



January 22, 2019

Mr. Rich Burgess  
AllSite Contracting/Cor-Tuf  
11128 Industrial Rd  
Manassas, VA 20109

Phone: 703-361-2499  
E-mail: [rich@allsiteco.com](mailto:rich@allsiteco.com)

**Cor-Tuf UHPC Laboratory Evaluation  
CTLGroup Project No. 059301**

Dear Rich:

Attached are results of the Cor-Tuf UHPC laboratory evaluation program. Cor-Tuf UHPC was produced by you in our facility in Skokie, IL using your standard production process, and all of the test specimens were fabricated by our ACI-certified personnel. Five standard batches of Cor-Tuf UHPC were produced (identified as "S1" through "S5), in addition to one batch of Cor-Tuf UHPC without fibers (identified as "NF").

Testing of the fresh mixture was performed in accordance with the following test methods: flow (ASTM C1437), temperature (ASTM C1064) and time of setting (ASTM C191 as modified by ASTM C1856).

Testing of hardened specimens was carried out in accordance with the following test methods: compressive strength (ASTM C39 as modified by ASTM C1856), modulus of elasticity and Poisson's ratio (ASTM C469), tensile strength (ASTM C469), flexural toughness (ASTM C1609), surface resistivity (AASHTO T 358), drying shrinkage (ASTM C157), freeze-thaw resistance (ASTM C666), scaling resistance (ASTM C672), abrasion (ASTM C779), chloride diffusion (ASTM C1556), chloride penetrability (ASTM C120) and air void system parameters (ASTM C457). The maturity relationship was developed for specimens cured at three different temperature conditions in accordance with ASTM C1074.

Individual test reports are attached to this letter. Please note that the freeze-thaw and drying shrinkage testing is still in progress, as well as creep in compression measurements.

We appreciate the opportunity to work with you on this project. Please let us know if you have any questions or concerns.

Sincerely,

**Construction Technology Laboratories, Inc. d/b/a CTLGroup  
An AASHTO Accredited Laboratory – Aggregates, Cement & Concrete**

A handwritten signature in blue ink, appearing to read "Jan Vosahlik".

**Jan Vosahlik, PhD**  
Concrete & Cement-Based Materials  
[JVosahlik@CTLGroup.com](mailto:JVosahlik@CTLGroup.com)  
Cell: (785) 477-7470

*Attachment: 59 pages*

**ASTM C192 Mixture Summary**

		Mixture ID:		S1	S2	S3	S4	S5	NF
		Date Fabricated: 10/4/2018 10/4/2018 10/4/2018 10/4/2018 10/4/2018 10/4/2018							
Material	Product	SG	lbs/yd <sup>3</sup> (SSD)						
Cement	Type III, Lehigh	3.15	1295						
Pre-Mix	Cor-Tuf	2.39	1079						
Fine Aggregate	Vulcan Sand	2.63	1252						
Fibers	Steel fibers, 19mm	7.85	200	200	200	200	200	200	--
Water	Potable, Skokie, IL	1.00	320						
<b>Total Cementitious Content</b>		2374							
<i>w/cm (not including water in admixtures)</i>		0.13							
<i>w/cm (including water in admixtures)</i>		0.17							
Chemical Admixtures	Product	SG	fl oz/cwt						
High-Range Water Reducer	Chryso Premia 150	1.08	40.0						
High-Range Water Reducer	Chryso Optima 100	1.27	26.0						
Fresh Concrete Properties	Test Method	Test Results							
Flow, in.	ASTM C1437	After sampling	0.938	1.000	0.875	0.938	0.938	1.000	
		30 minutes after sampling	--	--	0.625	--	--	--	
Temperature, °F	ASTM C1064		79.7	78.0	76.7	77.0	77.7	77.2	
Hardened Concrete Performance	Test Method	Curing	Age	Test Results					
Time of Setting, mins	ASTM C191/ASTM C1856	--	Initial	168	215	148	171	206	230
		--	Final	357	279	278	231	244	273
Compressive Strength, psi	ASTM C39/ASTM C1856	Mold, 73°F	24 hours	--	7,200	--	--	7,980	8,380
		100% RH, 73°F	48 hours	--	11,500	--	--	--	--
		100% RH, 73°F	4 days	--	12,750	--	--	12,740	--
		100% RH, 73°F	7 days	--	14,300	--	--	14,290	14,810
		100% RH, 73°F	14 days	--	15,860	--	--	14,900	16,080
		100% RH, 73°F	21 days	--	16,930	--	--	16,820	16,350
		100% RH, 73°F	28 days	--	18,520	--	--	18,250	18,420
		100% RH, 73°F	56 days	--	19,260	--	--	--	--
		100% RH, 73°F	28 days (4x8)	--	--	17,420	--	--	--
		Mold, 100°F	24 hours	10,740	--	--	--	--	--
		Limewater, 100°F	48 hours	12,550	--	--	--	--	--
		Limewater, 100°F	4 days	14,420	--	--	--	--	--
		Limewater, 100°F	7 days	16,840	--	--	--	--	--
		Limewater, 100°F	14 days	19,260	--	--	--	--	--
		Limewater, 100°F	21 days	20,650	--	--	--	--	--
		Limewater, 100°F	28 days	21,500	--	--	--	--	--
		Mold, 45°F	24 hours	--	--	--	--	--	--
		Limewater, 45°F	48 hours	5,940	--	--	--	--	--
		Limewater, 45°F	4 days	9,200	--	--	--	--	--
		Limewater, 45°F	7 days	11,320	--	--	--	--	--
Limewater, 45°F	14 days	14,330	--	--	--	--	--		
Limewater, 45°F	21 days	13,700	--	--	--	--	--		
Limewater, 45°F	28 days	15,970	--	--	--	--	--		
			14 days	--	--	--	28,520	--	
			21 days	--	--	--	28,880	--	
			28 days	--	--	--	29,190	--	
			56 days	--	--	--	29,560	--	
Modulus of Elasticity, ksi	ASTM C469	100% RH, 73°F	7 days	--	5,350	--	--	--	--
		100% RH, 73°F	28 days	--	5,750	--	--	--	--
		100% RH, 73°F	28 days (4x8)	--	--	5,650	--	--	--
		Note 3	32 days	--	--	--	--	6,250	--
Poisson's Ratio, -	ASTM C469	100% RH, 73°F	7 days	--	0.21	--	--	--	--
Splitting Tensile Strength, psi	ASTM C496	100% RH, 73°F	7 days	--	--	1,690	--	--	--
Flexural Toughness	ASTM C1609	First Peak Strength, psi	28 days	--	--	2,050	--	--	--
		Residual Strength at L/150, $\mu$	28 days	--	--	5,795	--	--	--
		Residual Strength at L/600, $\mu$	28 days	--	--	1,055	--	--	--
Surface Resistivity, k $\Omega$ -cm	AASHTO T 358	Mold, 73°F	1	--	--	--	--	--	2.8
		100% RH, 73°F	7	--	--	--	--	--	23.8
		100% RH, 73°F	14	--	--	--	--	--	38.5
		100% RH, 73°F	21	--	--	--	--	--	55.5
		100% RH, 73°F	28	--	--	--	--	--	85.9
		100% RH, 73°F	56	--	--	--	--	--	228.1

