1.34E+03	3.43E+08	2.08E+01	1.82E+03	4.14E+08	1.53E+01	1.42E+03	3.68E+08	1.84E+01
1.50E+03	3.33E+08	2.16E+01	1.84E+03	3.99E+08	1.82E+01	1.56E+03	3.72E+08	1.86E+01
1.61E+03	3.56E+08	2.01E+01	1.87E+03	4.17E+08	1.71E+01	1.75E+03	3.73E+08	1.79E+01
1.70E+03	3.59E+08	2.03E+01	2.03E+03	4.21E+08	1.70E+01	1.81E+03	3.89E+08	1.81E+01
1.88E+03	3.35E+08	2.12E+01	2.31E+03	4.32E+08	1.92E+01	2.16E+03	4.02E+08	1.89E+01
2.08E+03	3.67E+08	2.00E+01	2.56E+03	4.31E+08	1.67E+01	2.25E+03	4.02E+08	1.79E+01
2.12E+03	3.82E+08	1.99E+01	2.88E+03	4.66E+08	1.66E+01	2.48E+03	4.11E+08	1.85E+01
2.56E+03	3.86E+08	1.98E+01	2.96E+03	4.53E+08	1.66E+01	2.77E+03	4.11E+08	1.90E+01
2.69E+03	3.99E+08	1.95E+01	3.21E+03	4.59E+08	1.65E+01	2.87E+03	4.27E+08	1.76E+01
2.98E+03	3.81E+08	2.00E+01	3.67E+03	4.64E+08	1.65E+01	3.42E+03	4.42E+08	1.81E+01
3.30E+03	4.14E+08	1.95E+01	4.05E+03	4.76E+08	1.64E+01	3.56E+03	4.40E+08	1.74E+01
3.36E+03	4.20E+08	1.91E+01	4.57E+03	4.91E+08	1.66E+01	3.93E+03	4.47E+08	1.73E+01
4.05E+03	4.25E+08	1.79E+01	4.69E+03	4.90E+08	1.61E+01	4.40E+03	4.67E+08	1.52E+01
4.26E+03	4.38E+08	1.88E+01	5.09E+03	4.97E+08	1.60E+01	4.55E+03	4.67E+08	1.71E+01
4.72E+03	4.33E+08	2.12E+01	5.81E+03	5.06E+08	1.78E+01	5.42E+03	4.76E+08	1.66E+01
5.22E+03	4.53E+08	1.87E+01	6.42E+03	5.17E+08	1.58E+01	5.64E+03	4.79E+08	1.69E+01
5.32E+03	4.59E+08	1.84E+01	7.20E+03	5.20E+08	1.64E+01	6.23E+03	4.87E+08	1.67E+01
6.42E+03	4.68E+08	1.79E+01	7.24E+03	5.45E+08	1.49E+01	6.29E+03	4.83E+08	1.97E+01

Table B.8 Summary of Complex Modulus and Phase Angle Values for Binder 5828LL with Different Aging Conditions (Continued)

STA			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
6.76E+03	4.80E+08	1.80E+01	7.43E+03	5.32E+08	1.56E+01	6.97E+03	5.24E+08	1.74E+01
7.40E+03	4.71E+08	2.15E+01	8.07E+03	5.38E+08	1.55E+01	7.21E+03	5.08E+08	1.66E+01
7.48E+03	4.68E+08	1.86E+01	9.04E+03	5.55E+08	1.57E+01	7.90E+03	4.73E+08	1.54E+01
8.28E+03	4.95E+08	1.78E+01	9.21E+03	5.47E+08	1.50E+01	8.58E+03	5.16E+08	1.66E+01
8.44E+03	5.04E+08	1.76E+01	1.02E+04	5.59E+08	1.53E+01	8.94E+03	5.22E+08	1.64E+01
9.30E+03	4.71E+08	2.03E+01	1.15E+04	5.86E+08	1.56E+01	9.87E+03	5.32E+08	1.63E+01
1.02E+04	5.10E+08	1.77E+01	1.28E+04	5.82E+08	1.50E+01	1.10E+04	5.41E+08	1.77E+01
1.18E+04	5.17E+08	1.74E+01	1.43E+04	5.65E+08	1.38E+01	1.25E+04	5.20E+08	1.89E+01
1.31E+04	5.41E+08	1.70E+01	1.46E+04	5.92E+08	1.40E+01	1.36E+04	5.68E+08	1.59E+01
1.34E+04	5.52E+08	1.68E+01	1.61E+04	6.03E+08	1.47E+01	1.42E+04	5.67E+08	1.58E+01
1.47E+04	5.21E+08	1.69E+01	1.82E+04	6.32E+08	1.41E+01	1.56E+04	5.78E+08	1.57E+01
1.61E+04	5.59E+08	1.69E+01	2.03E+04	6.27E+08	1.45E+01	1.75E+04	5.97E+08	1.49E+01
1.88E+04	5.70E+08	1.75E+01	2.15E+04	6.50E+08	1.29E+01	1.98E+04	5.66E+08	1.86E+01
2.05E+04	6.09E+08	2.02E+01	2.27E+04	6.18E+08	1.55E+01	2.04E+04	6.07E+08	1.77E+01
2.08E+04	5.88E+08	1.63E+01	2.31E+04	6.40E+08	1.44E+01	2.16E+04	6.10E+08	1.55E+01
2.12E+04	5.99E+08	1.60E+01	2.56E+04	6.50E+08	1.42E+01	2.25E+04	6.12E+08	1.53E+01
2.34E+04	5.61E+08	1.61E+01	2.70E+04	6.42E+08	1.48E+01	2.48E+04	6.25E+08	1.52E+01
2.56E+04	6.10E+08	1.60E+01	2.88E+04	6.80E+08	1.38E+01	2.57E+04	6.03E+08	1.56E+01
2.58E+04	5.98E+08	1.70E+01	3.60E+04	6.80E+08	1.59E+01	2.77E+04	6.45E+08	1.50E+01
2.98E+04	6.13E+08	1.64E+01	3.67E+04	6.92E+08	1.42E+01	3.15E+04	6.15E+08	1.71E+01
3.30E+04	6.37E+08	1.55E+01	4.05E+04	6.97E+08	1.37E+01	3.42E+04	6.62E+08	1.49E+01
3.70E+04	6.10E+08	1.82E+01	4.27E+04	6.85E+08	1.74E+01	3.93E+04	6.76E+08	1.46E+01
4.05E+04	6.61E+08	1.51E+01	4.57E+04	7.28E+08	1.34E+01	4.07E+04	6.13E+08	1.19E+01
4.08E+04	6.67E+08	1.09E+01	5.70E+04	7.08E+08	1.28E+01	4.40E+04	6.89E+08	1.47E+01

Table B.8 Summary of Complex Modulus and Phase Angle Values for Binder 5828LL with Different Aging Conditions (Continued)

STA			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
4.72E+04	6.68E+08	1.57E+01	5.81E+04	7.31E+08	1.36E+01	4.99E+04	6.87E+08	1.64E+01
5.22E+04	6.87E+08	1.47E+01	6.42E+04	7.46E+08	1.31E+01	5.42E+04	7.10E+08	1.43E+01
5.87E+04	6.72E+08	1.61E+01	6.77E+04	7.53E+08	1.21E+01	6.23E+04	7.25E+08	1.40E+01
6.42E+04	7.13E+08	1.45E+01	7.24E+04	7.79E+08	1.29E+01	6.45E+04	7.14E+08	1.97E+01
6.47E+04	6.66E+08	1.40E+01	8.21E+04	7.95E+08	1.58E+01	6.97E+04	7.36E+08	1.42E+01
7.48E+04	7.18E+08	1.48E+01	9.04E+04	7.84E+08	1.40E+01	7.90E+04	7.28E+08	1.42E+01
9.30E+04	7.00E+08	1.46E+01	9.21E+04	7.84E+08	1.31E+01	8.58E+04	7.64E+08	1.37E+01
1.02E+05	7.69E+08	1.37E+01	1.07E+05	8.29E+08	1.45E+01	1.02E+05	8.05E+08	1.20E+01
1.03E+05	8.07E+08	1.28E+01	1.15E+05	8.27E+08	1.23E+01	1.10E+05	7.96E+08	1.36E+01
1.18E+05	7.74E+08	1.40E+01	1.43E+05	8.26E+08	1.30E+01	1.25E+05	7.78E+08	1.30E+01
1.47E+05	7.73E+08	1.36E+01	1.46E+05	8.37E+08	1.24E+01	1.36E+05	8.17E+08	1.31E+01
1.61E+05	8.22E+08	1.29E+01	1.70E+05	8.30E+08	9.57E+00	1.62E+05	8.15E+08	1.54E+01
1.63E+05	8.39E+08	1.41E+01	1.82E+05	8.81E+08	1.18E+01	1.75E+05	8.51E+08	1.29E+01
1.67E+05	7.47E+08	2.40E+01	2.06E+05	9.03E+08	9.70E+00	1.98E+05	8.42E+08	1.35E+01
1.88E+05	8.29E+08	1.31E+01	2.27E+05	8.79E+08	1.19E+01	2.16E+05	8.73E+08	1.26E+01
2.10E+05	7.94E+08	1.20E+01	2.31E+05	8.88E+08	1.18E+01	2.57E+05	8.71E+08	1.41E+01
2.34E+05	8.25E+08	1.34E+01	2.57E+05	9.27E+08	1.34E+01	2.77E+05	9.06E+08	1.24E+01
2.58E+05	8.82E+08	1.33E+01	2.70E+05	9.06E+08	1.20E+01	3.15E+05	8.99E+08	1.27E+01
2.98E+05	8.88E+08	1.23E+01	3.27E+05	8.93E+08	1.06E+01	4.07E+05	9.82E+08	1.14E+01
3.32E+05	7.88E+08	1.67E+01	3.60E+05	9.36E+08	1.16E+01	4.40E+05	9.64E+08	1.18E+01
3.65E+05	9.99E+08	1.95E+01	3.67E+05	9.44E+08	1.14E+01	4.99E+05	9.56E+08	1.21E+01
3.70E+05	8.87E+08	1.26E+01	4.07E+05	1.11E+09	1.04E+01	6.45E+05	1.04E+09	1.16E+01
4.08E+05	9.24E+08	1.34E+01	4.27E+05	9.73E+08	1.39E+01	6.97E+05	1.02E+09	1.12E+01
4.59E+05	8.88E+08	6.13E+00	5.18E+05	1.00E+09	1.22E+01	7.90E+05	1.02E+09	1.15E+01

Table B.8 Summary of Complex Modulus and Phase Angle Values for Binder 5828LL with Different Aging Conditions (Continued)

STA			12days@95°C			24hr.@135°C		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
4.72E+05	9.45E+08	1.16E+01	5.70E+05	9.87E+08	1.10E+01	1.02E+06	1.08E+09	1.11E+01
5.26E+05	8.53E+08	1.30E+01	5.81E+05	9.94E+08	1.08E+01	1.25E+06	1.07E+09	1.10E+01
5.87E+05	9.44E+08	1.18E+01	6.45E+05	1.12E+09	1.27E+01	1.62E+06	1.14E+09	1.05E+01
6.47E+05	9.97E+08	1.13E+01	6.77E+05	1.01E+09	1.07E+01	1.98E+06	1.14E+09	1.03E+01
7.27E+05	9.11E+08	1.57E+01	8.21E+05	1.13E+09	9.68E+00	2.57E+06	1.20E+09	1.02E+01
7.48E+05	9.99E+08	1.09E+01	9.04E+05	1.04E+09	1.05E+01	3.15E+06	1.19E+09	9.80E+00
8.34E+05	1.00E+09	1.25E+01	9.21E+05	1.05E+09	1.03E+01	4.07E+06	1.26E+09	9.41E+00
9.30E+05	9.99E+08	1.12E+01	1.02E+06	1.10E+09	1.04E+01	6.45E+06	1.32E+09	8.94E+00
1.03E+06	1.07E+09	1.07E+01	1.07E+06	1.06E+09	1.03E+01	1.02E+07	1.38E+09	8.34E+00
1.15E+06	1.03E+09	9.79E+00	1.30E+06	1.15E+09	1.19E+01	1.16E+07	7.58E+08	1.22E+01
1.32E+06	1.03E+09	1.06E+01	1.43E+06	1.10E+09	1.00E+01	1.19E+07	8.73E+08	1.11E+01
1.47E+06	1.06E+09	1.06E+01	1.62E+06	1.16E+09	9.19E+00	1.31E+07	8.66E+08	1.15E+01
1.62E+06	1.11E+09	1.05E+01	1.70E+06	1.12E+09	9.94E+00	1.48E+07	9.51E+08	1.20E+01
1.83E+06	1.14E+09	8.38E+00	2.06E+06	1.18E+09	9.62E+00	1.84E+07	9.36E+08	1.14E+01
2.10E+06	1.09E+09	1.15E+01	2.27E+06	1.15E+09	9.46E+00	1.88E+07	9.20E+08	1.07E+01
2.34E+06	1.11E+09	9.83E+00	2.70E+06	1.18E+09	9.25E+00	2.08E+07	9.17E+08	1.12E+01
2.58E+06	1.17E+09	9.41E+00	3.27E+06	1.24E+09	9.20E+00	2.35E+07	1.01E+09	1.12E+01
2.89E+06	1.21E+09	1.10E+01	3.60E+06	1.21E+09	8.94E+00	2.91E+07	1.01E+09	1.25E+01
3.32E+06	1.16E+09	1.19E+01	4.07E+06	1.23E+09	1.24E+01	3.30E+07	9.64E+08	1.04E+01
3.70E+06	1.16E+09	9.27E+00	4.27E+06	1.24E+09	8.90E+00	3.72E+07	1.06E+09	1.05E+01
4.08E+06	1.23E+09	8.91E+00	5.18E+06	1.29E+09	8.84E+00	4.61E+07	1.03E+09	9.42E+00

Table B.9 Summary of Complex Modulus and Phase Angle Values for Binder 5828LL (Field Core)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
5.63E-06	5.64E+04	6.41E+01	4.81E-06	5.28E+04	6.90E+01	5.97E-06	3.49E+04	7.03E+01
7.07E-06	6.65E+04	6.39E+01	6.04E-06	6.20E+04	6.79E+01	7.49E-06	4.13E+04	6.95E+01
1.12E-05	9.16E+04	6.42E+01	9.57E-06	8.70E+04	6.70E+01	1.19E-05	5.86E+04	6.86E+01
1.78E-05	1.26E+05	6.34E+01	1.52E-05	1.21E+05	6.57E+01	1.88E-05	8.19E+04	6.70E+01
2.82E-05	1.75E+05	6.26E+01	2.40E-05	1.68E+05	6.44E+01	2.98E-05	1.14E+05	6.58E+01
4.46E-05	2.37E+05	6.18E+01	3.81E-05	2.31E+05	6.31E+01	4.73E-05	1.59E+05	6.46E+01
7.07E-05	3.22E+05	6.09E+01	6.04E-05	3.16E+05	6.19E+01	7.49E-05	2.18E+05	6.34E+01
7.50E-05	3.40E+05	5.96E+01	6.42E-05	3.33E+05	6.12E+01	7.61E-05	2.24E+05	6.22E+01
9.42E-05	3.95E+05	5.88E+01	8.06E-05	3.88E+05	6.05E+01	9.56E-05	2.60E+05	6.19E+01
1.12E-04	4.40E+05	5.99E+01	9.57E-05	4.31E+05	6.07E+01	1.19E-04	3.00E+05	6.22E+01
1.49E-04	5.29E+05	5.79E+01	1.28E-04	5.21E+05	5.92E+01	1.52E-04	3.53E+05	6.04E+01
1.78E-04	5.94E+05	5.89E+01	1.52E-04	5.83E+05	5.96E+01	1.88E-04	4.09E+05	6.12E+01
2.37E-04	7.09E+05	5.68E+01	2.02E-04	6.99E+05	5.78E+01	2.40E-04	4.81E+05	5.91E+01
2.82E-04	7.92E+05	5.79E+01	2.40E-04	7.84E+05	5.84E+01	2.98E-04	5.56E+05	6.01E+01
3.14E-04	8.54E+05	5.52E+01	2.64E-04	8.37E+05	5.69E+01	3.07E-04	5.67E+05	5.79E+01
3.75E-04	9.40E+05	5.54E+01	3.21E-04	9.35E+05	5.64E+01	3.81E-04	6.44E+05	5.80E+01
3.94E-04	9.85E+05	5.49E+01	3.32E-04	9.62E+05	5.59E+01	3.86E-04	6.50E+05	5.76E+01
4.46E-04	1.06E+06	5.69E+01	3.81E-04	1.05E+06	5.73E+01	4.73E-04	7.52E+05	5.90E+01
5.95E-04	1.24E+06	5.44E+01	5.09E-04	1.24E+06	5.50E+01	6.03E-04	8.61E+05	5.67E+01
6.25E-04	1.30E+06	5.34E+01	5.26E-04	1.26E+06	5.46E+01	6.12E-04	8.72E+05	5.61E+01
7.07E-04	1.41E+06	5.59E+01	6.04E-04	1.39E+06	5.62E+01	7.49E-04	1.01E+06	5.80E+01
9.42E-04	1.63E+06	5.31E+01	8.06E-04	1.62E+06	5.37E+01	9.56E-04	1.14E+06	5.55E+01
9.91E-04	1.68E+06	5.22E+01	8.33E-04	1.67E+06	5.32E+01	9.70E-04	1.16E+06	5.48E+01
1.12E-03	1.85E+06	5.49E+01	9.57E-04	1.83E+06	5.50E+01	1.19E-03	1.34E+06	5.70E+01

Table B.9 Summary of Complex Modulus and Phase Angle Values for Binder 5828LL (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
5.63E-06	5.64E+04	6.41E+01	4.81E-06	5.28E+04	6.90E+01	5.97E-06	3.49E+04	7.03E+01
1.34E-03	2.03E+06	5.13E+01	1.16E-03	2.03E+06	5.20E+01	1.34E-03	1.42E+06	5.40E+01
1.49E-03	2.13E+06	5.19E+01	1.28E-03	2.12E+06	5.23E+01	1.52E-03	1.50E+06	5.42E+01
1.57E-03	2.19E+06	5.10E+01	1.32E-03	2.17E+06	5.16E+01	1.54E-03	1.52E+06	5.35E+01
1.68E-03	2.31E+06	5.08E+01	1.45E-03	2.32E+06	5.15E+01	1.68E-03	1.64E+06	5.31E+01
1.78E-03	2.40E+06	5.40E+01	1.52E-03	2.39E+06	5.41E+01	1.88E-03	1.77E+06	5.62E+01
2.37E-03	2.74E+06	5.07E+01	2.02E-03	2.75E+06	5.10E+01	2.40E-03	1.98E+06	5.30E+01
2.49E-03	2.82E+06	4.97E+01	2.09E-03	2.81E+06	5.02E+01	2.44E-03	1.99E+06	5.21E+01
2.67E-03	2.96E+06	4.92E+01	2.30E-03	2.99E+06	4.97E+01	2.66E-03	2.10E+06	5.17E+01
2.82E-03	3.11E+06	5.37E+01	2.40E-03	3.09E+06	5.36E+01	2.98E-03	2.30E+06	5.57E+01
3.75E-03	3.54E+06	4.94E+01	3.21E-03	3.57E+06	4.97E+01	3.81E-03	2.56E+06	5.18E+01
3.94E-03	3.61E+06	4.84E+01	3.32E-03	3.61E+06	4.88E+01	3.86E-03	2.58E+06	5.08E+01
4.23E-03	3.79E+06	4.78E+01	3.65E-03	3.83E+06	4.82E+01	4.22E-03	2.77E+06	5.03E+01
5.95E-03	4.52E+06	4.83E+01	5.09E-03	4.54E+06	4.84E+01	6.03E-03	3.33E+06	5.05E+01
6.23E-03	4.76E+06	4.68E+01	5.26E-03	4.60E+06	4.74E+01	6.12E-03	3.33E+06	4.95E+01
6.25E-03	4.60E+06	4.71E+01	5.57E-03	4.80E+06	4.74E+01	6.13E-03	3.37E+06	4.92E+01
6.70E-03	4.81E+06	4.65E+01	5.78E-03	4.87E+06	4.67E+01	6.69E-03	3.47E+06	4.90E+01
7.83E-03	5.24E+06	4.58E+01	6.99E-03	5.39E+06	4.61E+01	7.69E-03	3.78E+06	4.87E+01
9.42E-03	5.69E+06	4.71E+01	8.06E-03	5.76E+06	4.72E+01	9.56E-03	4.25E+06	4.93E+01
9.91E-03	5.84E+06	4.58E+01	8.33E-03	5.81E+06	4.61E+01	9.70E-03	4.28E+06	4.82E+01
1.06E-02	6.05E+06	4.51E+01	9.16E-03	6.13E+06	4.52E+01	1.06E-02	4.44E+06	4.76E+01
1.24E-02	6.60E+06	4.46E+01	1.11E-02	6.82E+06	4.48E+01	1.22E-02	4.84E+06	4.69E+01
1.49E-02	7.25E+06	4.60E+01	1.28E-02	7.26E+06	4.60E+01	1.52E-02	5.46E+06	4.81E+01
1.57E-02	7.30E+06	4.46E+01	1.32E-02	7.34E+06	4.47E+01	1.54E-02	5.43E+06	4.69E+01

Table B.9 Summary of Complex Modulus and Phase Angle Values for Binder 5828LL (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
5.63E-06	5.64E+04	6.41E+01	4.81E-06	5.28E+04	6.90E+01	5.97E-06	3.49E+04	7.03E+01
1.68E-02	7.57E+06	4.38E+01	1.45E-02	7.68E+06	4.39E+01	1.68E-02	5.73E+06	4.61E+01
1.97E-02	8.19E+06	4.32E+01	1.76E-02	8.52E+06	4.32E+01	1.93E-02	6.12E+06	4.54E+01
2.37E-02	9.10E+06	4.48E+01	2.02E-02	9.12E+06	4.48E+01	2.40E-02	6.91E+06	4.70E+01
2.49E-02	9.13E+06	4.34E+01	2.09E-02	9.16E+06	4.35E+01	2.44E-02	6.86E+06	4.56E+01
2.67E-02	9.40E+06	4.25E+01	2.30E-02	9.61E+06	4.25E+01	2.66E-02	7.16E+06	4.47E+01
3.12E-02	1.01E+07	4.18E+01	2.78E-02	1.05E+07	4.18E+01	3.06E-02	7.73E+06	4.40E+01
3.18E-02	1.04E+07	4.22E+01	3.18E-02	1.09E+07	4.20E+01	3.18E-02	8.02E+06	4.41E+01
3.75E-02	1.13E+07	4.39E+01	3.21E-02	1.13E+07	4.39E+01	3.81E-02	8.66E+06	4.60E+01
3.94E-02	1.14E+07	4.22E+01	3.32E-02	1.13E+07	4.23E+01	3.86E-02	8.60E+06	4.44E+01
4.00E-02	1.14E+07	4.11E+01	3.65E-02	1.18E+07	4.12E+01	4.00E-02	8.87E+06	4.33E+01
4.23E-02	1.17E+07	4.13E+01	4.00E-02	1.20E+07	4.13E+01	4.22E-02	9.01E+06	4.34E+01
4.94E-02	1.25E+07	4.05E+01	4.41E-02	1.31E+07	4.03E+01	4.85E-02	9.65E+06	4.24E+01
6.25E-02	1.40E+07	4.11E+01	5.26E-02	1.40E+07	4.11E+01	6.12E-02	1.07E+07	4.32E+01
6.34E-02	1.39E+07	3.99E+01	5.78E-02	1.44E+07	4.00E+01	6.34E-02	1.08E+07	4.17E+01
6.70E-02	1.43E+07	4.01E+01	6.34E-02	1.49E+07	3.97E+01	6.69E-02	1.11E+07	4.22E+01
7.83E-02	1.53E+07	3.91E+01	6.99E-02	1.58E+07	3.90E+01	7.69E-02	1.19E+07	4.11E+01
9.91E-02	1.72E+07	4.00E+01	8.33E-02	1.72E+07	4.00E+01	9.70E-02	1.33E+07	4.21E+01
1.00E-01	1.69E+07	3.86E+01	9.16E-02	1.76E+07	3.88E+01	1.00E-01	1.33E+07	4.03E+01
1.06E-01	1.74E+07	3.90E+01	1.00E-01	1.82E+07	3.81E+01	1.06E-01	1.35E+07	4.10E+01
1.24E-01	1.85E+07	3.79E+01	1.11E-01	1.92E+07	3.77E+01	1.22E-01	1.45E+07	3.99E+01
1.57E-01	2.09E+07	3.89E+01	1.32E-01	2.09E+07	3.90E+01	1.54E-01	1.64E+07	4.10E+01
1.59E-01	2.06E+07	3.71E+01	1.45E-01	2.14E+07	3.77E+01	1.59E-01	1.63E+07	3.90E+01
1.68E-01	2.12E+07	3.79E+01	1.59E-01	2.24E+07	3.68E+01	1.68E-01	1.67E+07	3.98E+01

Table B.9 Summary of Complex Modulus and Phase Angle Values for Binder 5828LL (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
5.63E-06	5.64E+04	6.41E+01	4.81E-06	5.28E+04	6.90E+01	5.97E-06	3.49E+04	7.03E+01
1.84E-01	2.27E+07	3.68E+01	1.64E-01	2.28E+07	3.70E+01	1.93E-01	1.76E+07	3.87E+01
1.97E-01	2.24E+07	3.68E+01	1.76E-01	2.32E+07	3.66E+01	2.01E-01	1.83E+07	3.88E+01
2.31E-01	2.44E+07	3.64E+01	2.06E-01	2.49E+07	3.64E+01	2.52E-01	2.01E+07	3.76E+01
2.52E-01	2.49E+07	3.59E+01	2.30E-01	2.59E+07	3.66E+01	2.52E-01	1.98E+07	3.76E+01
2.67E-01	2.55E+07	3.68E+01	2.52E-01	2.69E+07	3.54E+01	2.66E-01	2.02E+07	3.87E+01
3.12E-01	2.69E+07	3.57E+01	2.78E-01	2.74E+07	3.55E+01	3.06E-01	2.14E+07	3.75E+01
3.67E-01	2.91E+07	3.50E+01	3.26E-01	2.97E+07	3.49E+01	3.99E-01	2.42E+07	3.66E+01
4.00E-01	2.98E+07	3.47E+01	3.65E-01	3.11E+07	3.56E+01	4.00E-01	2.38E+07	3.65E+01
4.23E-01	3.06E+07	3.59E+01	4.00E-01	3.26E+07	3.41E+01	4.22E-01	2.44E+07	3.77E+01
4.94E-01	3.21E+07	3.46E+01	4.41E-01	3.26E+07	3.45E+01	4.85E-01	2.57E+07	3.64E+01
5.81E-01	3.45E+07	3.38E+01	5.17E-01	3.52E+07	3.38E+01	6.33E-01	2.88E+07	3.51E+01
6.34E-01	3.54E+07	3.36E+01	5.78E-01	3.70E+07	3.46E+01	6.34E-01	2.85E+07	3.53E+01
6.70E-01	3.66E+07	3.49E+01	6.34E-01	3.83E+07	3.31E+01	6.69E-01	2.94E+07	3.67E+01
7.83E-01	3.82E+07	3.36E+01	6.99E-01	3.89E+07	3.35E+01	7.69E-01	3.07E+07	3.53E+01
9.21E-01	4.06E+07	3.27E+01	8.19E-01	4.17E+07	3.26E+01	1.00E+00	3.38E+07	3.41E+01
1.00E+00	4.19E+07	3.26E+01	1.00E+00	4.54E+07	3.20E+01	1.00E+00	3.41E+07	3.41E+01
1.18E+00	4.49E+07	3.23E+01	1.08E+00	4.68E+07	3.20E+01	1.13E+00	3.54E+07	3.41E+01
1.24E+00	4.50E+07	3.27E+01	1.11E+00	4.55E+07	3.26E+01	1.22E+00	3.68E+07	3.43E+01
1.46E+00	4.73E+07	3.15E+01	1.30E+00	4.90E+07	3.14E+01	1.42E+00	3.80E+07	3.35E+01
1.49E+00	4.83E+07	3.18E+01	1.35E+00	5.05E+07	3.17E+01	1.59E+00	4.02E+07	3.30E+01
1.59E+00	4.90E+07	3.16E+01	1.59E+00	5.26E+07	3.11E+01	1.59E+00	4.06E+07	3.30E+01
1.97E+00	5.29E+07	3.18E+01	1.76E+00	5.34E+07	3.17E+01	1.93E+00	4.36E+07	3.33E+01
2.31E+00	5.52E+07	3.06E+01	2.06E+00	5.70E+07	3.03E+01	2.26E+00	4.57E+07	3.22E+01

Table B.9 Summary of Complex Modulus and Phase Angle Values for Binder 5828LL (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
5.63E-06	5.64E+04	6.41E+01	4.81E-06	5.28E+04	6.90E+01	5.97E-06	3.49E+04	7.03E+01
2.36E+00	5.61E+07	3.06E+01	2.14E+00	5.90E+07	3.02E+01	2.52E+00	4.85E+07	3.15E+01
2.52E+00	5.73E+07	3.07E+01	2.52E+00	6.13E+07	3.01E+01	2.52E+00	4.79E+07	3.20E+01
3.12E+00	6.18E+07	3.10E+01	2.78E+00	6.21E+07	3.09E+01	3.06E+00	5.18E+07	3.24E+01
3.67E+00	6.48E+07	2.96E+01	3.26E+00	6.67E+07	2.93E+01	3.58E+00	5.45E+07	3.09E+01
3.74E+00	6.51E+07	2.96E+01	3.39E+00	6.79E+07	2.92E+01	3.99E+00	5.56E+07	3.07E+01
4.00E+00	6.70E+07	2.98E+01	4.00E+00	7.10E+07	2.93E+01	4.00E+00	5.63E+07	3.11E+01
5.81E+00	7.48E+07	2.86E+01	5.17E+00	7.73E+07	2.83E+01	5.67E+00	6.31E+07	3.00E+01
5.92E+00	7.56E+07	2.86E+01	5.38E+00	7.91E+07	2.83E+01	6.33E+00	6.69E+07	2.95E+01
6.34E+00	7.78E+07	2.89E+01	6.34E+00	8.15E+07	2.85E+01	6.34E+00	6.61E+07	3.01E+01
9.21E+00	8.66E+07	2.78E+01	8.19E+00	8.90E+07	2.75E+01	8.98E+00	7.39E+07	2.87E+01
9.39E+00	8.68E+07	2.76E+01	8.53E+00	9.06E+07	2.72E+01	9.74E+00	7.56E+07	2.91E+01
1.00E+01	9.00E+07	2.81E+01	1.00E+01	9.31E+07	2.77E+01	1.00E+01	7.49E+07	2.88E+01
1.41E+01	9.68E+07	2.75E+01	1.12E+01	9.70E+07	2.75E+01	1.00E+01	7.66E+07	2.93E+01
1.46E+01	9.94E+07	2.70E+01	1.30E+01	1.03E+08	2.66E+01	1.22E+01	8.06E+07	2.87E+01
1.49E+01	9.95E+07	2.68E+01	1.35E+01	1.03E+08	2.63E+01	1.42E+01	8.47E+07	2.76E+01
1.59E+01	1.04E+08	2.73E+01	1.40E+01	1.05E+08	2.58E+01	1.59E+01	8.62E+07	2.79E+01
1.77E+01	1.05E+08	2.67E+01	1.59E+01	1.06E+08	2.70E+01	1.59E+01	8.84E+07	2.85E+01
2.31E+01	1.13E+08	2.62E+01	2.06E+01	1.17E+08	2.58E+01	1.94E+01	9.27E+07	2.74E+01
2.36E+01	1.14E+08	2.58E+01	2.14E+01	1.18E+08	2.55E+01	2.26E+01	9.93E+07	2.67E+01
2.80E+01	1.20E+08	2.61E+01	2.22E+01	1.19E+08	2.56E+01	2.52E+01	9.91E+07	2.70E+01
3.67E+01	1.29E+08	2.54E+01	3.26E+01	1.34E+08	2.50E+01	3.07E+01	1.07E+08	2.60E+01
3.74E+01	1.29E+08	2.51E+01	3.36E+01	1.31E+08	2.55E+01	3.58E+01	1.12E+08	2.60E+01
4.44E+01	1.36E+08	2.48E+01	3.39E+01	1.34E+08	2.47E+01	3.99E+01	1.14E+08	2.62E+01

Table B.9 Summary of Complex Modulus and Phase Angle Values for Binder 5828LL (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
5.63E-06	5.64E+04	6.41E+01	4.81E-06	5.28E+04	6.90E+01	5.97E-06	3.49E+04	7.03E+01
4.44E+01	1.34E+08	2.60E+01	3.53E+01	1.36E+08	2.46E+01	4.16E+01	1.14E+08	2.67E+01
5.58E+01	1.44E+08	2.47E+01	4.22E+01	1.40E+08	2.44E+01	4.87E+01	1.22E+08	2.53E+01
5.81E+01	1.46E+08	2.47E+01	5.17E+01	1.52E+08	2.42E+01	5.22E+01	1.20E+08	2.58E+01
5.92E+01	1.46E+08	2.43E+01	5.38E+01	1.50E+08	2.39E+01	5.67E+01	1.24E+08	2.52E+01
7.04E+01	1.52E+08	2.37E+01	5.59E+01	1.52E+08	2.37E+01	6.33E+01	1.29E+08	2.55E+01
8.84E+01	1.62E+08	2.41E+01	6.69E+01	1.56E+08	2.38E+01	7.72E+01	1.37E+08	2.45E+01
9.21E+01	1.65E+08	2.40E+01	8.19E+01	1.72E+08	2.35E+01	8.27E+01	1.37E+08	2.50E+01
9.39E+01	1.65E+08	2.35E+01	8.53E+01	1.68E+08	2.32E+01	8.98E+01	1.42E+08	2.44E+01
1.12E+02	1.73E+08	2.32E+01	8.86E+01	1.74E+08	2.25E+01	1.00E+02	1.46E+08	2.47E+01
1.40E+02	1.82E+08	2.31E+01	1.06E+02	1.78E+08	2.30E+01	1.22E+02	1.54E+08	2.39E+01
1.48E+02	1.85E+08	2.33E+01	1.09E+02	1.77E+08	2.25E+01	1.31E+02	1.53E+08	2.42E+01
1.49E+02	1.85E+08	2.28E+01	1.35E+02	1.89E+08	2.24E+01	1.42E+02	1.59E+08	2.37E+01
1.77E+02	1.94E+08	2.25E+01	1.37E+02	1.86E+08	2.26E+01	1.45E+02	1.59E+08	2.25E+01
1.86E+02	1.95E+08	2.22E+01	1.40E+02	1.92E+08	2.19E+01	1.82E+02	1.67E+08	2.34E+01
2.22E+02	2.04E+08	2.23E+01	1.68E+02	2.02E+08	2.19E+01	1.94E+02	1.76E+08	2.28E+01
2.36E+02	2.08E+08	2.21E+01	2.14E+02	2.12E+08	2.17E+01	2.08E+02	1.78E+08	2.26E+01
2.80E+02	2.17E+08	2.18E+01	2.17E+02	2.12E+08	2.17E+01	2.26E+02	1.79E+08	2.29E+01
2.95E+02	2.18E+08	2.24E+01	2.22E+02	2.14E+08	2.13E+01	2.89E+02	1.85E+08	2.41E+01
3.52E+02	2.27E+08	2.16E+01	2.66E+02	2.21E+08	2.11E+01	3.07E+02	1.93E+08	2.21E+01
3.74E+02	2.33E+08	2.14E+01	3.39E+02	2.36E+08	2.10E+01	3.29E+02	1.98E+08	2.19E+01
4.44E+02	2.41E+08	2.09E+01	3.44E+02	2.34E+08	2.21E+01	3.58E+02	2.00E+08	2.22E+01
4.68E+02	2.42E+08	2.09E+01	3.53E+02	2.38E+08	2.05E+01	4.58E+02	2.13E+08	2.32E+01
5.04E+02	2.43E+08	2.21E+01	3.97E+02	2.29E+08	1.96E+01	4.87E+02	2.15E+08	2.15E+01

Table B.9 Summary of Complex Modulus and Phase Angle Values for Binder 5828LL (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
5.63E-06	5.64E+04	6.41E+01	4.81E-06	5.28E+04	6.90E+01	5.97E-06	3.49E+04	7.03E+01
5.58E+02	2.51E+08	2.10E+01	4.22E+02	2.45E+08	2.02E+01	5.20E+02	2.12E+08	2.42E+01
5.92E+02	2.58E+08	2.08E+01	4.98E+02	2.39E+08	2.01E+01	5.22E+02	2.23E+08	2.17E+01
6.33E+02	2.53E+08	2.03E+01	5.38E+02	2.62E+08	2.03E+01	5.67E+02	2.24E+08	2.15E+01
7.04E+02	2.66E+08	2.03E+01	5.45E+02	2.61E+08	1.97E+01	6.53E+02	2.34E+08	2.11E+01
7.41E+02	2.62E+08	2.07E+01	5.59E+02	2.64E+08	1.98E+01	7.26E+02	2.38E+08	2.08E+01
8.84E+02	2.79E+08	1.99E+01	6.69E+02	2.74E+08	1.97E+01	7.72E+02	2.41E+08	2.07E+01
1.00E+03	2.85E+08	1.98E+01	7.90E+02	2.88E+08	2.18E+01	8.27E+02	2.43E+08	2.05E+01
1.12E+03	2.94E+08	1.96E+01	8.64E+02	2.90E+08	1.94E+01	1.03E+03	2.58E+08	2.00E+01
1.17E+03	2.98E+08	1.98E+01	8.86E+02	2.90E+08	1.92E+01	1.15E+03	2.69E+08	2.08E+01
1.40E+03	3.08E+08	1.93E+01	1.06E+03	3.06E+08	1.88E+01	1.22E+03	2.68E+08	1.99E+01
1.59E+03	3.10E+08	1.80E+01	1.25E+03	3.07E+08	1.90E+01	1.31E+03	2.72E+08	1.97E+01
1.77E+03	3.24E+08	1.89E+01	1.37E+03	3.19E+08	1.82E+01	1.64E+03	2.93E+08	2.32E+01
1.86E+03	3.25E+08	1.93E+01	1.40E+03	3.18E+08	1.85E+01	1.82E+03	2.93E+08	2.01E+01
1.87E+03	3.09E+08	1.97E+01	1.48E+03	3.20E+08	2.12E+01	1.94E+03	2.92E+08	1.93E+01
2.22E+03	3.38E+08	1.86E+01	1.68E+03	3.30E+08	1.82E+01	2.08E+03	3.01E+08	1.90E+01
2.34E+03	3.26E+08	1.98E+01	1.86E+03	3.24E+08	1.98E+01	2.50E+03	3.25E+08	2.10E+01
2.52E+03	3.46E+08	1.87E+01	1.98E+03	3.53E+08	1.79E+01	2.60E+03	3.04E+08	1.71E+01
2.80E+03	3.55E+08	1.83E+01	2.17E+03	3.47E+08	1.82E+01	2.89E+03	3.13E+08	1.84E+01
2.95E+03	3.55E+08	1.82E+01	2.22E+03	3.47E+08	1.79E+01	3.07E+03	3.24E+08	1.85E+01
3.52E+03	3.69E+08	1.80E+01	2.66E+03	3.63E+08	1.75E+01	3.14E+03	3.01E+08	1.95E+01
3.71E+03	3.73E+08	1.79E+01	2.94E+03	3.64E+08	1.68E+01	3.29E+03	3.34E+08	1.82E+01
4.00E+03	3.82E+08	1.72E+01	3.14E+03	3.81E+08	1.67E+01	4.12E+03	3.38E+08	1.93E+01
4.44E+03	3.87E+08	1.76E+01	3.44E+03	3.81E+08	1.75E+01	4.58E+03	3.49E+08	1.78E+01

Table B.9 Summary of Complex Modulus and Phase Angle Values for Binder 5828LL (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
5.63E-06	5.64E+04	6.41E+01	4.81E-06	5.28E+04	6.90E+01	5.97E-06	3.49E+04	7.03E+01
4.68E+03	3.88E+08	1.77E+01	3.53E+03	3.80E+08	1.72E+01	4.87E+03	3.55E+08	1.78E+01
5.58E+03	4.03E+08	1.73E+01	4.22E+03	4.01E+08	1.67E+01	4.98E+03	3.42E+08	2.26E+01
5.88E+03	4.08E+08	1.74E+01	4.66E+03	4.13E+08	1.81E+01	5.22E+03	3.61E+08	1.76E+01
6.33E+03	4.17E+08	1.66E+01	4.98E+03	4.06E+08	1.75E+01	6.53E+03	3.70E+08	1.62E+01
7.04E+03	4.22E+08	1.70E+01	5.45E+03	4.15E+08	1.65E+01	7.26E+03	3.84E+08	1.71E+01
7.41E+03	4.23E+08	1.70E+01	5.59E+03	4.14E+08	1.65E+01	7.90E+03	3.51E+08	1.80E+01
8.84E+03	4.41E+08	1.66E+01	6.69E+03	4.32E+08	1.61E+01	8.27E+03	3.96E+08	1.68E+01
9.33E+03	4.43E+08	1.68E+01	7.39E+03	4.33E+08	1.50E+01	1.03E+04	4.03E+08	1.66E+01
9.76E+03	4.15E+08	1.76E+01	7.90E+03	4.54E+08	1.63E+01	1.15E+04	4.15E+08	1.64E+01
1.00E+04	4.58E+08	1.67E+01	8.64E+03	4.47E+08	1.56E+01	1.25E+04	3.88E+08	1.62E+01
1.17E+04	4.58E+08	1.64E+01	1.06E+04	4.71E+08	1.54E+01	1.31E+04	4.32E+08	1.61E+01
1.23E+04	4.43E+08	1.80E+01	1.17E+04	4.69E+08	1.75E+01	1.64E+04	4.36E+08	1.62E+01
1.40E+04	4.78E+08	1.60E+01	1.25E+04	4.94E+08	1.54E+01	1.65E+04	3.77E+08	1.92E+01
1.48E+04	4.89E+08	1.63E+01	1.37E+04	4.82E+08	1.52E+01	1.82E+04	4.51E+08	1.57E+01
1.59E+04	4.95E+08	1.57E+01	1.67E+04	3.90E+08	1.98E+01	1.98E+04	4.37E+08	1.51E+01
1.86E+04	4.98E+08	1.57E+01	1.68E+04	5.07E+08	1.47E+01	2.07E+04	3.88E+08	1.64E+01
1.94E+04	4.81E+08	1.68E+01	1.86E+04	5.04E+08	1.43E+01	2.08E+04	4.61E+08	1.55E+01
2.22E+04	5.17E+08	1.53E+01	1.98E+04	5.26E+08	1.43E+01	2.60E+04	4.70E+08	1.56E+01
2.34E+04	5.25E+08	1.57E+01	2.10E+04	4.48E+08	1.77E+01	2.89E+04	4.88E+08	1.49E+01
2.52E+04	5.36E+08	1.53E+01	2.17E+04	5.17E+08	1.45E+01	3.06E+04	4.38E+08	2.15E+01
2.89E+04	5.56E+08	1.69E+01	2.94E+04	5.44E+08	1.36E+01	3.14E+04	4.63E+08	1.69E+01
2.95E+04	5.38E+08	1.50E+01	3.14E+04	5.64E+08	1.40E+01	3.28E+04	4.28E+08	1.75E+01
3.08E+04	5.30E+08	1.56E+01	3.33E+04	4.75E+08	1.63E+01	3.85E+04	4.93E+08	1.12E+01

Table B.9 Summary of Complex Modulus and Phase Angle Values for Binder 5828LL (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
5.63E-06	5.64E+04	6.41E+01	4.81E-06	5.28E+04	6.90E+01	5.97E-06	3.49E+04	7.03E+01
3.64E+04	5.40E+08	1.39E+01	3.44E+04	5.56E+08	1.39E+01	4.12E+04	5.19E+08	1.49E+01
3.71E+04	5.60E+08	1.45E+01	4.66E+04	5.96E+08	1.35E+01	4.58E+04	5.25E+08	1.44E+01
4.00E+04	5.81E+08	1.44E+01	4.98E+04	6.07E+08	1.32E+01	4.98E+04	5.14E+08	1.42E+01
4.68E+04	5.80E+08	1.43E+01	5.28E+04	5.36E+08	1.67E+01	5.20E+04	4.65E+08	1.69E+01
4.88E+04	5.75E+08	1.65E+01	5.45E+04	5.97E+08	1.32E+01	6.10E+04	5.09E+08	1.10E+01
5.76E+04	5.56E+08	1.51E+01	7.39E+04	6.35E+08	1.28E+01	6.53E+04	5.53E+08	1.40E+01
5.88E+04	6.13E+08	1.41E+01	7.90E+04	6.49E+08	1.25E+01	7.26E+04	5.65E+08	1.37E+01
6.33E+04	6.24E+08	1.37E+01	8.37E+04	5.61E+08	1.49E+01	7.90E+04	5.50E+08	1.43E+01
7.41E+04	6.24E+08	1.37E+01	8.89E+04	5.48E+08	1.40E+01	8.25E+04	5.06E+08	1.73E+01
7.74E+04	6.27E+08	1.55E+01	1.12E+05	6.36E+08	1.97E+01	9.66E+04	5.38E+08	1.35E+01
8.22E+04	7.45E+08	1.27E+01	1.17E+05	6.88E+08	1.21E+01	1.03E+05	5.98E+08	1.32E+01
9.13E+04	6.59E+08	1.50E+01	1.25E+05	6.90E+08	1.18E+01	1.14E+05	6.15E+08	1.09E+01
9.33E+04	6.57E+08	1.31E+01	1.33E+05	5.83E+08	1.47E+01	1.25E+05	5.75E+08	1.37E+01
1.00E+05	6.73E+08	1.31E+01	1.77E+05	7.29E+08	1.30E+01	1.31E+05	5.28E+08	1.40E+01
1.03E+05	7.26E+08	1.78E+01	1.86E+05	7.25E+08	1.15E+01	1.53E+05	6.22E+08	1.55E+01
1.23E+05	6.57E+08	1.35E+01	1.98E+05	7.29E+08	1.12E+01	1.64E+05	6.39E+08	1.25E+01
1.48E+05	7.02E+08	1.28E+01	2.10E+05	6.59E+08	1.41E+01	1.81E+05	6.20E+08	2.33E+01
1.59E+05	7.17E+08	1.24E+01	2.13E+05	6.96E+08	7.01E+00	1.98E+05	6.11E+08	1.30E+01
1.64E+05	7.77E+08	1.01E+01	2.68E+05	8.68E+08	1.55E+01	2.07E+05	5.98E+08	1.44E+01
1.94E+05	6.81E+08	1.32E+01	2.80E+05	7.38E+08	1.31E+01	2.43E+05	6.65E+08	1.44E+01
2.29E+05	7.27E+08	1.25E+01	2.94E+05	7.71E+08	1.09E+01	2.60E+05	6.76E+08	1.19E+01
2.34E+05	7.53E+08	1.21E+01	3.33E+05	7.00E+08	1.36E+01	2.87E+05	6.44E+08	1.21E+01
2.38E+05	7.68E+08	1.16E+01	4.25E+05	9.03E+08	8.87E+00	3.14E+05	6.49E+08	1.24E+01

Table B.9 Summary of Complex Modulus and Phase Angle Values for Binder 5828LL (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
5.63E-06	5.64E+04	6.41E+01	4.81E-06	5.28E+04	6.90E+01	5.97E-06	3.49E+04	7.03E+01
2.52E+05	7.62E+08	1.18E+01	4.45E+05	7.71E+08	1.20E+01	3.28E+05	6.23E+08	1.43E+01
2.59E+05	8.70E+08	1.09E+01	4.66E+05	8.11E+08	1.02E+01	3.61E+05	6.88E+08	1.25E+01
3.08E+05	7.51E+08	1.25E+01	5.28E+05	7.24E+08	1.14E+01	3.85E+05	6.85E+08	1.43E+01
3.64E+05	8.26E+08	1.49E+01	6.73E+05	8.75E+08	1.47E+01	4.54E+05	7.41E+08	2.22E+01
3.71E+05	7.99E+08	1.15E+01	7.05E+05	8.53E+08	8.09E+00	4.55E+05	7.35E+08	1.18E+01
3.77E+05	8.47E+08	1.21E+01	7.39E+05	8.49E+08	9.60E+00	4.98E+05	6.94E+08	1.17E+01
4.11E+05	9.10E+08	1.02E+01	8.37E+05	7.63E+08	1.15E+01	5.20E+05	6.62E+08	1.26E+01
4.88E+05	7.91E+08	1.18E+01	1.07E+06	9.79E+08	9.68E+00	6.10E+05	7.73E+08	1.01E+01
5.76E+05	9.10E+08	1.15E+01	1.12E+06	9.47E+08	1.60E+01	7.21E+05	9.14E+08	1.14E+01
5.88E+05	8.43E+08	1.09E+01	1.33E+06	8.09E+08	1.05E+01	7.90E+05	7.43E+08	1.09E+01
5.98E+05	9.30E+08	1.05E+01	1.69E+06	1.07E+09	6.70E+00	8.25E+05	7.10E+08	1.17E+01
6.51E+05	9.12E+08	1.21E+01	1.77E+06	8.41E+08	1.32E+01	9.66E+05	7.70E+08	9.55E+00
7.74E+05	8.41E+08	1.11E+01	2.10E+06	8.59E+08	9.90E+00	1.14E+06	8.73E+08	1.22E+01
9.13E+05	8.87E+08	1.05E+01	2.68E+06	9.66E+08	7.09E+00	1.14E+06	8.00E+08	1.22E+01
9.33E+05	8.89E+08	1.03E+01	2.80E+06	9.58E+08	1.05E+01	1.25E+06	7.74E+08	1.04E+01
9.48E+05	9.90E+08	1.17E+01	3.33E+06	8.96E+08	9.32E+00	1.31E+06	7.54E+08	1.10E+01
1.03E+06	9.01E+08	1.44E+01	4.25E+06	1.12E+09	8.16E+00	1.53E+06	8.40E+08	9.93E+00
1.23E+06	8.89E+08	1.06E+01	4.45E+06	9.97E+08	8.16E+00	1.81E+06	8.44E+08	8.27E+00
1.45E+06	9.41E+08	1.00E+01	5.28E+06	9.38E+08	8.71E+00	1.81E+06	8.56E+08	1.00E+01
1.64E+06	1.01E+09	1.87E+01	6.73E+06	1.15E+09	9.14E+00	2.07E+06	7.87E+08	1.05E+01
1.94E+06	9.35E+08	9.93E+00	7.05E+06	1.07E+09	7.97E+00	2.43E+06	8.68E+08	9.40E+00
2.29E+06	9.96E+08	9.88E+00	8.37E+06	9.72E+08	8.25E+00	2.86E+06	9.18E+08	1.05E+01
2.38E+06	1.07E+09	1.34E+01	1.07E+07	1.15E+09	7.70E+00	2.87E+06	9.43E+08	9.83E+00

Table B.9 Summary of Complex Modulus and Phase Angle Values for Binder 5828LL (Field Core) (Continued)

Field Core L1			Field Core L2			Field Core L3		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
5.63E-06	5.64E+04	6.41E+01	4.81E-06	5.28E+04	6.90E+01	5.97E-06	3.49E+04	7.03E+01
3.08E+06	9.81E+08	9.35E+00	1.12E+07	1.12E+09	6.98E+00	3.28E+06	8.38E+08	9.77E+00
3.64E+06	1.04E+09	9.12E+00	1.69E+07	1.18E+09	6.10E+00	3.85E+06	9.08E+08	8.96E+00
3.77E+06	1.21E+09	6.30E+00	1.77E+07	1.14E+09	6.73E+00	4.54E+06	9.97E+08	9.76E+00
4.11E+06	1.11E+09	8.81E+00	2.68E+07	1.22E+09	6.53E+00	4.55E+06	9.48E+08	9.46E+00
4.88E+06	1.03E+09	8.80E+00	2.80E+07	1.18E+09	6.27E+00	5.20E+06	8.80E+08	9.13E+00
5.76E+06	1.09E+09	8.28E+00	4.25E+07	1.26E+09	5.85E+00	6.10E+06	9.57E+08	8.36E+00

Table B.10 Summary of Complex Modulus and Phase Angle Values for Binder 6428SV with Different Aging Conditions

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
6.69E-06	1.34E+04	6.75E+01	4.99E-06	4.16E+04	6.53E+01	4.40E-06	1.21E+05	6.00E+01	4.41E-06	6.58E+04	5.61E+01
8.41E-06	1.45E+04	6.76E+01	6.27E-06	4.85E+04	6.49E+01	5.52E-06	1.39E+05	5.89E+01	5.54E-06	7.49E+04	5.51E+01
1.33E-05	1.86E+04	6.95E+01	9.93E-06	6.54E+04	6.42E+01	8.76E-06	1.84E+05	5.83E+01	8.78E-06	9.85E+04	5.49E+01
2.11E-05	2.41E+04	7.03E+01	1.57E-05	8.97E+04	6.28E+01	1.39E-05	2.42E+05	5.67E+01	1.39E-05	1.28E+05	5.36E+01
3.35E-05	3.25E+04	7.04E+01	2.50E-05	1.21E+05	6.16E+01	2.20E-05	3.18E+05	5.54E+01	2.20E-05	1.66E+05	5.28E+01
5.30E-05	4.40E+04	7.05E+01	3.96E-05	1.65E+05	6.04E+01	3.49E-05	4.14E+05	5.42E+01	3.49E-05	2.15E+05	5.21E+01
8.41E-05	6.08E+04	7.00E+01	6.27E-05	2.21E+05	5.95E+01	5.52E-05	5.38E+05	5.31E+01	5.54E-05	2.77E+05	5.15E+01
8.49E-05	6.11E+04	6.69E+01	7.22E-05	2.45E+05	5.70E+01	6.56E-05	6.00E+05	5.23E+01	6.70E-05	3.14E+05	4.97E+01
1.07E-04	7.09E+04	6.61E+01	9.07E-05	2.82E+05	5.68E+01	8.24E-05	6.72E+05	5.16E+01	8.42E-05	3.55E+05	4.94E+01
1.33E-04	8.38E+04	6.93E+01	9.93E-05	2.97E+05	5.84E+01	8.76E-05	6.93E+05	5.21E+01	8.78E-05	3.56E+05	5.09E+01
1.69E-04	9.62E+04	6.61E+01	1.44E-04	3.73E+05	5.56E+01	1.31E-04	8.67E+05	5.05E+01	1.33E-04	4.51E+05	4.85E+01
2.11E-04	1.17E+05	6.86E+01	1.57E-04	3.95E+05	5.74E+01	1.39E-04	8.90E+05	5.11E+01	1.39E-04	4.56E+05	5.05E+01
2.68E-04	1.32E+05	6.55E+01	2.28E-04	4.92E+05	5.45E+01	2.07E-04	1.11E+06	4.93E+01	2.11E-04	5.73E+05	4.77E+01
3.35E-04	1.62E+05	6.77E+01	2.50E-04	5.23E+05	5.65E+01	2.20E-04	1.14E+06	5.03E+01	2.20E-04	5.82E+05	5.00E+01
3.41E-04	1.59E+05	6.29E+01	3.01E-04	5.86E+05	5.36E+01	2.97E-04	1.34E+06	4.82E+01	2.98E-04	6.83E+05	4.66E+01
4.24E-04	1.81E+05	6.48E+01	3.61E-04	6.43E+05	5.36E+01	3.28E-04	1.40E+06	4.80E+01	3.35E-04	7.26E+05	4.71E+01
4.28E-04	1.84E+05	6.32E+01	3.78E-04	6.71E+05	5.31E+01	3.49E-04	1.44E+06	4.95E+01	3.49E-04	7.44E+05	4.97E+01
5.30E-04	2.26E+05	6.70E+01	3.96E-04	6.92E+05	5.56E+01	3.73E-04	1.51E+06	4.76E+01	3.74E-04	7.73E+05	4.65E+01
6.72E-04	2.49E+05	6.40E+01	5.72E-04	8.40E+05	5.25E+01	5.20E-04	1.76E+06	4.70E+01	5.31E-04	9.14E+05	4.65E+01
6.79E-04	2.53E+05	6.25E+01	6.00E-04	8.69E+05	5.19E+01	5.52E-04	1.82E+06	4.87E+01	5.54E-04	9.48E+05	4.94E+01
8.41E-04	3.12E+05	6.63E+01	6.27E-04	9.10E+05	5.48E+01	5.91E-04	1.89E+06	4.63E+01	5.93E-04	9.80E+05	4.54E+01
1.07E-03	3.42E+05	6.30E+01	9.07E-04	1.09E+06	5.15E+01	8.24E-04	2.21E+06	4.60E+01	8.42E-04	1.15E+06	4.59E+01
1.08E-03	3.44E+05	6.18E+01	9.50E-04	1.13E+06	5.08E+01	8.76E-04	2.30E+06	4.80E+01	8.78E-04	1.20E+06	4.93E+01
1.33E-03	4.30E+05	6.59E+01	9.93E-04	1.19E+06	5.41E+01	9.36E-04	2.36E+06	4.52E+01	9.39E-04	1.23E+06	4.47E+01

Table B.10 Summary of Complex Modulus and Phase Angle Values for Binder 6428SV with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
1.39E-03	4.10E+05	6.10E+01	1.33E-03	1.38E+06	4.99E+01	1.30E-03	2.80E+06	4.46E+01	1.30E-03	1.46E+06	4.42E+01
1.69E-03	4.69E+05	6.21E+01	1.44E-03	1.41E+06	5.05E+01	1.31E-03	2.76E+06	4.50E+01	1.33E-03	1.44E+06	4.54E+01
1.70E-03	4.66E+05	6.11E+01	1.51E-03	1.45E+06	4.97E+01	1.39E-03	2.88E+06	4.75E+01	1.39E-03	1.51E+06	4.94E+01
1.75E-03	4.79E+05	6.05E+01	1.57E-03	1.53E+06	5.37E+01	1.48E-03	2.95E+06	4.41E+01	1.49E-03	1.53E+06	4.41E+01
2.11E-03	5.84E+05	6.60E+01	1.67E-03	1.55E+06	4.94E+01	1.63E-03	3.11E+06	4.42E+01	1.63E-03	1.63E+06	4.34E+01
2.68E-03	6.36E+05	6.11E+01	2.28E-03	1.81E+06	4.96E+01	2.07E-03	3.43E+06	4.41E+01	2.11E-03	1.80E+06	4.49E+01
2.70E-03	6.33E+05	6.00E+01	2.39E-03	1.85E+06	4.86E+01	2.35E-03	3.65E+06	4.30E+01	2.20E-03	1.88E+06	5.02E+01
2.78E-03	6.43E+05	5.95E+01	2.64E-03	1.99E+06	4.81E+01	2.58E-03	3.84E+06	4.28E+01	2.36E-03	1.91E+06	4.34E+01
4.24E-03	8.65E+05	6.00E+01	3.61E-03	2.32E+06	4.87E+01	3.28E-03	4.22E+06	4.33E+01	2.58E-03	2.02E+06	4.29E+01
4.28E-03	8.50E+05	5.90E+01	3.78E-03	2.37E+06	4.76E+01	3.73E-03	4.49E+06	4.20E+01	3.35E-03	2.24E+06	4.45E+01
4.40E-03	8.66E+05	5.84E+01	4.19E-03	2.52E+06	4.70E+01	4.09E-03	4.72E+06	4.17E+01	3.74E-03	2.37E+06	4.28E+01
6.43E-03	1.13E+06	5.67E+01	5.72E-03	2.93E+06	4.78E+01	5.20E-03	5.19E+06	4.25E+01	4.09E-03	2.50E+06	4.22E+01
6.72E-03	1.17E+06	5.90E+01	6.00E-03	3.01E+06	4.65E+01	5.91E-03	5.51E+06	4.10E+01	5.31E-03	2.79E+06	4.41E+01
6.79E-03	1.14E+06	5.78E+01	6.27E-03	3.14E+06	4.60E+01	6.25E-03	5.79E+06	4.09E+01	5.93E-03	2.94E+06	4.23E+01
6.97E-03	1.16E+06	5.72E+01	6.64E-03	3.17E+06	4.58E+01	6.48E-03	5.77E+06	4.07E+01	6.31E-03	3.11E+06	4.13E+01
8.07E-03	1.30E+06	5.61E+01	7.87E-03	3.49E+06	4.53E+01	7.85E-03	6.35E+06	4.03E+01	6.48E-03	3.08E+06	4.14E+01
1.07E-02	1.57E+06	5.79E+01	9.07E-03	3.72E+06	4.70E+01	8.24E-03	6.37E+06	4.18E+01	7.93E-03	3.45E+06	4.06E+01
1.08E-02	1.53E+06	5.67E+01	9.50E-03	3.79E+06	4.55E+01	9.36E-03	6.74E+06	4.01E+01	8.42E-03	3.47E+06	4.37E+01
1.11E-02	1.55E+06	5.60E+01	1.05E-02	3.98E+06	4.47E+01	1.03E-02	7.04E+06	3.96E+01	9.39E-03	3.64E+06	4.18E+01
1.28E-02	1.71E+06	5.49E+01	1.25E-02	4.39E+06	4.41E+01	1.24E-02	7.76E+06	3.91E+01	1.03E-02	3.79E+06	4.09E+01
1.69E-02	2.08E+06	5.70E+01	1.44E-02	4.69E+06	4.61E+01	1.31E-02	7.79E+06	4.11E+01	1.26E-02	4.22E+06	3.99E+01
1.70E-02	2.02E+06	5.55E+01	1.51E-02	4.76E+06	4.46E+01	1.48E-02	8.21E+06	3.93E+01	1.33E-02	4.31E+06	4.34E+01
1.75E-02	2.05E+06	5.46E+01	1.67E-02	4.99E+06	4.37E+01	1.63E-02	8.53E+06	3.86E+01	1.49E-02	4.48E+06	4.13E+01
2.03E-02	2.25E+06	5.37E+01	1.98E-02	5.46E+06	4.30E+01	1.97E-02	9.35E+06	3.81E+01	1.63E-02	4.65E+06	4.03E+01

Table B.10 Summary of Complex Modulus and Phase Angle Values for Binder 6428SV with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
2.68E-02	2.74E+06	5.61E+01	2.28E-02	5.87E+06	4.53E+01	2.07E-02	9.50E+06	4.04E+01	1.99E-02	5.13E+06	3.93E+01
2.70E-02	2.68E+06	5.43E+01	2.39E-02	5.92E+06	4.37E+01	2.35E-02	9.93E+06	3.85E+01	2.11E-02	5.35E+06	4.29E+01
2.78E-02	2.70E+06	5.34E+01	2.64E-02	6.20E+06	4.27E+01	2.58E-02	1.03E+07	3.78E+01	2.36E-02	5.49E+06	4.09E+01
3.18E-02	2.99E+06	5.25E+01	3.13E-02	6.73E+06	4.18E+01	3.13E-02	1.13E+07	3.70E+01	2.58E-02	5.69E+06	3.97E+01
3.21E-02	2.94E+06	5.22E+01	3.18E-02	6.88E+06	4.21E+01	3.18E-02	1.14E+07	3.75E+01	3.16E-02	6.28E+06	3.86E+01
4.00E-02	3.39E+06	5.13E+01	3.61E-02	7.28E+06	4.50E+01	3.28E-02	1.14E+07	4.01E+01	3.18E-02	6.42E+06	3.86E+01
4.24E-02	3.58E+06	5.55E+01	3.78E-02	7.35E+06	4.28E+01	3.73E-02	1.20E+07	3.78E+01	3.74E-02	6.71E+06	4.05E+01
4.28E-02	3.52E+06	5.32E+01	4.00E-02	7.59E+06	4.16E+01	4.00E-02	1.25E+07	3.71E+01	4.00E-02	7.08E+06	3.80E+01
4.40E-02	3.54E+06	5.21E+01	4.19E-02	7.65E+06	4.17E+01	4.09E-02	1.24E+07	3.69E+01	4.09E-02	6.93E+06	3.92E+01
5.09E-02	3.83E+06	5.11E+01	4.97E-02	8.33E+06	4.08E+01	4.95E-02	1.35E+07	3.61E+01	5.00E-02	7.64E+06	3.80E+01
6.34E-02	4.35E+06	5.01E+01	6.00E-02	9.09E+06	4.20E+01	5.91E-02	1.45E+07	3.71E+01	5.93E-02	8.22E+06	4.01E+01
6.79E-02	4.58E+06	5.20E+01	6.34E-02	9.34E+06	4.04E+01	6.34E-02	1.49E+07	3.58E+01	6.34E-02	8.50E+06	3.72E+01
6.97E-02	4.59E+06	5.08E+01	6.64E-02	9.42E+06	4.08E+01	6.48E-02	1.49E+07	3.62E+01	6.48E-02	8.44E+06	3.88E+01
8.07E-02	4.95E+06	4.95E+01	7.87E-02	1.02E+07	3.98E+01	7.85E-02	1.61E+07	3.52E+01	7.93E-02	9.21E+06	3.74E+01
1.00E-01	5.60E+06	4.87E+01	9.50E-02	1.12E+07	4.13E+01	9.36E-02	1.74E+07	3.65E+01	9.39E-02	1.01E+07	3.98E+01
1.08E-01	5.91E+06	5.10E+01	1.00E-01	1.14E+07	3.93E+01	1.00E-01	1.78E+07	3.48E+01	1.00E-01	1.03E+07	3.67E+01
1.11E-01	5.93E+06	4.96E+01	1.05E-01	1.16E+07	4.00E+01	1.03E-01	1.79E+07	3.54E+01	1.03E-01	1.02E+07	3.84E+01
1.28E-01	6.30E+06	4.83E+01	1.25E-01	1.24E+07	3.88E+01	1.24E-01	1.92E+07	3.43E+01	1.26E-01	1.11E+07	3.69E+01
1.59E-01	7.13E+06	4.73E+01	1.51E-01	1.37E+07	4.07E+01	1.48E-01	2.08E+07	3.60E+01	1.59E-01	1.24E+07	3.61E+01
1.70E-01	7.54E+06	5.03E+01	1.59E-01	1.39E+07	3.82E+01	1.59E-01	2.11E+07	3.40E+01	1.63E-01	1.24E+07	3.79E+01
1.72E-01	7.53E+06	4.72E+01	1.67E-01	1.41E+07	3.91E+01	1.63E-01	2.13E+07	3.47E+01	1.82E-01	1.33E+07	3.61E+01
1.75E-01	7.56E+06	4.84E+01	1.76E-01	1.45E+07	3.87E+01	1.84E-01	2.24E+07	3.43E+01	1.99E-01	1.34E+07	3.64E+01
2.03E-01	8.05E+06	4.70E+01	1.98E-01	1.51E+07	3.79E+01	1.97E-01	2.27E+07	3.36E+01	2.28E-01	1.46E+07	3.53E+01
2.16E-01	8.47E+06	4.63E+01	2.21E-01	1.60E+07	3.76E+01	2.32E-01	2.44E+07	3.37E+01	2.52E-01	1.49E+07	3.54E+01

Table B.10 Summary of Complex Modulus and Phase Angle Values for Binder 6428SV with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
2.52E-01	9.04E+06	4.59E+01	2.52E-01	1.68E+07	3.71E+01	2.52E-01	2.49E+07	3.30E+01	2.58E-01	1.50E+07	3.75E+01
2.78E-01	9.59E+06	4.72E+01	2.64E-01	1.71E+07	3.84E+01	2.58E-01	2.51E+07	3.41E+01	3.16E-01	1.61E+07	3.59E+01
3.21E-01	1.02E+07	4.57E+01	3.13E-01	1.82E+07	3.70E+01	3.13E-01	2.68E+07	3.29E+01	3.62E-01	1.73E+07	3.47E+01
3.43E-01	1.06E+07	4.47E+01	3.50E-01	1.92E+07	3.66E+01	3.67E-01	2.85E+07	3.26E+01	4.00E-01	1.77E+07	3.49E+01
4.00E-01	1.13E+07	4.46E+01	4.00E-01	2.02E+07	3.63E+01	4.00E-01	2.93E+07	3.23E+01	4.09E-01	1.80E+07	3.71E+01
4.40E-01	1.21E+07	4.61E+01	4.19E-01	2.07E+07	3.77E+01	4.09E-01	2.97E+07	3.35E+01	5.00E-01	1.93E+07	3.55E+01
5.09E-01	1.28E+07	4.45E+01	4.97E-01	2.20E+07	3.62E+01	4.95E-01	3.15E+07	3.22E+01	5.73E-01	2.06E+07	3.42E+01
5.44E-01	1.32E+07	4.34E+01	5.55E-01	2.30E+07	3.57E+01	5.82E-01	3.34E+07	3.16E+01	6.34E-01	2.11E+07	3.43E+01
6.34E-01	1.42E+07	4.33E+01	6.34E-01	2.41E+07	3.53E+01	6.34E-01	3.44E+07	3.14E+01	6.48E-01	2.17E+07	3.67E+01
6.97E-01	1.52E+07	4.51E+01	6.64E-01	2.49E+07	3.70E+01	6.48E-01	3.51E+07	3.30E+01	7.93E-01	2.31E+07	3.50E+01
8.07E-01	1.60E+07	4.33E+01	7.87E-01	2.63E+07	3.54E+01	7.85E-01	3.69E+07	3.16E+01	9.08E-01	2.44E+07	3.35E+01
8.62E-01	1.64E+07	4.22E+01	8.79E-01	2.75E+07	3.46E+01	9.22E-01	3.92E+07	3.09E+01	1.00E+00	2.52E+07	3.38E+01
1.00E+00	1.75E+07	4.20E+01	1.00E+00	2.88E+07	3.45E+01	1.00E+00	4.01E+07	3.07E+01	1.11E+00	2.65E+07	3.35E+01
1.08E+00	1.82E+07	4.18E+01	1.11E+00	3.01E+07	3.49E+01	1.11E+00	4.21E+07	3.13E+01	1.26E+00	2.75E+07	3.47E+01
1.28E+00	1.99E+07	4.22E+01	1.25E+00	3.14E+07	3.47E+01	1.24E+00	4.32E+07	3.10E+01	1.40E+00	2.87E+07	3.29E+01
1.35E+00	2.01E+07	4.10E+01	1.39E+00	3.27E+07	3.39E+01	1.40E+00	4.52E+07	3.03E+01	1.44E+00	2.88E+07	3.29E+01
1.37E+00	2.02E+07	4.07E+01	1.39E+00	3.26E+07	3.37E+01	1.46E+00	4.55E+07	2.99E+01	1.59E+00	2.98E+07	3.34E+01
1.59E+00	2.16E+07	4.08E+01	1.59E+00	3.41E+07	3.37E+01	1.59E+00	4.66E+07	3.01E+01	1.99E+00	3.27E+07	3.42E+01
2.03E+00	2.45E+07	4.11E+01	1.98E+00	3.73E+07	3.40E+01	1.97E+00	5.04E+07	3.04E+01	2.21E+00	3.40E+07	3.24E+01
2.14E+00	2.47E+07	3.96E+01	2.20E+00	3.86E+07	3.31E+01	2.22E+00	5.21E+07	2.96E+01	2.28E+00	3.41E+07	3.23E+01
2.16E+00	2.48E+07	3.94E+01	2.21E+00	3.86E+07	3.28E+01	2.32E+00	5.30E+07	2.92E+01	2.52E+00	3.53E+07	3.30E+01
2.52E+00	2.65E+07	3.97E+01	2.52E+00	4.05E+07	3.29E+01	2.52E+00	5.41E+07	2.94E+01	3.16E+00	3.88E+07	3.39E+01
3.21E+00	2.99E+07	4.01E+01	3.13E+00	4.43E+07	3.32E+01	3.13E+00	5.87E+07	2.99E+01	3.51E+00	3.98E+07	3.18E+01
3.39E+00	3.00E+07	3.83E+01	3.49E+00	4.53E+07	3.22E+01	3.51E+00	6.02E+07	2.87E+01	3.62E+00	4.02E+07	3.18E+01