ASTM C192 Mixture Summary

		Mixture ID: S1 S2 S3 S4 S5 NF								
		Date Fabricated: 10/4/2018 10/4/2018 10/4/2018 10/4/2018 10/4/2018 10/4/2018								
Material	Product	SG	lbs/yd <sup>3</sup> (SSD)							
Cement	Type III, Lehigh	3.15					1295			
Pre-Mix	Cor-Tuf	2.39					1079			
Fine Aggregate	Vulcan Sand	2.63					1252			
Fibers	Steel fibers, 19mm	7.85	200	200	200	200	200	200	--	
Water	Potable, Skokie, IL	1.00					320			
<b>Total Cementitious Content</b>							2374			
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High-Range Water Reducer	Chryso Optima 100	1.27					26.0			
Fresh Concrete Properties	Test Method	Test Results								
Flow, in.	ASTM C1437	After sampling	0.938	1.000	0.875	0.938	0.938	1.000		
		30 minutes after sampling	--	--	0.625	--	--	--		
Temperature, °F	ASTM C1064		79.7	78.0	76.7	77.0	77.7	77.2		
Hardened Concrete Performance	Test Method	Curing	Age	Test Results						
Drying Shrinkage, % <sup>†</sup>	ASTM C157	7 days @ 73°F, limewater	180 days of	--	--	--	--	0.033@90c	--	--
		28 days @ 73°F, limewater	drying	--	--	--	--	0.027@56c	--	--
Freeze-Thaw Resistance, RDM, % <sup>†</sup>	ASTM C666 Method A	14 days @ 73°F, limewater	600 cycles 16% @ 480	--	--	--	--	--	--	--
Salt Scaling Resistance	ASTM C672	14 days @ 73°F/100% RH, 14 days @ 73°F/50% RH	50 cycles	--	0	--	--	--	--	--
Depth of Wear (Normalized), in.	ASTM C779, Method B	28 days @ 73°F, limewater	28 days	--	--	--	0.013	--	--	--
Bulk Diffusion Coefficient, x10 <sup>-12</sup> m <sup>2</sup> /s	ASTM C1556	28 days @ 73°F, limewater	35d of exposure	--	--	--	--	0.218		
Resistance to Chloride Ion Penetration, Coulombs	ASTM C1202	28 days @ 73°F, limewater	--	--	--	--	--	--	395	
Hardened Air Void Content, %	ASTM C457	--	--	--	4.6	--	--	--	--	--
Spacing Factor, in.	ASTM C457	--	--	--	0.035	--	--	--	--	--
Specific Surface, in. <sup>2</sup> /in. <sup>3</sup>	ASTM C457	--	--	--	218	--	--	--	--	--

<sup>†</sup> indicates test in progress

- Notes:**
1. This report may not be reproduced except in its entirety
  2. All specimens fabricated by CTLGroup using concrete mixture provided by others.
  3. Mixture proportions reported by the client.
  4. Test specimens moist-cured (100% RH, 73°F) for 7 days, followed by a 5-day immersion in LW at 190°F and a 2-day drying period in an oven at 190°F. Subsequently stored at 73°F/100% RH until testing.

Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Report Date: **October 6, 2018**

CTL Project No.: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved by: **M. Salguero**

**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	S1 - A	S1 - B	S1 - C
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/18 8:55 AM	10/4/18 8:55 AM	10/4/18 8:55 AM
Test Date / Time	10/6/18 8:30 AM	10/6/18 8:35 AM	10/6/18 8:40 AM
Loading Rate, psi/sec	35	35	35

**Concrete Description**

Concrete Age at Test, hours	48	48	48
Moisture Condition at Test	Mold	Mold	Mold
Curing Conditions (Temp/RH)	45°F/Mold	45°F/Mold	45°F/Mold
Cylinder End Preparation	Ground	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.01	3.02	3.00
Diameter 2, in.	3.00	3.01	3.00
Length, in.	5.88	5.83	5.86
Average Diameter, in.	3.01	3.01	3.00
Length / Diameter (L/D)	1.95	1.94	1.95
Cross-Sectional Area, in <sup>2</sup>	7.12	7.12	7.07

**Compressive Strength and Fracture Pattern**

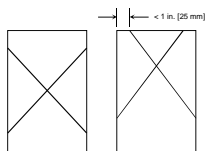
Maximum Load, lb	42,683	42,440	41,438
Compressive Strength, psi	5,990	5,960	5,860
Fracture Pattern	Type 1	Type 1	Type 1

Average Compressive Strength, psi	5,940
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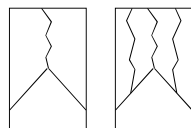
**Notes:**

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2. Samples cast by CTLGroup using concrete mixture provided by others.

**Schematic of Typical Fracture Patterns**



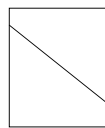
**Type 1**  
 Reasonable well-formed cones on both ends, less than 1 in. [25 mm] of cracking through caps



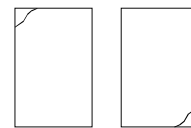
**Type 2**  
 Well-formed cone on one end, vertical cracks running through both caps, no well-defined cone on other end



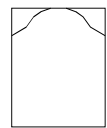
**Type 3**  
 Columnar vertical cracking through both ends, no well-formed cones



**Type 4**  
 Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1



**Type 5**  
 Side fractures at top or bottom (occur commonly with unbounded caps)



**Type 6**  
 Similar to Type 5 but end of cylinder is pointed

Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Report Date: **October 8, 2018**

CTL Project No.: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved by: **M. Salguero**

**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	S1 - A	S1 - B	S1 - C
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/2018	10/4/2018	10/4/2018
Test Date / Time	10/8/2018	10/8/2018	10/8/2018
Loading Rate, psi/sec	145	145	145

**Concrete Description**

Concrete Age at Test, days	4	4	4
Moisture Condition at Test	SSD	SSD	SSD
Curing Conditions (Temp/RH)	45°F/Limewater	45°F/Limewater	45°F/Limewater
Cylinder End Preparation	Ground	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.00	3.02	3.01
Diameter 2, in.	3.01	3.01	3.01
Length, in.	5.85	5.88	5.86
Average Diameter, in.	3.01	3.02	3.01
Length / Diameter (L/D)	1.94	1.95	1.95
Cross-Sectional Area, in <sup>2</sup>	7.12	7.16	7.12

**Compressive Strength and Fracture Pattern**

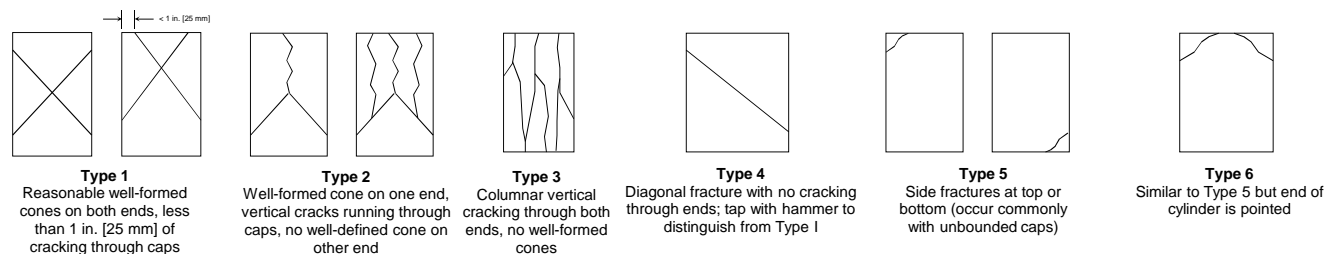
Maximum Load, lb	65,523	64,587	66,683
Compressive Strength, psi	9,200	9,020	9,370
Fracture Pattern	Type 1	Type 1	Type 1