Table B.10 Summary of Complex Modulus and Phase Angle Values for Binder 6428SV with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
3.43E+00	3.02E+07	3.83E+01	3.50E+00	4.55E+07	3.19E+01	3.67E+00	6.10E+07	2.85E+01	4.00E+00	4.16E+07	3.24E+01
4.00E+00	3.22E+07	3.86E+01	4.00E+00	4.77E+07	3.21E+01	4.00E+00	6.27E+07	2.88E+01	5.56E+00	4.68E+07	3.10E+01
5.38E+00	3.65E+07	3.70E+01	5.53E+00	5.35E+07	3.12E+01	5.56E+00	6.96E+07	2.80E+01	5.73E+00	4.71E+07	3.12E+01
5.44E+00	3.65E+07	3.71E+01	5.55E+00	5.34E+07	3.11E+01	5.82E+00	7.04E+07	2.78E+01	6.34E+00	4.90E+07	3.19E+01
6.34E+00	3.92E+07	3.75E+01	6.34E+00	5.59E+07	3.14E+01	6.34E+00	7.22E+07	2.83E+01	8.80E+00	5.49E+07	3.05E+01
8.53E+00	4.38E+07	3.58E+01	8.76E+00	6.21E+07	3.03E+01	8.82E+00	7.96E+07	2.71E+01	9.08E+00	5.51E+07	3.07E+01
8.62E+00	4.39E+07	3.60E+01	8.79E+00	6.22E+07	3.03E+01	9.22E+00	8.07E+07	2.72E+01	1.00E+01	5.76E+07	3.15E+01
1.00E+01	4.71E+07	3.64E+01	1.00E+01	6.53E+07	3.07E+01	1.00E+01	8.30E+07	2.78E+01	1.07E+01	5.92E+07	3.05E+01
1.35E+01	5.23E+07	3.45E+01	1.17E+01	6.79E+07	3.04E+01	1.10E+01	8.61E+07	2.72E+01	1.34E+01	6.36E+07	2.98E+01
1.37E+01	5.26E+07	3.49E+01	1.39E+01	7.24E+07	2.95E+01	1.39E+01	9.23E+07	2.66E+01	1.40E+01	6.38E+07	2.98E+01
1.42E+01	5.38E+07	3.51E+01	1.39E+01	7.25E+07	2.95E+01	1.40E+01	9.13E+07	2.65E+01	1.44E+01	6.43E+07	3.02E+01
1.59E+01	5.65E+07	3.54E+01	1.47E+01	7.31E+07	2.97E+01	1.46E+01	9.22E+07	2.66E+01	1.59E+01	6.75E+07	3.11E+01
1.78E+01	5.90E+07	3.45E+01	1.59E+01	7.62E+07	3.00E+01	1.59E+01	9.56E+07	2.72E+01	2.12E+01	7.42E+07	2.90E+01
2.14E+01	6.25E+07	3.34E+01	2.20E+01	8.38E+07	2.85E+01	2.20E+01	1.04E+08	2.58E+01	2.21E+01	7.43E+07	2.92E+01
2.16E+01	6.24E+07	3.39E+01	2.21E+01	8.40E+07	2.88E+01	2.22E+01	1.04E+08	2.57E+01	2.28E+01	7.48E+07	2.97E+01
2.83E+01	6.94E+07	3.30E+01	2.33E+01	8.51E+07	2.92E+01	2.32E+01	1.05E+08	2.60E+01	3.36E+01	8.58E+07	2.88E+01
3.39E+01	7.42E+07	3.23E+01	3.49E+01	9.68E+07	2.77E+01	3.48E+01	1.18E+08	2.51E+01	3.51E+01	8.60E+07	2.86E+01
3.43E+01	7.41E+07	3.28E+01	3.50E+01	9.68E+07	2.81E+01	3.51E+01	1.18E+08	2.51E+01	3.51E+01	8.69E+07	2.91E+01
4.48E+01	8.16E+07	3.18E+01	3.69E+01	9.86E+07	2.79E+01	3.57E+01	1.19E+08	2.58E+01	3.62E+01	8.69E+07	2.92E+01
4.59E+01	8.24E+07	3.22E+01	4.43E+01	1.03E+08	2.81E+01	3.67E+01	1.20E+08	2.55E+01	4.40E+01	9.23E+07	2.83E+01
5.38E+01	8.68E+07	3.13E+01	5.53E+01	1.11E+08	2.70E+01	4.48E+01	1.28E+08	2.53E+01	5.33E+01	9.88E+07	2.79E+01
5.44E+01	8.71E+07	3.19E+01	5.55E+01	1.12E+08	2.74E+01	5.52E+01	1.35E+08	2.44E+01	5.56E+01	9.94E+07	2.81E+01
5.76E+01	8.85E+07	3.17E+01	5.56E+01	1.10E+08	2.75E+01	5.56E+01	1.34E+08	2.45E+01	5.73E+01	1.01E+08	2.87E+01
7.10E+01	9.54E+07	3.07E+01	5.85E+01	1.13E+08	2.68E+01	5.82E+01	1.36E+08	2.49E+01	6.98E+01	1.07E+08	2.78E+01

Table B.10 Summary of Complex Modulus and Phase Angle Values for Binder 6428SV with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
8.53E+01	1.02E+08	3.03E+01	8.76E+01	1.27E+08	2.63E+01	7.10E+01	1.43E+08	2.42E+01	8.45E+01	1.13E+08	2.68E+01
8.62E+01	1.02E+08	3.09E+01	8.79E+01	1.29E+08	2.67E+01	8.75E+01	1.52E+08	2.36E+01	8.80E+01	1.15E+08	2.75E+01
9.14E+01	1.04E+08	3.04E+01	8.81E+01	1.26E+08	2.66E+01	8.82E+01	1.52E+08	2.39E+01	9.08E+01	1.16E+08	2.83E+01
1.13E+02	1.10E+08	2.99E+01	9.27E+01	1.30E+08	2.61E+01	9.22E+01	1.55E+08	2.44E+01	1.11E+02	1.24E+08	2.71E+01
1.35E+02	1.18E+08	2.93E+01	1.39E+02	1.45E+08	2.55E+01	1.13E+02	1.61E+08	2.34E+01	1.19E+02	1.24E+08	2.66E+01
1.45E+02	1.20E+08	2.93E+01	1.40E+02	1.45E+08	2.59E+01	1.19E+02	1.64E+08	2.45E+01	1.34E+02	1.31E+08	2.62E+01
1.48E+02	1.20E+08	3.06E+01	1.47E+02	1.48E+08	2.52E+01	1.39E+02	1.70E+08	2.30E+01	1.40E+02	1.32E+08	2.68E+01
1.78E+02	1.28E+08	2.85E+01	1.99E+02	1.60E+08	2.58E+01	1.40E+02	1.70E+08	2.34E+01	1.49E+02	1.33E+08	2.71E+01
1.86E+02	1.29E+08	2.90E+01	2.20E+02	1.64E+08	2.48E+01	1.50E+02	1.71E+08	2.32E+01	1.75E+02	1.40E+08	2.62E+01
2.14E+02	1.37E+08	2.83E+01	2.21E+02	1.65E+08	2.49E+01	1.78E+02	1.81E+08	2.29E+01	2.12E+02	1.49E+08	2.58E+01
2.29E+02	1.37E+08	2.81E+01	2.33E+02	1.67E+08	2.44E+01	2.20E+02	1.92E+08	2.23E+01	2.21E+02	1.51E+08	2.62E+01
2.83E+02	1.49E+08	2.76E+01	2.50E+02	1.70E+08	2.53E+01	2.22E+02	1.91E+08	2.28E+01	2.36E+02	1.53E+08	2.52E+01
2.95E+02	1.49E+08	2.75E+01	3.49E+02	1.87E+08	2.41E+01	2.37E+02	1.95E+08	2.21E+01	2.78E+02	1.60E+08	2.55E+01
3.39E+02	1.58E+08	2.73E+01	3.51E+02	1.87E+08	2.40E+01	2.83E+02	2.03E+08	2.21E+01	3.36E+02	1.69E+08	2.52E+01
3.64E+02	1.59E+08	2.71E+01	3.69E+02	1.90E+08	2.36E+01	3.48E+02	2.13E+08	2.18E+01	3.51E+02	1.72E+08	2.57E+01
4.48E+02	1.69E+08	2.65E+01	3.96E+02	1.88E+08	2.36E+01	3.51E+02	2.15E+08	2.22E+01	3.75E+02	1.75E+08	2.55E+01
4.68E+02	1.70E+08	2.69E+01	5.53E+02	2.10E+08	2.34E+01	3.76E+02	2.14E+08	2.18E+01	3.84E+02	1.73E+08	2.54E+01
4.93E+02	1.74E+08	2.72E+01	5.56E+02	2.12E+08	2.31E+01	4.31E+02	2.20E+08	2.05E+01	4.40E+02	1.81E+08	2.47E+01
5.38E+02	1.80E+08	2.64E+01	5.85E+02	2.14E+08	2.29E+01	4.48E+02	2.27E+08	2.13E+01	4.82E+02	1.88E+08	2.42E+01
5.76E+02	1.83E+08	2.60E+01	6.12E+02	2.14E+08	2.25E+01	5.41E+02	2.34E+08	2.28E+01	5.33E+02	1.93E+08	2.44E+01
6.20E+02	1.80E+08	2.67E+01	6.28E+02	2.15E+08	2.33E+01	5.52E+02	2.38E+08	2.12E+01	5.56E+02	1.95E+08	2.50E+01
7.10E+02	1.93E+08	2.55E+01	7.69E+02	2.30E+08	2.38E+01	5.56E+02	2.40E+08	2.17E+01	5.94E+02	1.96E+08	2.45E+01
7.42E+02	1.93E+08	2.51E+01	8.81E+02	2.36E+08	2.22E+01	5.96E+02	2.41E+08	2.05E+01	6.98E+02	2.07E+08	2.40E+01
9.14E+02	2.07E+08	2.51E+01	9.27E+02	2.40E+08	2.22E+01	7.10E+02	2.51E+08	2.06E+01	7.65E+02	2.11E+08	2.43E+01

Table B.10 Summary of Complex Modulus and Phase Angle Values for Binder 6428SV with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
9.82E+02	2.09E+08	2.52E+01	9.95E+02	2.48E+08	2.23E+01	8.58E+02	2.57E+08	2.09E+01	8.45E+02	2.17E+08	2.39E+01
1.13E+03	2.20E+08	2.45E+01	1.22E+03	2.55E+08	2.14E+01	8.75E+02	2.65E+08	2.05E+01	9.41E+02	2.22E+08	2.40E+01
1.18E+03	2.20E+08	2.49E+01	1.40E+03	2.64E+08	2.15E+01	9.45E+02	2.68E+08	2.10E+01	1.11E+03	2.34E+08	2.32E+01
1.45E+03	2.34E+08	2.40E+01	1.47E+03	2.69E+08	2.14E+01	1.13E+03	2.79E+08	2.01E+01	1.21E+03	2.37E+08	2.34E+01
1.56E+03	2.38E+08	2.42E+01	1.58E+03	2.73E+08	2.09E+01	1.36E+03	2.83E+08	2.03E+01	1.34E+03	2.45E+08	2.32E+01
1.62E+03	2.33E+08	2.35E+01	1.93E+03	2.85E+08	2.09E+01	1.39E+03	2.81E+08	2.12E+01	1.40E+03	2.46E+08	2.44E+01
1.78E+03	2.47E+08	2.36E+01	2.21E+03	2.94E+08	2.07E+01	1.39E+03	2.92E+08	1.99E+01	1.49E+03	2.52E+08	2.38E+01
1.86E+03	2.49E+08	2.35E+01	2.33E+03	3.00E+08	2.06E+01	1.50E+03	2.96E+08	1.98E+01	1.75E+03	2.61E+08	2.26E+01
2.03E+03	2.44E+08	2.46E+01	2.50E+03	3.00E+08	1.98E+01	1.74E+03	2.92E+08	2.07E+01	1.75E+03	2.63E+08	2.48E+01
2.29E+03	2.64E+08	2.31E+01	2.83E+03	2.93E+08	2.49E+01	1.78E+03	3.09E+08	1.95E+01	1.92E+03	2.69E+08	2.23E+01
2.47E+03	2.67E+08	2.34E+01	3.06E+03	3.18E+08	2.14E+01	2.16E+03	3.18E+08	2.03E+01	2.12E+03	2.75E+08	2.24E+01
2.83E+03	2.78E+08	2.27E+01	3.51E+03	3.27E+08	1.99E+01	2.20E+03	3.23E+08	1.93E+01	2.36E+03	2.82E+08	2.22E+01
2.95E+03	2.83E+08	2.31E+01	3.56E+03	3.10E+08	1.96E+01	2.37E+03	3.26E+08	1.90E+01	2.78E+03	2.94E+08	2.20E+01
3.22E+03	2.77E+08	2.30E+01	3.69E+03	3.32E+08	1.99E+01	2.76E+03	3.26E+08	2.01E+01	2.78E+03	3.10E+08	1.92E+01
3.64E+03	2.95E+08	2.21E+01	3.96E+03	3.40E+08	1.96E+01	2.83E+03	3.39E+08	1.89E+01	3.04E+03	3.00E+08	2.12E+01
3.91E+03	3.00E+08	2.20E+01	4.85E+03	3.46E+08	1.96E+01	3.42E+03	3.54E+08	1.87E+01	3.36E+03	3.08E+08	2.17E+01
4.48E+03	3.12E+08	2.18E+01	5.56E+03	3.61E+08	1.92E+01	3.48E+03	3.57E+08	1.87E+01	3.75E+03	3.15E+08	2.16E+01
4.68E+03	3.12E+08	2.16E+01	5.64E+03	3.47E+08	2.14E+01	3.76E+03	3.60E+08	1.85E+01	4.40E+03	3.28E+08	2.12E+01
5.10E+03	3.19E+08	2.34E+01	5.85E+03	3.65E+08	1.92E+01	4.37E+03	3.71E+08	1.97E+01	4.41E+03	3.21E+08	2.14E+01
5.26E+03	3.23E+08	2.16E+01	6.28E+03	3.70E+08	1.92E+01	4.48E+03	3.74E+08	1.82E+01	4.82E+03	3.38E+08	2.12E+01
5.76E+03	3.30E+08	2.12E+01	7.60E+03	3.67E+08	2.09E+01	4.91E+03	3.64E+08	2.03E+01	5.33E+03	3.44E+08	2.09E+01
6.20E+03	3.33E+08	2.04E+01	7.69E+03	3.78E+08	1.85E+01	5.41E+03	3.84E+08	1.86E+01	5.94E+03	3.50E+08	2.08E+01
6.61E+03	3.40E+08	2.20E+01	8.81E+03	3.98E+08	1.84E+01	5.52E+03	3.93E+08	1.80E+01	6.15E+03	3.31E+08	2.32E+01
7.10E+03	3.46E+08	2.09E+01	8.94E+03	3.67E+08	1.98E+01	5.96E+03	3.95E+08	1.78E+01	6.98E+03	3.64E+08	2.05E+01

Table B.10 Summary of Complex Modulus and Phase Angle Values for Binder 6428SV with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
7.42E+03	3.48E+08	2.08E+01	9.55E+03	3.77E+08	1.85E+01	6.17E+03	3.76E+08	1.91E+01	6.99E+03	3.57E+08	1.97E+01
8.08E+03	3.51E+08	2.17E+01	9.95E+03	4.08E+08	1.82E+01	6.93E+03	3.95E+08	1.76E+01	7.65E+03	3.76E+08	1.97E+01
9.14E+03	3.66E+08	2.03E+01	1.22E+04	4.27E+08	1.78E+01	7.10E+03	4.09E+08	1.76E+01	7.72E+03	3.52E+08	2.26E+01
9.82E+03	3.68E+08	2.01E+01	1.40E+04	4.37E+08	1.76E+01	8.58E+03	4.23E+08	1.76E+01	9.41E+03	3.88E+08	1.99E+01
1.05E+04	3.63E+08	1.96E+01	1.42E+04	4.20E+08	1.95E+01	9.45E+03	4.32E+08	1.72E+01	1.11E+04	4.04E+08	1.96E+01
1.18E+04	3.85E+08	2.00E+01	1.51E+04	3.90E+08	1.97E+01	9.78E+03	4.24E+08	1.78E+01	1.11E+04	3.89E+08	2.08E+01
1.28E+04	3.82E+08	2.06E+01	1.58E+04	4.47E+08	1.74E+01	1.10E+04	4.35E+08	1.72E+01	1.21E+04	4.16E+08	1.95E+01
1.45E+04	4.05E+08	1.94E+01	1.92E+04	4.33E+08	2.00E+01	1.13E+04	4.47E+08	1.70E+01	1.22E+04	3.99E+08	2.27E+01
1.56E+04	4.11E+08	1.95E+01	1.93E+04	4.58E+08	1.73E+01	1.23E+04	4.70E+08	1.44E+01	1.49E+04	4.28E+08	1.91E+01
1.66E+04	4.12E+08	1.92E+01	2.21E+04	4.78E+08	1.69E+01	1.36E+04	4.59E+08	1.69E+01	1.75E+04	4.45E+08	1.89E+01
1.86E+04	4.25E+08	1.89E+01	2.24E+04	4.54E+08	1.76E+01	1.50E+04	4.70E+08	1.65E+01	1.75E+04	4.39E+08	1.95E+01
2.03E+04	4.21E+08	1.86E+01	2.40E+04	4.58E+08	1.94E+01	1.54E+04	4.73E+08	1.72E+01	1.79E+04	4.18E+08	1.71E+01
2.29E+04	4.47E+08	1.85E+01	2.41E+04	4.73E+08	1.40E+01	1.55E+04	4.61E+08	1.73E+01	1.92E+04	4.57E+08	1.87E+01
2.47E+04	4.49E+08	1.87E+01	2.50E+04	4.87E+08	1.67E+01	1.74E+04	4.76E+08	1.71E+01	1.94E+04	4.16E+08	2.11E+01
2.63E+04	4.65E+08	1.90E+01	3.06E+04	4.97E+08	1.66E+01	1.78E+04	4.84E+08	1.63E+01	2.25E+04	4.83E+08	1.85E+01
2.95E+04	4.65E+08	1.81E+01	3.56E+04	4.99E+08	1.73E+01	2.16E+04	4.95E+08	1.62E+01	2.36E+04	4.71E+08	1.83E+01
3.22E+04	4.77E+08	1.85E+01	3.80E+04	5.06E+08	1.58E+01	2.37E+04	5.09E+08	1.59E+01	2.78E+04	4.89E+08	1.80E+01
3.80E+04	4.68E+08	1.94E+01	3.81E+04	4.78E+08	1.50E+01	2.44E+04	5.28E+08	1.36E+01	3.04E+04	5.02E+08	1.78E+01
3.91E+04	4.95E+08	1.75E+01	3.96E+04	5.28E+08	1.59E+01	2.46E+04	5.08E+08	1.64E+01	3.07E+04	4.71E+08	1.77E+01
4.17E+04	4.91E+08	1.87E+01	4.85E+04	5.37E+08	1.59E+01	2.76E+04	5.17E+08	1.64E+01	3.75E+04	5.15E+08	1.76E+01
4.68E+04	5.09E+08	1.72E+01	5.64E+04	5.36E+08	1.62E+01	3.42E+04	5.38E+08	1.56E+01	4.41E+04	5.32E+08	1.76E+01
5.10E+04	5.16E+08	1.73E+01	6.02E+04	5.62E+08	1.61E+01	3.76E+04	5.51E+08	1.53E+01	4.82E+04	5.47E+08	1.71E+01
6.02E+04	4.67E+08	2.24E+01	6.05E+04	6.08E+08	2.04E+01	3.87E+04	5.53E+08	1.58E+01	4.87E+04	5.07E+08	1.93E+01
6.20E+04	5.38E+08	1.68E+01	6.28E+04	5.69E+08	1.52E+01	3.89E+04	5.37E+08	1.55E+01	5.65E+04	5.37E+08	1.54E+01

Table B.10 Summary of Complex Modulus and Phase Angle Values for Binder 6428SV with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
6.61E+04	5.49E+08	1.70E+01	7.43E+04	5.83E+08	1.92E+01	4.37E+04	5.61E+08	1.52E+01	5.94E+04	5.62E+08	1.67E+01
7.42E+04	5.53E+08	1.63E+01	7.69E+04	5.81E+08	1.51E+01	5.41E+04	5.80E+08	1.49E+01	6.99E+04	5.83E+08	1.68E+01
7.79E+04	6.31E+08	1.36E+01	8.94E+04	5.74E+08	1.59E+01	5.96E+04	5.94E+08	1.46E+01	7.65E+04	5.97E+08	1.63E+01
8.08E+04	5.63E+08	1.67E+01	9.33E+04	5.67E+08	1.65E+01	6.14E+04	6.02E+08	1.64E+01	7.72E+04	5.46E+08	1.81E+01
9.53E+04	5.20E+08	2.00E+01	9.55E+04	5.73E+08	1.55E+01	6.17E+04	5.72E+08	1.59E+01	7.82E+04	5.60E+08	1.76E+01
9.82E+04	5.85E+08	1.59E+01	9.58E+04	6.12E+08	1.84E+01	6.93E+04	6.07E+08	1.47E+01	8.96E+04	6.05E+08	1.92E+01
1.05E+05	5.80E+08	1.57E+01	9.95E+04	6.13E+08	1.44E+01	8.58E+04	6.25E+08	1.42E+01	9.82E+04	6.05E+08	1.75E+01
1.28E+05	6.11E+08	1.56E+01	1.22E+05	6.23E+08	1.45E+01	9.73E+04	6.69E+08	1.60E+01	1.11E+05	6.32E+08	1.59E+01
1.51E+05	5.74E+08	1.57E+01	1.42E+05	6.18E+08	1.47E+01	9.78E+04	6.26E+08	1.43E+01	1.21E+05	6.47E+08	1.55E+01
1.55E+05	6.33E+08	1.51E+01	1.48E+05	6.30E+08	1.01E+01	1.10E+05	6.52E+08	1.39E+01	1.22E+05	6.23E+08	1.60E+01
1.56E+05	6.33E+08	1.50E+01	1.51E+05	6.59E+08	1.40E+01	1.36E+05	6.72E+08	1.35E+01	1.42E+05	6.79E+08	1.42E+01
1.66E+05	6.37E+08	1.52E+01	1.52E+05	6.15E+08	1.08E+01	1.54E+05	6.99E+08	1.30E+01	1.56E+05	6.95E+08	1.68E+01
2.03E+05	6.61E+08	1.47E+01	1.93E+05	6.66E+08	1.38E+01	1.55E+05	6.75E+08	1.40E+01	1.71E+05	7.16E+08	1.33E+01
2.40E+05	6.19E+08	1.35E+01	2.24E+05	6.60E+08	1.40E+01	1.74E+05	6.98E+08	1.33E+01	1.75E+05	6.82E+08	1.51E+01
2.46E+05	6.43E+08	1.53E+01	2.34E+05	6.91E+08	1.43E+01	2.16E+05	7.15E+08	1.29E+01	1.92E+05	6.99E+08	1.46E+01
2.47E+05	6.77E+08	1.42E+01	2.40E+05	6.80E+08	1.41E+01	2.44E+05	7.47E+08	1.34E+01	1.94E+05	6.66E+08	1.56E+01
2.63E+05	6.86E+08	1.44E+01	2.41E+05	7.20E+08	1.22E+01	2.46E+05	7.26E+08	1.31E+01	2.15E+05	7.59E+08	1.60E+01
3.21E+05	7.15E+08	1.64E+01	3.06E+05	7.10E+08	1.30E+01	2.76E+05	7.44E+08	1.26E+01	2.25E+05	7.69E+08	1.43E+01
3.22E+05	7.10E+08	1.39E+01	3.56E+05	7.06E+08	1.33E+01	3.27E+05	5.98E+08	1.78E+01	2.47E+05	6.84E+08	1.75E+01
3.80E+05	6.40E+08	1.65E+01	3.71E+05	7.90E+08	1.65E+01	3.87E+05	8.04E+08	1.14E+01	2.78E+05	7.37E+08	1.43E+01
3.89E+05	6.72E+08	1.23E+01	3.80E+05	7.39E+08	1.29E+01	3.89E+05	7.73E+08	1.24E+01	3.07E+05	7.20E+08	1.49E+01
4.03E+05	6.62E+08	1.91E+01	3.81E+05	7.44E+08	1.23E+01	4.11E+05	6.11E+08	1.86E+01	3.41E+05	8.05E+08	1.63E+01
4.17E+05	7.39E+08	1.37E+01	5.64E+05	7.51E+08	1.27E+01	4.37E+05	7.92E+08	1.20E+01	3.57E+05	7.50E+08	1.44E+01
5.10E+05	7.61E+08	1.30E+01	5.89E+05	8.38E+08	1.33E+01	6.14E+05	8.51E+08	1.13E+01	3.91E+05	7.65E+08	1.67E+01

Table B.10 Summary of Complex Modulus and Phase Angle Values for Binder 6428SV with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
6.02E+05	6.97E+08	1.47E+01	6.02E+05	7.85E+08	1.25E+01	6.17E+05	8.19E+08	1.18E+01	4.41E+05	7.90E+08	1.36E+01
6.17E+05	7.83E+08	1.50E+01	6.05E+05	8.16E+08	1.36E+01	6.28E+05	7.12E+08	1.81E+01	4.87E+05	7.77E+08	1.40E+01
6.39E+05	8.17E+08	1.83E+01	6.98E+05	6.98E+08	1.69E+01	6.51E+05	6.41E+08	1.32E+01	5.41E+05	8.78E+08	1.56E+01
6.61E+05	7.90E+08	1.29E+01	8.77E+05	7.19E+08	1.36E+01	6.93E+05	8.39E+08	1.13E+01	5.65E+05	8.32E+08	1.43E+01
8.08E+05	8.09E+08	1.22E+01	8.94E+05	7.95E+08	1.19E+01	7.88E+05	7.48E+08	1.47E+01	6.20E+05	7.87E+08	1.48E+01
9.53E+05	7.95E+08	1.34E+01	9.33E+05	8.34E+08	1.10E+01	9.73E+05	9.02E+08	1.07E+01	6.99E+05	8.43E+08	1.27E+01
9.78E+05	8.01E+08	1.34E+01	9.55E+05	8.35E+08	1.16E+01	9.78E+05	8.71E+08	1.11E+01	7.72E+05	8.31E+08	1.33E+01
1.01E+06	7.74E+08	1.08E+01	9.58E+05	8.73E+08	1.25E+01	1.03E+06	7.27E+08	1.55E+01	8.57E+05	8.65E+08	1.02E+01
1.05E+06	8.40E+08	1.20E+01	1.39E+06	7.90E+08	1.51E+01	1.25E+06	7.81E+08	1.26E+01	8.96E+05	8.84E+08	1.30E+01
1.51E+06	8.34E+08	1.25E+01	1.42E+06	8.41E+08	1.13E+01	1.54E+06	9.52E+08	1.06E+01	9.82E+05	8.81E+08	1.39E+01
1.55E+06	8.85E+08	1.14E+01	1.48E+06	8.73E+08	9.97E+00	1.55E+06	9.18E+08	1.05E+01	1.22E+06	8.86E+08	1.25E+01
1.61E+06	8.70E+08	1.12E+01	1.51E+06	8.82E+08	1.11E+01	1.64E+06	7.25E+08	1.17E+01	1.36E+06	9.20E+08	1.01E+01
1.66E+06	8.88E+08	1.13E+01	1.52E+06	9.15E+08	1.10E+01	1.98E+06	8.17E+08	1.14E+01	1.42E+06	9.37E+08	1.20E+01
2.40E+06	8.88E+08	1.18E+01	2.20E+06	8.17E+08	1.64E+01	2.44E+06	1.00E+09	9.68E+00	1.56E+06	9.22E+08	1.38E+01
2.46E+06	9.17E+08	1.04E+01	2.34E+06	9.62E+08	1.22E+01	2.46E+06	9.66E+08	9.92E+00	1.94E+06	9.40E+08	1.17E+01
2.54E+06	8.98E+08	1.31E+01	2.40E+06	9.29E+08	1.03E+01	2.59E+06	8.40E+08	1.08E+01	2.15E+06	1.06E+09	1.10E+01
2.63E+06	9.41E+08	1.05E+01	2.41E+06	9.63E+08	1.02E+01	3.14E+06	9.36E+08	1.11E+01	2.25E+06	9.97E+08	1.13E+01
3.80E+06	9.38E+08	1.10E+01	3.71E+06	1.01E+09	1.06E+01	3.87E+06	1.05E+09	9.13E+00	2.47E+06	9.89E+08	1.15E+01
3.89E+06	9.86E+08	1.08E+01	3.80E+06	9.78E+08	9.66E+00	4.11E+06	8.15E+08	8.93E+00	3.07E+06	9.96E+08	1.10E+01
4.03E+06	9.89E+08	1.33E+01	3.81E+06	1.01E+09	9.57E+00	4.97E+06	8.91E+08	1.07E+01	3.41E+06	1.08E+09	1.34E+01
5.07E+06	1.03E+09	9.92E+00	5.53E+06	9.20E+08	8.75E+00	6.14E+06	1.10E+09	8.61E+00	3.57E+06	1.05E+09	1.06E+01
6.02E+06	9.93E+08	1.01E+01	5.89E+06	1.08E+09	9.29E+00	6.51E+06	8.94E+08	9.14E+00	3.91E+06	1.05E+09	1.08E+01
6.17E+06	1.03E+09	9.83E+00	6.05E+06	1.06E+09	8.96E+00	7.88E+06	1.00E+09	1.05E+01	5.41E+06	1.16E+09	1.21E+01
6.37E+06	9.95E+08	1.37E+01	8.77E+06	9.49E+08	8.00E+00	1.03E+07	9.63E+08	1.07E+01	5.65E+06	1.11E+09	9.98E+00

Table B.10 Summary of Complex Modulus and Phase Angle Values for Binder 6428SV with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
6.39E+06	1.01E+09	9.83E+00	9.17E+06	1.10E+09	1.10E+01	1.25E+07	1.06E+09	9.05E+00	6.20E+06	1.11E+09	1.02E+01
9.53E+06	1.04E+09	9.44E+00	9.33E+06	1.11E+09	8.67E+00	1.30E+07	1.03E+09	1.21E+01	8.57E+06	1.23E+09	9.46E+00
9.78E+06	1.08E+09	9.41E+00	9.58E+06	1.11E+09	8.31E+00	1.63E+07	1.12E+09	9.70E+00	8.96E+06	1.17E+09	9.19E+00
1.01E+07	1.06E+09	9.26E+00	1.39E+07	1.05E+09	5.57E+00	1.64E+07	1.02E+09	1.01E+01	9.82E+06	1.16E+09	9.70E+00
1.01E+07	1.08E+09	1.16E+01	1.48E+07	1.16E+09	8.03E+00	1.98E+07	1.10E+09	1.09E+01	1.31E+07	1.30E+09	1.03E+01
1.51E+07	1.09E+09	8.69E+00	2.20E+07	1.10E+09	9.43E+00	2.58E+07	1.16E+09	1.23E+01	1.36E+07	1.27E+09	8.56E+00
1.55E+07	1.14E+09	8.64E+00	2.34E+07	1.20E+09	7.55E+00	2.59E+07	1.05E+09	9.34E+00	1.56E+07	1.23E+09	8.95E+00
1.60E+07	1.30E+09	5.08E+00	2.89E+07	1.22E+09	3.45E+00	3.14E+07	1.15E+09	9.20E+00	2.15E+07	1.32E+09	8.21E+00
1.61E+07	1.11E+09	9.81E+00	3.49E+07	1.15E+09	8.12E+00	4.09E+07	1.17E+09	7.90E+00	2.47E+07	1.28E+09	8.30E+00
2.46E+07	1.18E+09	7.96E+00	3.71E+07	1.25E+09	6.86E+00	4.11E+07	1.11E+09	8.77E+00	3.30E+07	1.40E+09	6.29E+00
2.54E+07	1.18E+09	1.11E+01	4.58E+07	1.25E+09	9.96E+00	4.97E+07	1.20E+09	8.08E+00	3.41E+07	1.38E+09	7.63E+00
2.54E+07	1.17E+09	8.16E+00	5.53E+07	1.20E+09	7.68E+00	6.48E+07	1.19E+09	9.44E+00	3.91E+07	1.33E+09	7.87E+00
3.89E+07	1.23E+09	7.34E+00	7.26E+07	1.29E+09	1.23E+01	6.51E+07	1.15E+09	8.16E+00	5.24E+07	1.48E+09	7.13E+00
4.02E+07	1.34E+09	6.06E+00	8.77E+07	1.25E+09	7.36E+00	7.88E+07	1.25E+09	7.45E+00	5.41E+07	1.43E+09	6.86E+00
4.03E+07	1.20E+09	8.00E+00	1.15E+08	1.38E+09	9.67E+00	1.03E+08	1.25E+09	7.18E+00	8.30E+07	1.52E+09	6.73E+00
6.37E+07	1.26E+09	8.40E+00	1.39E+08	1.29E+09	7.06E+00	1.03E+08	1.20E+09	7.67E+00	8.57E+07	1.50E+09	6.28E+00
6.39E+07	1.26E+09	7.20E+00	1.82E+08	1.47E+09	3.93E+00	1.25E+08	1.30E+09	7.18E+00	1.31E+08	1.56E+09	5.58E+00
1.01E+08	1.37E+09	7.00E+00	2.20E+08	1.33E+09	6.41E+00	1.63E+08	1.27E+09	3.93E+00	2.08E+08	1.61E+09	5.79E+00
1.01E+08	1.33E+09	6.49E+00	2.89E+08	1.45E+09	4.64E+00	1.64E+08	1.24E+09	7.12E+00	3.30E+08	1.68E+09	5.39E+00
1.60E+08	1.46E+09	6.46E+00	3.49E+08	1.38E+09	5.98E+00	1.98E+08	1.34E+09	6.42E+00	5.24E+08	1.71E+09	5.04E+00
1.61E+08	1.41E+09	5.33E+00	4.58E+08	1.48E+09	5.66E+00	2.58E+08	1.41E+09	6.06E+00	8.30E+08	1.76E+09	4.56E+00
2.54E+08	1.48E+09	5.41E+00	7.26E+08	1.50E+09	5.52E+00	3.14E+08	1.38E+09	6.05E+00	1.31E+09	1.79E+09	4.17E+00
4.02E+08	1.51E+09	4.86E+00	1.15E+09	1.55E+09	5.04E+00	4.09E+08	1.43E+09	5.47E+00	2.08E+09	1.83E+09	3.90E+00

Table B.11 Summary of Complex Modulus and Phase Angle Values for Binder 6428SM with Different Aging Conditions

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
6.86E-06	1.73E+04	7.09E+01	4.76E-06	8.89E+04	6.21E+01	2.91E-06	1.71E+05	5.70E+01	3.76E-06	6.36E+04	5.55E+01
8.62E-06	2.02E+04	7.19E+01	5.98E-06	1.02E+05	6.20E+01	3.65E-06	1.94E+05	5.58E+01	4.72E-06	7.15E+04	5.50E+01
1.37E-05	2.81E+04	7.09E+01	9.48E-06	1.37E+05	6.01E+01	5.78E-06	2.54E+05	5.52E+01	7.48E-06	9.41E+04	5.39E+01
2.16E-05	4.00E+04	7.04E+01	1.50E-05	1.84E+05	5.91E+01	9.17E-06	3.27E+05	5.36E+01	1.19E-05	1.22E+05	5.35E+01
3.43E-05	5.62E+04	6.93E+01	2.38E-05	2.44E+05	5.77E+01	1.45E-05	4.20E+05	5.24E+01	1.88E-05	1.58E+05	5.27E+01
5.44E-05	7.90E+04	6.81E+01	3.77E-05	3.22E+05	5.63E+01	2.30E-05	5.34E+05	5.14E+01	2.98E-05	2.04E+05	5.18E+01
8.44E-05	1.10E+05	6.52E+01	5.98E-05	4.24E+05	5.53E+01	3.65E-05	6.77E+05	5.04E+01	4.72E-05	2.63E+05	5.14E+01
8.62E-05	1.11E+05	6.70E+01	6.67E-05	4.54E+05	5.46E+01	4.98E-05	8.12E+05	4.89E+01	6.09E-05	3.08E+05	4.94E+01
1.06E-04	1.29E+05	6.53E+01	8.38E-05	5.16E+05	5.36E+01	5.78E-05	8.55E+05	4.94E+01	7.48E-05	3.38E+05	5.08E+01
1.37E-04	1.55E+05	6.60E+01	9.48E-05	5.53E+05	5.42E+01	6.25E-05	9.01E+05	4.84E+01	7.65E-05	3.49E+05	4.92E+01
1.68E-04	1.77E+05	6.39E+01	1.33E-04	6.69E+05	5.27E+01	9.17E-05	1.07E+06	4.86E+01	1.19E-04	4.32E+05	5.03E+01
2.16E-04	2.15E+05	6.50E+01	1.50E-04	7.17E+05	5.33E+01	9.91E-05	1.13E+06	4.72E+01	1.21E-04	4.42E+05	4.82E+01
2.66E-04	2.44E+05	6.28E+01	2.10E-04	8.66E+05	5.15E+01	1.45E-04	1.35E+06	4.78E+01	1.88E-04	5.54E+05	4.99E+01
3.42E-04	2.92E+05	6.12E+01	2.38E-04	9.27E+05	5.24E+01	1.57E-04	1.41E+06	4.60E+01	1.92E-04	5.63E+05	4.74E+01
3.43E-04	2.97E+05	6.40E+01	2.95E-04	1.05E+06	5.01E+01	2.30E-04	1.69E+06	4.71E+01	2.74E-04	6.91E+05	4.63E+01
4.22E-04	3.34E+05	6.18E+01	3.33E-04	1.11E+06	5.01E+01	2.49E-04	1.74E+06	4.49E+01	2.98E-04	7.08E+05	4.96E+01
4.29E-04	3.41E+05	6.03E+01	3.71E-04	1.18E+06	4.97E+01	2.65E-04	1.82E+06	4.48E+01	3.04E-04	7.12E+05	4.67E+01
5.44E-04	4.09E+05	6.30E+01	3.77E-04	1.19E+06	5.16E+01	3.33E-04	2.00E+06	4.39E+01	3.45E-04	7.73E+05	4.58E+01
6.69E-04	4.54E+05	6.07E+01	5.28E-04	1.42E+06	4.91E+01	3.65E-04	2.10E+06	4.64E+01	4.72E-04	8.99E+05	4.93E+01
6.80E-04	4.65E+05	5.98E+01	5.88E-04	1.52E+06	4.84E+01	3.95E-04	2.15E+06	4.39E+01	4.82E-04	8.94E+05	4.61E+01
8.62E-04	5.59E+05	6.22E+01	5.98E-04	1.53E+06	5.08E+01	5.28E-04	2.47E+06	4.29E+01	5.46E-04	9.72E+05	4.50E+01
1.06E-03	6.15E+05	5.96E+01	8.38E-04	1.81E+06	4.81E+01	5.78E-04	2.62E+06	4.57E+01	7.48E-04	1.14E+06	4.92E+01
1.08E-03	6.23E+05	5.88E+01	9.31E-04	1.92E+06	4.72E+01	6.25E-04	2.63E+06	4.30E+01	7.65E-04	1.12E+06	4.55E+01
1.37E-03	7.61E+05	6.15E+01	9.48E-04	1.96E+06	5.01E+01	8.36E-04	3.02E+06	4.17E+01	8.66E-04	1.22E+06	4.43E+01

Table B.11 Summary of Complex Modulus and Phase Angle Values for Binder 6428SM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
1.43E-03	7.56E+05	5.78E+01	1.28E-03	2.29E+06	4.65E+01	9.91E-04	3.21E+06	4.21E+01	1.19E-03	1.43E+06	4.94E+01
1.68E-03	8.29E+05	5.86E+01	1.33E-03	2.28E+06	4.70E+01	1.21E-03	3.65E+06	4.10E+01	1.21E-03	1.41E+06	4.50E+01
1.71E-03	8.36E+05	5.75E+01	1.48E-03	2.42E+06	4.60E+01	1.33E-03	3.68E+06	4.05E+01	1.28E-03	1.50E+06	4.34E+01
1.79E-03	8.72E+05	5.75E+01	1.61E-03	2.58E+06	4.59E+01	1.52E-03	4.00E+06	4.06E+01	1.37E-03	1.52E+06	4.34E+01
2.16E-03	1.02E+06	6.09E+01	2.10E-03	2.87E+06	4.61E+01	1.57E-03	3.90E+06	4.13E+01	1.61E-03	1.66E+06	4.31E+01
2.66E-03	1.11E+06	5.75E+01	2.34E-03	3.04E+06	4.50E+01	2.10E-03	4.48E+06	3.95E+01	1.88E-03	1.78E+06	5.04E+01
2.71E-03	1.12E+06	5.65E+01	2.54E-03	3.21E+06	4.45E+01	2.41E-03	4.83E+06	3.93E+01	1.92E-03	1.77E+06	4.45E+01
2.84E-03	1.16E+06	5.61E+01	3.33E-03	3.59E+06	4.52E+01	2.49E-03	4.73E+06	4.06E+01	2.18E-03	1.88E+06	4.28E+01
3.43E-03	1.36E+06	6.12E+01	3.71E-03	3.78E+06	4.39E+01	3.33E-03	5.40E+06	3.87E+01	2.55E-03	2.06E+06	4.22E+01
4.22E-03	1.48E+06	5.64E+01	4.03E-03	3.99E+06	4.34E+01	3.82E-03	5.81E+06	3.83E+01	3.04E-03	2.20E+06	4.40E+01
4.29E-03	1.48E+06	5.53E+01	5.28E-03	4.48E+06	4.44E+01	3.95E-03	5.70E+06	4.00E+01	3.45E-03	2.35E+06	4.23E+01
4.51E-03	1.54E+06	5.49E+01	5.88E-03	4.71E+06	4.29E+01	5.28E-03	6.49E+06	3.78E+01	4.04E-03	2.54E+06	4.16E+01
6.47E-03	1.94E+06	5.37E+01	6.25E-03	4.96E+06	4.27E+01	6.06E-03	6.92E+06	3.74E+01	4.82E-03	2.74E+06	4.36E+01
6.69E-03	1.97E+06	5.53E+01	6.39E-03	4.94E+06	4.24E+01	6.25E-03	6.88E+06	3.94E+01	5.46E-03	2.89E+06	4.18E+01
6.80E-03	1.96E+06	5.42E+01	7.85E-03	5.49E+06	4.18E+01	6.37E-03	7.25E+06	3.73E+01	6.20E-03	3.13E+06	4.08E+01
7.14E-03	2.02E+06	5.37E+01	8.38E-03	5.55E+06	4.36E+01	8.00E-03	7.84E+06	3.68E+01	6.41E-03	3.12E+06	4.11E+01
8.13E-03	2.20E+06	5.32E+01	9.31E-03	5.82E+06	4.19E+01	8.36E-03	7.79E+06	3.71E+01	7.65E-03	3.39E+06	4.33E+01
1.06E-02	2.60E+06	5.42E+01	1.01E-02	6.08E+06	4.13E+01	9.60E-03	8.23E+06	3.65E+01	7.79E-03	3.45E+06	4.03E+01
1.08E-02	2.57E+06	5.31E+01	1.24E-02	6.72E+06	4.07E+01	9.91E-03	8.30E+06	3.88E+01	8.66E-03	3.56E+06	4.13E+01
1.13E-02	2.65E+06	5.23E+01	1.33E-02	6.87E+06	4.29E+01	1.27E-02	9.33E+06	3.57E+01	1.02E-02	3.84E+06	4.02E+01
1.29E-02	2.88E+06	5.17E+01	1.48E-02	7.17E+06	4.10E+01	1.33E-02	9.28E+06	3.64E+01	1.21E-02	4.21E+06	4.29E+01
1.68E-02	3.40E+06	5.32E+01	1.61E-02	7.46E+06	4.02E+01	1.52E-02	9.76E+06	3.57E+01	1.23E-02	4.22E+06	3.96E+01
1.71E-02	3.36E+06	5.19E+01	1.97E-02	8.21E+06	3.97E+01	1.57E-02	1.00E+07	3.82E+01	1.37E-02	4.40E+06	4.08E+01
1.79E-02	3.45E+06	5.11E+01	2.10E-02	8.50E+06	4.21E+01	2.01E-02	1.10E+07	3.48E+01	1.61E-02	4.71E+06	3.98E+01

Table B.11 Summary of Complex Modulus and Phase Angle Values for Binder 6428SM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
2.04E-02	3.72E+06	5.05E+01	2.34E-02	8.79E+06	4.02E+01	2.10E-02	1.10E+07	3.57E+01	1.92E-02	5.22E+06	4.27E+01
2.66E-02	4.43E+06	5.23E+01	2.54E-02	9.08E+06	3.93E+01	2.41E-02	1.16E+07	3.49E+01	1.96E-02	5.21E+06	3.89E+01
2.71E-02	4.35E+06	5.08E+01	3.13E-02	1.00E+07	3.85E+01	2.49E-02	1.20E+07	3.78E+01	2.18E-02	5.37E+06	4.04E+01
2.84E-02	4.45E+06	4.99E+01	3.18E-02	1.02E+07	3.89E+01	3.18E-02	1.33E+07	3.45E+01	2.55E-02	5.76E+06	3.92E+01
3.18E-02	4.81E+06	4.95E+01	3.33E-02	1.03E+07	4.17E+01	3.19E-02	1.30E+07	3.39E+01	3.04E-02	6.37E+06	4.27E+01
3.23E-02	4.80E+06	4.90E+01	3.71E-02	1.07E+07	3.94E+01	3.33E-02	1.31E+07	3.51E+01	3.10E-02	6.35E+06	3.79E+01
4.00E-02	5.44E+06	4.84E+01	4.00E-02	1.12E+07	3.85E+01	3.82E-02	1.37E+07	3.42E+01	3.18E-02	6.69E+06	3.84E+01
4.22E-02	5.70E+06	5.15E+01	4.03E-02	1.10E+07	3.84E+01	4.00E-02	1.43E+07	3.39E+01	3.45E-02	6.52E+06	4.01E+01
4.29E-02	5.62E+06	4.96E+01	4.95E-02	1.21E+07	3.75E+01	5.05E-02	1.52E+07	3.30E+01	4.00E-02	7.42E+06	3.78E+01
4.51E-02	5.70E+06	4.87E+01	5.88E-02	1.30E+07	3.87E+01	5.28E-02	1.55E+07	3.46E+01	4.04E-02	7.00E+06	3.87E+01
5.13E-02	6.14E+06	4.77E+01	6.34E-02	1.34E+07	3.71E+01	6.06E-02	1.61E+07	3.35E+01	4.91E-02	7.68E+06	3.77E+01
6.34E-02	6.90E+06	4.71E+01	6.39E-02	1.33E+07	3.76E+01	6.34E-02	1.67E+07	3.30E+01	5.46E-02	7.98E+06	3.97E+01
6.80E-02	7.18E+06	4.85E+01	7.85E-02	1.45E+07	3.66E+01	8.00E-02	1.79E+07	3.24E+01	6.34E-02	9.05E+06	3.72E+01
7.14E-02	7.30E+06	4.75E+01	9.31E-02	1.58E+07	3.80E+01	8.36E-02	1.84E+07	3.41E+01	6.41E-02	8.53E+06	3.82E+01
8.13E-02	7.77E+06	4.64E+01	1.00E-01	1.61E+07	3.61E+01	9.60E-02	1.89E+07	3.30E+01	7.79E-02	9.33E+06	3.70E+01
1.00E-01	8.69E+06	4.58E+01	1.01E-01	1.60E+07	3.68E+01	1.00E-01	1.95E+07	3.22E+01	8.66E-02	9.82E+06	3.93E+01
1.08E-01	9.20E+06	4.74E+01	1.24E-01	1.74E+07	3.57E+01	1.27E-01	2.08E+07	3.17E+01	1.00E-01	1.06E+07	3.65E+01
1.13E-01	9.22E+06	4.63E+01	1.48E-01	1.90E+07	3.74E+01	1.33E-01	2.17E+07	3.36E+01	1.02E-01	1.03E+07	3.78E+01
1.29E-01	9.85E+06	4.52E+01	1.59E-01	1.93E+07	3.53E+01	1.52E-01	2.21E+07	3.24E+01	1.23E-01	1.13E+07	3.65E+01
1.59E-01	1.10E+07	4.44E+01	1.61E-01	1.93E+07	3.61E+01	1.59E-01	2.26E+07	3.14E+01	1.37E-01	1.18E+07	3.91E+01
1.71E-01	1.16E+07	4.63E+01	1.90E-01	2.07E+07	3.54E+01	1.93E-01	2.45E+07	3.13E+01	1.55E-01	1.23E+07	3.64E+01
1.74E-01	1.15E+07	4.44E+01	1.97E-01	2.08E+07	3.49E+01	2.01E-01	2.43E+07	3.10E+01	1.59E-01	1.25E+07	3.60E+01
1.79E-01	1.16E+07	4.52E+01	2.38E-01	2.25E+07	3.48E+01	2.41E-01	2.60E+07	3.19E+01	1.61E-01	1.25E+07	3.76E+01
2.04E-01	1.23E+07	4.40E+01	2.52E-01	2.29E+07	3.43E+01	2.42E-01	2.63E+07	3.06E+01	1.95E-01	1.35E+07	3.61E+01

Table B.11 Summary of Complex Modulus and Phase Angle Values for Binder 6428SM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
2.18E-01	1.29E+07	4.39E+01	2.54E-01	2.30E+07	3.54E+01	2.52E-01	2.63E+07	3.07E+01	1.96E-01	1.35E+07	3.60E+01
2.52E-01	1.37E+07	4.32E+01	3.13E-01	2.47E+07	3.41E+01	3.19E-01	2.81E+07	3.05E+01	2.52E-01	1.45E+07	3.55E+01
2.84E-01	1.46E+07	4.41E+01	3.78E-01	2.67E+07	3.38E+01	3.82E-01	3.04E+07	3.14E+01	2.55E-01	1.51E+07	3.70E+01
3.23E-01	1.53E+07	4.28E+01	4.00E-01	2.72E+07	3.34E+01	3.83E-01	3.04E+07	3.00E+01	3.08E-01	1.61E+07	3.52E+01
3.46E-01	1.60E+07	4.22E+01	4.03E-01	2.74E+07	3.48E+01	4.00E-01	3.03E+07	2.98E+01	3.10E-01	1.62E+07	3.55E+01
4.00E-01	1.70E+07	4.17E+01	4.95E-01	2.93E+07	3.34E+01	5.05E-01	3.27E+07	2.99E+01	4.00E-01	1.75E+07	3.48E+01
4.51E-01	1.82E+07	4.30E+01	5.98E-01	3.15E+07	3.29E+01	6.06E-01	3.59E+07	3.08E+01	4.04E-01	1.83E+07	3.68E+01
5.13E-01	1.90E+07	4.16E+01	6.34E-01	3.21E+07	3.26E+01	6.08E-01	3.50E+07	2.93E+01	4.89E-01	1.89E+07	3.45E+01
5.48E-01	1.97E+07	4.09E+01	6.39E-01	3.26E+07	3.41E+01	6.34E-01	3.51E+07	2.93E+01	4.91E-01	1.93E+07	3.51E+01
6.34E-01	2.08E+07	4.06E+01	7.85E-01	3.47E+07	3.27E+01	8.00E-01	3.77E+07	2.94E+01	6.34E-01	2.06E+07	3.43E+01
7.14E-01	2.26E+07	4.20E+01	9.48E-01	3.71E+07	3.19E+01	9.63E-01	4.01E+07	2.85E+01	6.41E-01	2.17E+07	3.63E+01
8.13E-01	2.34E+07	4.05E+01	1.00E+00	3.76E+07	3.18E+01	1.00E+00	4.03E+07	2.87E+01	7.75E-01	2.26E+07	3.40E+01
8.69E-01	2.41E+07	3.97E+01	1.19E+00	4.05E+07	3.19E+01	1.11E+00	4.26E+07	2.88E+01	7.79E-01	2.31E+07	3.46E+01
1.00E+00	2.56E+07	3.94E+01	1.24E+00	4.07E+07	3.21E+01	1.27E+00	4.36E+07	2.89E+01	8.89E-01	2.46E+07	3.40E+01
1.09E+00	2.68E+07	3.96E+01	1.50E+00	4.36E+07	3.15E+01	1.39E+00	4.51E+07	2.83E+01	1.00E+00	2.49E+07	3.37E+01
1.29E+00	2.86E+07	3.94E+01	1.50E+00	4.35E+07	3.09E+01	1.53E+00	4.59E+07	2.77E+01	1.12E+00	2.65E+07	3.39E+01
1.37E+00	2.95E+07	3.85E+01	1.59E+00	4.41E+07	3.11E+01	1.59E+00	4.62E+07	2.81E+01	1.23E+00	2.76E+07	3.31E+01
1.38E+00	2.93E+07	3.83E+01	1.97E+00	4.78E+07	3.15E+01	2.01E+00	5.03E+07	2.85E+01	1.23E+00	2.73E+07	3.43E+01
1.59E+00	3.11E+07	3.83E+01	2.38E+00	5.09E+07	3.04E+01	2.21E+00	5.16E+07	2.75E+01	1.59E+00	2.93E+07	3.33E+01
2.04E+00	3.49E+07	3.84E+01	2.38E+00	5.07E+07	3.03E+01	2.42E+00	5.26E+07	2.72E+01	1.77E+00	3.10E+07	3.30E+01
2.17E+00	3.56E+07	3.74E+01	2.52E+00	5.15E+07	3.04E+01	2.52E+00	5.28E+07	2.76E+01	1.95E+00	3.17E+07	3.26E+01
2.18E+00	3.55E+07	3.72E+01	3.13E+00	5.59E+07	3.09E+01	3.19E+00	5.85E+07	2.79E+01	1.96E+00	3.20E+07	3.38E+01
2.52E+00	3.77E+07	3.72E+01	3.76E+00	5.91E+07	2.95E+01	3.50E+00	5.87E+07	2.68E+01	2.52E+00	3.46E+07	3.27E+01
3.23E+00	4.22E+07	3.73E+01	3.78E+00	5.86E+07	2.94E+01	3.83E+00	5.99E+07	2.65E+01	2.80E+00	3.68E+07	3.21E+01

Table B.11 Summary of Complex Modulus and Phase Angle Values for Binder 6428SM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
3.44E+00	4.26E+07	3.61E+01	4.00E+00	5.99E+07	2.98E+01	4.00E+00	6.04E+07	2.71E+01	3.08E+00	3.67E+07	3.21E+01
3.46E+00	4.29E+07	3.59E+01	5.97E+00	6.80E+07	2.88E+01	5.55E+00	6.65E+07	2.62E+01	3.10E+00	3.85E+07	3.33E+01
4.00E+00	4.52E+07	3.62E+01	5.98E+00	6.82E+07	2.87E+01	6.08E+00	6.81E+07	2.60E+01	4.00E+00	4.06E+07	3.23E+01
5.45E+00	5.13E+07	3.50E+01	6.34E+00	6.95E+07	2.91E+01	6.34E+00	6.90E+07	2.67E+01	4.44E+00	4.29E+07	3.17E+01
5.48E+00	5.12E+07	3.49E+01	9.46E+00	7.87E+07	2.79E+01	8.79E+00	7.56E+07	2.54E+01	4.89E+00	4.40E+07	3.15E+01
6.34E+00	5.45E+07	3.51E+01	9.48E+00	7.86E+07	2.80E+01	9.63E+00	7.73E+07	2.55E+01	6.34E+00	4.78E+07	3.18E+01
8.64E+00	6.10E+07	3.37E+01	1.00E+01	8.03E+07	2.86E+01	1.00E+01	7.86E+07	2.62E+01	7.04E+00	4.86E+07	3.07E+01
8.69E+00	6.10E+07	3.38E+01	1.44E+01	8.92E+07	2.77E+01	1.39E+01	8.55E+07	2.49E+01	7.75E+00	5.00E+07	3.09E+01
1.00E+01	6.47E+07	3.41E+01	1.50E+01	9.06E+07	2.70E+01	1.44E+01	8.67E+07	2.49E+01	1.00E+01	5.62E+07	3.13E+01
1.23E+01	6.92E+07	3.31E+01	1.50E+01	9.06E+07	2.73E+01	1.53E+01	8.72E+07	2.50E+01	1.12E+01	5.82E+07	3.02E+01
1.37E+01	7.20E+07	3.26E+01	1.59E+01	9.28E+07	2.80E+01	1.59E+01	9.03E+07	2.57E+01	1.14E+01	5.95E+07	3.06E+01
1.38E+01	7.21E+07	3.28E+01	1.80E+01	9.54E+07	2.76E+01	1.81E+01	9.21E+07	2.43E+01	1.23E+01	6.01E+07	3.03E+01
1.55E+01	7.57E+07	3.27E+01	2.38E+01	1.04E+08	2.63E+01	2.21E+01	9.62E+07	2.43E+01	1.43E+01	6.38E+07	3.04E+01
1.59E+01	7.67E+07	3.32E+01	2.38E+01	1.04E+08	2.67E+01	2.42E+01	9.88E+07	2.45E+01	1.59E+01	6.52E+07	3.08E+01
2.17E+01	8.46E+07	3.15E+01	2.86E+01	1.09E+08	2.65E+01	2.88E+01	1.04E+08	2.39E+01	1.77E+01	6.65E+07	2.96E+01
2.18E+01	8.50E+07	3.18E+01	3.76E+01	1.18E+08	2.57E+01	3.50E+01	1.08E+08	2.37E+01	1.95E+01	6.90E+07	2.98E+01
2.45E+01	8.91E+07	3.13E+01	3.78E+01	1.18E+08	2.61E+01	3.83E+01	1.11E+08	2.40E+01	2.27E+01	7.38E+07	2.94E+01
3.44E+01	9.89E+07	3.05E+01	4.53E+01	1.24E+08	2.56E+01	4.56E+01	1.16E+08	2.34E+01	2.80E+01	7.65E+07	2.90E+01
3.46E+01	9.95E+07	3.08E+01	4.90E+01	1.26E+08	2.63E+01	5.07E+01	1.19E+08	2.39E+01	3.08E+01	8.16E+07	2.92E+01
3.75E+01	1.03E+08	3.09E+01	5.97E+01	1.34E+08	2.50E+01	5.55E+01	1.21E+08	2.32E+01	3.59E+01	8.52E+07	2.87E+01
3.88E+01	1.03E+08	3.03E+01	5.98E+01	1.35E+08	2.55E+01	6.08E+01	1.25E+08	2.35E+01	4.07E+01	8.77E+07	2.90E+01
4.72E+01	1.12E+08	3.02E+01	6.15E+01	1.34E+08	2.56E+01	6.37E+01	1.26E+08	2.32E+01	4.44E+01	9.09E+07	2.82E+01
5.45E+01	1.16E+08	2.94E+01	7.18E+01	1.42E+08	2.49E+01	7.22E+01	1.31E+08	2.27E+01	4.89E+01	9.61E+07	2.84E+01
5.48E+01	1.16E+08	2.99E+01	9.46E+01	1.53E+08	2.44E+01	8.79E+01	1.36E+08	2.27E+01	5.12E+01	9.11E+07	2.86E+01

Table B.11 Summary of Complex Modulus and Phase Angle Values for Binder 6428SM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
6.16E+01	1.21E+08	2.91E+01	9.48E+01	1.53E+08	2.49E+01	9.63E+01	1.41E+08	2.30E+01	5.69E+01	9.65E+07	2.74E+01
7.47E+01	1.29E+08	2.87E+01	9.75E+01	1.52E+08	2.47E+01	1.01E+02	1.40E+08	2.31E+01	7.04E+01	1.04E+08	2.76E+01
8.64E+01	1.34E+08	2.85E+01	1.14E+02	1.60E+08	2.41E+01	1.15E+02	1.46E+08	2.20E+01	7.75E+01	1.11E+08	2.79E+01
8.69E+01	1.35E+08	2.89E+01	1.50E+02	1.72E+08	2.37E+01	1.39E+02	1.52E+08	2.22E+01	8.11E+01	1.05E+08	2.76E+01
9.76E+01	1.39E+08	2.79E+01	1.55E+02	1.72E+08	2.41E+01	1.60E+02	1.57E+08	2.19E+01	9.02E+01	1.13E+08	2.71E+01
1.18E+02	1.47E+08	2.79E+01	1.73E+02	1.75E+08	2.40E+01	1.81E+02	1.62E+08	2.13E+01	1.12E+02	1.21E+08	2.70E+01
1.23E+02	1.48E+08	2.78E+01	1.80E+02	1.80E+08	2.34E+01	2.02E+02	1.64E+08	2.19E+01	1.29E+02	1.24E+08	2.71E+01
1.37E+02	1.54E+08	2.75E+01	2.18E+02	1.85E+08	2.42E+01	2.21E+02	1.69E+08	2.16E+01	1.42E+02	1.27E+08	2.77E+01
1.55E+02	1.55E+08	2.80E+01	2.38E+02	1.93E+08	2.31E+01	2.53E+02	1.74E+08	2.12E+01	1.43E+02	1.26E+08	2.65E+01
1.55E+02	1.60E+08	2.72E+01	2.45E+02	1.94E+08	2.32E+01	2.54E+02	1.75E+08	2.16E+01	1.77E+02	1.37E+08	2.63E+01
1.88E+02	1.69E+08	2.68E+01	2.86E+02	2.03E+08	2.27E+01	2.88E+02	1.80E+08	2.09E+01	1.78E+02	1.40E+08	2.76E+01
2.17E+02	1.76E+08	2.66E+01	3.45E+02	2.06E+08	2.32E+01	3.50E+02	1.88E+08	2.11E+01	2.04E+02	1.42E+08	2.62E+01
2.45E+02	1.80E+08	2.69E+01	3.76E+02	2.17E+08	2.25E+01	4.02E+02	1.95E+08	2.04E+01	2.27E+02	1.44E+08	2.55E+01
2.45E+02	1.84E+08	2.60E+01	3.88E+02	2.18E+08	2.24E+01	4.02E+02	1.93E+08	2.05E+01	2.80E+02	1.57E+08	2.56E+01
2.98E+02	1.94E+08	2.55E+01	4.53E+02	2.27E+08	2.20E+01	4.56E+02	2.00E+08	2.03E+01	2.83E+02	1.55E+08	2.67E+01
3.44E+02	2.02E+08	2.57E+01	5.47E+02	2.33E+08	2.24E+01	5.55E+02	2.10E+08	2.06E+01	3.23E+02	1.63E+08	2.50E+01
3.88E+02	2.08E+08	2.53E+01	5.97E+02	2.43E+08	2.19E+01	6.36E+02	2.13E+08	2.05E+01	3.59E+02	1.65E+08	2.48E+01
3.88E+02	2.08E+08	2.51E+01	6.15E+02	2.43E+08	2.14E+01	6.37E+02	2.14E+08	1.98E+01	4.44E+02	1.81E+08	2.48E+01
4.31E+02	2.11E+08	2.53E+01	6.28E+02	2.35E+08	2.37E+01	7.22E+02	2.21E+08	1.99E+01	4.48E+02	1.74E+08	2.44E+01
4.72E+02	2.18E+08	2.49E+01	7.18E+02	2.52E+08	2.13E+01	7.33E+02	2.22E+08	2.08E+01	5.12E+02	1.82E+08	2.40E+01
5.41E+02	2.18E+08	2.51E+01	7.88E+02	2.47E+08	2.25E+01	9.21E+02	2.24E+08	2.00E+01	5.31E+02	1.74E+08	2.35E+01
5.45E+02	2.30E+08	2.48E+01	8.67E+02	2.65E+08	2.14E+01	1.01E+03	2.35E+08	1.97E+01	5.69E+02	1.88E+08	2.42E+01
6.15E+02	2.34E+08	2.51E+01	9.75E+02	2.71E+08	2.10E+01	1.01E+03	2.35E+08	1.95E+01	7.10E+02	1.95E+08	2.50E+01
6.16E+02	2.36E+08	2.42E+01	1.14E+03	2.81E+08	2.06E+01	1.15E+03	2.44E+08	1.93E+01	8.11E+02	2.08E+08	2.39E+01

Table B.11 Summary of Complex Modulus and Phase Angle Values for Binder 6428SM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
7.47E+02	2.47E+08	2.37E+01	1.25E+03	2.80E+08	2.27E+01	1.46E+03	2.53E+08	1.96E+01	9.02E+02	2.12E+08	2.35E+01
8.58E+02	2.51E+08	2.44E+01	1.37E+03	2.95E+08	2.06E+01	1.60E+03	2.59E+08	1.89E+01	1.06E+03	2.15E+08	2.54E+01
9.75E+02	2.64E+08	2.35E+01	1.55E+03	3.00E+08	2.03E+01	1.60E+03	2.61E+08	1.89E+01	1.12E+03	2.20E+08	2.22E+01
9.76E+02	2.67E+08	2.32E+01	1.80E+03	3.11E+08	2.00E+01	1.81E+03	2.68E+08	1.88E+01	1.29E+03	2.35E+08	2.27E+01
1.18E+03	2.78E+08	2.28E+01	1.98E+03	3.10E+08	2.09E+01	1.98E+03	2.66E+08	1.87E+01	1.43E+03	2.39E+08	2.27E+01
1.36E+03	2.86E+08	2.39E+01	2.18E+03	3.24E+08	1.97E+01	2.31E+03	2.74E+08	1.96E+01	1.68E+03	2.31E+08	2.34E+01
1.55E+03	2.95E+08	2.29E+01	2.32E+03	3.14E+08	2.21E+01	2.48E+03	2.74E+08	1.86E+01	1.78E+03	2.46E+08	2.36E+01
1.55E+03	2.99E+08	2.24E+01	2.45E+03	3.32E+08	1.95E+01	2.53E+03	2.85E+08	1.93E+01	2.04E+03	2.63E+08	2.20E+01
1.74E+03	2.86E+08	2.39E+01	2.86E+03	3.45E+08	1.93E+01	2.54E+03	2.85E+08	1.84E+01	2.16E+03	2.65E+08	2.13E+01
1.88E+03	3.11E+08	2.19E+01	2.92E+03	3.22E+08	2.00E+01	2.88E+03	2.96E+08	1.82E+01	2.27E+03	2.71E+08	2.18E+01
2.16E+03	3.17E+08	2.22E+01	3.14E+03	3.42E+08	2.02E+01	3.67E+03	3.03E+08	1.91E+01	2.65E+03	2.75E+08	2.36E+01
2.18E+03	3.08E+08	2.34E+01	3.45E+03	3.56E+08	1.91E+01	3.94E+03	3.09E+08	1.83E+01	2.83E+03	2.77E+08	2.18E+01
2.45E+03	3.32E+08	2.15E+01	3.88E+03	3.66E+08	1.89E+01	4.02E+03	3.13E+08	1.75E+01	3.23E+03	2.92E+08	2.12E+01
2.45E+03	3.35E+08	2.14E+01	4.53E+03	3.79E+08	1.87E+01	4.02E+03	3.13E+08	1.78E+01	3.42E+03	2.86E+08	2.10E+01
2.98E+03	3.47E+08	2.09E+01	4.62E+03	3.58E+08	2.04E+01	4.56E+03	3.23E+08	1.76E+01	3.59E+03	3.02E+08	2.11E+01
3.42E+03	3.49E+08	2.23E+01	4.97E+03	3.74E+08	1.82E+01	5.81E+03	3.29E+08	1.75E+01	4.21E+03	3.07E+08	2.35E+01
3.46E+03	3.42E+08	2.32E+01	5.47E+03	3.90E+08	1.85E+01	6.24E+03	3.33E+08	1.70E+01	4.48E+03	3.08E+08	2.10E+01
3.88E+03	3.63E+08	2.05E+01	6.15E+03	4.03E+08	1.82E+01	6.36E+03	3.41E+08	1.71E+01	5.12E+03	3.26E+08	2.03E+01
3.88E+03	3.74E+08	2.05E+01	7.18E+03	4.16E+08	1.80E+01	6.37E+03	3.40E+08	1.72E+01	5.43E+03	3.32E+08	2.23E+01
4.72E+03	3.86E+08	2.00E+01	7.33E+03	4.07E+08	1.88E+01	7.16E+03	3.33E+08	1.86E+01	5.69E+03	3.37E+08	2.02E+01
5.41E+03	3.88E+08	1.94E+01	7.68E+03	4.19E+08	1.88E+01	7.22E+03	3.53E+08	1.70E+01	6.67E+03	3.38E+08	2.10E+01
5.49E+03	3.86E+08	2.14E+01	7.88E+03	4.19E+08	1.86E+01	8.99E+03	3.43E+08	1.74E+01	7.10E+03	3.49E+08	2.01E+01
5.94E+03	3.85E+08	2.11E+01	8.67E+03	4.29E+08	1.79E+01	9.21E+03	3.59E+08	1.83E+01	8.11E+03	3.63E+08	1.96E+01
6.15E+03	4.05E+08	1.96E+01	9.64E+03	4.01E+08	1.82E+01	9.88E+03	3.69E+08	1.73E+01	8.16E+03	3.25E+08	2.35E+01