Average Compressive Strength, psi	9,200
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**Schematic of Typical Fracture Patterns**



Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Report Date: **October 11, 2018**

CTL Project No.: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved by: **M. Salguero**

**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	S1 - A	S1 - B	S1 - C
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/2018	10/4/2018	10/4/2018
Test Date / Time	10/11/2018	10/11/2018	10/11/2018
Loading Rate, psi/sec	145	145	145

**Concrete Description**

Concrete Age at Test, days	7	7	7
Moisture Condition at Test	SSD	SSD	SSD
Curing Conditions (Temp/RH)	45°F/Limewater	45°F/Limewater	45°F/Limewater
Cylinder End Preparation	Ground	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.00	3.01	3.01
Diameter 2, in.	3.00	3.01	3.01
Length, in.	5.81	5.84	5.83
Average Diameter, in.	3.00	3.01	3.01
Length / Diameter (L/D)	1.94	1.94	1.94
Cross-Sectional Area, in <sup>2</sup>	7.07	7.12	7.12

**Compressive Strength and Fracture Pattern**

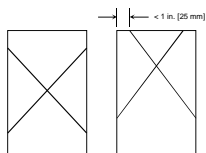
Maximum Load, lb	81,485	79,163	80,568
Compressive Strength, psi	11,530	11,120	11,320
Fracture Pattern	Type 1	Type 1	Type 1

Average Compressive Strength, psi	11,320
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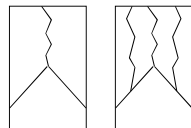
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**Schematic of Typical Fracture Patterns**



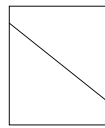
**Type 1**  
 Reasonable well-formed cones on both ends, less than 1 in. [25 mm] of cracking through caps



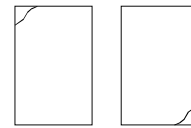
**Type 2**  
 Well-formed cone on one end, vertical cracks running through both caps, no well-defined cone on other end



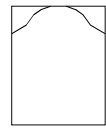
**Type 3**  
 Columnar vertical cracking through both ends, no well-formed cones



**Type 4**  
 Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1



**Type 5**  
 Side fractures at top or bottom (occur commonly with unbounded caps)



**Type 6**  
 Similar to Type 5 but end of cylinder is pointed

Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Report Date: **October 18, 2018**

CTL Project No.: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved by: **M. Salguero**

**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	S1 - A	S1 - B	S1 - C
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/2018	10/4/2018	10/4/2018
Test Date / Time	10/18/2018	10/18/2018	10/18/2018
Loading Rate, psi/sec	145	145	145

**Concrete Description**

Concrete Age at Test, days	14	14	14
Moisture Condition at Test	SSD	SSD	SSD
Curing Conditions (Temp/RH)	45°F/Limewater	45°F/Limewater	45°F/Limewater
Cylinder End Preparation	Ground	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.01	3.00	3.01
Diameter 2, in.	3.01	3.01	3.01
Length, in.	5.83	5.87	5.86
Average Diameter, in.	3.01	3.00	3.01
Length / Diameter (L/D)	1.94	1.96	1.95
Cross-Sectional Area, in <sup>2</sup>	7.12	7.07	7.12

**Compressive Strength and Fracture Pattern**

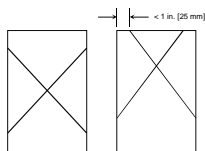
Maximum Load, lb	101,160	102,226	101,889
Compressive Strength, psi	14,210	14,460	14,310
Fracture Pattern	Type 1	Type 1	Type 1

Average Compressive Strength, psi	14,330
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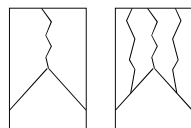
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**Schematic of Typical Fracture Patterns**



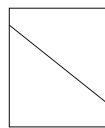
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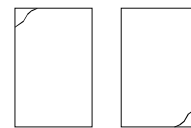
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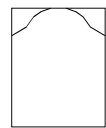
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**Type 6**  
Similar to Type 5 but end of cylinder is pointed

Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Report Date: **October 25, 2018**

CTL Project No.: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved by: **M. Salguero**

**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	S1 - A	S1 - B	S1 - C
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/2018	10/4/2018	10/4/2018
Test Date / Time	10/25/2018	10/25/2018	10/25/2018
Loading Rate, psi/sec	145	145	145

**Concrete Description**

Concrete Age at Test, days	21	21	21
Moisture Condition at Test	SSD	SSD	SSD
Curing Conditions (Temp/RH)	45°F/Limewater	45°F/Limewater	45°F/Limewater
Cylinder End Preparation	Ground	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.00	3.01	3.01
Diameter 2, in.	3.00	3.01	3.00
Length, in.	5.89	5.86	5.88
Average Diameter, in.	3.00	3.01	3.00
Length / Diameter (L/D)	1.96	1.95	1.96
Cross-Sectional Area, in <sup>2</sup>	7.07	7.12	7.07

**Compressive Strength and Fracture Pattern**

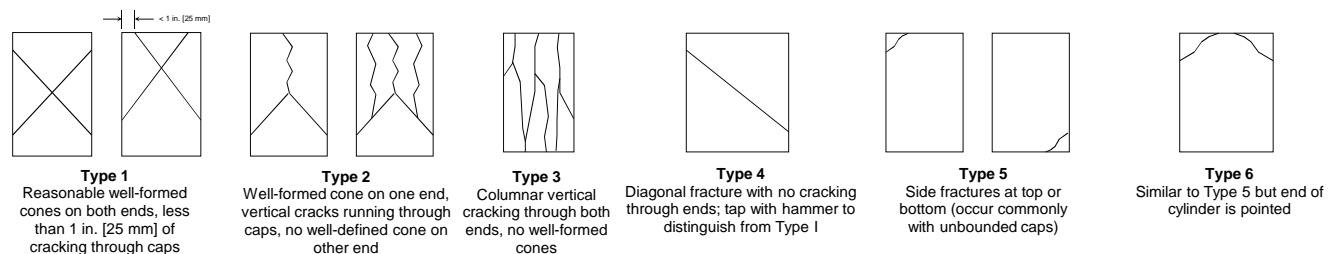
Maximum Load, lb	97,334	96,861	97,121
Compressive Strength, psi	13,770	13,600	13,740
Fracture Pattern	Type 1	Type 1	Type 1

Average Compressive Strength, psi	13,700
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**Notes:**

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**Schematic of Typical Fracture Patterns**





Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Report Date: **November 1, 2018**

CTL Project No.: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved by: **M. Salguero**

**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	S1 - A	S1 - B	S1 - C
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/2018	10/4/2018	10/4/2018
Test Date / Time	11/1/2018	11/1/2018	11/1/2018
Loading Rate, psi/sec	145	145	145

**Concrete Description**

Concrete Age at Test, days	28	28	28
Moisture Condition at Test	SSD	SSD	SSD
Curing Conditions (Temp/RH)	45°F/Limewater	45°F/Limewater	45°F/Limewater
Cylinder End Preparation	Ground	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.00	3.01	3.01
Diameter 2, in.	3.01	3.00	3.01
Length, in.	5.88	5.89	5.88
Average Diameter, in.	3.01	3.01	3.01
Length / Diameter (L/D)	1.95	1.96	1.95
Cross-Sectional Area, in <sup>2</sup>	7.12	7.12	7.12