Table B.11 Summary of Complex Modulus and Phase Angle Values for Binder 6428SM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
6.16E+03	4.11E+08	1.97E+01	9.75E+03	4.41E+08	1.75E+01	1.01E+04	3.70E+08	1.67E+01	8.60E+03	3.54E+08	2.22E+01
7.46E+03	4.03E+08	2.09E+01	1.16E+04	4.34E+08	1.77E+01	1.01E+04	3.71E+08	1.66E+01	1.06E+04	3.75E+08	1.87E+01
7.47E+03	4.25E+08	1.92E+01	1.25E+04	4.56E+08	1.72E+01	1.43E+04	3.86E+08	1.72E+01	1.12E+04	3.84E+08	1.92E+01
8.58E+03	4.37E+08	2.02E+01	1.37E+04	4.67E+08	1.72E+01	1.46E+04	3.86E+08	1.56E+01	1.29E+04	3.99E+08	1.87E+01
8.70E+03	4.21E+08	1.91E+01	1.53E+04	4.60E+08	1.72E+01	1.57E+04	3.94E+08	1.60E+01	1.29E+04	3.43E+08	2.20E+01
9.75E+03	4.46E+08	1.89E+01	1.55E+04	4.80E+08	1.69E+01	1.60E+04	4.02E+08	1.60E+01	1.36E+04	3.82E+08	1.92E+01
1.18E+04	4.56E+08	2.01E+01	1.84E+04	4.83E+08	1.78E+01	1.60E+04	4.02E+08	1.61E+01	1.68E+04	4.19E+08	1.87E+01
1.18E+04	4.67E+08	1.83E+01	1.98E+04	4.96E+08	1.68E+01	2.26E+04	4.18E+08	1.70E+01	1.78E+04	4.14E+08	1.85E+01
1.36E+04	4.73E+08	1.86E+01	2.18E+04	5.08E+08	1.64E+01	2.31E+04	4.24E+08	1.56E+01	1.96E+04	4.04E+08	2.18E+01
1.38E+04	4.74E+08	1.88E+01	2.42E+04	4.98E+08	1.81E+01	2.48E+04	4.35E+08	1.57E+01	2.04E+04	4.37E+08	1.80E+01
1.46E+04	4.62E+08	1.91E+01	2.45E+04	5.22E+08	1.62E+01	2.53E+04	4.35E+08	1.54E+01	2.05E+04	4.27E+08	1.61E+01
1.55E+04	4.91E+08	1.79E+01	2.92E+04	5.24E+08	1.68E+01	2.54E+04	4.37E+08	1.54E+01	2.16E+04	4.47E+08	1.68E+01
1.84E+04	5.03E+08	2.04E+01	3.14E+04	5.38E+08	1.60E+01	3.58E+04	4.51E+08	1.65E+01	2.65E+04	4.52E+08	1.79E+01
1.87E+04	4.84E+08	1.97E+01	3.34E+04	5.35E+08	2.11E+01	3.67E+04	4.57E+08	1.51E+01	2.83E+04	4.67E+08	1.75E+01
1.88E+04	5.09E+08	1.75E+01	3.45E+04	5.52E+08	1.58E+01	3.94E+04	4.66E+08	1.58E+01	3.25E+04	4.83E+08	1.84E+01
2.16E+04	5.20E+08	1.78E+01	3.84E+04	5.44E+08	1.66E+01	4.02E+04	4.70E+08	1.48E+01	3.42E+04	4.77E+08	1.72E+01
2.18E+04	5.13E+08	1.76E+01	4.19E+04	5.03E+08	1.60E+01	5.67E+04	4.82E+08	1.49E+01	4.21E+04	4.88E+08	1.73E+01
2.45E+04	5.36E+08	1.70E+01	4.62E+04	5.70E+08	1.58E+01	5.81E+04	4.94E+08	1.45E+01	4.48E+04	5.04E+08	1.67E+01
2.91E+04	5.41E+08	1.71E+01	4.97E+04	5.82E+08	1.55E+01	6.24E+04	5.06E+08	1.41E+01	5.15E+04	5.66E+08	1.74E+01
2.97E+04	5.44E+08	1.66E+01	5.47E+04	5.96E+08	1.51E+01	6.36E+04	5.06E+08	1.42E+01	5.43E+04	5.29E+08	1.77E+01
3.38E+04	5.55E+08	1.94E+01	6.08E+04	5.92E+08	1.63E+01	7.64E+04	4.51E+08	1.94E+01	6.67E+04	5.28E+08	1.63E+01
3.42E+04	5.68E+08	1.67E+01	6.64E+04	5.43E+08	1.59E+01	8.99E+04	5.12E+08	1.44E+01	7.10E+04	5.44E+08	1.60E+01
3.46E+04	5.73E+08	1.79E+01	7.33E+04	6.11E+08	1.54E+01	9.21E+04	5.28E+08	1.39E+01	7.80E+04	5.86E+08	1.40E+01
3.88E+04	5.83E+08	1.62E+01	7.88E+04	6.29E+08	1.47E+01	9.59E+04	4.12E+08	1.39E+01	8.16E+04	5.68E+08	1.73E+01

Table B.11 Summary of Complex Modulus and Phase Angle Values for Binder 6428SM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
4.25E+04	7.01E+08	1.40E+01	8.67E+04	6.42E+08	1.44E+01	9.88E+04	5.40E+08	1.39E+01	8.60E+04	5.74E+08	1.60E+01
4.62E+04	5.61E+08	1.60E+01	9.64E+04	6.33E+08	1.47E+01	1.01E+05	5.44E+08	1.36E+01	1.06E+05	5.77E+08	1.55E+01
4.71E+04	5.85E+08	1.71E+01	1.05E+05	6.32E+08	1.50E+01	1.43E+05	5.59E+08	1.34E+01	1.24E+05	6.37E+08	1.68E+01
5.41E+04	6.16E+08	1.58E+01	1.10E+05	6.86E+08	1.71E+01	1.46E+05	5.64E+08	1.32E+01	1.29E+05	5.94E+08	1.57E+01
5.49E+04	6.12E+08	1.64E+01	1.16E+05	6.64E+08	1.44E+01	1.52E+05	4.69E+08	1.95E+01	1.36E+05	6.07E+08	1.52E+01
6.15E+04	6.31E+08	1.53E+01	1.25E+05	6.76E+08	1.40E+01	1.57E+05	5.77E+08	1.32E+01	1.62E+05	6.80E+08	1.44E+01
6.73E+04	6.90E+08	1.38E+01	1.53E+05	6.92E+08	1.46E+01	2.26E+05	6.01E+08	1.29E+01	1.68E+05	6.16E+08	1.48E+01
7.32E+04	6.42E+08	1.58E+01	1.67E+05	7.02E+08	1.36E+01	2.31E+05	6.05E+08	1.26E+01	1.71E+05	6.99E+08	1.49E+01
7.46E+04	6.32E+08	1.61E+01	1.75E+05	6.63E+08	1.28E+01	2.41E+05	4.98E+08	1.97E+01	1.96E+05	5.95E+08	1.43E+01
8.58E+04	6.66E+08	1.49E+01	1.84E+05	7.07E+08	1.38E+01	2.48E+05	6.17E+08	1.26E+01	2.05E+05	6.48E+08	1.46E+01
8.70E+04	6.62E+08	1.52E+01	1.98E+05	7.24E+08	1.33E+01	3.56E+05	5.21E+08	1.82E+01	2.16E+05	6.70E+08	1.41E+01
1.07E+05	7.41E+08	1.11E+01	2.42E+05	7.38E+08	1.36E+01	3.58E+05	6.37E+08	1.23E+01	2.57E+05	6.82E+08	1.35E+01
1.16E+05	7.46E+08	1.41E+01	2.64E+05	7.62E+08	1.45E+01	3.67E+05	6.41E+08	1.21E+01	2.65E+05	6.78E+08	1.37E+01
1.18E+05	6.98E+08	1.57E+01	2.77E+05	7.92E+08	1.22E+01	3.82E+05	5.50E+08	1.59E+01	2.71E+05	9.64E+08	7.78E+00
1.36E+05	7.14E+08	1.41E+01	2.92E+05	7.58E+08	1.30E+01	3.94E+05	6.59E+08	1.18E+01	3.11E+05	6.85E+08	1.61E+01
1.38E+05	7.13E+08	1.45E+01	3.04E+05	8.05E+08	1.49E+01	4.47E+05	5.45E+08	1.33E+01	3.25E+05	6.98E+08	1.47E+01
1.69E+05	7.84E+08	1.54E+01	3.14E+05	7.73E+08	1.26E+01	5.67E+05	6.77E+08	1.18E+01	3.42E+05	7.05E+08	1.35E+01
1.84E+05	7.48E+08	1.52E+01	3.82E+05	7.64E+08	1.21E+01	6.05E+05	5.80E+08	1.31E+01	4.29E+05	7.76E+08	1.01E+01
1.86E+05	8.39E+08	1.47E+01	3.84E+05	7.87E+08	1.29E+01	6.24E+05	6.96E+08	1.13E+01	4.92E+05	7.30E+08	1.38E+01
1.87E+05	7.39E+08	1.43E+01	4.19E+05	7.75E+08	1.37E+01	7.08E+05	5.57E+08	1.33E+01	5.15E+05	7.48E+08	1.32E+01
2.16E+05	7.66E+08	1.33E+01	4.39E+05	8.12E+08	1.54E+01	8.67E+05	6.14E+08	1.40E+01	5.43E+05	7.61E+08	1.27E+01
2.18E+05	7.67E+08	1.36E+01	4.62E+05	8.07E+08	1.24E+01	8.99E+05	7.19E+08	1.11E+01	6.45E+05	8.15E+08	1.42E+01
2.34E+05	9.06E+08	2.25E+01	6.08E+05	8.40E+08	1.23E+01	9.59E+05	6.26E+08	1.15E+01	6.80E+05	8.78E+08	1.20E+01
2.68E+05	8.61E+08	1.24E+01	6.64E+05	8.48E+08	1.29E+01	9.88E+05	7.34E+08	1.07E+01	7.80E+05	7.80E+08	1.23E+01

Table B.11 Summary of Complex Modulus and Phase Angle Values for Binder 6428SM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
2.91E+05	8.20E+08	1.47E+01	6.95E+05	8.60E+08	1.20E+01	1.09E+06	6.01E+08	1.54E+01	8.16E+05	8.00E+08	1.24E+01
2.97E+05	8.05E+08	1.34E+01	7.33E+05	8.60E+08	1.17E+01	1.12E+06	5.94E+08	1.56E+01	8.60E+05	8.01E+08	1.19E+01
3.46E+05	8.20E+08	1.28E+01	9.60E+05	9.87E+08	1.43E+01	1.43E+06	7.56E+08	1.05E+01	1.02E+06	8.66E+08	1.30E+01
3.71E+05	8.41E+08	1.45E+01	9.64E+05	8.91E+08	1.16E+01	1.52E+06	6.84E+08	1.22E+01	1.24E+06	8.34E+08	1.16E+01
4.25E+05	9.46E+08	1.01E+01	1.05E+06	8.75E+08	1.23E+01	1.73E+06	6.98E+08	1.04E+01	1.29E+06	8.45E+08	1.15E+01
4.62E+05	8.77E+08	1.24E+01	1.10E+06	9.39E+08	1.48E+01	1.78E+06	6.57E+08	1.39E+01	1.62E+06	9.02E+08	1.13E+01
4.71E+05	8.49E+08	1.28E+01	1.16E+06	9.09E+08	1.10E+01	2.26E+06	7.97E+08	9.90E+00	1.71E+06	9.72E+08	1.21E+01
5.49E+05	8.72E+08	1.19E+01	1.52E+06	9.63E+08	1.10E+01	2.41E+06	7.00E+08	1.13E+01	1.96E+06	8.93E+08	1.10E+01
5.88E+05	9.09E+08	1.21E+01	1.53E+06	9.44E+08	1.09E+01	2.74E+06	7.54E+08	1.32E+01	2.05E+06	8.91E+08	1.08E+01
6.73E+05	9.66E+08	1.27E+01	1.67E+06	9.45E+08	1.14E+01	2.82E+06	6.96E+08	1.16E+01	2.57E+06	9.73E+08	1.04E+01
7.32E+05	9.36E+08	1.18E+01	1.75E+06	9.83E+08	1.35E+01	3.58E+06	8.38E+08	9.37E+00	2.71E+06	1.02E+09	1.09E+01
7.46E+05	9.04E+08	1.18E+01	2.41E+06	1.00E+09	9.80E+00	3.82E+06	7.46E+08	1.16E+01	3.11E+06	9.51E+08	1.03E+01
8.70E+05	9.23E+08	1.12E+01	2.42E+06	9.93E+08	1.02E+01	4.34E+06	7.88E+08	9.06E+00	4.07E+06	1.01E+09	9.73E+00
9.31E+05	9.28E+08	1.56E+01	2.64E+06	9.93E+08	1.03E+01	4.47E+06	7.06E+08	1.03E+01	4.29E+06	1.09E+09	8.85E+00
1.07E+06	1.03E+09	1.15E+01	2.77E+06	1.05E+09	1.04E+01	6.05E+06	7.85E+08	1.07E+01	4.92E+06	9.97E+08	9.31E+00
1.16E+06	9.89E+08	1.09E+01	3.82E+06	1.04E+09	1.17E+01	6.87E+06	8.05E+08	1.16E+01	6.45E+06	1.07E+09	8.74E+00
1.18E+06	9.55E+08	1.11E+01	3.84E+06	1.05E+09	9.62E+00	7.08E+06	7.99E+08	9.35E+00	6.80E+06	1.15E+09	8.92E+00
1.48E+06	1.09E+09	1.04E+01	4.19E+06	1.04E+09	1.00E+01	9.59E+06	8.27E+08	9.81E+00	1.02E+07	1.12E+09	8.23E+00
1.69E+06	1.08E+09	1.06E+01	4.39E+06	1.09E+09	1.01E+01	1.09E+07	8.77E+08	9.66E+00	1.08E+07	1.20E+09	7.96E+00
1.84E+06	1.04E+09	1.03E+01	6.06E+06	1.16E+09	9.23E+00	1.12E+07	8.04E+08	1.01E+01	1.62E+07	1.17E+09	7.10E+00
1.87E+06	1.00E+09	1.04E+01	6.64E+06	1.10E+09	9.27E+00	1.52E+07	8.60E+08	9.17E+00	1.71E+07	1.23E+09	6.83E+00
2.34E+06	1.07E+09	1.07E+01	6.95E+06	1.14E+09	9.02E+00	1.73E+07	8.60E+08	1.06E+01	2.71E+07	1.27E+09	6.33E+00
2.68E+06	1.13E+09	9.26E+00	9.60E+06	1.19E+09	7.48E+00	1.78E+07	8.48E+08	9.73E+00	4.29E+07	1.31E+09	6.06E+00
2.91E+06	1.09E+09	9.57E+00	1.05E+07	1.14E+09	8.62E+00	2.41E+07	9.00E+08	8.55E+00	5.65E+06	1.11E+09	9.98E+00

Table B.11 Summary of Complex Modulus and Phase Angle Values for Binder 6428SM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
2.97E+06	1.06E+09	9.64E+00	1.10E+07	1.19E+09	8.38E+00	2.74E+07	9.25E+08	9.14E+00	6.20E+06	1.11E+09	1.02E+01
3.71E+06	1.13E+09	8.03E+00	1.52E+07	1.24E+09	9.06E+00	2.82E+07	8.88E+08	8.61E+00	8.57E+06	1.23E+09	9.46E+00
4.25E+06	1.18E+09	8.68E+00	1.67E+07	1.19E+09	8.01E+00	3.82E+07	9.36E+08	8.01E+00	8.96E+06	1.17E+09	9.19E+00
4.62E+06	1.14E+09	8.86E+00	1.75E+07	1.24E+09	7.89E+00	4.34E+07	9.67E+08	8.79E+00	9.82E+06	1.16E+09	9.70E+00
5.88E+06	1.21E+09	8.62E+00	2.41E+07	1.29E+09	7.53E+00	4.47E+07	9.33E+08	8.63E+00	1.31E+07	1.30E+09	1.03E+01
6.73E+06	1.23E+09	8.17E+00	2.77E+07	1.29E+09	7.30E+00	6.87E+07	1.01E+09	7.77E+00	1.36E+07	1.27E+09	8.56E+00
7.32E+06	1.19E+09	8.30E+00	3.82E+07	1.34E+09	6.98E+00	7.08E+07	9.68E+08	7.75E+00	1.56E+07	1.23E+09	8.95E+00
9.31E+06	1.25E+09	9.20E+00	4.39E+07	1.33E+09	6.66E+00	1.09E+08	1.05E+09	7.01E+00	2.15E+07	1.32E+09	8.21E+00
1.05E+07	1.03E+09	1.32E+01	6.06E+07	1.39E+09	6.51E+00	1.12E+08	1.01E+09	7.26E+00	2.47E+07	1.28E+09	8.30E+00
1.07E+07	1.28E+09	7.49E+00	9.60E+07	1.43E+09	6.13E+00	1.73E+08	1.08E+09	6.73E+00	3.30E+07	1.40E+09	6.29E+00
1.31E+07	1.18E+09	8.01E+00	1.52E+08	1.47E+09	5.48E+00	1.78E+08	1.04E+09	6.95E+00	3.41E+07	1.38E+09	7.63E+00
1.48E+07	1.30E+09	7.74E+00	5.53E+07	1.20E+09	7.68E+00	2.74E+08	1.12E+09	6.07E+00	3.91E+07	1.33E+09	7.87E+00
1.69E+07	1.33E+09	6.81E+00	7.26E+07	1.29E+09	1.23E+01	4.34E+08	1.15E+09	5.58E+00	5.24E+07	1.48E+09	7.13E+00
2.08E+07	1.51E+09	5.61E+00	8.77E+07	1.25E+09	7.36E+00	7.88E+07	1.25E+09	7.45E+00	5.41E+07	1.43E+09	6.86E+00
2.34E+07	1.35E+09	6.97E+00	1.15E+08	1.38E+09	9.67E+00	1.03E+08	1.25E+09	7.18E+00	8.30E+07	1.52E+09	6.73E+00
3.30E+07	1.24E+09	4.42E+00	1.39E+08	1.29E+09	7.06E+00	1.03E+08	1.20E+09	7.67E+00	8.57E+07	1.50E+09	6.28E+00
3.71E+07	1.40E+09	6.51E+00	1.82E+08	1.47E+09	3.93E+00	1.25E+08	1.30E+09	7.18E+00	1.31E+08	1.56E+09	5.58E+00
5.23E+07	1.49E+09	4.13E+00	2.20E+08	1.33E+09	6.41E+00	1.63E+08	1.27E+09	3.93E+00	2.08E+08	1.61E+09	5.79E+00
5.88E+07	1.45E+09	6.10E+00	2.89E+08	1.45E+09	4.64E+00	1.64E+08	1.24E+09	7.12E+00	3.30E+08	1.68E+09	5.39E+00
8.28E+07	1.43E+09	8.45E+00	3.49E+08	1.38E+09	5.98E+00	1.98E+08	1.34E+09	6.42E+00	5.24E+08	1.71E+09	5.04E+00
9.31E+07	1.49E+09	5.42E+00	4.58E+08	1.48E+09	5.66E+00	2.58E+08	1.41E+09	6.06E+00	8.30E+08	1.76E+09	4.56E+00
1.31E+08	1.48E+09	7.01E+00	7.26E+08	1.50E+09	5.52E+00	3.14E+08	1.38E+09	6.05E+00	1.31E+09	1.79E+09	4.17E+00
2.08E+08	1.58E+09	3.83E+00	1.15E+09	1.55E+09	5.04E+00	4.09E+08	1.43E+09	5.47E+00	2.08E+09	1.83E+09	3.90E+00

Table B.12 Summary of Complex Modulus and Phase Angle Values for Binder 7034LV with Different Aging Conditions

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
1.15E-03	3.24E+04	4.71E+01	6.29E-05	3.82E+04	5.12E+01	6.28E-04	4.22E+05	4.74E+01	8.12E-05	2.89E+04	4.85E+01
1.45E-03	3.53E+04	4.72E+01	7.89E-05	4.25E+04	5.16E+01	7.88E-04	4.73E+05	4.71E+01	1.02E-04	3.23E+04	4.86E+01
2.30E-03	4.27E+04	5.00E+01	1.25E-04	5.36E+04	5.13E+01	1.25E-03	5.92E+05	4.71E+01	1.62E-04	4.15E+04	4.97E+01
3.64E-03	5.29E+04	5.15E+01	1.98E-04	6.75E+04	5.16E+01	1.98E-03	7.47E+05	4.68E+01	2.56E-04	5.27E+04	5.05E+01
3.99E-03	6.07E+04	4.56E+01	3.14E-04	8.57E+04	5.19E+01	2.51E-03	8.53E+05	4.63E+01	4.06E-04	6.82E+04	5.12E+01
5.01E-03	6.70E+04	4.71E+01	4.98E-04	1.10E+05	5.21E+01	3.14E-03	9.44E+05	4.62E+01	6.43E-04	8.83E+04	5.20E+01
5.77E-03	6.64E+04	5.36E+01	7.15E-04	1.37E+05	5.07E+01	3.15E-03	9.57E+05	4.62E+01	8.22E-04	1.02E+05	5.13E+01
7.94E-03	8.17E+04	4.91E+01	7.89E-04	1.41E+05	5.26E+01	4.98E-03	1.19E+06	4.60E+01	1.02E-03	1.15E+05	5.28E+01
9.15E-03	8.45E+04	5.50E+01	8.98E-04	1.54E+05	5.08E+01	4.99E-03	1.20E+06	4.54E+01	1.03E-03	1.16E+05	5.18E+01
1.26E-02	1.04E+05	5.13E+01	1.25E-03	1.83E+05	5.29E+01	7.88E-03	1.49E+06	4.55E+01	1.62E-03	1.50E+05	5.35E+01
1.33E-02	1.07E+05	5.18E+01	1.42E-03	1.97E+05	5.13E+01	7.92E-03	1.50E+06	4.50E+01	1.64E-03	1.50E+05	5.23E+01
1.45E-02	1.10E+05	5.64E+01	1.98E-03	2.37E+05	5.32E+01	1.01E-02	1.71E+06	4.47E+01	2.56E-03	1.98E+05	5.43E+01
1.67E-02	1.21E+05	5.29E+01	2.26E-03	2.55E+05	5.12E+01	1.25E-02	1.87E+06	4.50E+01	2.59E-03	1.97E+05	5.27E+01
1.99E-02	1.32E+05	5.36E+01	2.71E-03	2.86E+05	5.07E+01	1.25E-02	1.88E+06	4.44E+01	2.87E-03	2.13E+05	5.19E+01
2.30E-02	1.46E+05	5.79E+01	3.14E-03	3.09E+05	5.33E+01	1.26E-02	1.92E+06	4.45E+01	3.61E-03	2.43E+05	5.23E+01
2.65E-02	1.55E+05	5.46E+01	3.40E-03	3.24E+05	5.06E+01	1.98E-02	2.33E+06	4.45E+01	4.06E-03	2.61E+05	5.49E+01
3.16E-02	1.72E+05	5.54E+01	3.58E-03	3.29E+05	5.12E+01	1.99E-02	2.35E+06	4.37E+01	4.11E-03	2.59E+05	5.32E+01
3.64E-02	1.95E+05	5.87E+01	4.98E-03	4.05E+05	5.35E+01	2.00E-02	2.38E+06	4.35E+01	5.72E-03	3.20E+05	5.28E+01
4.20E-02	2.04E+05	5.59E+01	5.39E-03	4.16E+05	5.07E+01	3.14E-02	2.91E+06	4.40E+01	6.43E-03	3.47E+05	5.56E+01
4.97E-02	2.32E+05	5.51E+01	5.67E-03	4.25E+05	5.13E+01	3.15E-02	2.92E+06	4.31E+01	6.51E-03	3.39E+05	5.37E+01
5.01E-02	2.28E+05	5.67E+01	7.89E-03	5.29E+05	5.38E+01	3.18E-02	2.95E+06	4.28E+01	9.06E-03	4.17E+05	5.30E+01
5.77E-02	2.61E+05	5.97E+01	8.54E-03	5.35E+05	5.05E+01	4.35E-02	3.48E+06	4.24E+01	1.02E-02	4.60E+05	5.62E+01
6.24E-02	2.64E+05	5.57E+01	8.98E-03	5.49E+05	5.12E+01	4.97E-02	3.62E+06	4.35E+01	1.03E-02	4.48E+05	5.39E+01
6.65E-02	2.70E+05	5.70E+01	1.04E-02	6.06E+05	5.02E+01	4.99E-02	3.61E+06	4.25E+01	1.11E-02	4.69E+05	5.27E+01

Table B.12 Summary of Complex Modulus and Phase Angle Values for Binder 7034LV with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
7.94E-02	3.03E+05	5.80E+01	1.25E-02	6.83E+05	5.42E+01	5.04E-02	3.66E+06	4.21E+01	1.39E-02	5.37E+05	5.30E+01
9.15E-02	3.52E+05	6.05E+01	1.30E-02	6.81E+05	5.03E+01	5.46E-02	3.87E+06	4.16E+01	1.44E-02	5.43E+05	5.31E+01
9.90E-02	3.51E+05	5.68E+01	1.35E-02	6.94E+05	5.02E+01	7.88E-02	4.50E+06	4.30E+01	1.62E-02	6.09E+05	5.69E+01
1.05E-01	3.61E+05	5.78E+01	1.42E-02	7.09E+05	5.11E+01	7.92E-02	4.47E+06	4.18E+01	1.64E-02	5.93E+05	5.41E+01
1.26E-01	4.07E+05	5.87E+01	1.98E-02	8.82E+05	5.47E+01	7.98E-02	4.50E+06	4.13E+01	2.21E-02	7.06E+05	5.28E+01
1.45E-01	4.79E+05	6.11E+01	2.06E-02	8.81E+05	4.97E+01	8.65E-02	4.73E+06	4.09E+01	2.28E-02	7.14E+05	5.33E+01
1.57E-01	4.68E+05	5.73E+01	2.14E-02	8.88E+05	5.00E+01	1.25E-01	5.54E+06	4.25E+01	2.56E-02	8.02E+05	5.78E+01
1.67E-01	4.84E+05	5.83E+01	2.26E-02	9.15E+05	5.08E+01	1.25E-01	5.52E+06	4.11E+01	2.59E-02	7.80E+05	5.42E+01
1.99E-01	5.47E+05	5.93E+01	3.27E-02	1.13E+06	4.92E+01	1.26E-01	5.55E+06	4.05E+01	3.50E-02	9.27E+05	5.26E+01
2.00E-01	5.52E+05	5.72E+01	3.40E-02	1.14E+06	4.96E+01	1.37E-01	5.79E+06	4.00E+01	3.61E-02	9.43E+05	5.33E+01
2.30E-01	6.51E+05	6.16E+01	3.58E-02	1.18E+06	5.05E+01	1.98E-01	6.87E+06	4.18E+01	4.06E-02	1.04E+06	5.97E+01
2.49E-01	6.21E+05	5.76E+01	4.45E-02	1.36E+06	4.88E+01	1.99E-01	6.74E+06	4.05E+01	4.11E-02	1.03E+06	5.41E+01
2.51E-01	6.37E+05	5.72E+01	5.18E-02	1.45E+06	4.86E+01	2.00E-01	6.94E+06	3.93E+01	4.62E-02	1.13E+06	5.22E+01
2.65E-01	6.55E+05	5.86E+01	5.39E-02	1.47E+06	4.91E+01	2.00E-01	6.77E+06	3.97E+01	5.54E-02	1.22E+06	5.24E+01
3.16E-01	7.40E+05	5.97E+01	5.59E-02	1.52E+06	4.82E+01	2.17E-01	7.07E+06	3.91E+01	5.72E-02	1.24E+06	5.31E+01
3.64E-01	8.78E+05	6.21E+01	5.67E-02	1.52E+06	5.01E+01	2.51E-01	7.64E+06	3.90E+01	5.80E-02	1.29E+06	5.19E+01
3.94E-01	8.38E+05	5.78E+01	8.21E-02	1.84E+06	4.79E+01	3.15E-01	8.26E+06	3.98E+01	6.51E-02	1.36E+06	5.40E+01
3.98E-01	8.50E+05	5.73E+01	8.54E-02	1.89E+06	4.86E+01	3.18E-01	8.25E+06	3.90E+01	8.78E-02	1.60E+06	5.20E+01
4.20E-01	8.79E+05	5.88E+01	8.85E-02	1.93E+06	4.76E+01	3.44E-01	8.58E+06	3.82E+01	9.06E-02	1.62E+06	5.28E+01
5.01E-01	1.01E+06	5.98E+01	8.98E-02	1.96E+06	4.98E+01	3.98E-01	9.25E+06	3.78E+01	9.19E-02	1.66E+06	5.14E+01
5.77E-01	1.17E+06	6.31E+01	1.30E-01	2.34E+06	4.73E+01	4.99E-01	1.01E+07	3.92E+01	1.03E-01	1.78E+06	5.38E+01
6.24E-01	1.12E+06	5.76E+01	1.35E-01	2.40E+06	4.80E+01	5.04E-01	1.00E+07	3.83E+01	1.39E-01	2.09E+06	5.16E+01
6.31E-01	1.13E+06	5.72E+01	1.40E-01	2.45E+06	4.68E+01	5.46E-01	1.04E+07	3.74E+01	1.44E-01	2.12E+06	5.24E+01
6.65E-01	1.19E+06	5.87E+01	1.42E-01	2.52E+06	4.93E+01	6.31E-01	1.11E+07	3.69E+01	1.46E-01	2.14E+06	5.09E+01

Table B.12 Summary of Complex Modulus and Phase Angle Values for Binder 7034LV with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
7.94E-01	1.36E+06	5.98E+01	2.00E-01	3.01E+06	4.66E+01	7.92E-01	1.23E+07	3.86E+01	1.64E-01	2.33E+06	5.35E+01
8.96E-01	1.46E+06	5.56E+01	2.06E-01	2.97E+06	4.66E+01	7.98E-01	1.21E+07	3.76E+01	2.00E-01	2.59E+06	5.00E+01
9.90E-01	1.51E+06	5.74E+01	2.14E-01	3.06E+06	4.74E+01	8.65E-01	1.26E+07	3.66E+01	2.21E-01	2.71E+06	5.10E+01
1.00E+00	1.52E+06	5.67E+01	2.22E-01	3.12E+06	4.59E+01	9.90E-01	1.36E+07	3.63E+01	2.28E-01	2.78E+06	5.19E+01
1.05E+00	1.60E+06	5.84E+01	2.26E-01	3.20E+06	4.90E+01	1.00E+00	1.34E+07	3.61E+01	2.31E-01	2.79E+06	5.02E+01
1.13E+00	1.68E+06	5.54E+01	2.51E-01	3.34E+06	4.57E+01	1.24E+00	1.47E+07	3.54E+01	2.51E-01	2.93E+06	4.98E+01
1.26E+00	1.83E+06	5.99E+01	3.27E-01	3.75E+06	4.59E+01	1.25E+00	1.48E+07	3.81E+01	2.59E-01	3.06E+06	5.33E+01
1.57E+00	2.02E+06	5.69E+01	3.40E-01	3.87E+06	4.68E+01	1.26E+00	1.46E+07	3.69E+01	3.50E-01	3.53E+06	5.03E+01
1.58E+00	2.03E+06	5.62E+01	3.52E-01	3.91E+06	4.51E+01	1.37E+00	1.50E+07	3.58E+01	3.61E-01	3.60E+06	5.13E+01
1.67E+00	2.15E+06	5.80E+01	3.98E-01	4.21E+06	4.49E+01	1.58E+00	1.60E+07	3.52E+01	3.66E-01	3.61E+06	4.94E+01
1.78E+00	2.22E+06	5.49E+01	5.18E-01	4.73E+06	4.51E+01	1.97E+00	1.76E+07	3.46E+01	3.98E-01	3.78E+06	4.88E+01
2.49E+00	2.69E+06	5.62E+01	5.39E-01	4.90E+06	4.62E+01	2.00E+00	1.76E+07	3.62E+01	4.11E-01	3.95E+06	5.32E+01
2.51E+00	2.70E+06	5.53E+01	5.59E-01	4.92E+06	4.42E+01	2.17E+00	1.79E+07	3.51E+01	5.54E-01	4.56E+06	4.96E+01
2.65E+00	2.88E+06	5.74E+01	6.31E-01	5.26E+06	4.39E+01	2.51E+00	1.91E+07	3.43E+01	5.72E-01	4.68E+06	5.07E+01
2.83E+00	2.92E+06	5.42E+01	8.21E-01	5.93E+06	4.44E+01	3.12E+00	2.09E+07	3.38E+01	5.80E-01	4.64E+06	4.87E+01
3.94E+00	3.58E+06	5.54E+01	8.54E-01	6.16E+06	4.56E+01	3.18E+00	2.10E+07	3.56E+01	6.31E-01	4.83E+06	4.80E+01
3.98E+00	3.57E+06	5.45E+01	8.85E-01	6.13E+06	4.33E+01	3.44E+00	2.14E+07	3.44E+01	8.78E-01	5.85E+06	4.89E+01
4.20E+00	3.83E+06	5.68E+01	1.00E+00	6.55E+06	4.28E+01	3.98E+00	2.26E+07	3.36E+01	9.06E-01	6.03E+06	5.01E+01
4.31E+00	3.85E+06	5.33E+01	1.01E+00	6.66E+06	4.28E+01	4.95E+00	2.47E+07	3.29E+01	9.19E-01	5.89E+06	4.79E+01
4.48E+00	3.83E+06	5.34E+01	1.27E+00	7.41E+06	4.24E+01	5.04E+00	2.51E+07	3.51E+01	1.00E+00	6.21E+06	4.70E+01
5.41E+00	4.40E+06	5.23E+01	1.30E+00	7.40E+06	4.36E+01	5.37E+00	2.58E+07	3.26E+01	1.02E+00	6.68E+06	4.65E+01
6.24E+00	4.75E+06	5.45E+01	1.40E+00	7.65E+06	4.24E+01	5.46E+00	2.54E+07	3.37E+01	1.28E+00	7.34E+06	4.60E+01
6.31E+00	4.70E+06	5.36E+01	1.58E+00	8.09E+06	4.17E+01	6.31E+00	2.66E+07	3.29E+01	1.39E+00	7.44E+06	4.81E+01
6.65E+00	5.06E+06	5.64E+01	2.02E+00	9.18E+06	4.11E+01	6.75E+00	2.79E+07	3.23E+01	1.44E+00	7.74E+06	4.95E+01