**Compressive Strength and Fracture Pattern**

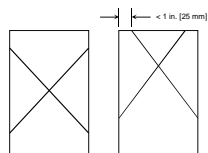
Maximum Load, lb	112,955	114,988	113,121
Compressive Strength, psi	15,860	16,150	15,890
Fracture Pattern	Type 1	Type 1	Type 1

Average Compressive Strength, psi	15,970
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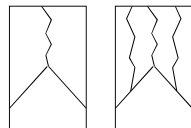
**Notes:**

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**Schematic of Typical Fracture Patterns**



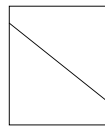
**Type 1**  
Reasonable well-formed cones on both ends, less than 1 in. [25 mm] of cracking through caps



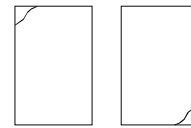
**Type 2**  
Well-formed cone on one end, vertical cracks running through both caps, no well-defined cone on other end



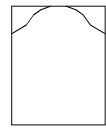
**Type 3**  
Columnar vertical cracking through both ends, no well-formed cones



**Type 4**  
Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1



**Type 5**  
Side fractures at top or bottom (occur commonly with unbounded caps)



**Type 6**  
Similar to Type 5 but end of cylinder is pointed

Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Report Date: **October 5, 2018**

CTL Project No.: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved by: **M. Salguero**

**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	S1 - A	S1 - B	S1 - C
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/18 8:55 AM	10/4/18 8:55 AM	10/4/18 8:55 AM
Test Date / Time	10/5/18 9:20 AM	10/5/18 9:25 AM	10/5/18 9:30 AM
Loading Rate, psi/sec	35	35	35

**Concrete Description**

Concrete Age at Test, hours	24	24	25
Moisture Condition at Test	Mold	Mold	Mold
Curing Conditions (Temp/RH)	Mold/100°F Limewater	Mold/100°F Limewater	Mold/100°F Limewater
Cylinder End Preparation	Ground	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.01	3.01	3.00
Diameter 2, in.	3.01	3.00	3.00
Length, in.	5.84	5.87	5.85
Average Diameter, in.	3.01	3.00	3.00
Length / Diameter (L/D)	1.94	1.96	1.95
Cross-Sectional Area, in <sup>2</sup>	7.12	7.07	7.07

**Compressive Strength and Fracture Pattern**

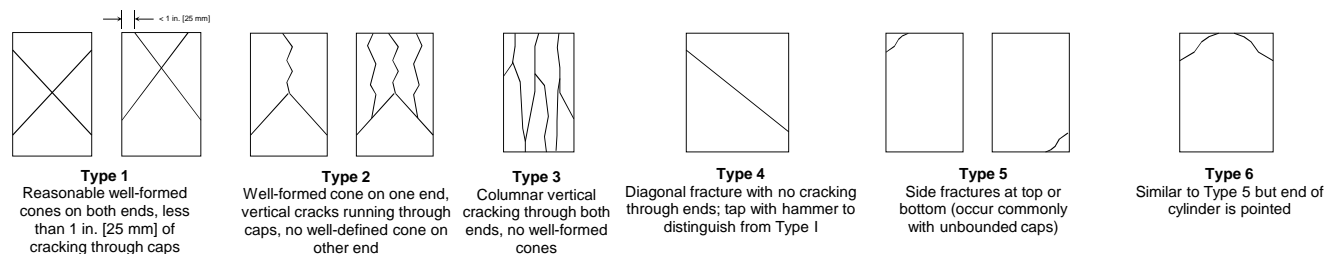
Maximum Load, lb	76,027	75,556	76,852
Compressive Strength, psi	10,680	10,690	10,870
Fracture Pattern	Type 1	Type 1	Type 1

Average Compressive Strength, psi	10,740
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**Notes:**

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**Schematic of Typical Fracture Patterns**



Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Report Date: **October 6, 2018**

CTL Project No.: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved by: **M. Salguero**

**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	S1 - A	S1 - B	S1 - C
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/18 8:55 AM	10/4/18 8:55 AM	10/4/18 8:55 AM
Test Date / Time	10/6/18 9:00 AM	10/6/18 9:05 AM	10/6/18 9:10 AM
Loading Rate, psi/sec	35	35	35

**Concrete Description**

Concrete Age at Test, hours	48	48	48
Moisture Condition at Test	SSD	SSD	SSD
Curing Conditions (Temp/RH)	100°F/Limewater	100°F/Limewater	100°F/Limewater
Cylinder End Preparation	Ground	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.01	3.01	3.01
Diameter 2, in.	3.00	3.01	3.01
Length, in.	5.82	5.84	5.83
Average Diameter, in.	3.00	3.01	3.01
Length / Diameter (L/D)	1.94	1.94	1.94
Cross-Sectional Area, in <sup>2</sup>	7.07	7.12	7.12

**Compressive Strength and Fracture Pattern**

Maximum Load, lb	88,277	89,705	89,540
Compressive Strength, psi	12,490	12,600	12,580
Fracture Pattern	Type 1	Type 1	Type 1

Average Compressive Strength, psi	12,550
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**Schematic of Typical Fracture Patterns**

**Type 1**  
Reasonable well-formed cones on both ends, less than 1 in. [25 mm] of cracking through caps

**Type 2**  
Well-formed cone on one end, vertical cracks running through both caps, no well-defined cone on other end

**Type 3**  
Columnar vertical cracking through both ends, no well-formed cones

**Type 4**  
Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1

**Type 5**  
Side fractures at top or bottom (occur commonly with unbounded caps)

**Type 6**  
Similar to Type 5 but end of cylinder is pointed

Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Report Date: **October 8, 2018**

CTL Project No.: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved by: **M. Salguero**

**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	S1 - A	S1 - B	S1 - C
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/2018	10/4/2018	10/4/2018
Test Date / Time	10/8/2018	10/8/2018	10/8/2018
Loading Rate, psi/sec	145	145	150

**Concrete Description**

Concrete Age at Test, days	4	4	4
Moisture Condition at Test	SSD	SSD	SSD
Curing Conditions (Temp/RH)	100°F/Limewater	100°F/Limewater	100°F/Limewater
Cylinder End Preparation	Ground	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.01	3.02	3.00
Diameter 2, in.	3.00	3.01	3.00
Length, in.	5.82	5.87	5.84
Average Diameter, in.	3.01	3.01	3.00
Length / Diameter (L/D)	1.93	1.95	1.95
Cross-Sectional Area, in <sup>2</sup>	7.12	7.12	7.07

**Compressive Strength and Fracture Pattern**

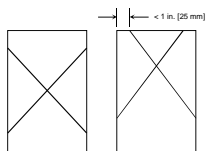
Maximum Load, lb	103,016	102,444	101,929
Compressive Strength, psi	14,470	14,390	14,420
Fracture Pattern	Type 1	Type 1	Type 1

Average Compressive Strength, psi	14,420
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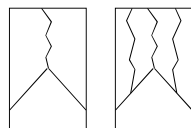
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**Schematic of Typical Fracture Patterns**



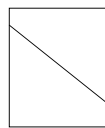
**Type 1**  
Reasonable well-formed cones on both ends, less than 1 in. [25 mm] of cracking through caps



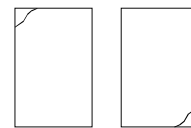
**Type 2**  
Well-formed cone on one end, vertical cracks running through both caps, no well-defined cone on other end



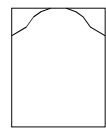
**Type 3**  
Columnar vertical cracking through both ends, no well-formed cones



**Type 4**  
Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1



**Type 5**  
Side fractures at top or bottom (occur commonly with unbounded caps)



**Type 6**  
Similar to Type 5 but end of cylinder is pointed

Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Report Date: **October 11, 2018**

CTL Project No.: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved by: **M. Salguero**

**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	S1 - A	S1 - B	S1 - C
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/2018	10/4/2018	10/4/2018
Test Date / Time	10/11/2018	10/11/2018	10/11/2018
Loading Rate, psi/sec	145	145	150

**Concrete Description**

Concrete Age at Test, days	7	7	7
Moisture Condition at Test	SSD	SSD	SSD
Curing Conditions (Temp/RH)	100°F/Limewater	100°F/Limewater	100°F/Limewater
Cylinder End Preparation	Ground	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.01	3.01	3.01
Diameter 2, in.	3.01	3.01	3.01
Length, in.	5.83	5.86	5.85
Average Diameter, in.	3.01	3.01	3.01
Length / Diameter (L/D)	1.94	1.95	1.94
Cross-Sectional Area, in <sup>2</sup>	7.12	7.12	7.12

**Compressive Strength and Fracture Pattern**

Maximum Load, lb	118,921	121,174	119,661
Compressive Strength, psi	16,700	17,020	16,810
Fracture Pattern	Type 1	Type 1	Type 1

Average Compressive Strength, psi	16,840
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**Notes:**

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**Schematic of Typical Fracture Patterns**

**Type 1**  
Reasonable well-formed cones on both ends, less than 1 in. [25 mm] of cracking through caps

**Type 2**  
Well-formed cone on one end, vertical cracks running through both caps, no well-defined cone on other end

**Type 3**  
Columnar vertical cracking through both ends, no well-formed cones

**Type 4**  
Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1

**Type 5**  
Side fractures at top or bottom (occur commonly with unbounded caps)

**Type 6**  
Similar to Type 5 but end of cylinder is pointed

Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Report Date: **October 18, 2018**

CTL Project No.: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved by: **M. Salguero**

**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	S1 - A	S1 - B	S1 - C
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/2018	10/4/2018	10/4/2018
Test Date / Time	10/18/2018	10/18/2018	10/18/2018
Loading Rate, psi/sec	145	145	150

**Concrete Description**

Concrete Age at Test, days	14	14	14
Moisture Condition at Test	SSD	SSD	SSD
Curing Conditions (Temp/RH)	100°F/Limewater	100°F/Limewater	100°F/Limewater
Cylinder End Preparation	Ground	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.00	3.01	3.00
Diameter 2, in.	3.00	3.00	3.00
Length, in.	5.86	5.89	5.87
Average Diameter, in.	3.00	3.01	3.00
Length / Diameter (L/D)	1.95	1.96	1.96
Cross-Sectional Area, in <sup>2</sup>	7.07	7.12	7.07

**Compressive Strength and Fracture Pattern**

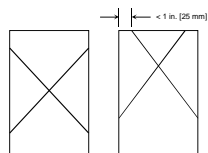
Maximum Load, lb	136,690	136,827	135,981
Compressive Strength, psi	19,330	19,220	19,230
Fracture Pattern	Type 1	Type 1	Type 1

Average Compressive Strength, psi	19,260
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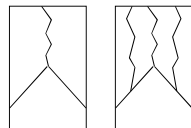
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**Schematic of Typical Fracture Patterns**



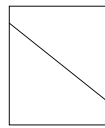
**Type 1**  
Reasonable well-formed cones on both ends, less than 1 in. [25 mm] of cracking through caps



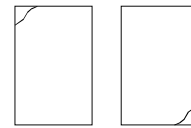
**Type 2**  
Well-formed cone on one end, vertical cracks running through both caps, no well-defined cone on other end



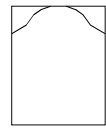
**Type 3**  
Columnar vertical cracking through both ends, no well-formed cones



**Type 4**  
Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1



**Type 5**  
Side fractures at top or bottom (occur commonly with unbounded caps)



**Type 6**  
Similar to Type 5 but end of cylinder is pointed

Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Report Date: **October 25, 2018**

CTL Project No.: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved by: **M. Salguero**

**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	S1 - A	S1 - B	S1 - C
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/2018	10/4/2018	10/4/2018
Test Date / Time	10/25/2018	10/25/2018	10/25/2018
Loading Rate, psi/sec	145	145	150

**Concrete Description**

Concrete Age at Test, days	21	21	21
Moisture Condition at Test	SSD	SSD	SSD
Curing Conditions (Temp/RH)	100°F/Limewater	100°F/Limewater	100°F/Limewater
Cylinder End Preparation	Ground	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.01	3.00	3.01
Diameter 2, in.	3.01	3.00	3.01
Length, in.	5.90	5.87	5.89
Average Diameter, in.	3.01	3.00	3.01
Length / Diameter (L/D)	1.96	1.96	1.96
Cross-Sectional Area, in <sup>2</sup>	7.12	7.07	7.12

**Compressive Strength and Fracture Pattern**

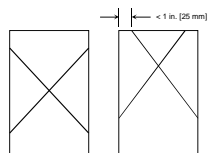
Maximum Load, lb	147,386	145,990	146,666
Compressive Strength, psi	20,700	20,650	20,600
Fracture Pattern	Type 1	Type 1	Type 1

Average Compressive Strength, psi	20,650
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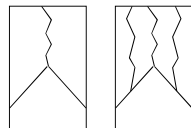
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**Schematic of Typical Fracture Patterns**



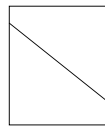
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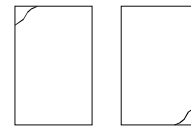
**Type 2**  
 Well-formed cone on one end, vertical cracks running through both caps, no well-defined cone on other end



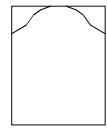
**Type 3**  
 Columnar vertical cracking through both ends, no well-formed cones



**Type 4**  
 Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1



**Type 5**  
 Side fractures at top or bottom (occur commonly with unbounded caps)



**Type 6**  
 Similar to Type 5 but end of cylinder is pointed

Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Report Date: **November 1, 2018**

CTL Project No.: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved by: **M. Salguero**

**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	S1 - A	S1 - B	S1 - C
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/2018	10/4/2018	10/4/2018
Test Date / Time	11/1/2018	11/1/2018	11/1/2018
Loading Rate, psi/sec	145	145	150

**Concrete Description**

Concrete Age at Test, days	28	28	28
Moisture Condition at Test	SSD	SSD	SSD
Curing Conditions (Temp/RH)	100°F/Limewater	100°F/Limewater	100°F/Limewater
Cylinder End Preparation	Ground	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.01	3.01	3.01
Diameter 2, in.	3.01	3.01	3.01
Length, in.	5.88	5.88	5.88
Average Diameter, in.	3.01	3.01	3.01
Length / Diameter (L/D)	1.95	1.95	1.95
Cross-Sectional Area, in <sup>2</sup>	7.12	7.12	7.12

**Compressive Strength and Fracture Pattern**

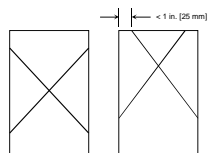
Maximum Load, lb	153,690	153,540	151,999
Compressive Strength, psi	21,590	21,560	21,350
Fracture Pattern	Type 1	Type 1	Type 1