Table B.12 Summary of Complex Modulus and Phase Angle Values for Binder 7034LV with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
7.10E+00	5.03E+06	5.24E+01	2.06E+00	9.22E+06	4.28E+01	7.85E+00	2.90E+07	3.21E+01	1.46E+00	7.51E+06	4.70E+01
8.58E+00	5.68E+06	5.13E+01	2.22E+00	9.41E+06	4.16E+01	8.65E+00	3.01E+07	3.31E+01	1.58E+00	7.88E+06	4.61E+01
9.90E+00	6.24E+06	5.35E+01	2.51E+00	9.98E+06	4.09E+01	1.00E+01	3.14E+07	3.22E+01	2.02E+00	9.23E+06	4.48E+01
1.00E+01	6.17E+06	5.25E+01	3.20E+00	1.12E+07	4.01E+01	1.07E+01	3.26E+07	3.13E+01	2.21E+00	9.45E+06	4.73E+01
1.13E+01	6.55E+06	5.12E+01	3.27E+00	1.13E+07	4.21E+01	1.24E+01	3.39E+07	3.13E+01	2.31E+00	9.61E+06	4.61E+01
1.36E+01	7.33E+06	5.02E+01	3.52E+00	1.16E+07	4.07E+01	1.37E+01	3.55E+07	3.25E+01	2.51E+00	9.97E+06	4.51E+01
1.57E+01	8.18E+06	5.23E+01	3.98E+00	1.22E+07	3.98E+01	1.58E+01	3.68E+07	3.16E+01	3.21E+00	1.14E+07	4.39E+01
1.58E+01	8.05E+06	5.13E+01	5.07E+00	1.36E+07	3.91E+01	1.70E+01	3.80E+07	3.05E+01	3.50E+00	1.20E+07	4.65E+01
1.78E+01	8.47E+06	5.02E+01	5.18E+00	1.40E+07	4.14E+01	1.97E+01	3.98E+07	3.06E+01	3.66E+00	1.20E+07	4.52E+01
2.16E+01	9.46E+06	4.90E+01	5.18E+00	1.38E+07	3.92E+01	2.17E+01	4.17E+07	3.18E+01	3.98E+00	1.26E+07	4.41E+01
2.49E+01	1.06E+07	5.13E+01	5.59E+00	1.42E+07	3.99E+01	2.51E+01	4.31E+07	3.09E+01	5.08E+00	1.43E+07	4.30E+01
2.51E+01	1.04E+07	5.01E+01	6.31E+00	1.48E+07	3.89E+01	2.69E+01	4.46E+07	2.98E+01	5.54E+00	1.53E+07	4.58E+01
2.83E+01	1.09E+07	4.89E+01	6.51E+00	1.52E+07	3.87E+01	3.12E+01	4.63E+07	2.99E+01	5.63E+00	1.54E+07	4.28E+01
3.19E+01	1.20E+07	4.71E+01	8.03E+00	1.66E+07	3.81E+01	3.98E+01	5.06E+07	3.03E+01	5.80E+00	1.51E+07	4.42E+01
3.42E+01	1.20E+07	4.76E+01	8.85E+00	1.74E+07	3.91E+01	4.26E+01	5.19E+07	2.89E+01	6.31E+00	1.58E+07	4.30E+01
3.98E+01	1.34E+07	4.89E+01	1.00E+01	1.81E+07	3.80E+01	4.89E+01	5.45E+07	2.89E+01	7.07E+00	1.69E+07	4.18E+01
4.00E+01	1.34E+07	4.63E+01	1.03E+01	1.84E+07	3.74E+01	4.95E+01	5.39E+07	2.92E+01	8.05E+00	1.76E+07	4.17E+01
4.48E+01	1.39E+07	4.76E+01	1.27E+01	1.98E+07	3.70E+01	6.14E+01	5.88E+07	2.84E+01	9.19E+00	1.89E+07	4.33E+01
5.41E+01	1.53E+07	4.63E+01	1.40E+01	2.11E+07	3.83E+01	6.31E+01	5.86E+07	2.97E+01	1.00E+01	1.97E+07	4.21E+01
6.31E+01	1.71E+07	4.77E+01	1.58E+01	2.18E+07	3.72E+01	6.75E+01	5.95E+07	2.83E+01	1.12E+01	2.08E+07	4.08E+01
6.35E+01	1.68E+07	4.47E+01	1.64E+01	2.23E+07	3.64E+01	7.85E+01	6.23E+07	2.86E+01	1.28E+01	2.16E+07	4.10E+01
7.10E+01	1.77E+07	4.64E+01	2.02E+01	2.40E+07	3.61E+01	9.74E+01	6.70E+07	2.77E+01	1.46E+01	2.35E+07	4.25E+01
8.58E+01	1.93E+07	4.50E+01	2.22E+01	2.55E+07	3.77E+01	1.00E+02	6.81E+07	2.91E+01	1.58E+01	2.42E+07	4.11E+01
8.99E+01	2.03E+07	4.46E+01	2.51E+01	2.63E+07	3.63E+01	1.07E+02	6.85E+07	2.77E+01	1.78E+01	2.54E+07	3.97E+01

Table B.12 Summary of Complex Modulus and Phase Angle Values for Binder 7034LV with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
1.00E+02	2.16E+07	4.65E+01	2.59E+01	2.67E+07	3.53E+01	1.24E+02	7.17E+07	2.80E+01	2.02E+01	2.66E+07	3.97E+01
1.01E+02	2.11E+07	4.38E+01	3.20E+01	2.89E+07	3.52E+01	1.50E+02	7.70E+07	2.71E+01	2.31E+01	2.90E+07	4.17E+01
1.13E+02	2.23E+07	4.51E+01	3.98E+01	3.15E+07	3.55E+01	1.54E+02	7.69E+07	2.68E+01	2.51E+01	2.98E+07	4.01E+01
1.13E+02	2.24E+07	4.32E+01	4.11E+01	3.20E+07	3.44E+01	1.70E+02	7.89E+07	2.71E+01	2.81E+01	3.08E+07	3.87E+01
1.36E+02	2.41E+07	4.37E+01	4.60E+01	3.39E+07	3.41E+01	1.89E+02	8.23E+07	2.73E+01	3.21E+01	3.26E+07	3.88E+01
1.59E+02	2.61E+07	4.21E+01	5.07E+01	3.44E+07	3.43E+01	1.97E+02	8.25E+07	2.75E+01	3.98E+01	3.67E+07	3.92E+01
1.78E+02	2.79E+07	4.38E+01	5.77E+01	3.68E+07	3.36E+01	2.45E+02	8.85E+07	2.64E+01	4.46E+01	3.75E+07	3.76E+01
1.79E+02	2.78E+07	4.19E+01	6.31E+01	3.77E+07	3.47E+01	2.69E+02	9.05E+07	2.65E+01	5.08E+01	3.96E+07	3.78E+01
2.16E+02	3.00E+07	4.24E+01	6.51E+01	3.78E+07	3.34E+01	2.99E+02	9.43E+07	2.59E+01	6.31E+01	4.50E+07	3.81E+01
2.53E+02	3.22E+07	4.06E+01	8.03E+01	4.08E+07	3.35E+01	3.12E+02	9.49E+07	2.69E+01	6.73E+01	4.37E+07	3.65E+01
2.59E+02	3.37E+07	4.07E+01	9.15E+01	4.31E+07	3.25E+01	3.88E+02	1.01E+08	2.54E+01	7.07E+01	4.53E+07	3.66E+01
2.83E+02	3.48E+07	4.25E+01	1.00E+02	4.47E+07	3.40E+01	4.26E+02	1.03E+08	2.59E+01	8.05E+01	4.79E+07	3.68E+01
2.84E+02	3.44E+07	4.07E+01	1.03E+02	4.48E+07	3.25E+01	4.74E+02	1.07E+08	2.52E+01	8.45E+01	5.00E+07	3.64E+01
3.25E+02	3.71E+07	4.06E+01	1.27E+02	4.82E+07	3.27E+01	4.80E+02	1.07E+08	2.54E+01	1.00E+02	5.44E+07	3.72E+01
3.42E+02	3.70E+07	4.11E+01	1.45E+02	5.07E+07	3.14E+01	4.95E+02	1.09E+08	2.63E+01	1.12E+02	5.41E+07	3.55E+01
4.00E+02	4.00E+07	3.98E+01	1.49E+02	5.18E+07	3.18E+01	6.03E+02	1.15E+08	2.56E+01	1.28E+02	5.77E+07	3.58E+01
4.48E+02	4.31E+07	4.12E+01	1.64E+02	5.25E+07	3.16E+01	6.14E+02	1.15E+08	2.45E+01	1.34E+02	5.89E+07	3.46E+01
4.50E+02	4.18E+07	3.87E+01	1.87E+02	5.56E+07	3.12E+01	6.75E+02	1.17E+08	2.53E+01	1.78E+02	6.47E+07	3.46E+01
5.15E+02	4.49E+07	3.84E+01	2.02E+02	5.67E+07	3.19E+01	7.52E+02	1.21E+08	2.46E+01	2.01E+02	6.81E+07	3.41E+01
5.41E+02	4.57E+07	3.98E+01	2.30E+02	5.94E+07	3.10E+01	9.56E+02	1.29E+08	2.44E+01	2.02E+02	6.87E+07	3.49E+01
6.35E+02	4.86E+07	3.83E+01	2.59E+02	6.14E+07	3.08E+01	9.74E+02	1.30E+08	2.44E+01	2.12E+02	7.08E+07	3.35E+01
7.12E+02	5.13E+07	3.83E+01	2.96E+02	6.52E+07	3.05E+01	1.07E+03	1.33E+08	2.48E+01	2.52E+02	7.35E+07	3.37E+01
8.16E+02	5.46E+07	3.73E+01	3.20E+02	6.63E+07	3.11E+01	1.19E+03	1.38E+08	2.40E+01	2.81E+02	7.72E+07	3.36E+01
8.58E+02	5.60E+07	3.85E+01	3.64E+02	6.96E+07	2.99E+01	1.51E+03	1.46E+08	2.37E+01	3.21E+02	8.21E+07	3.40E+01

Table B.12 Summary of Complex Modulus and Phase Angle Values for Binder 7034LV with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
8.76E+02	5.14E+07	3.66E+01	4.11E+02	7.21E+07	3.00E+01	1.54E+03	1.47E+08	2.38E+01	3.36E+02	8.34E+07	3.29E+01
1.01E+03	5.89E+07	3.71E+01	4.69E+02	7.68E+07	2.93E+01	1.60E+03	1.46E+08	2.37E+01	3.99E+02	8.68E+07	3.25E+01
1.10E+03	5.73E+07	3.35E+01	4.71E+02	7.41E+07	3.01E+01	1.70E+03	1.50E+08	2.42E+01	4.46E+02	9.13E+07	3.27E+01
1.13E+03	6.16E+07	3.66E+01	5.07E+02	7.70E+07	3.05E+01	1.89E+03	1.55E+08	2.33E+01	5.08E+02	9.78E+07	3.30E+01
1.29E+03	6.53E+07	3.62E+01	5.77E+02	8.06E+07	2.90E+01	2.01E+03	1.56E+08	2.40E+01	5.33E+02	9.84E+07	3.18E+01
1.36E+03	6.78E+07	3.73E+01	5.92E+02	8.04E+07	2.89E+01	2.40E+03	1.64E+08	2.34E+01	5.48E+02	9.74E+07	3.23E+01
1.59E+03	7.07E+07	3.60E+01	6.51E+02	8.38E+07	2.92E+01	2.45E+03	1.65E+08	2.32E+01	6.33E+02	1.03E+08	3.12E+01
1.74E+03	6.89E+07	3.53E+01	7.43E+02	8.77E+07	2.85E+01	2.69E+03	1.70E+08	2.37E+01	6.88E+02	1.07E+08	3.16E+01
1.79E+03	7.36E+07	3.53E+01	9.15E+02	9.33E+07	2.81E+01	2.99E+03	1.74E+08	2.28E+01	7.07E+02	1.08E+08	3.17E+01
2.05E+03	7.91E+07	3.45E+01	9.38E+02	9.41E+07	2.77E+01	3.19E+03	1.76E+08	2.31E+01	8.45E+02	1.15E+08	3.07E+01
2.16E+03	8.16E+07	3.60E+01	1.03E+03	9.72E+07	2.84E+01	3.80E+03	1.86E+08	2.22E+01	1.00E+03	1.23E+08	3.02E+01
2.29E+03	8.32E+07	3.39E+01	1.18E+03	1.00E+08	2.75E+01	3.88E+03	1.86E+08	2.27E+01	1.09E+03	1.26E+08	2.99E+01
2.53E+03	8.46E+07	3.47E+01	1.43E+03	1.09E+08	2.71E+01	4.74E+03	1.95E+08	2.22E+01	1.12E+03	1.26E+08	3.08E+01
2.76E+03	8.73E+07	3.33E+01	1.45E+03	1.07E+08	2.73E+01	5.05E+03	1.97E+08	2.22E+01	1.34E+03	1.34E+08	2.98E+01
2.84E+03	8.83E+07	3.41E+01	1.49E+03	1.08E+08	2.70E+01	5.42E+03	1.99E+08	2.26E+01	1.59E+03	1.44E+08	2.95E+01
2.88E+03	9.44E+07	3.30E+01	1.64E+03	1.12E+08	2.76E+01	6.03E+03	2.06E+08	2.19E+01	1.73E+03	1.46E+08	2.90E+01
3.25E+03	9.28E+07	3.32E+01	1.80E+03	1.15E+08	2.78E+01	6.14E+03	2.08E+08	2.21E+01	1.78E+03	1.48E+08	2.99E+01
4.00E+03	1.01E+08	3.35E+01	1.87E+03	1.14E+08	2.65E+01	6.80E+03	2.12E+08	2.22E+01	2.12E+03	1.54E+08	2.89E+01
4.38E+03	1.10E+08	3.29E+01	2.30E+03	1.23E+08	2.65E+01	7.52E+03	2.19E+08	2.17E+01	2.52E+03	1.66E+08	2.82E+01
4.50E+03	1.05E+08	3.29E+01	2.36E+03	1.24E+08	2.57E+01	8.00E+03	2.22E+08	2.26E+01	2.74E+03	1.67E+08	2.90E+01
4.56E+03	1.10E+08	3.16E+01	2.59E+03	1.29E+08	2.69E+01	9.56E+03	2.32E+08	2.14E+01	2.79E+03	1.66E+08	2.77E+01
5.15E+03	1.09E+08	3.30E+01	2.85E+03	1.32E+08	2.52E+01	9.74E+03	2.33E+08	2.15E+01	2.81E+03	1.71E+08	2.89E+01
6.35E+03	1.19E+08	3.23E+01	2.96E+03	1.32E+08	2.57E+01	1.08E+04	2.39E+08	2.15E+01	3.36E+03	1.78E+08	2.80E+01
6.94E+03	1.30E+08	3.14E+01	3.64E+03	1.41E+08	2.57E+01	1.19E+04	2.43E+08	2.12E+01	3.99E+03	1.89E+08	2.75E+01

Table B.12 Summary of Complex Modulus and Phase Angle Values for Binder 7034LV with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
7.12E+03	1.23E+08	3.17E+01	3.73E+03	1.41E+08	2.56E+01	1.27E+04	2.45E+08	2.12E+01	4.34E+03	1.96E+08	2.70E+01
7.23E+03	1.24E+08	3.23E+01	4.52E+03	1.51E+08	2.51E+01	1.51E+04	2.58E+08	2.08E+01	4.42E+03	1.93E+08	2.80E+01
7.72E+03	1.33E+08	3.04E+01	4.53E+03	1.50E+08	2.59E+01	1.54E+04	2.60E+08	2.10E+01	5.33E+03	2.03E+08	2.71E+01
8.16E+03	1.27E+08	3.12E+01	4.69E+03	1.51E+08	2.51E+01	1.71E+04	2.62E+08	2.12E+01	6.33E+03	2.16E+08	2.65E+01
9.69E+03	1.40E+08	3.11E+01	5.69E+03	1.57E+08	2.52E+01	1.89E+04	2.71E+08	2.06E+01	6.37E+03	2.13E+08	2.77E+01
1.01E+04	1.40E+08	3.11E+01	5.77E+03	1.59E+08	2.50E+01	1.92E+04	2.68E+08	2.11E+01	6.88E+03	2.26E+08	2.65E+01
1.10E+04	1.47E+08	2.99E+01	5.92E+03	1.62E+08	2.45E+01	2.01E+04	2.73E+08	2.07E+01	7.00E+03	2.29E+08	2.94E+01
1.13E+04	1.44E+08	3.05E+01	7.17E+03	1.67E+08	2.47E+01	2.40E+04	2.86E+08	2.02E+01	8.00E+03	2.27E+08	2.85E+01
1.15E+04	1.47E+08	3.08E+01	7.43E+03	1.71E+08	2.44E+01	2.41E+04	2.82E+08	2.01E+01	8.45E+03	2.32E+08	2.63E+01
1.29E+04	1.48E+08	3.02E+01	9.02E+03	1.76E+08	2.46E+01	2.45E+04	2.88E+08	2.04E+01	1.00E+04	2.49E+08	2.57E+01
1.54E+04	1.59E+08	2.99E+01	9.15E+03	1.81E+08	2.42E+01	2.71E+04	2.89E+08	2.03E+01	1.09E+04	2.54E+08	2.52E+01
1.59E+04	1.64E+08	2.98E+01	9.38E+03	1.83E+08	2.41E+01	2.99E+04	3.00E+08	2.00E+01	1.11E+04	2.50E+08	2.55E+01
1.74E+04	1.73E+08	2.86E+01	1.14E+04	1.92E+08	2.35E+01	3.19E+04	3.02E+08	1.98E+01	1.27E+04	2.52E+08	2.52E+01
1.79E+04	1.68E+08	2.93E+01	1.18E+04	1.93E+08	2.36E+01	3.80E+04	3.16E+08	1.96E+01	1.34E+04	2.67E+08	2.54E+01
1.82E+04	1.70E+08	2.85E+01	1.43E+04	2.01E+08	2.37E+01	3.82E+04	3.17E+08	2.05E+01	1.59E+04	2.83E+08	2.47E+01
2.05E+04	1.71E+08	2.90E+01	1.45E+04	2.04E+08	2.34E+01	4.29E+04	3.23E+08	2.00E+01	1.73E+04	2.88E+08	2.46E+01
2.05E+04	1.95E+08	2.87E+01	1.49E+04	2.06E+08	2.31E+01	4.74E+04	3.32E+08	1.94E+01	1.76E+04	2.94E+08	2.36E+01
2.43E+04	1.87E+08	2.87E+01	1.78E+04	2.05E+08	2.38E+01	5.05E+04	3.34E+08	1.93E+01	2.01E+04	2.93E+08	2.47E+01
2.58E+04	1.94E+08	2.72E+01	1.80E+04	2.13E+08	2.31E+01	6.03E+04	3.48E+08	1.91E+01	2.12E+04	3.04E+08	2.43E+01
2.76E+04	1.99E+08	2.77E+01	1.87E+04	2.19E+08	2.28E+01	6.06E+04	3.39E+08	1.98E+01	2.30E+04	3.03E+08	2.49E+01
2.84E+04	1.94E+08	2.81E+01	2.23E+04	2.17E+08	2.49E+01	6.60E+04	3.29E+08	1.97E+01	2.52E+04	3.20E+08	2.38E+01
2.88E+04	1.95E+08	2.85E+01	2.27E+04	2.27E+08	2.27E+01	6.80E+04	3.54E+08	1.87E+01	2.74E+04	3.27E+08	2.38E+01
3.25E+04	1.99E+08	2.77E+01	2.30E+04	2.30E+08	2.26E+01	7.52E+04	3.66E+08	1.88E+01	2.79E+04	3.28E+08	2.44E+01
3.86E+04	2.17E+08	2.73E+01	2.36E+04	2.31E+08	2.22E+01	8.00E+04	3.69E+08	1.87E+01	2.89E+04	3.14E+08	2.50E+01

Table B.12 Summary of Complex Modulus and Phase Angle Values for Binder 7034LV with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
4.09E+04	2.10E+08	2.79E+01	2.85E+04	2.40E+08	2.23E+01	8.29E+04	3.71E+08	1.78E+01	3.18E+04	3.48E+08	2.30E+01
4.38E+04	2.26E+08	2.67E+01	2.96E+04	2.44E+08	2.20E+01	9.56E+04	3.83E+08	1.85E+01	3.36E+04	3.45E+08	2.33E+01
4.50E+04	2.24E+08	2.70E+01	3.54E+04	2.43E+08	2.25E+01	9.60E+04	3.78E+08	1.87E+01	3.99E+04	3.60E+08	2.28E+01
4.56E+04	2.24E+08	2.64E+01	3.59E+04	2.56E+08	2.21E+01	1.08E+05	3.88E+08	1.87E+01	4.34E+04	3.69E+08	2.27E+01
5.15E+04	2.30E+08	2.66E+01	3.73E+04	2.59E+08	2.14E+01	1.27E+05	4.04E+08	1.81E+01	4.42E+04	3.66E+08	2.28E+01
6.11E+04	2.46E+08	2.46E+01	4.52E+04	2.67E+08	2.11E+01	1.31E+05	3.93E+08	1.79E+01	4.58E+04	3.65E+08	2.46E+01
6.48E+04	2.29E+08	2.72E+01	4.69E+04	2.72E+08	2.12E+01	1.51E+05	4.18E+08	1.79E+01	5.05E+04	3.80E+08	2.11E+01
6.94E+04	2.58E+08	2.55E+01	5.61E+04	2.73E+08	2.24E+01	1.52E+05	4.19E+08	1.80E+01	6.33E+04	4.08E+08	2.20E+01
7.23E+04	2.57E+08	2.58E+01	5.69E+04	2.78E+08	2.02E+01	1.71E+05	4.29E+08	1.78E+01	6.88E+04	4.15E+08	2.17E+01
8.16E+04	2.66E+08	2.53E+01	5.92E+04	2.89E+08	2.07E+01	2.01E+05	4.44E+08	1.75E+01	7.00E+04	4.10E+08	2.24E+01
9.69E+04	2.86E+08	2.41E+01	6.28E+04	2.75E+08	2.21E+01	2.08E+05	4.39E+08	2.06E+01	7.25E+04	4.05E+08	2.27E+01
1.03E+05	2.86E+08	2.45E+01	7.17E+04	2.98E+08	2.05E+01	2.40E+05	4.58E+08	1.72E+01	8.00E+04	4.36E+08	2.06E+01
1.10E+05	2.92E+08	2.45E+01	7.43E+04	3.02E+08	2.04E+01	2.41E+05	4.54E+08	1.74E+01	1.00E+05	4.52E+08	2.11E+01
1.15E+05	2.91E+08	2.43E+01	7.88E+04	2.82E+08	2.12E+01	2.45E+05	4.26E+08	1.94E+01	1.09E+05	4.62E+08	2.09E+01
1.29E+05	3.09E+08	2.39E+01	8.89E+04	3.07E+08	2.07E+01	2.71E+05	4.67E+08	1.70E+01	1.11E+05	4.58E+08	2.11E+01
1.31E+05	2.83E+08	2.25E+01	9.02E+04	3.10E+08	1.94E+01	3.08E+05	4.70E+08	1.68E+01	1.15E+05	4.64E+08	2.11E+01
1.54E+05	3.19E+08	2.40E+01	9.38E+04	3.19E+08	1.99E+01	3.19E+05	4.84E+08	1.69E+01	1.17E+05	4.25E+08	2.15E+01
1.63E+05	3.26E+08	2.40E+01	1.14E+05	3.28E+08	1.97E+01	3.30E+05	5.02E+08	1.73E+01	1.27E+05	4.87E+08	2.10E+01
1.64E+05	3.14E+08	2.32E+01	1.25E+05	3.37E+08	1.89E+01	3.82E+05	4.94E+08	1.70E+01	1.73E+05	5.12E+08	2.00E+01
1.74E+05	3.29E+08	2.33E+01	1.41E+05	3.38E+08	2.05E+01	4.29E+05	5.12E+08	1.64E+01	1.76E+05	5.06E+08	2.02E+01
1.82E+05	3.32E+08	2.34E+01	1.43E+05	3.46E+08	1.95E+01	4.88E+05	5.17E+08	1.67E+01	1.82E+05	5.10E+08	2.04E+01
2.43E+05	3.57E+08	2.29E+01	1.49E+05	3.52E+08	1.92E+01	5.05E+05	5.26E+08	1.62E+01	2.01E+05	5.39E+08	2.04E+01
2.58E+05	3.75E+08	1.95E+01	1.80E+05	3.61E+08	1.89E+01	5.23E+05	5.24E+08	1.50E+01	2.61E+05	6.09E+08	1.70E+01
2.60E+05	3.64E+08	2.07E+01	1.98E+05	3.65E+08	1.87E+01	6.06E+05	5.40E+08	1.61E+01	2.74E+05	5.66E+08	1.90E+01

Table B.12 Summary of Complex Modulus and Phase Angle Values for Binder 7034LV with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
2.61E+05	3.68E+08	2.90E+01	2.23E+05	3.71E+08	1.84E+01	6.80E+05	5.54E+08	1.58E+01	2.79E+05	5.64E+08	1.92E+01
2.76E+05	3.68E+08	2.23E+01	2.27E+05	3.54E+08	1.89E+01	8.00E+05	5.71E+08	1.56E+01	2.89E+05	5.69E+08	1.96E+01
2.88E+05	3.78E+08	2.21E+01	2.27E+05	3.80E+08	1.85E+01	8.29E+05	5.77E+08	1.57E+01	2.94E+05	5.87E+08	2.38E+01
3.27E+05	4.10E+08	1.97E+01	2.36E+05	3.86E+08	1.84E+01	9.08E+05	5.99E+08	1.46E+01	3.18E+05	5.84E+08	1.93E+01
3.86E+05	4.00E+08	2.17E+01	2.84E+05	4.06E+08	1.80E+01	9.60E+05	5.83E+08	1.54E+01	3.27E+05	5.71E+08	2.05E+01
4.09E+05	4.04E+08	2.19E+01	2.85E+05	3.97E+08	1.82E+01	1.08E+06	5.99E+08	1.52E+01	4.42E+05	6.14E+08	1.83E+01
4.13E+05	3.97E+08	2.07E+01	3.14E+05	3.99E+08	2.11E+01	1.14E+06	6.11E+08	1.64E+01	4.58E+05	6.26E+08	1.83E+01
4.38E+05	4.09E+08	2.12E+01	3.54E+05	4.07E+08	1.83E+01	1.23E+06	6.33E+08	1.62E+01	4.66E+05	6.47E+08	1.59E+01
4.56E+05	4.31E+08	2.07E+01	3.59E+05	4.18E+08	1.78E+01	1.31E+06	6.33E+08	1.49E+01	5.05E+05	6.41E+08	1.79E+01
5.18E+05	4.36E+08	1.78E+01	4.51E+05	4.45E+08	1.92E+01	1.52E+06	6.31E+08	1.48E+01	7.00E+05	6.68E+08	1.75E+01
6.11E+05	4.44E+08	2.06E+01	4.52E+05	4.36E+08	1.73E+01	1.71E+06	6.47E+08	1.46E+01	7.25E+05	6.83E+08	1.78E+01
6.48E+05	4.43E+08	2.06E+01	4.97E+05	4.42E+08	1.69E+01	1.81E+06	6.14E+08	1.69E+01	7.39E+05	6.94E+08	2.02E+01
6.55E+05	4.17E+08	2.17E+01	5.61E+05	4.48E+08	1.73E+01	1.94E+06	6.68E+08	1.33E+01	8.00E+05	6.99E+08	1.75E+01
7.23E+05	4.85E+08	1.95E+01	5.69E+05	4.57E+08	1.70E+01	2.08E+06	6.71E+08	1.45E+01	8.22E+05	6.59E+08	1.88E+01
8.21E+05	4.76E+08	2.12E+01	7.15E+05	4.74E+08	1.90E+01	2.41E+06	6.81E+08	1.42E+01	1.03E+06	7.01E+08	1.72E+01
9.69E+05	4.90E+08	1.96E+01	7.17E+05	4.73E+08	1.66E+01	2.71E+06	6.95E+08	1.39E+01	1.11E+06	7.28E+08	1.66E+01
1.03E+06	4.94E+08	1.99E+01	7.88E+05	4.87E+08	1.60E+01	2.86E+06	6.90E+08	1.24E+01	1.15E+06	7.53E+08	1.70E+01
1.04E+06	5.22E+08	1.81E+01	8.89E+05	4.86E+08	1.67E+01	3.08E+06	7.07E+08	1.49E+01	1.17E+06	7.75E+08	1.49E+01
1.15E+06	5.33E+08	1.85E+01	9.02E+05	4.97E+08	1.62E+01	3.30E+06	7.14E+08	1.38E+01	1.27E+06	7.61E+08	1.63E+01
1.30E+06	5.38E+08	1.85E+01	9.20E+05	4.55E+08	1.65E+01	3.82E+06	7.30E+08	1.36E+01	1.30E+06	7.76E+08	1.57E+01
1.54E+06	5.37E+08	1.85E+01	1.13E+06	5.19E+08	1.46E+01	4.54E+06	7.72E+08	1.60E+01	1.82E+06	8.19E+08	1.59E+01
1.63E+06	5.43E+08	1.85E+01	1.15E+06	5.22E+08	1.68E+01	4.88E+06	7.59E+08	1.43E+01	1.86E+06	7.70E+08	1.68E+01
1.64E+06	5.38E+08	1.96E+01	1.25E+06	5.24E+08	1.63E+01	5.23E+06	7.71E+08	1.35E+01	2.01E+06	8.24E+08	1.55E+01
2.06E+06	6.11E+08	1.81E+01	1.41E+06	5.29E+08	1.58E+01	6.06E+06	7.77E+08	1.30E+01	2.06E+06	8.27E+08	1.68E+01

Table B.12 Summary of Complex Modulus and Phase Angle Values for Binder 7034LV with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
2.43E+06	5.90E+08	1.74E+01	1.43E+06	5.38E+08	1.54E+01	7.19E+06	8.26E+08	1.57E+01	2.07E+06	7.72E+08	1.60E+01
2.58E+06	5.93E+08	1.78E+01	1.79E+06	5.54E+08	1.56E+01	7.74E+06	8.30E+08	1.23E+01	2.89E+06	8.85E+08	1.50E+01
2.61E+06	5.80E+08	1.79E+01	1.98E+06	5.59E+08	1.56E+01	8.29E+06	8.20E+08	1.25E+01	2.94E+06	8.66E+08	1.47E+01
3.27E+06	6.33E+08	1.69E+01	2.23E+06	5.71E+08	1.49E+01	9.60E+06	8.30E+08	1.23E+01	3.18E+06	8.90E+08	1.47E+01
3.86E+06	6.46E+08	1.64E+01	2.27E+06	5.78E+08	1.47E+01	1.14E+07	8.49E+08	9.63E+00	3.26E+06	9.53E+08	1.68E+01
4.09E+06	6.47E+08	1.67E+01	2.84E+06	6.03E+08	1.52E+01	1.23E+07	8.62E+08	1.19E+01	3.27E+06	8.95E+08	1.99E+01
4.13E+06	6.38E+08	1.76E+01	2.90E+06	5.97E+08	1.50E+01	1.31E+07	8.71E+08	1.20E+01	4.58E+06	9.51E+08	1.42E+01
5.18E+06	7.06E+08	1.48E+01	3.14E+06	6.06E+08	1.46E+01	1.81E+07	9.11E+08	1.17E+01	4.66E+06	9.14E+08	1.51E+01
6.48E+06	6.99E+08	1.55E+01	3.54E+06	6.13E+08	1.42E+01	1.94E+07	9.20E+08	1.15E+01	5.19E+06	9.22E+08	1.27E+01
6.55E+06	6.91E+08	1.61E+01	4.51E+06	6.33E+08	1.16E+01	2.08E+07	9.24E+08	1.13E+01	7.25E+06	1.02E+09	1.34E+01
8.21E+06	7.57E+08	1.50E+01	4.60E+06	6.59E+08	1.44E+01	2.86E+07	9.60E+08	1.18E+01	7.39E+06	9.88E+08	1.41E+01
1.03E+07	7.54E+08	1.46E+01	4.97E+06	6.50E+08	1.40E+01	3.08E+07	9.70E+08	1.08E+01	8.19E+06	1.03E+09	1.36E+01
1.04E+07	7.54E+08	1.49E+01	5.61E+06	6.55E+08	1.34E+01	3.30E+07	9.77E+08	1.06E+01	8.22E+06	1.02E+09	1.40E+01
1.23E+07	8.68E+08	1.47E+01	7.15E+06	6.95E+08	1.27E+01	4.54E+07	1.02E+09	1.05E+01	1.15E+07	1.08E+09	1.25E+01
1.30E+07	8.03E+08	1.57E+01	7.29E+06	6.72E+08	1.42E+01	4.88E+07	1.03E+09	1.03E+01	1.17E+07	1.06E+09	1.35E+01
1.54E+07	7.77E+08	2.12E+01	7.88E+06	6.94E+08	1.30E+01	7.19E+07	1.08E+09	9.90E+00	1.30E+07	1.08E+09	1.17E+01
1.64E+07	8.05E+08	1.43E+01	8.89E+06	7.02E+08	1.26E+01	7.74E+07	1.08E+09	9.62E+00	1.30E+07	1.08E+09	1.39E+01
2.06E+07	8.67E+08	1.35E+01	1.13E+07	7.36E+08	1.23E+01	1.14E+08	1.13E+09	9.15E+00	1.86E+07	1.13E+09	1.23E+01
2.44E+07	7.61E+08	1.66E+01	1.15E+07	7.26E+08	1.46E+01	1.23E+08	1.13E+09	9.11E+00	2.06E+07	1.21E+09	1.39E+01
2.61E+07	8.69E+08	1.31E+01	1.25E+07	7.40E+08	1.22E+01	1.81E+08	1.19E+09	8.70E+00	2.07E+07	1.16E+09	1.18E+01
3.27E+07	9.20E+08	1.23E+01	1.79E+07	7.81E+08	1.21E+01	2.86E+08	1.24E+09	8.04E+00	2.94E+07	1.19E+09	1.17E+01
3.87E+07	9.28E+08	1.19E+01	1.83E+07	7.72E+08	1.25E+01	4.54E+08	1.29E+09	7.47E+00	3.26E+07	1.27E+09	1.17E+01
4.13E+07	9.31E+08	1.21E+01	1.98E+07	7.85E+08	1.15E+01	1.78E+07	8.48E+08	9.73E+00	3.27E+07	1.24E+09	1.19E+01
5.18E+07	9.75E+08	1.16E+01	2.84E+07	8.27E+08	1.12E+01	2.41E+07	9.00E+08	8.55E+00	4.66E+07	1.25E+09	1.08E+01