Average Compressive Strength, psi	21,500
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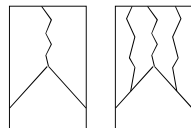
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**Schematic of Typical Fracture Patterns**



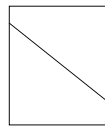
**Type 1**  
Reasonable well-formed cones on both ends, less than 1 in. [25 mm] of cracking through caps



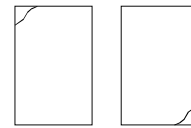
**Type 2**  
Well-formed cone on one end, vertical cracks running through both caps, no well-defined cone on other end



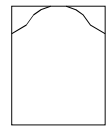
**Type 3**  
Columnar vertical cracking through both ends, no well-formed cones



**Type 4**  
Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1



**Type 5**  
Side fractures at top or bottom (occur commonly with unbounded caps)



**Type 6**  
Similar to Type 5 but end of cylinder is pointed



Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Report Date: **October 5, 2018**

CTL Project No.: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved by: **M. Salguero**

**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	S2 - A	S2 - B	S2 - C
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/18 10:05 AM	10/4/18 10:05 AM	10/4/18 10:05 AM
Test Date / Time	10/5/18 9:50 AM	10/5/18 9:55 AM	10/5/18 10:00 AM
Loading Rate, psi/sec	35	35	35

**Concrete Description**

Concrete Age at Test, hours	24	24	24
Moisture Condition at Test	Mold	Mold	Mold
Curing Conditions (Temp/RH)	73°F/Mold	73°F/Mold	73°F/Mold
Cylinder End Preparation	Ground	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.02	3.01	3.02
Diameter 2, in.	3.01	3.01	3.01
Length, in.	5.82	5.78	5.79
Average Diameter, in.	3.02	3.01	3.01
Length / Diameter (L/D)	1.93	1.92	1.92
Cross-Sectional Area, in <sup>2</sup>	7.16	7.12	7.12

**Compressive Strength and Fracture Pattern**

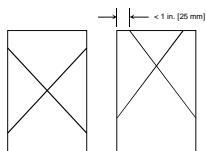
Maximum Load, lb	50,532	51,489	52,125
Compressive Strength, psi	7,060	7,230	7,320
Fracture Pattern	Type 1	Type 1	Type 1

Average Compressive Strength, psi	7,200
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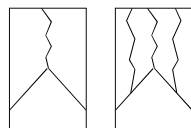
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**Schematic of Typical Fracture Patterns**



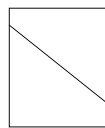
**Type 1**  
Reasonable well-formed cones on both ends, less than 1 in. [25 mm] of cracking through caps



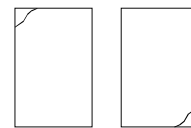
**Type 2**  
Well-formed cone on one end, vertical cracks running through both caps, no well-defined cone on other end



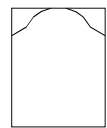
**Type 3**  
Columnar vertical cracking through both ends, no well-formed cones



**Type 4**  
Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1



**Type 5**  
Side fractures at top or bottom (occur commonly with unbounded caps)



**Type 6**  
Similar to Type 5 but end of cylinder is pointed

Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Report Date: **October 6, 2018**

CTL Project No.: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved by: **M. Salguero**

**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	S2 - A	S2 - B	S2 - C
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/18 10:05 AM	10/4/18 10:05 AM	10/4/18 10:05 AM
Test Date / Time	10/6/18 9:30 AM	10/6/18 9:35 AM	10/6/18 9:40 AM
Loading Rate, psi/sec	35	35	35

**Concrete Description**

Concrete Age at Test, hours	47	47	48
Moisture Condition at Test	SSD	SSD	SSD
Curing Conditions (Temp/RH)	73°F/100% RH	73°F/100% RH	73°F/100% RH
Cylinder End Preparation	Ground	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.00	3.01	3.01
Diameter 2, in.	3.00	3.01	3.00
Length, in.	5.89	5.83	5.87
Average Diameter, in.	3.00	3.01	3.00
Length / Diameter (L/D)	1.96	1.94	1.96
Cross-Sectional Area, in <sup>2</sup>	7.07	7.12	7.07

**Compressive Strength and Fracture Pattern**

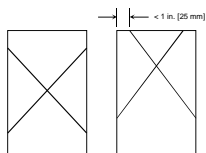
Maximum Load, lb	80,721	82,150	81,666
Compressive Strength, psi	11,420	11,540	11,550
Fracture Pattern	Type 1	Type 1	Type 1

Average Compressive Strength, psi	11,500
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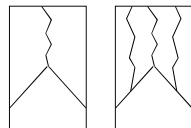
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**Schematic of Typical Fracture Patterns**



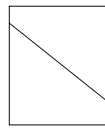
**Type 1**  
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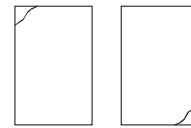
**Type 2**  
Well-formed cone on one end, vertical cracks running through both caps, no well-defined cone on other end



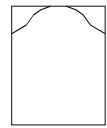
**Type 3**  
Columnar vertical cracking through both ends, no well-formed cones



**Type 4**  
Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1



**Type 5**  
Side fractures at top or bottom (occur commonly with unbounded caps)



**Type 6**  
Similar to Type 5 but end of cylinder is pointed

Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Report Date: **October 8, 2018**

CTL Project No.: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved by: **M. Salguero**

**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	S2 - A	S2 - B	S2 - C
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/2018	10/4/2018	10/4/2018
Test Date / Time	10/8/2018	10/8/2018	10/8/2018
Loading Rate, psi/sec	145	145	150

**Concrete Description**

Concrete Age at Test, days	4	4	4
Moisture Condition at Test	SSD	SSD	SSD
Curing Conditions (Temp/RH)	73°F/100% RH	73°F/100% RH	73°F/100% RH
Cylinder End Preparation	Ground	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.01	3.01	3.00
Diameter 2, in.	3.01	3.01	3.00
Length, in.	5.81	5.85	5.83
Average Diameter, in.	3.01	3.01	3.00
Length / Diameter (L/D)	1.93	1.94	1.94
Cross-Sectional Area, in <sup>2</sup>	7.12	7.12	7.07

**Compressive Strength and Fracture Pattern**

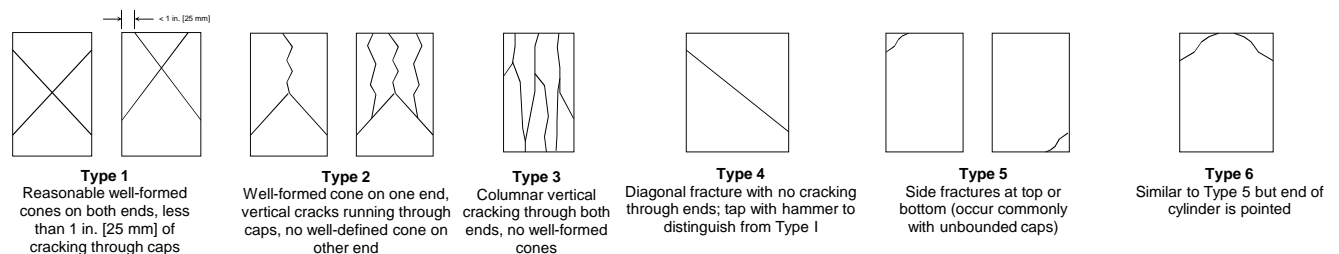
Maximum Load, lb	91,111	90,572	89,986
Compressive Strength, psi	12,800	12,720	12,730
Fracture Pattern	Type 1	Type 1	Type 1