Table B.12 Summary of Complex Modulus and Phase Angle Values for Binder 7034LV with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
6.13E+07	9.63E+08	1.33E+01	2.90E+07	8.25E+08	1.21E+01	2.74E+07	9.25E+08	9.14E+00	5.17E+07	1.35E+09	1.11E+01
6.55E+07	9.93E+08	1.12E+01	3.14E+07	8.31E+08	1.08E+01	2.82E+07	8.88E+08	8.61E+00	5.19E+07	1.30E+09	1.08E+01
8.21E+07	1.03E+09	1.07E+01	4.51E+07	8.74E+08	1.04E+01	3.82E+07	9.36E+08	8.01E+00	8.19E+07	1.42E+09	9.75E+00
9.71E+07	1.06E+09	1.17E+01	4.60E+07	8.64E+08	1.09E+01	4.34E+07	9.67E+08	8.79E+00	8.22E+07	1.37E+09	1.00E+01
1.30E+08	1.08E+09	9.92E+00	7.15E+07	9.18E+08	9.69E+00	4.47E+07	9.33E+08	8.63E+00	1.30E+08	1.49E+09	9.30E+00
1.54E+08	1.16E+09	9.17E+00	7.29E+07	9.15E+08	1.01E+01	6.87E+07	1.01E+09	7.77E+00	1.30E+08	1.42E+09	9.46E+00
2.44E+08	1.25E+09	1.03E+01	1.13E+08	9.60E+08	9.09E+00	7.08E+07	9.68E+08	7.75E+00	2.06E+08	1.55E+09	8.64E+00
3.87E+08	1.27E+09	8.47E+00	1.15E+08	9.65E+08	9.36E+00	1.09E+08	1.05E+09	7.01E+00	3.26E+08	1.62E+09	7.95E+00
6.13E+08	1.33E+09	8.97E+00	1.83E+08	1.01E+09	8.62E+00	1.12E+08	1.01E+09	7.26E+00	5.17E+08	1.68E+09	7.32E+00
9.71E+08	1.38E+09	7.12E+00	2.90E+08	1.05E+09	8.01E+00	1.73E+08	1.08E+09	6.73E+00	3.30E+07	1.40E+09	6.29E+00
1.54E+09	1.42E+09	6.90E+00	4.60E+08	1.09E+09	7.51E+00	1.78E+08	1.04E+09	6.95E+00	3.41E+07	1.38E+09	7.63E+00
2.44E+09	1.47E+09	6.34E+00	5.53E+07	1.20E+09	7.68E+00	2.74E+08	1.12E+09	6.07E+00	3.91E+07	1.33E+09	7.87E+00
3.87E+09	1.51E+09	5.70E+00	7.26E+07	1.29E+09	1.23E+01	4.34E+08	1.15E+09	5.58E+00	5.24E+07	1.48E+09	7.13E+00
6.13E+09	1.55E+09	5.17E+00	8.77E+07	1.25E+09	7.36E+00	7.88E+07	1.25E+09	7.45E+00	5.41E+07	1.43E+09	6.86E+00
2.34E+07	1.35E+09	6.97E+00	1.15E+08	1.38E+09	9.67E+00	1.03E+08	1.25E+09	7.18E+00	8.30E+07	1.52E+09	6.73E+00
3.30E+07	1.24E+09	4.42E+00	1.39E+08	1.29E+09	7.06E+00	1.03E+08	1.20E+09	7.67E+00	8.57E+07	1.50E+09	6.28E+00
3.71E+07	1.40E+09	6.51E+00	1.82E+08	1.47E+09	3.93E+00	1.25E+08	1.30E+09	7.18E+00	1.31E+08	1.56E+09	5.58E+00
5.23E+07	1.49E+09	4.13E+00	2.20E+08	1.33E+09	6.41E+00	1.63E+08	1.27E+09	3.93E+00	2.08E+08	1.61E+09	5.79E+00
5.88E+07	1.45E+09	6.10E+00	2.89E+08	1.45E+09	4.64E+00	1.64E+08	1.24E+09	7.12E+00	3.30E+08	1.68E+09	5.39E+00
8.28E+07	1.43E+09	8.45E+00	3.49E+08	1.38E+09	5.98E+00	1.98E+08	1.34E+09	6.42E+00	5.24E+08	1.71E+09	5.04E+00
9.31E+07	1.49E+09	5.42E+00	4.58E+08	1.48E+09	5.66E+00	2.58E+08	1.41E+09	6.06E+00	8.30E+08	1.76E+09	4.56E+00
1.31E+08	1.48E+09	7.01E+00	7.26E+08	1.50E+09	5.52E+00	3.14E+08	1.38E+09	6.05E+00	1.31E+09	1.79E+09	4.17E+00
2.08E+08	1.58E+09	3.83E+00	1.15E+09	1.55E+09	5.04E+00	4.09E+08	1.43E+09	5.47E+00	2.08E+09	1.83E+09	3.90E+00

Table B.13 Summary of Complex Modulus and Phase Angle Values for Binder 7628SM with Different Aging Conditions

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
1.18E-05	2.58E+04	6.28E+01	5.56E-06	1.55E+05	5.46E+01	4.10E-06	4.85E+05	4.92E+01	8.75E-06	9.05E+04	4.83E+01
1.48E-05	2.89E+04	6.38E+01	6.98E-06	1.76E+05	5.39E+01	5.15E-06	5.39E+05	4.89E+01	1.10E-05	1.02E+05	4.83E+01
2.34E-05	3.68E+04	6.29E+01	1.11E-05	2.33E+05	5.39E+01	8.16E-06	6.83E+05	4.77E+01	1.74E-05	1.30E+05	4.92E+01
3.71E-05	4.83E+04	6.35E+01	1.75E-05	3.02E+05	5.31E+01	1.29E-05	8.56E+05	4.72E+01	2.76E-05	1.67E+05	4.91E+01
5.88E-05	6.37E+04	6.37E+01	2.78E-05	3.92E+05	5.26E+01	2.05E-05	1.07E+06	4.64E+01	4.37E-05	2.15E+05	4.93E+01
9.33E-05	8.50E+04	6.37E+01	4.40E-05	5.10E+05	5.21E+01	3.25E-05	1.34E+06	4.57E+01	6.93E-05	2.75E+05	4.96E+01
1.24E-04	1.03E+05	6.21E+01	6.98E-05	6.56E+05	5.16E+01	5.15E-05	1.67E+06	4.50E+01	1.08E-04	3.55E+05	4.89E+01
1.48E-04	1.14E+05	6.38E+01	7.72E-05	7.13E+05	5.07E+01	7.07E-05	1.97E+06	4.41E+01	1.10E-04	3.53E+05	4.99E+01
1.55E-04	1.18E+05	6.23E+01	9.69E-05	8.01E+05	5.00E+01	8.16E-05	2.07E+06	4.43E+01	1.36E-04	4.04E+05	4.91E+01
2.34E-04	1.56E+05	6.37E+01	1.11E-04	8.48E+05	5.11E+01	8.88E-05	2.19E+06	4.35E+01	1.74E-04	4.54E+05	5.01E+01
2.46E-04	1.60E+05	6.20E+01	1.54E-04	1.03E+06	4.95E+01	1.29E-04	2.55E+06	4.36E+01	2.15E-04	5.13E+05	4.88E+01
3.71E-04	2.13E+05	6.37E+01	1.75E-04	1.09E+06	5.06E+01	1.41E-04	2.69E+06	4.24E+01	2.76E-04	5.86E+05	5.03E+01
3.90E-04	2.17E+05	6.19E+01	2.43E-04	1.31E+06	4.87E+01	2.05E-04	3.13E+06	4.30E+01	3.40E-04	6.59E+05	4.87E+01
4.38E-04	2.38E+05	6.00E+01	2.78E-04	1.40E+06	5.01E+01	2.23E-04	3.28E+06	4.15E+01	4.13E-04	7.40E+05	4.82E+01
5.50E-04	2.73E+05	6.02E+01	3.33E-04	1.56E+06	4.79E+01	3.25E-04	3.84E+06	4.24E+01	4.37E-04	7.56E+05	5.04E+01
5.88E-04	2.91E+05	6.36E+01	3.86E-04	1.66E+06	4.78E+01	3.26E-04	3.90E+06	4.08E+01	5.19E-04	8.36E+05	4.84E+01
6.18E-04	2.93E+05	6.18E+01	4.18E-04	1.76E+06	4.73E+01	3.53E-04	4.02E+06	4.07E+01	5.40E-04	8.45E+05	4.86E+01
8.72E-04	3.68E+05	6.04E+01	4.40E-04	1.78E+06	4.95E+01	4.10E-04	4.32E+06	4.01E+01	6.93E-04	9.74E+05	5.05E+01
9.33E-04	3.99E+05	6.35E+01	6.12E-04	2.10E+06	4.71E+01	5.15E-04	4.68E+06	4.18E+01	8.22E-04	1.07E+06	4.78E+01
9.79E-04	3.96E+05	6.15E+01	6.62E-04	2.22E+06	4.62E+01	5.60E-04	4.88E+06	3.97E+01	8.55E-04	1.08E+06	4.84E+01
1.38E-03	4.98E+05	6.01E+01	6.98E-04	2.26E+06	4.90E+01	6.49E-04	5.22E+06	3.90E+01	1.10E-03	1.25E+06	5.06E+01
1.48E-03	5.47E+05	6.35E+01	9.69E-04	2.65E+06	4.63E+01	8.16E-04	5.70E+06	4.12E+01	1.30E-03	1.36E+06	4.75E+01
1.55E-03	5.39E+05	6.11E+01	1.05E-03	2.77E+06	4.54E+01	8.88E-04	5.89E+06	3.89E+01	1.36E-03	1.38E+06	4.81E+01
1.67E-03	5.71E+05	5.95E+01	1.11E-03	2.88E+06	4.85E+01	1.03E-03	6.31E+06	3.81E+01	1.60E-03	1.54E+06	4.73E+01

Table B.13 Summary of Complex Modulus and Phase Angle Values for Binder 7628SM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
2.10E-03	6.57E+05	5.97E+01	1.40E-03	3.27E+06	4.51E+01	1.29E-03	6.97E+06	4.05E+01	1.74E-03	1.61E+06	5.07E+01
2.19E-03	6.73E+05	5.96E+01	1.54E-03	3.32E+06	4.55E+01	1.36E-03	7.20E+06	3.81E+01	2.02E-03	1.75E+06	4.70E+01
2.34E-03	7.47E+05	6.34E+01	1.66E-03	3.46E+06	4.45E+01	1.41E-03	7.09E+06	3.81E+01	2.07E-03	1.73E+06	4.71E+01
2.46E-03	7.32E+05	6.07E+01	1.75E-03	3.64E+06	4.80E+01	1.63E-03	7.61E+06	3.72E+01	2.15E-03	1.76E+06	4.78E+01
3.32E-03	8.89E+05	5.89E+01	1.75E-03	3.63E+06	4.43E+01	1.71E-03	7.88E+06	3.72E+01	2.76E-03	2.06E+06	5.09E+01
3.47E-03	9.08E+05	5.92E+01	2.43E-03	4.13E+06	4.47E+01	2.05E-03	8.27E+06	4.05E+01	3.19E-03	2.20E+06	4.63E+01
3.71E-03	1.02E+06	6.35E+01	2.64E-03	4.32E+06	4.36E+01	2.23E-03	8.51E+06	3.73E+01	3.27E-03	2.20E+06	4.66E+01
3.90E-03	9.92E+05	6.01E+01	2.78E-03	4.51E+06	4.79E+01	2.58E-03	9.10E+06	3.62E+01	3.40E-03	2.24E+06	4.75E+01
5.27E-03	1.20E+06	5.82E+01	2.78E-03	4.48E+06	4.35E+01	2.71E-03	9.37E+06	3.63E+01	4.37E-03	2.61E+06	5.15E+01
5.50E-03	1.22E+06	5.85E+01	3.86E-03	5.13E+06	4.40E+01	3.53E-03	1.01E+07	3.66E+01	5.06E-03	2.78E+06	4.58E+01
5.88E-03	1.36E+06	6.45E+01	4.18E-03	5.33E+06	4.27E+01	4.10E-03	1.09E+07	3.53E+01	5.19E-03	2.79E+06	4.61E+01
6.18E-03	1.34E+06	5.95E+01	4.41E-03	5.56E+06	4.24E+01	4.30E-03	1.11E+07	3.54E+01	5.40E-03	2.85E+06	4.72E+01
7.01E-03	1.48E+06	5.73E+01	6.12E-03	6.35E+06	4.33E+01	5.60E-03	1.21E+07	3.60E+01	7.14E-03	3.30E+06	4.52E+01
8.35E-03	1.61E+06	5.75E+01	6.62E-03	6.60E+06	4.18E+01	6.49E-03	1.29E+07	3.45E+01	8.02E-03	3.51E+06	4.53E+01
8.72E-03	1.65E+06	5.78E+01	6.68E-03	6.81E+06	4.15E+01	6.55E-03	1.31E+07	3.46E+01	8.22E-03	3.53E+06	4.57E+01
8.80E-03	1.68E+06	5.69E+01	6.98E-03	6.83E+06	4.14E+01	6.82E-03	1.32E+07	3.45E+01	8.55E-03	3.62E+06	4.68E+01
9.79E-03	1.80E+06	5.88E+01	8.39E-03	7.48E+06	4.10E+01	8.23E-03	1.42E+07	3.43E+01	8.96E-03	3.73E+06	4.51E+01
1.32E-02	2.14E+06	5.64E+01	9.69E-03	7.83E+06	4.26E+01	8.88E-03	1.43E+07	3.53E+01	1.27E-02	4.39E+06	4.46E+01
1.38E-02	2.20E+06	5.71E+01	1.05E-02	8.08E+06	4.10E+01	1.03E-02	1.53E+07	3.38E+01	1.30E-02	4.44E+06	4.52E+01
1.40E-02	2.24E+06	5.59E+01	1.11E-02	8.34E+06	4.05E+01	1.08E-02	1.56E+07	3.37E+01	1.36E-02	4.57E+06	4.64E+01
1.55E-02	2.42E+06	5.80E+01	1.33E-02	9.13E+06	3.98E+01	1.30E-02	1.68E+07	3.31E+01	1.42E-02	4.71E+06	4.41E+01
2.10E-02	2.84E+06	5.55E+01	1.54E-02	9.64E+06	4.19E+01	1.41E-02	1.70E+07	3.47E+01	2.02E-02	5.50E+06	4.40E+01
2.19E-02	2.93E+06	5.62E+01	1.66E-02	9.92E+06	4.02E+01	1.63E-02	1.80E+07	3.31E+01	2.07E-02	5.57E+06	4.46E+01
2.21E-02	2.96E+06	5.49E+01	1.75E-02	1.02E+07	3.95E+01	1.71E-02	1.83E+07	3.28E+01	2.15E-02	5.76E+06	4.60E+01

Table B.13 Summary of Complex Modulus and Phase Angle Values for Binder 7628SM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
2.46E-02	3.23E+06	5.72E+01	2.11E-02	1.11E+07	3.88E+01	2.07E-02	1.97E+07	3.22E+01	2.25E-02	5.88E+06	4.34E+01
3.18E-02	3.76E+06	5.38E+01	2.43E-02	1.18E+07	4.12E+01	2.23E-02	2.01E+07	3.41E+01	3.18E-02	7.12E+06	4.28E+01
3.32E-02	3.75E+06	5.45E+01	2.64E-02	1.21E+07	3.94E+01	2.58E-02	2.12E+07	3.24E+01	3.19E-02	6.90E+06	4.34E+01
3.47E-02	3.90E+06	5.52E+01	2.78E-02	1.23E+07	3.87E+01	2.71E-02	2.15E+07	3.20E+01	3.27E-02	7.02E+06	4.41E+01
3.51E-02	3.91E+06	5.37E+01	3.18E-02	1.34E+07	3.83E+01	3.18E-02	2.33E+07	3.20E+01	3.40E-02	7.27E+06	4.56E+01
3.90E-02	4.31E+06	5.63E+01	3.34E-02	1.33E+07	3.79E+01	3.28E-02	2.31E+07	3.14E+01	3.57E-02	7.34E+06	4.27E+01
4.00E-02	4.24E+06	5.33E+01	3.86E-02	1.44E+07	4.07E+01	3.53E-02	2.38E+07	3.35E+01	4.00E-02	7.90E+06	4.24E+01
5.27E-02	4.95E+06	5.33E+01	4.00E-02	1.45E+07	3.78E+01	4.00E-02	2.49E+07	3.13E+01	5.06E-02	8.61E+06	4.27E+01
5.50E-02	5.14E+06	5.42E+01	4.18E-02	1.46E+07	3.87E+01	4.10E-02	2.48E+07	3.18E+01	5.19E-02	8.76E+06	4.35E+01
5.56E-02	5.07E+06	5.25E+01	4.41E-02	1.48E+07	3.78E+01	4.30E-02	2.51E+07	3.14E+01	5.40E-02	9.02E+06	4.53E+01
6.18E-02	5.63E+06	5.58E+01	5.29E-02	1.60E+07	3.68E+01	5.19E-02	2.70E+07	3.05E+01	5.66E-02	9.10E+06	4.18E+01
6.34E-02	5.55E+06	5.20E+01	6.34E-02	1.75E+07	3.67E+01	6.34E-02	2.91E+07	3.06E+01	6.34E-02	9.84E+06	4.13E+01
8.35E-02	6.46E+06	5.22E+01	6.62E-02	1.77E+07	3.79E+01	6.49E-02	2.90E+07	3.12E+01	8.02E-02	1.07E+07	4.21E+01
8.72E-02	6.73E+06	5.31E+01	6.98E-02	1.78E+07	3.71E+01	6.82E-02	2.92E+07	3.07E+01	8.22E-02	1.09E+07	4.29E+01
8.80E-02	6.62E+06	5.14E+01	8.39E-02	1.93E+07	3.60E+01	8.23E-02	3.14E+07	2.98E+01	8.96E-02	1.12E+07	4.11E+01
1.00E-01	7.14E+06	5.07E+01	1.00E-01	2.08E+07	3.58E+01	1.00E-01	3.36E+07	2.97E+01	1.00E-01	1.20E+07	4.06E+01
1.32E-01	8.38E+06	5.10E+01	1.05E-01	2.14E+07	3.72E+01	1.03E-01	3.39E+07	3.06E+01	1.27E-01	1.31E+07	4.14E+01
1.38E-01	8.76E+06	5.20E+01	1.11E-01	2.13E+07	3.63E+01	1.08E-01	3.38E+07	3.01E+01	1.30E-01	1.35E+07	4.23E+01
1.40E-01	8.54E+06	5.01E+01	1.33E-01	2.29E+07	3.51E+01	1.30E-01	3.63E+07	2.91E+01	1.42E-01	1.38E+07	4.04E+01
1.59E-01	9.19E+06	4.93E+01	1.59E-01	2.47E+07	3.48E+01	1.59E-01	3.89E+07	2.89E+01	1.58E-01	1.48E+07	3.98E+01
1.75E-01	9.92E+06	4.88E+01	1.66E-01	2.58E+07	3.65E+01	1.63E-01	3.95E+07	3.01E+01	1.59E-01	1.48E+07	3.99E+01
2.10E-01	1.08E+07	4.98E+01	1.75E-01	2.55E+07	3.56E+01	1.71E-01	3.93E+07	2.95E+01	1.98E-01	1.63E+07	3.91E+01
2.19E-01	1.13E+07	5.12E+01	1.78E-01	2.63E+07	3.47E+01	1.74E-01	4.04E+07	2.90E+01	2.02E-01	1.62E+07	4.08E+01
2.20E-01	1.12E+07	4.83E+01	2.11E-01	2.73E+07	3.43E+01	2.07E-01	4.19E+07	2.84E+01	2.07E-01	1.68E+07	4.17E+01

Table B.13 Summary of Complex Modulus and Phase Angle Values for Binder 7628SM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)
2.21E-01	1.10E+07	4.88E+01	2.24E-01	2.83E+07	3.41E+01	2.19E-01	4.30E+07	2.85E+01	2.25E-01	1.70E+07	3.96E+01
2.52E-01	1.17E+07	4.80E+01	2.52E-01	2.93E+07	3.39E+01	2.52E-01	4.47E+07	2.82E+01	2.52E-01	1.79E+07	3.89E+01
3.32E-01	1.39E+07	4.85E+01	2.78E-01	3.04E+07	3.48E+01	2.71E-01	4.53E+07	2.90E+01	3.14E-01	1.96E+07	3.84E+01
3.49E-01	1.42E+07	4.66E+01	3.34E-01	3.24E+07	3.36E+01	3.28E-01	4.83E+07	2.78E+01	3.19E-01	1.99E+07	4.01E+01
3.51E-01	1.40E+07	4.75E+01	3.54E-01	3.33E+07	3.32E+01	3.47E-01	4.94E+07	2.77E+01	3.57E-01	2.08E+07	3.88E+01
4.00E-01	1.50E+07	4.65E+01	4.00E-01	3.45E+07	3.29E+01	4.00E-01	5.09E+07	2.75E+01	4.00E-01	2.17E+07	3.81E+01
5.27E-01	1.77E+07	4.73E+01	4.41E-01	3.61E+07	3.41E+01	4.30E-01	5.24E+07	2.84E+01	4.98E-01	2.42E+07	3.74E+01
5.53E-01	1.78E+07	4.51E+01	5.29E-01	3.80E+07	3.28E+01	5.19E-01	5.54E+07	2.73E+01	5.06E-01	2.43E+07	3.95E+01
5.56E-01	1.78E+07	4.62E+01	5.61E-01	3.89E+07	3.24E+01	5.50E-01	5.66E+07	2.70E+01	5.66E-01	2.55E+07	3.81E+01
6.34E-01	1.89E+07	4.51E+01	6.34E-01	4.05E+07	3.22E+01	6.34E-01	5.80E+07	2.69E+01	6.34E-01	2.61E+07	3.74E+01
8.35E-01	2.23E+07	4.62E+01	6.98E-01	4.27E+07	3.34E+01	6.82E-01	6.03E+07	2.78E+01	7.89E-01	2.91E+07	3.63E+01
8.76E-01	2.22E+07	4.38E+01	8.39E-01	4.48E+07	3.21E+01	8.23E-01	6.35E+07	2.67E+01	8.02E-01	2.96E+07	3.88E+01
8.80E-01	2.23E+07	4.49E+01	8.90E-01	4.57E+07	3.14E+01	8.72E-01	6.47E+07	2.63E+01	8.89E-01	3.07E+07	3.67E+01
1.00E+00	2.36E+07	4.38E+01	1.00E+00	4.73E+07	3.14E+01	1.00E+00	6.63E+07	2.63E+01	8.96E-01	3.06E+07	3.74E+01
1.02E+00	2.41E+07	4.34E+01	1.10E+00	5.00E+07	3.14E+01	1.08E+00	7.03E+07	2.61E+01	1.00E+00	3.17E+07	3.66E+01
1.28E+00	2.68E+07	4.27E+01	1.33E+00	5.24E+07	3.15E+01	1.30E+00	7.26E+07	2.62E+01	1.12E+00	3.35E+07	3.56E+01
1.39E+00	2.75E+07	4.25E+01	1.38E+00	5.31E+07	3.10E+01	1.36E+00	7.41E+07	2.57E+01	1.25E+00	3.44E+07	3.56E+01
1.40E+00	2.80E+07	4.36E+01	1.41E+00	5.35E+07	3.06E+01	1.38E+00	7.35E+07	2.55E+01	1.42E+00	3.69E+07	3.67E+01
1.59E+00	2.94E+07	4.24E+01	1.59E+00	5.52E+07	3.07E+01	1.59E+00	7.62E+07	2.57E+01	1.59E+00	3.82E+07	3.58E+01
2.03E+00	3.32E+07	4.10E+01	2.11E+00	6.12E+07	3.08E+01	2.07E+00	8.28E+07	2.57E+01	1.77E+00	4.01E+07	3.49E+01
2.20E+00	3.41E+07	4.08E+01	2.18E+00	6.19E+07	3.00E+01	2.15E+00	8.44E+07	2.50E+01	1.98E+00	4.15E+07	3.48E+01
2.21E+00	3.47E+07	4.24E+01	2.24E+00	6.20E+07	2.97E+01	2.19E+00	8.37E+07	2.50E+01	2.25E+00	4.49E+07	3.58E+01
2.52E+00	3.63E+07	4.11E+01	2.52E+00	6.43E+07	3.00E+01	2.52E+00	8.79E+07	2.51E+01	2.52E+00	4.58E+07	3.50E+01
3.21E+00	4.02E+07	3.97E+01	3.34E+00	7.14E+07	3.01E+01	3.28E+00	9.45E+07	2.52E+01	2.81E+00	4.79E+07	3.39E+01

Table B.13 Summary of Complex Modulus and Phase Angle Values for Binder 7628SM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
3.49E+00	4.18E+07	3.96E+01	3.46E+00	7.14E+07	2.91E+01	3.41E+00	9.50E+07	2.45E+01	3.14E+00	5.00E+07	3.39E+01
3.51E+00	4.28E+07	4.12E+01	3.54E+00	7.16E+07	2.90E+01	3.47E+00	9.44E+07	2.44E+01	3.57E+00	5.39E+07	3.50E+01
4.00E+00	4.48E+07	3.98E+01	4.00E+00	7.45E+07	2.93E+01	4.00E+00	9.92E+07	2.46E+01	4.00E+00	5.47E+07	3.43E+01
5.09E+00	4.93E+07	3.84E+01	5.48E+00	8.24E+07	2.82E+01	5.40E+00	1.08E+08	2.37E+01	4.45E+00	5.76E+07	3.28E+01
5.53E+00	5.08E+07	3.83E+01	5.61E+00	8.27E+07	2.82E+01	5.50E+00	1.07E+08	2.38E+01	4.98E+00	5.98E+07	3.30E+01
6.34E+00	5.47E+07	3.85E+01	6.34E+00	8.59E+07	2.86E+01	6.34E+00	1.11E+08	2.41E+01	6.34E+00	6.44E+07	3.35E+01
8.07E+00	5.94E+07	3.70E+01	8.69E+00	9.47E+07	2.74E+01	8.56E+00	1.20E+08	2.32E+01	7.05E+00	6.77E+07	3.22E+01
8.76E+00	6.16E+07	3.70E+01	8.90E+00	9.50E+07	2.75E+01	8.72E+00	1.20E+08	2.33E+01	7.89E+00	7.02E+07	3.23E+01
1.00E+01	6.63E+07	3.72E+01	1.00E+01	9.92E+07	2.79E+01	1.00E+01	1.25E+08	2.37E+01	7.95E+00	6.99E+07	3.21E+01
1.09E+01	6.66E+07	3.64E+01	1.32E+01	1.06E+08	2.71E+01	1.30E+01	1.34E+08	2.33E+01	9.99E+00	7.68E+07	3.09E+01
1.28E+01	7.14E+07	3.57E+01	1.38E+01	1.08E+08	2.66E+01	1.36E+01	1.34E+08	2.27E+01	1.00E+01	7.63E+07	3.28E+01
1.37E+01	7.32E+07	3.53E+01	1.41E+01	1.09E+08	2.68E+01	1.38E+01	1.36E+08	2.28E+01	1.12E+01	7.87E+07	3.12E+01
1.39E+01	7.38E+07	3.57E+01	1.59E+01	1.14E+08	2.72E+01	1.59E+01	1.41E+08	2.32E+01	1.25E+01	8.30E+07	3.14E+01
1.59E+01	8.01E+07	3.60E+01	1.66E+01	1.14E+08	2.64E+01	1.64E+01	1.40E+08	2.29E+01	1.58E+01	8.99E+07	3.04E+01
2.03E+01	8.53E+07	3.43E+01	2.18E+01	1.23E+08	2.59E+01	2.15E+01	1.50E+08	2.21E+01	1.59E+01	9.00E+07	3.19E+01
2.17E+01	8.75E+07	3.40E+01	2.24E+01	1.24E+08	2.62E+01	2.19E+01	1.52E+08	2.23E+01	1.77E+01	9.28E+07	3.03E+01
2.20E+01	8.78E+07	3.46E+01	2.64E+01	1.30E+08	2.54E+01	2.60E+01	1.57E+08	2.21E+01	1.98E+01	9.69E+07	3.06E+01
3.21E+01	1.01E+08	3.31E+01	3.46E+01	1.40E+08	2.52E+01	3.41E+01	1.68E+08	2.16E+01	2.13E+01	9.99E+07	2.98E+01
3.44E+01	1.04E+08	3.27E+01	3.54E+01	1.41E+08	2.55E+01	3.47E+01	1.71E+08	2.18E+01	2.51E+01	1.04E+08	2.95E+01
3.49E+01	1.04E+08	3.34E+01	4.18E+01	1.47E+08	2.51E+01	4.12E+01	1.75E+08	2.18E+01	2.68E+01	1.09E+08	2.95E+01
3.52E+01	1.06E+08	3.30E+01	4.49E+01	1.51E+08	2.52E+01	4.46E+01	1.74E+08	2.18E+01	2.81E+01	1.09E+08	2.94E+01
4.43E+01	1.14E+08	3.27E+01	5.48E+01	1.58E+08	2.45E+01	5.40E+01	1.86E+08	2.11E+01	3.14E+01	1.12E+08	2.99E+01
5.09E+01	1.19E+08	3.19E+01	5.61E+01	1.61E+08	2.48E+01	5.50E+01	1.91E+08	2.13E+01	3.98E+01	1.22E+08	2.86E+01
5.45E+01	1.23E+08	3.15E+01	5.64E+01	1.62E+08	2.47E+01	5.60E+01	1.89E+08	2.19E+01	4.25E+01	1.26E+08	2.84E+01

Table B.13 Summary of Complex Modulus and Phase Angle Values for Binder 7628SM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
5.53E+01	1.24E+08	3.21E+01	6.62E+01	1.66E+08	2.40E+01	6.52E+01	1.94E+08	2.07E+01	4.45E+01	1.27E+08	2.86E+01
7.02E+01	1.35E+08	3.10E+01	8.69E+01	1.78E+08	2.39E+01	8.56E+01	2.06E+08	2.07E+01	4.98E+01	1.30E+08	2.90E+01
8.07E+01	1.40E+08	3.07E+01	8.90E+01	1.82E+08	2.42E+01	8.72E+01	2.12E+08	2.09E+01	6.30E+01	1.43E+08	2.73E+01
8.64E+01	1.43E+08	3.01E+01	8.94E+01	1.80E+08	2.41E+01	8.88E+01	2.05E+08	2.09E+01	6.74E+01	1.45E+08	2.75E+01
8.76E+01	1.45E+08	3.10E+01	1.05E+02	1.88E+08	2.35E+01	1.03E+02	2.16E+08	2.04E+01	7.05E+01	1.45E+08	2.78E+01
1.10E+02	1.54E+08	3.06E+01	1.38E+02	2.00E+08	2.32E+01	1.36E+02	2.29E+08	2.02E+01	7.27E+01	1.44E+08	2.81E+01
1.11E+02	1.57E+08	2.98E+01	1.42E+02	2.06E+08	2.33E+01	1.41E+02	2.30E+08	2.05E+01	7.89E+01	1.50E+08	2.82E+01
1.28E+02	1.63E+08	2.96E+01	1.51E+02	2.04E+08	2.40E+01	1.54E+02	2.30E+08	2.00E+01	9.14E+01	1.57E+08	2.89E+01
1.37E+02	1.67E+08	2.90E+01	1.66E+02	2.11E+08	2.29E+01	1.64E+02	2.37E+08	1.99E+01	9.99E+01	1.64E+08	2.66E+01
1.38E+02	1.64E+08	3.04E+01	1.90E+02	2.11E+08	2.35E+01	1.94E+02	2.46E+08	1.97E+01	1.07E+02	1.67E+08	2.65E+01
1.76E+02	1.80E+08	2.86E+01	2.18E+02	2.24E+08	2.25E+01	2.15E+02	2.53E+08	1.97E+01	1.12E+02	1.67E+08	2.70E+01
2.03E+02	1.88E+08	2.84E+01	2.25E+02	2.29E+08	2.24E+01	2.23E+02	2.52E+08	1.97E+01	1.45E+02	1.84E+08	2.57E+01
2.17E+02	1.93E+08	2.79E+01	2.64E+02	2.37E+08	2.19E+01	2.60E+02	2.64E+08	1.94E+01	1.58E+02	1.87E+08	2.57E+01
2.19E+02	1.88E+08	2.80E+01	3.01E+02	2.38E+08	2.22E+01	3.07E+02	2.69E+08	1.93E+01	1.69E+02	1.93E+08	2.55E+01
2.79E+02	2.06E+08	2.75E+01	3.46E+02	2.52E+08	2.18E+01	3.41E+02	2.79E+08	1.92E+01	1.77E+02	1.90E+08	2.62E+01
3.21E+02	2.16E+08	2.73E+01	3.56E+02	2.53E+08	2.17E+01	3.53E+02	2.80E+08	1.90E+01	2.21E+02	1.93E+08	2.52E+01
3.44E+02	2.22E+08	2.67E+01	4.18E+02	2.68E+08	2.11E+01	4.12E+02	2.89E+08	1.88E+01	2.30E+02	2.11E+08	2.52E+01
3.47E+02	2.16E+08	2.80E+01	4.77E+02	2.71E+08	2.11E+01	4.87E+02	2.89E+08	1.91E+01	2.51E+02	2.12E+08	2.48E+01
3.84E+02	2.23E+08	2.79E+01	5.48E+02	2.81E+08	2.12E+01	5.40E+02	3.08E+08	1.87E+01	2.68E+02	2.14E+08	2.49E+01
4.43E+02	2.38E+08	2.63E+01	5.53E+02	2.65E+08	2.16E+01	5.86E+02	3.04E+08	1.86E+01	2.77E+02	2.03E+08	2.47E+01
4.82E+02	2.35E+08	2.66E+01	5.64E+02	2.81E+08	2.05E+01	6.52E+02	3.17E+08	1.83E+01	2.81E+02	2.18E+08	2.52E+01
5.09E+02	2.47E+08	2.62E+01	6.62E+02	2.98E+08	2.04E+01	7.36E+02	3.19E+08	1.74E+01	3.64E+02	2.35E+08	2.46E+01
5.45E+02	2.55E+08	2.57E+01	6.94E+02	2.85E+08	2.17E+01	7.72E+02	3.29E+08	1.94E+01	3.98E+02	2.42E+08	2.39E+01
5.50E+02	2.56E+08	2.66E+01	7.56E+02	2.97E+08	2.04E+01	8.88E+02	3.35E+08	1.81E+01	4.25E+02	2.43E+08	2.41E+01

Table B.13 Summary of Complex Modulus and Phase Angle Values for Binder 7628SM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
7.02E+02	2.69E+08	2.53E+01	8.94E+02	3.12E+08	2.01E+01	1.03E+03	3.47E+08	1.79E+01	4.39E+02	2.49E+08	2.41E+01
7.64E+02	2.72E+08	2.57E+01	1.05E+03	3.29E+08	1.98E+01	1.17E+03	3.44E+08	2.00E+01	4.45E+02	2.48E+08	2.43E+01
8.64E+02	2.88E+08	2.46E+01	1.10E+03	3.13E+08	2.13E+01	1.22E+03	3.58E+08	1.81E+01	5.76E+02	2.64E+08	2.34E+01
8.71E+02	2.85E+08	2.40E+01	1.20E+03	3.35E+08	2.01E+01	1.41E+03	3.69E+08	1.75E+01	6.30E+02	2.76E+08	2.31E+01
1.11E+03	3.04E+08	2.41E+01	1.42E+03	3.45E+08	1.96E+01	1.64E+03	3.80E+08	1.73E+01	6.71E+02	2.74E+08	2.37E+01
1.21E+03	3.10E+08	2.48E+01	1.66E+03	3.62E+08	1.91E+01	1.85E+03	3.92E+08	1.81E+01	6.74E+02	2.77E+08	2.29E+01
1.37E+03	3.26E+08	2.35E+01	1.70E+03	3.54E+08	2.12E+01	1.94E+03	3.88E+08	1.71E+01	6.96E+02	2.84E+08	2.49E+01
1.38E+03	3.24E+08	2.23E+01	1.74E+03	3.52E+08	2.00E+01	2.04E+03	3.75E+08	1.78E+01	8.43E+02	2.97E+08	2.27E+01
1.44E+03	3.07E+08	2.52E+01	1.90E+03	3.66E+08	1.92E+01	2.23E+03	3.99E+08	1.71E+01	9.14E+02	2.98E+08	2.23E+01
1.76E+03	3.44E+08	2.30E+01	2.13E+03	3.64E+08	1.97E+01	2.57E+03	4.08E+08	1.84E+01	9.99E+02	3.07E+08	2.22E+01
1.81E+03	3.27E+08	2.50E+01	2.25E+03	3.79E+08	1.88E+01	2.60E+03	4.13E+08	1.68E+01	1.07E+03	3.05E+08	2.22E+01
1.92E+03	3.46E+08	2.42E+01	2.64E+03	3.96E+08	1.85E+01	2.93E+03	4.21E+08	1.79E+01	1.10E+03	3.07E+08	2.14E+01
2.17E+03	3.66E+08	2.25E+01	2.76E+03	3.91E+08	1.88E+01	3.07E+03	4.27E+08	1.70E+01	1.34E+03	3.37E+08	2.24E+01
2.19E+03	3.69E+08	2.27E+01	3.01E+03	4.03E+08	1.87E+01	3.53E+03	4.33E+08	1.65E+01	1.45E+03	3.31E+08	2.16E+01
2.79E+03	3.85E+08	2.20E+01	3.38E+03	3.95E+08	1.89E+01	4.07E+03	4.43E+08	1.69E+01	1.58E+03	3.45E+08	2.13E+01
2.87E+03	3.70E+08	2.27E+01	3.56E+03	4.17E+08	1.81E+01	4.12E+03	4.48E+08	1.64E+01	1.69E+03	3.52E+08	2.11E+01
3.04E+03	3.89E+08	2.17E+01	4.18E+03	4.34E+08	1.78E+01	4.65E+03	4.44E+08	1.67E+01	1.75E+03	3.48E+08	1.98E+01
3.44E+03	4.10E+08	2.14E+01	4.38E+03	4.38E+08	1.84E+01	4.87E+03	4.60E+08	1.62E+01	2.12E+03	3.57E+08	2.31E+01
3.47E+03	4.07E+08	2.14E+01	4.77E+03	4.41E+08	1.78E+01	5.60E+03	4.70E+08	1.60E+01	2.30E+03	3.66E+08	2.10E+01
4.43E+03	4.28E+08	2.10E+01	5.35E+03	4.45E+08	1.75E+01	6.45E+03	4.86E+08	1.61E+01	2.51E+03	3.79E+08	2.05E+01
4.55E+03	4.21E+08	2.31E+01	5.64E+03	4.57E+08	1.74E+01	6.52E+03	4.87E+08	1.58E+01	2.68E+03	3.86E+08	2.03E+01
4.82E+03	4.33E+08	2.15E+01	6.47E+03	4.61E+08	1.77E+01	7.36E+03	4.80E+08	1.53E+01	2.77E+03	4.07E+08	2.10E+01
5.45E+03	4.56E+08	2.04E+01	6.62E+03	4.75E+08	1.71E+01	7.72E+03	4.95E+08	1.59E+01	3.02E+03	4.18E+08	2.00E+01
5.50E+03	4.51E+08	2.07E+01	6.94E+03	4.67E+08	1.81E+01	8.88E+03	5.08E+08	1.55E+01	3.35E+03	3.97E+08	1.97E+01