Average Compressive Strength, psi	12,750
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**Schematic of Typical Fracture Patterns**



**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	S2 - A	S2 - B
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/2018	10/4/2018
Test Date / Time	10/18/2018	10/18/2018
Loading Rate, psi/sec	145	145

**Concrete Description**

Concrete Age at Test, days	14	14
Moisture Condition at Test	SSD	SSD
Curing Conditions (Temp/RH)	73°F/100% RH	73°F/100% RH
Cylinder End Preparation	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.01	3.01
Diameter 2, in.	3.00	3.01
Length, in.	5.84	5.87
Average Diameter, in.	3.00	3.01
Length / Diameter (L/D)	1.95	1.95
Cross-Sectional Area, in <sup>2</sup>	7.07	7.12

**Compressive Strength and Fracture Pattern**

Maximum Load, lb	113,043	111,998
Compressive Strength, psi	15,990	15,730
Fracture Pattern	Type 1	Type 1

Average Compressive Strength, psi	15,860
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**Schematic of Typical Fracture Patterns**

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Reasonable well-formed cones on both ends, less than 1 in. [25 mm] of cracking through caps

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Well-formed cone on one end, vertical cracks running through both caps, no well-defined cone on other end

**Type 3**  
Columnar vertical cracking through both ends, no well-formed cones

**Type 4**  
Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1

**Type 5**  
Side fractures at top or bottom (occur commonly with unbounded caps)

**Type 6**  
Similar to Type 5 but end of cylinder is pointed

Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Report Date: **October 25, 2018**

CTL Project No.: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved by: **M. Salguero**

**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	S2 - A	S2 - B
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/2018	10/4/2018
Test Date / Time	10/25/2018	10/25/2018
Loading Rate, psi/sec	145	145

**Concrete Description**

Concrete Age at Test, days	21	21
Moisture Condition at Test	SSD	SSD
Curing Conditions (Temp/RH)	73°F/100% RH	73°F/100% RH
Cylinder End Preparation	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.01	3.00
Diameter 2, in.	3.01	3.00
Length, in.	5.86	5.84
Average Diameter, in.	3.01	3.00
Length / Diameter (L/D)	1.95	1.95
Cross-Sectional Area, in <sup>2</sup>	7.12	7.07

**Compressive Strength and Fracture Pattern**

Maximum Load, lb	119,161	121,091
Compressive Strength, psi	16,740	17,130
Fracture Pattern	Type 1	Type 1

Average Compressive Strength, psi	16,930
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**Schematic of Typical Fracture Patterns**

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**Type 4**  
Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1

**Type 5**  
Side fractures at top or bottom (occur commonly with unbounded caps)

**Type 6**  
Similar to Type 5 but end of cylinder is pointed

Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Report Date: **November 29, 2018**

CTL Project No.: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved by: **M. Salguero**

**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	S2 - A	S2 - B
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/2018	10/4/2018
Test Date / Time	11/29/2018	11/29/2018
Loading Rate, psi/sec	145	145

**Concrete Description**

Concrete Age at Test, days	56	56
Moisture Condition at Test	SSD	SSD
Curing Conditions (Temp/RH)	73°F/100% RH	73°F/100% RH
Cylinder End Preparation	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.01	3.01
Diameter 2, in.	3.01	3.00
Length, in.	5.85	5.87
Average Diameter, in.	3.01	3.01
Length / Diameter (L/D)	1.94	1.95
Cross-Sectional Area, in <sup>2</sup>	7.12	7.12

**Compressive Strength and Fracture Pattern**

Maximum Load, lb	136,010	138,249
Compressive Strength, psi	19,100	19,420
Fracture Pattern	Type 1	Type 1

Average Compressive Strength, psi	19,260
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**Schematic of Typical Fracture Patterns**

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Columnar vertical cracking through both ends, no well-formed cones

**Type 4**  
Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1

**Type 5**  
Side fractures at top or bottom (occur commonly with unbounded caps)

**Type 6**  
Similar to Type 5 but end of cylinder is pointed

Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Report Date: **October 5, 2018**

CTL Project No.: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved by: **M. Salguero**

**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	S5 - A	S5 - B	S5 - C
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/18 11:55 AM	10/4/18 11:55 AM	10/4/18 11:55 AM
Test Date / Time	10/5/18 11:40 AM	10/5/18 11:45 AM	10/5/18 11:50 AM
Loading Rate, psi/sec	35	35	35

**Concrete Description**

Concrete Age at Test, hours	24	24	24
Moisture Condition at Test	Mold	Mold	Mold
Curing Conditions (Temp/RH)	73°F/Mold	73°F/Mold	73°F/Mold
Cylinder End Preparation	Ground	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.01	3.01	3.01
Diameter 2, in.	3.01	3.00	3.02
Length, in.	5.86	5.82	5.83
Average Diameter, in.	3.01	3.01	3.02
Length / Diameter (L/D)	1.95	1.93	1.93
Cross-Sectional Area, in <sup>2</sup>	7.12	7.12	7.16

**Compressive Strength and Fracture Pattern**

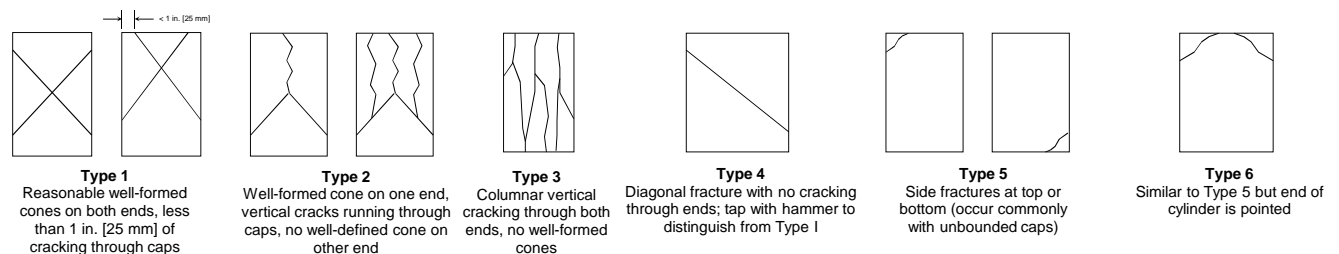
Maximum Load, lb	55,957	58,783	56,119
Compressive Strength, psi	7,860	8,260	7,840
Fracture Pattern	Type 1	Type 1	Type 1

Average Compressive Strength, psi	7,980
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**Schematic of Typical Fracture Patterns**



**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	S5 - A	S5 - B
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/2018	10/4/2018
Test Date / Time	10/8/2018	10/8/2018
Loading Rate, psi/sec	145	145

**Concrete Description**

Concrete Age at Test, days	4	4
Moisture Condition at Test	SSD	SSD
Curing Conditions (Temp/RH)	73°F/100% RH	73°F/100% RH
Cylinder End Preparation	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.01	3.00
Diameter 2, in.	3.00	3.00
Length, in.	5.86	5.83
Average Diameter, in.	3.00	3.00
Length / Diameter (L/D)	1.95	1.94
Cross-Sectional Area, in <sup>2</sup>	7.07	7.07

**Compressive Strength and Fracture Pattern**

Maximum Load, lb	89,653	90,440
Compressive Strength, psi	12,680	12,790
Fracture Pattern	Type 1	Type 1