Table B.13 Summary of Complex Modulus and Phase Angle Values for Binder 7628SM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
6.01E+03	4.43E+08	2.27E+01	7.56E+03	4.80E+08	1.71E+01	9.36E+03	4.63E+08	1.77E+01	3.64E+03	4.04E+08	2.00E+01
7.02E+03	4.72E+08	2.00E+01	8.12E+03	4.74E+08	1.72E+01	1.02E+04	5.15E+08	1.49E+01	3.79E+03	3.82E+08	1.86E+01
7.21E+03	4.72E+08	2.04E+01	8.49E+03	4.89E+08	1.72E+01	1.17E+04	5.26E+08	1.60E+01	3.98E+03	4.20E+08	1.96E+01
7.55E+03	4.60E+08	2.16E+01	8.94E+03	4.97E+08	1.68E+01	1.18E+04	4.80E+08	1.67E+01	4.25E+03	4.29E+08	1.93E+01
7.64E+03	4.69E+08	1.97E+01	1.10E+04	5.03E+08	1.83E+01	1.22E+04	5.36E+08	1.52E+01	4.39E+03	4.35E+08	2.00E+01
8.71E+03	4.98E+08	1.97E+01	1.20E+04	5.23E+08	1.64E+01	1.41E+04	5.49E+08	1.50E+01	5.32E+03	4.47E+08	1.91E+01
1.11E+04	5.23E+08	1.90E+01	1.29E+04	5.26E+08	1.92E+01	1.62E+04	5.53E+08	1.65E+01	5.76E+03	4.46E+08	1.90E+01
1.14E+04	5.12E+08	1.98E+01	1.35E+04	5.40E+08	1.78E+01	1.85E+04	5.68E+08	1.56E+01	6.01E+03	4.58E+08	1.93E+01
1.20E+04	5.20E+08	2.04E+01	1.42E+04	5.41E+08	1.61E+01	1.86E+04	5.44E+08	1.73E+01	6.24E+03	5.01E+08	1.97E+01
1.21E+04	5.29E+08	1.92E+01	1.74E+04	5.58E+08	1.64E+01	1.94E+04	5.74E+08	1.47E+01	6.74E+03	4.72E+08	1.85E+01
1.38E+04	5.48E+08	1.87E+01	1.90E+04	5.72E+08	1.57E+01	2.23E+04	5.91E+08	1.45E+01	6.96E+03	4.74E+08	1.86E+01
1.76E+04	5.72E+08	1.81E+01	2.04E+04	5.60E+08	1.56E+01	2.57E+04	5.97E+08	1.53E+01	7.84E+03	5.28E+08	1.78E+01
1.81E+04	5.57E+08	1.91E+01	2.13E+04	5.74E+08	1.59E+01	2.93E+04	6.15E+08	1.41E+01	8.43E+03	4.79E+08	1.88E+01
1.90E+04	5.59E+08	1.97E+01	2.25E+04	5.84E+08	1.54E+01	2.95E+04	5.58E+08	1.62E+01	9.14E+03	4.89E+08	1.82E+01
1.92E+04	5.89E+08	1.79E+01	2.76E+04	6.00E+08	1.51E+01	3.07E+04	6.17E+08	1.42E+01	9.52E+03	5.13E+08	1.90E+01
2.19E+04	6.00E+08	1.77E+01	2.85E+04	6.00E+08	1.51E+01	4.07E+04	6.53E+08	1.34E+01	1.07E+04	5.16E+08	1.76E+01
2.87E+04	6.14E+08	1.82E+01	3.01E+04	6.24E+08	1.49E+01	4.65E+04	6.60E+08	1.39E+01	1.10E+04	5.23E+08	1.73E+01
3.01E+04	6.32E+08	1.71E+01	3.23E+04	6.11E+08	1.60E+01	4.68E+04	6.32E+08	1.68E+01	1.24E+04	5.60E+08	1.20E+01
3.04E+04	6.50E+08	1.71E+01	3.38E+04	6.26E+08	1.48E+01	4.87E+04	6.61E+08	1.36E+01	1.34E+04	5.29E+08	1.86E+01
3.47E+04	6.54E+08	1.67E+01	4.38E+04	6.47E+08	1.46E+01	5.75E+04	7.20E+08	1.25E+01	1.45E+04	5.34E+08	1.72E+01
4.42E+04	5.73E+08	2.09E+01	4.52E+04	6.37E+08	1.61E+01	6.45E+04	6.82E+08	1.36E+01	1.51E+04	5.69E+08	1.75E+01
4.55E+04	6.88E+08	1.73E+01	4.77E+04	6.61E+08	1.43E+01	7.36E+04	7.03E+08	1.34E+01	1.75E+04	5.73E+08	1.65E+01
4.76E+04	6.86E+08	1.73E+01	5.12E+04	6.55E+08	1.50E+01	7.42E+04	6.70E+08	1.35E+01	1.97E+04	5.61E+08	1.60E+01
4.82E+04	7.03E+08	1.60E+01	5.35E+04	6.68E+08	1.45E+01	7.72E+04	7.08E+08	1.31E+01	1.97E+04	5.94E+08	1.35E+01

Table B.13 Summary of Complex Modulus and Phase Angle Values for Binder 7628SM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
5.50E+04	7.09E+08	1.58E+01	6.36E+04	7.18E+08	8.78E+00	1.02E+05	7.32E+08	1.28E+01	2.12E+04	5.77E+08	1.62E+01
5.55E+04	5.91E+08	1.95E+01	6.94E+04	6.96E+08	1.40E+01	1.14E+05	7.49E+08	1.43E+01	2.30E+04	5.82E+08	1.64E+01
7.21E+04	7.40E+08	1.60E+01	7.16E+04	6.82E+08	1.40E+01	1.17E+05	7.52E+08	1.27E+01	2.39E+04	5.78E+08	1.84E+01
7.55E+04	7.37E+08	1.44E+01	7.56E+04	7.08E+08	1.37E+01	1.18E+05	7.28E+08	1.41E+01	2.48E+04	6.38E+08	1.78E+01
7.64E+04	7.59E+08	1.52E+01	7.98E+04	8.09E+08	1.53E+01	1.62E+05	7.86E+08	1.25E+01	2.77E+04	6.28E+08	1.56E+01
8.80E+04	6.82E+08	1.88E+01	8.12E+04	7.06E+08	1.36E+01	1.81E+05	7.78E+08	1.38E+01	3.12E+04	6.38E+08	1.00E+01
1.14E+05	7.99E+08	1.48E+01	8.49E+04	7.23E+08	1.37E+01	1.85E+05	8.02E+08	1.21E+01	3.35E+04	6.27E+08	1.56E+01
1.20E+05	7.55E+08	1.46E+01	1.10E+05	7.45E+08	1.33E+01	1.86E+05	7.68E+08	1.33E+01	3.64E+04	6.30E+08	1.55E+01
1.21E+05	8.19E+08	1.43E+01	1.27E+05	8.50E+08	1.51E+01	2.49E+05	7.77E+08	1.12E+01	3.79E+04	6.36E+08	1.55E+01
1.33E+05	7.21E+08	1.44E+01	1.29E+05	7.55E+08	1.29E+01	2.57E+05	8.36E+08	1.20E+01	3.93E+04	6.99E+08	1.37E+01
1.39E+05	7.11E+08	1.66E+01	1.35E+05	7.76E+08	1.31E+01	2.87E+05	7.98E+08	1.23E+01	4.39E+04	6.78E+08	1.47E+01
1.67E+05	7.66E+08	1.63E+01	1.74E+05	8.00E+08	1.26E+01	2.93E+05	8.46E+08	1.16E+01	4.94E+04	7.12E+08	2.50E+01
1.81E+05	8.63E+08	1.39E+01	1.80E+05	7.79E+08	1.32E+01	2.95E+05	8.11E+08	1.23E+01	5.03E+04	8.19E+08	1.64E+01
1.90E+05	8.66E+08	1.44E+01	2.01E+05	8.83E+08	1.47E+01	4.07E+05	8.81E+08	1.14E+01	5.32E+04	6.80E+08	1.47E+01
1.92E+05	8.75E+08	1.34E+01	2.04E+05	8.14E+08	1.24E+01	4.56E+05	9.14E+08	1.17E+01	6.01E+04	6.97E+08	1.52E+01
2.21E+05	7.80E+08	1.35E+01	2.04E+05	8.84E+08	1.94E+01	4.68E+05	8.60E+08	1.19E+01	6.23E+04	8.85E+08	1.13E+01
2.65E+05	8.86E+08	1.50E+01	2.13E+05	8.29E+08	1.24E+01	6.26E+05	9.66E+08	1.32E+01	6.96E+04	7.28E+08	1.39E+01
2.87E+05	9.22E+08	1.30E+01	2.56E+05	9.24E+08	7.88E+00	6.45E+05	9.33E+08	1.08E+01	7.84E+04	7.72E+08	1.62E+01
3.01E+05	9.24E+08	1.33E+01	2.76E+05	8.49E+08	1.20E+01	7.22E+05	1.03E+09	1.27E+01	8.43E+04	7.23E+08	1.40E+01
3.50E+05	8.76E+08	1.50E+01	2.85E+05	8.80E+08	1.23E+01	7.42E+05	9.11E+08	1.11E+01	9.52E+04	7.45E+08	1.38E+01
4.20E+05	9.72E+08	1.79E+01	3.18E+05	9.45E+08	1.05E+01	9.92E+05	1.09E+09	1.20E+01	9.87E+04	8.17E+08	1.12E+01
4.55E+05	9.82E+08	1.22E+01	3.23E+05	8.66E+08	1.22E+01	1.02E+06	9.87E+08	1.02E+01	1.00E+05	8.56E+08	1.24E+01
4.60E+05	9.30E+08	1.62E+01	3.38E+05	8.79E+08	1.18E+01	1.14E+06	1.04E+09	9.12E+00	1.10E+05	7.81E+08	1.30E+01
4.76E+05	9.77E+08	1.25E+01	4.06E+05	9.13E+08	1.55E+01	1.18E+06	9.56E+08	1.07E+01	1.24E+05	8.38E+08	1.09E+01

Table B.13 Summary of Complex Modulus and Phase Angle Values for Binder 7628SM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
5.55E+05	9.45E+08	1.22E+01	4.52E+05	9.32E+08	1.15E+01	1.57E+06	1.02E+09	1.06E+01	1.34E+05	7.75E+08	1.30E+01
5.78E+05	9.48E+08	1.51E+01	5.04E+05	9.87E+08	1.45E+01	1.81E+06	1.09E+09	1.17E+01	1.51E+05	8.01E+08	1.28E+01
6.66E+05	1.02E+09	1.65E+01	5.12E+05	9.20E+08	1.14E+01	1.86E+06	1.01E+09	1.01E+01	1.56E+05	1.03E+09	1.41E+01
7.21E+05	1.04E+09	1.14E+01	5.35E+05	9.36E+08	1.11E+01	2.49E+06	1.04E+09	5.47E+00	1.59E+05	9.90E+08	2.01E+01
7.55E+05	1.04E+09	1.16E+01	6.44E+05	1.07E+09	1.25E+01	2.87E+06	1.14E+09	8.56E+00	1.97E+05	9.09E+08	1.14E+01
8.80E+05	9.71E+08	1.04E+01	7.16E+05	9.66E+08	1.14E+01	2.95E+06	1.06E+09	9.59E+00	2.12E+05	8.36E+08	1.21E+01
9.16E+05	1.02E+09	1.40E+01	7.98E+05	1.06E+09	1.04E+01	4.56E+06	1.19E+09	8.51E+00	2.39E+05	8.49E+08	1.18E+01
1.06E+06	1.05E+09	1.27E+01	8.12E+05	9.71E+08	1.08E+01	4.68E+06	1.10E+09	9.04E+00	2.48E+05	1.01E+09	9.84E+00
1.20E+06	1.10E+09	1.10E+01	8.49E+05	9.86E+08	1.04E+01	6.26E+06	1.18E+09	9.66E+00	3.12E+05	9.38E+08	1.22E+01
1.39E+06	1.07E+09	1.28E+01	1.02E+06	1.05E+09	9.75E+00	7.22E+06	1.23E+09	8.17E+00	3.35E+05	8.87E+08	1.13E+01
1.45E+06	1.09E+09	1.05E+01	1.13E+06	1.02E+09	1.08E+01	9.92E+06	1.26E+09	8.25E+00	3.79E+05	9.00E+08	1.14E+01
1.67E+06	1.05E+09	1.17E+01	1.27E+06	1.10E+09	1.20E+01	1.14E+07	1.29E+09	7.47E+00	3.93E+05	9.95E+08	1.33E+01
1.90E+06	1.16E+09	1.02E+01	1.29E+06	1.03E+09	1.03E+01	1.57E+07	1.31E+09	7.58E+00	3.99E+05	1.01E+09	1.02E+01
2.21E+06	1.10E+09	1.11E+01	1.62E+06	1.16E+09	1.15E+01	1.81E+07	1.34E+09	7.05E+00	4.94E+05	1.02E+09	9.98E+00
2.30E+06	1.12E+09	1.25E+01	1.80E+06	1.06E+09	1.01E+01	2.49E+07	1.35E+09	7.03E+00	6.01E+05	9.52E+08	1.06E+01
2.65E+06	1.25E+09	9.36E+00	2.01E+06	1.12E+09	9.50E+00	2.87E+07	1.38E+09	6.52E+00	6.23E+05	1.13E+09	1.06E+01
3.01E+06	1.21E+09	9.52E+00	2.04E+06	1.08E+09	9.51E+00	3.95E+07	1.40E+09	6.69E+00	6.32E+05	1.12E+09	1.09E+01
3.50E+06	1.17E+09	1.06E+01	2.56E+06	1.16E+09	8.92E+00	6.26E+07	1.45E+09	6.22E+00	7.41E+05	1.06E+09	9.85E+00
3.65E+06	1.23E+09	8.25E+00	2.85E+06	1.12E+09	9.42E+00	9.92E+07	1.50E+09	5.79E+00	7.84E+05	1.05E+09	8.96E+00
4.20E+06	1.22E+09	1.09E+01	3.18E+06	1.18E+09	9.90E+00	1.81E+08	1.19E+09	8.70E+00	9.31E+05	1.14E+09	3.75E+00
5.55E+06	1.22E+09	9.73E+00	3.23E+06	1.12E+09	8.97E+00	2.86E+08	1.24E+09	8.04E+00	9.52E+05	1.00E+09	9.94E+00
5.78E+06	1.31E+09	9.98E+00	4.06E+06	1.24E+09	7.90E+00	4.54E+08	1.29E+09	7.47E+00	9.87E+05	1.09E+09	9.12E+00
6.66E+06	1.29E+09	9.05E+00	4.52E+06	1.17E+09	8.79E+00	1.78E+07	8.48E+08	9.73E+00	1.00E+06	1.27E+09	1.23E+01
8.80E+06	1.28E+09	9.24E+00	5.04E+06	1.23E+09	8.70E+00	2.41E+07	9.00E+08	8.55E+00	1.24E+06	1.11E+09	8.73E+00

Table B.13 Summary of Complex Modulus and Phase Angle Values for Binder 7628SM with Different Aging Conditions (Continued)

STA			5day@95°C			12days@95°C			20hr. PAV		
Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)	Frequency (Hz)	Complex Modulus (MPa)	Phase Angle (Degree)
9.16E+06	1.36E+09	8.75E+00	6.44E+06	1.30E+09	8.94E+00	2.74E+07	9.25E+08	9.14E+00	1.48E+06	1.12E+09	1.18E+01
1.06E+07	1.36E+09	8.65E+00	7.16E+06	1.22E+09	8.24E+00	2.82E+07	8.88E+08	8.61E+00	1.51E+06	1.05E+09	9.25E+00
1.30E+07	1.25E+09	1.01E+01	7.98E+06	1.28E+09	7.64E+00	3.82E+07	9.36E+08	8.01E+00	1.56E+06	1.19E+09	7.98E+00
1.39E+07	1.33E+09	8.53E+00	1.02E+07	1.34E+09	8.30E+00	4.34E+07	9.67E+08	8.79E+00	1.59E+06	1.19E+09	9.03E+00
1.45E+07	1.44E+09	8.99E+00	1.13E+07	1.27E+09	7.69E+00	4.47E+07	9.33E+08	8.63E+00	1.97E+06	1.15E+09	8.00E+00
1.63E+07	1.39E+09	3.22E+00	1.27E+07	1.33E+09	7.25E+00	6.87E+07	1.01E+09	7.77E+00	2.34E+06	1.20E+09	1.20E+01
1.67E+07	1.41E+09	8.40E+00	1.62E+07	1.38E+09	6.94E+00	7.08E+07	9.68E+08	7.75E+00	2.48E+06	1.21E+09	7.19E+00
2.21E+07	1.39E+09	7.79E+00	2.01E+07	1.38E+09	6.69E+00	1.09E+08	1.05E+09	7.01E+00	2.52E+06	1.23E+09	7.67E+00
2.30E+07	1.50E+09	7.73E+00	2.56E+07	1.43E+09	6.38E+00	1.12E+08	1.01E+09	7.26E+00	3.12E+06	1.20E+09	7.54E+00
2.59E+07	1.45E+09	9.68E+00	3.18E+07	1.42E+09	6.31E+00	1.73E+08	1.08E+09	6.73E+00	3.93E+06	1.26E+09	7.11E+00
2.65E+07	1.46E+09	7.46E+00	4.06E+07	1.48E+09	6.06E+00	1.78E+08	1.04E+09	6.95E+00	3.99E+06	1.28E+09	6.06E+00
3.65E+07	1.54E+09	6.97E+00	6.44E+07	1.52E+09	5.57E+00	2.74E+08	1.12E+09	6.07E+00	6.23E+06	1.29E+09	6.28E+00
4.10E+07	1.60E+09	8.07E+00	1.02E+08	1.56E+09	5.19E+00	4.34E+08	1.15E+09	5.58E+00	6.32E+06	1.32E+09	6.78E+00
4.20E+07	1.52E+09	6.84E+00	8.77E+07	1.25E+09	7.36E+00	7.88E+07	1.25E+09	7.45E+00	9.31E+06	1.64E+09	6.61E+00
5.78E+07	1.60E+09	6.79E+00	1.15E+08	1.38E+09	9.67E+00	1.03E+08	1.25E+09	7.18E+00	9.87E+06	1.33E+09	5.91E+00
6.50E+07	1.64E+09	4.71E+00	1.39E+08	1.29E+09	7.06E+00	1.03E+08	1.20E+09	7.67E+00	1.00E+07	1.35E+09	5.85E+00
6.66E+07	1.57E+09	6.40E+00	1.82E+08	1.47E+09	3.93E+00	1.25E+08	1.30E+09	7.18E+00	1.48E+07	1.42E+09	4.20E+00
9.16E+07	1.65E+09	5.76E+00	2.20E+08	1.33E+09	6.41E+00	1.63E+08	1.27E+09	3.93E+00	1.59E+07	1.39E+09	5.22E+00
1.03E+08	1.63E+09	7.58E+00	2.89E+08	1.45E+09	4.64E+00	1.64E+08	1.24E+09	7.12E+00	2.34E+07	1.49E+09	6.62E+00
1.45E+08	1.69E+09	5.54E+00	3.49E+08	1.38E+09	5.98E+00	1.98E+08	1.34E+09	6.42E+00	2.52E+07	1.43E+09	4.87E+00
1.63E+08	1.72E+09	6.60E+00	4.58E+08	1.48E+09	5.66E+00	2.58E+08	1.41E+09	6.06E+00	3.71E+07	1.48E+09	4.29E+00
2.30E+08	1.74E+09	4.95E+00	7.26E+08	1.50E+09	5.52E+00	3.14E+08	1.38E+09	6.05E+00	5.88E+07	1.56E+09	4.40E+00
2.59E+08	1.83E+09	5.82E+00	1.15E+09	1.55E+09	5.04E+00	4.09E+08	1.43E+09	5.47E+00	9.31E+07	1.59E+09	4.12E+00

Rheological Indices

Performance Grade Low Temperature (PGLT)

Table B.14 Summary of Performance Grade Low Temperature (PGLT) from DSR Test for Binder 5234LM

LTPG	STA	5days@95°C	12days@95°C	24hr.@135°C	Field Cores L1	Field Cores L2	Field Cores L3
R1	-32.43	-24.28	-15.39	-14.23	-26.36	-30.19	-30.98
R2	-31.22	-25.63	-15.45	-16.08	-28.72	-30.55	-27.97
R3	-32.03	-30.52	-15.34	-13.49	-27.54	-30.20	-27.97

Table B.15 Summary of Performance Grade Low Temperature (PGLT) from DSR Test for Binder 5234LL

LTPG	STA	5days@95°C	12days@95°C	24hr.@135°C	Field Cores L1	Field Cores L2	Field Cores L3
R1	-31.19	-22.58	-15.65	-12.81	-24.28	-25.50	-25.48
R2	-27.81	-21.59	-15.19	-12.98	-25.00	-25.39	-28.17
R3	-27.84	-23.57	-13.33	0.00	-24.64	-25.45	-26.82

Table B.16 Summary of Performance Grade Low Temperature (PGLT) from DSR Test for Binder 5834LM

LTPG	STA	5days@95°C	12days@95°C	20hr. PAV
R1	-34.56	-30.17	-26.75	-35.41
R2	-33.97	-31.54	-26.18	-33.66
R3	-33.69	-31.50	-26.68	-37.70

Table B.17 Summary of Performance Grade Low Temperature (PGLT) from DSR Test for Binder 5828LM

LTPG	STA	5days@95°C	12days@95°C	24hr.@135°C	Field Cores L1	Field Cores L2	Field Cores L3
R1	-30.13	0.00	-24.86	-14.55	-24.57	-27.66	-27.30
R2	-27.71	0.00	-26.11	-13.89	-25.26	-27.71	-29.65
R3	-30.81	0.00	-23.47	-11.79	-25.26	-25.93	-28.87

Table B.18 Summary of Performance Grade Low Temperature (PGLT) from DSR Test for Binder 5828LL

LTPG	STA	5days@95°C	12days@95°C	24hr.@135°C	Field Cores L1	Field Cores L2	Field Cores L3
R1	-27.70	0.00	-19.57	-21.43	-25.16	-25.13	-25.61
R2	-27.82	0.00	-19.07	-21.62	-25.23	-25.12	-25.50
R3	-27.59	0.00	-19.13	-21.81	-23.59	-25.70	-25.43

Table B.19 Summary of Performance Grade Low Temperature (PGLT) from DSR Test for Binder 6428SV

LTPG	STA	5days@95°C	12days@95°C	20hr. PAV
R1	-32.51	-29.31	-24.36	-31.89
R2	-32.03	-26.07	-24.66	-29.91
R3	-32.43	-34.35	-25.32	-33.96

Table B.20 Summary of Performance Grade Low Temperature (PGLT) from DSR Test for Binder 6428SM

LTPG	STA	5days@95°C	12days@95°C	20hr. PAV
R1	-30.43	-26.04	-20.37	-31.36
R2	-29.68	-25.04	-21.74	-31.98
R3	-30.69	-25.11	-21.05	-31.42

Table B.21 Summary of Performance Grade Low Temperature (PGLT) from DSR Test for Binder 7034LV

LTPG	STA	5days@95°C	12days@95°C	20hr. PAV
R1	-35.07	-34.85	-27.62	-33.64
R2	-39.90	-34.65	-29.05	-33.07
R3	-36.23	-34.90	-28.33	-35.60

Table B.22 Summary of Performance Grade Low Temperature (PGLT) from DSR Test for Binder 7628SM

LTPG	STA	5days@95°C	12days@95°C	20hr. PAV
R1	-29.76	-24.91	-23.54	-33.03
R2	-31.29	-24.54	-17.75	-32.97
R3	-31.66	-24.88	-17.43	-32.78

R-value from DSR Test

Table B.23 Summary of R-value from DSR Test for Binder 5234LM

R	STA	5days@95°C	12days@95°C	24hr.@135°C	Field Cores	Field Cores L2	Field Cores L3
R1	2.35	3.20	0.00	3.64	2.89	2.49	2.38
R2	2.42	3.26	4.03	4.55	2.52	2.46	2.23
R3	2.45	3.06	4.16	4.59	2.71	2.51	2.55

Table B.24 Summary of R-value from DSR Test for Binder 5234LL

R	STA	5days@95°C	12days@95°C	24hr.@135°C	Field Cores	Field Cores L2	Field Cores L3
R1	2.46	3.41	3.96	4.25	2.77	2.51	2.37
R2	2.60	3.59	4.07	3.59	2.73	2.42	2.53
R3	2.40	3.22	4.14	0.00	2.75	2.47	2.45

Table B.25 Summary of R-value from DSR Test for Binder 5834LM

R	STA	5days@95°C	12days@95°C	20hr. PAV
R1	2.84	2.69	3.24	2.88
R2	2.13	2.75	3.38	2.94
R3	2.30	2.69	3.31	2.96

Table B.26 Summary of R-value from DSR Test for Binder 5828LM

R	STA	5days@95°C	12days@95°C	24hr.@135°C	Field Cores	Field Cores L2	Field Cores L3
R1	2.10	0.00	3.40	4.22	2.45	2.40	2.36
R2	2.59	0.00	3.47	3.94	2.53	2.52	2.31
R3	2.50	0.00	3.68	4.25	2.53	2.45	2.46

Table B.27 Summary of R-value from DSR Test for Binder 5828LL

R	STA	5days@95°C	12days@95°C	24hr.@135°C	Field Cores	Field Cores L2	Field Cores L3
R1	2.21	0.00	2.92	3.25	2.51	2.66	2.64
R2	2.08	0.00	3.44	3.37	2.65	2.54	2.53
R3	2.35	0.00	3.42	3.49	2.43	2.67	2.49

Table B.28 Summary of R-value from DSR Test for Binder 6428SV

R	STA	5days@95°C	12days@95°C	20hr. PAV
R1	2.47	2.70	3.93	3.42
R2	2.56	2.88	3.92	3.33
R3	2.30	2.60	3.66	3.25

Table B.29 Summary of R-value from DSR Test for Binder 6428SM

R	STA	5days@95°C	12days@95°C	20hr. PAV
R1	2.36	3.00	3.46	3.33
R2	2.41	3.23	3.58	3.41
R3	2.68	3.29	3.52	2.99

Table B.30 Summary of R-value from DSR Test for Binder 7034LV

R	STA	5days@95°C	12days@95°C	20hr. PAV
R1	3.12	3.37	3.79	3.11
R2	2.70	3.27	3.57	3.00
R3	2.61	3.32	3.68	2.93

Table B.31 Summary of R-value from DSR Test for Binder 7628SM

R	STA	5days@95°C	12days@95°C	20hr. PAV
R1	2.43	3.25	3.93	4.52
R2	2.20	3.07	3.92	4.44
R3	1.95	2.61	3.66	4.21

Different in Critical Cracking Temperatures for Creep Stiffness and Relaxation Parameters (ΔT_c) from DSR Test

Table B.32 Summary of ΔT_c Value from DSR Test for Binder 5234LM

ΔTc	STA	5days@95°C	12days@95°C	24hr.@135°C	Field Cores	Field Cores L2	Field Cores L3
R1	-0.83	-5.43	-13.24	-16.91	-4.77	-2.64	-4.97
R2	-2.50	-2.34	-12.13	-11.50	-2.23	-2.89	3.63
R3	-1.54	-9.12	-14.35	-16.13	-3.50	-1.58	2.20

Table B.33 Summary of ΔT_c Value from DSR Test for Binder 5234LL

ΔTc	STA	5days@95°C	12days@95°C	24hr.@135°C	Field Cores	Field Cores L2	Field Cores L3
R1	-2.42	-8.57	-12.42	-14.46	-5.24	-3.18	-2.88
R2	-1.95	-8.48	-14.44	-14.60	-4.84	-3.20	-0.81
R3	-1.64	-8.66	-14.32	-14.53	-5.04	-3.19	-1.85

Table B.34 Summary of ΔT_c Value from DSR Test for Binder 5834LM

ΔTc	STA	5days@95°C	12days@95°C	20hr. PAV
R1	2.26	0.86	-3.76	0.77
R2	2.23	0.05	-3.89	2.41
R3	4.06	-0.53	-5.97	0.40

Table B.35 Summary of ΔT_c Value from DSR Test for Binder 5828LM

ΔTc	STA	5days@95°C	12days@95°C	24hr.@135°C	Field Cores	Field Cores L2	Field Cores L3
R1	-3.73	0.00	-9.46	-15.46	-3.04	-3.61	1.75
R2	-2.37	0.00	-6.51	-17.62	-3.72	-3.00	-1.88
R3	-1.01	0.00	-8.27	-17.65	-3.72	-2.90	-2.44

Table B.36 Summary of ΔT_c Value from DSR Test for Binder 5828LL

ΔTc	STA	5days@95°C	12days@95°C	24hr.@135°C	Field Cores	Field Cores L2	Field Cores L3
R1	-1.90	0.00	-9.93	-8.93	-3.12	-3.20	-3.37
R2	-2.92	0.00	-5.27	-7.93	-3.89	-2.63	-2.53
R3	-0.89	0.00	-6.13	-6.93	-1.57	-2.20	-3.61

Table B.37 Summary of ΔT_c Value from DSR Test for Binder 6428SV

ΔTc	STA	5days@95°C	12days@95°C	20hr. PAV
R1	0.49	-1.13	-4.97	-0.44
R2	0.30	-4.08	-5.73	1.50
R3	0.74	-1.73	-4.86	0.17

Table B.38 Summary of ΔT_c Value from DSR Test for Binder 6428SM

ΔTc	STA	5days@95°C	12days@95°C	20hr. PAV
R1	0.49	-3.31	-9.66	-0.09
R2	-1.05	-3.66	-6.86	-1.38
R3	0.97	-4.79	-8.26	0.35

Table B.39 Summary of ΔT_c Value from DSR Test for Binder 7034LV

ΔTc	STA	5days@95°C	12days@95°C	20hr. PAV
R1	-0.02	-1.59	-4.36	2.26
R2	0.42	-1.78	-4.76	2.63
R3	3.45	-0.07	-4.56	0.89

Table B.40 Summary of ΔT_c Value from DSR Test for Binder 7628SM

ΔTc	STA	5days@95°C	12days@95°C	20hr. PAV
R1	1.78	-2.69	-8.19	0.06
R2	3.17	-4.25	-7.77	-0.01
R3	1.01	-5.32	-8.05	0.53

Glover-Rowe (G-R) Parameter from DSR Test

Table B.41 Summary of G-R Parameter from DSR Test for Binder 5234LM

G-R	STA	5days@95°C	12days@95°C	24hr.@135°C	Field Cores	Field Cores L2	Field Cores L3
R1	22.19	504.15	0.00	2328.19	87.19	36.39	32.94
R2	22.09	463.19	1925.61	2361.14	96.25	39.00	42.83
R3	25.89	590.76	1889.99	2680.35	91.72	41.97	38.33

Table B.42 Summary of G-R Parameter from DSR Test for Binder 5234LL

G-R	STA	5days@95°C	12days@95°C	24hr.@135°C	Field Cores	Field Cores L2	Field Cores L3
R1	56.27	629.99	2225.06	3483.27	173.26	119.39	111.84
R2	66.47	642.03	2492.93	3365.53	207.26	121.28	128.14
R3	61.64	617.95	3517.60	0.00	190.26	120.33	119.99

Table B.43 Summary of G-R Parameter from DSR Test for Binder 5834LM

G-R	STA	5days@95°C	12days@95°C	20hr. PAV
R1	8.66	95.21	387.51	70.09
R2	7.95	90.07	425.10	83.94
R3	10.23	83.87	384.01	51.04

Table B.44 Summary of G-R Parameter from DSR Test for Binder 5828LM

G-R	STA	5days@95°C	12days@95°C	24hr.@135°C	Field Cores	Field Cores L2	Field Cores L3
R1	37.72	0.00	503.28	2946.79	144.25	49.50	40.56
R2	32.46	0.00	446.17	3514.90	141.22	46.05	41.51
R3	52.90	0.00	544.74	3486.74	141.22	50.30	47.30

Table B.45 Summary of G-R Parameter from DSR Test for Binder 5828LL

G-R	STA	5days@95°C	12days@95°C	24hr.@135°C	Field Cores	Field Cores L2	Field Cores L3
R1	62.07	0.00	1492.30	1135.48	184.66	184.18	88.52
R2	63.72	0.00	1502.69	1364.03	221.29	149.77	108.51
R3	60.42	0.00	1514.85	964.78	281.64	177.89	104.21

Table B.46 Summary of G-R Parameter from DSR Test for Binder 6428SV

G-R	STA	5days@95°C	12days@95°C	20hr. PAV
R1	15.06	145.74	667.76	289.16
R2	17.15	152.89	544.96	342.92
R3	15.05	124.19	789.59	299.29

Table B.47 Summary of G-R Parameter from DSR Test for Binder 6428SM

G-R	STA	5days@95°C	12days@95°C	20hr. PAV
R1	34.65	355.58	1026.77	419.10
R2	37.15	369.94	849.94	304.60
R3	47.21	401.18	938.36	465.32

Table B.48 Summary of G-R Parameter from DSR Test for Binder 7034LV

G-R	STA	5days@95°C	12days@95°C	20hr. PAV
R1	18.86	89.40	496.81	58.29
R2	18.86	93.60	334.93	65.01
R3	24.16	104.63	415.87	55.34

Table B.49 Summary of G-R Parameter from DSR Test for Binder 7628SM

G-R	STA	5days@95°C	12days@95°C	20hr. PAV
R1	33.61	512.07	2042.14	205.77
R2	31.55	512.07	2470.03	203.55
R3	28.85	456.56	2863.82	266.51