Average Compressive Strength, psi	12,740
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**Schematic of Typical Fracture Patterns**

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**Type 3**  
Columnar vertical cracking through both ends, no well-formed cones

**Type 4**  
Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1

**Type 5**  
Side fractures at top or bottom (occur commonly with unbounded caps)

**Type 6**  
Similar to Type 5 but end of cylinder is pointed



Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Report Date: **October 11, 2018**

CTL Project No.: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved by: **M. Salguero**

**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	S5 - A	S5 - B
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/2018	10/4/2018
Test Date / Time	10/11/2018	10/11/2018
Loading Rate, psi/sec	145	145

**Concrete Description**

Concrete Age at Test, days	7	7
Moisture Condition at Test	SSD	SSD
Curing Conditions (Temp/RH)	73°F/100% RH	73°F/100% RH
Cylinder End Preparation	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.00	3.01
Diameter 2, in.	3.00	3.01
Length, in.	5.85	5.88
Average Diameter, in.	3.00	3.01
Length / Diameter (L/D)	1.95	1.95
Cross-Sectional Area, in <sup>2</sup>	7.07	7.12

**Compressive Strength and Fracture Pattern**

Maximum Load, lb	102,161	100,666
Compressive Strength, psi	14,450	14,140
Fracture Pattern	Type 1	Type 1

Average Compressive Strength, psi	14,290
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**Schematic of Typical Fracture Patterns**

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Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1

**Type 5**  
Side fractures at top or bottom (occur commonly with unbounded caps)

**Type 6**  
Similar to Type 5 but end of cylinder is pointed

Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Report Date: **October 18, 2018**

CTL Project No.: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved by: **M. Salguero**

**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	S5 - A	S5 - B
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/2018	10/4/2018
Test Date / Time	10/18/2018	10/18/2018
Loading Rate, psi/sec	145	145

**Concrete Description**

Concrete Age at Test, days	14	14
Moisture Condition at Test	SSD	SSD
Curing Conditions (Temp/RH)	73°F/100% RH	73°F/100% RH
Cylinder End Preparation	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.00	3.01
Diameter 2, in.	3.00	3.00
Length, in.	5.87	5.82
Average Diameter, in.	3.00	3.01
Length / Diameter (L/D)	1.96	1.93
Cross-Sectional Area, in <sup>2</sup>	7.07	7.12

**Compressive Strength and Fracture Pattern**

Maximum Load, lb	106,351	105,111
Compressive Strength, psi	15,040	14,760
Fracture Pattern	Type 1	Type 1

Average Compressive Strength, psi	14,900
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**Schematic of Typical Fracture Patterns**

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**Type 3**  
Columnar vertical cracking through both ends, no well-formed cones

**Type 4**  
Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1

**Type 5**  
Side fractures at top or bottom (occur commonly with unbounded caps)

**Type 6**  
Similar to Type 5 but end of cylinder is pointed

Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Report Date: **October 25, 2018**

CTL Project No.: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved by: **M. Salguero**

**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	S5 - A	S5 - B
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/2018	10/4/2018
Test Date / Time	10/25/2018	10/25/2018
Loading Rate, psi/sec	145	145

**Concrete Description**

Concrete Age at Test, days	21	21
Moisture Condition at Test	SSD	SSD
Curing Conditions (Temp/RH)	73°F/100% RH	73°F/100% RH
Cylinder End Preparation	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.00	3.01
Diameter 2, in.	3.00	3.01
Length, in.	5.88	5.84
Average Diameter, in.	3.00	3.01
Length / Diameter (L/D)	1.96	1.94
Cross-Sectional Area, in <sup>2</sup>	7.07	7.12

**Compressive Strength and Fracture Pattern**

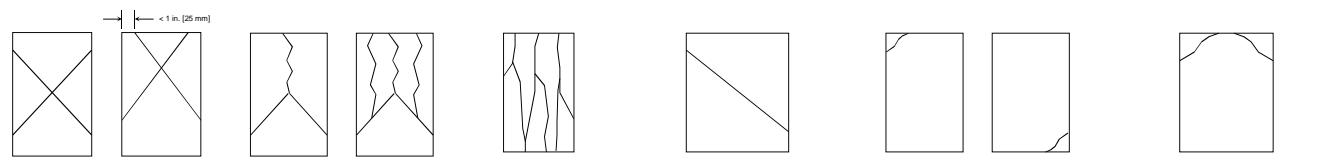
Maximum Load, lb	120,019	118,619
Compressive Strength, psi	16,980	16,660
Fracture Pattern	Type 1	Type 1

Average Compressive Strength, psi	16,820
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**Notes:**

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2. Samples cast by CTLGroup using concrete mixture provided by others.

**Schematic of Typical Fracture Patterns**



**Type 1**  
Reasonable well-formed cones on both ends, less than 1 in. [25 mm] of cracking through caps

**Type 2**  
Well-formed cone on one end, vertical cracks running through both caps, no well-defined cone on other end

**Type 3**  
Columnar vertical cracking through both ends, no well-formed cones

**Type 4**  
Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1

**Type 5**  
Side fractures at top or bottom (occur commonly with unbounded caps)

**Type 6**  
Similar to Type 5 but end of cylinder is pointed

Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Report Date: **November 1, 2018**

CTL Project No.: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved by: **M. Salguero**

**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	S5 - A	S5 - B
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/2018	10/4/2018
Test Date / Time	11/1/2018	11/1/2018
Loading Rate, psi/sec	145	145

**Concrete Description**

Concrete Age at Test, days	28	28
Moisture Condition at Test	SSD	SSD
Curing Conditions (Temp/RH)	73°F/100% RH	73°F/100% RH
Cylinder End Preparation	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.01	3.00
Diameter 2, in.	3.00	3.01
Length, in.	5.84	5.87
Average Diameter, in.	3.00	3.01
Length / Diameter (L/D)	1.95	1.95
Cross-Sectional Area, in <sup>2</sup>	7.07	7.12

**Compressive Strength and Fracture Pattern**

Maximum Load, lb	128,686	130,249
Compressive Strength, psi	18,200	18,290
Fracture Pattern	Type 1	Type 1

Average Compressive Strength, psi	18,250
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**Notes:**

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**Schematic of Typical Fracture Patterns**

**Type 1**  
Reasonable well-formed cones on both ends, less than 1 in. [25 mm] of cracking through caps

**Type 2**  
Well-formed cone on one end, vertical cracks running through both caps, no well-defined cone on other end

**Type 3**  
Columnar vertical cracking through both ends, no well-formed cones

**Type 4**  
Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1

**Type 5**  
Side fractures at top or bottom (occur commonly with unbounded caps)

**Type 6**  
Similar to Type 5 but end of cylinder is pointed

Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Report Date: **October 5, 2018**

CTL Project No.: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved by: **M. Salguero**

**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	NF - A	NF - B	NF - C
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/18 12:25 PM	10/4/18 12:25 PM	10/4/18 12:25 PM
Test Date / Time	10/5/18 1:10 PM	10/5/18 1:15 PM	10/5/18 1:20 PM
Loading Rate, psi/sec	35	35	35

**Concrete Description**

Concrete Age at Test, hours	25	25	25
Moisture Condition at Test	Mold	Mold	Mold
Curing Conditions (Temp/RH)	73°F/Mold	73°F/Mold	73°F/Mold
Cylinder End Preparation	Ground	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.00	3.02	3.01
Diameter 2, in.	3.00	3.02	3.01
Length, in.	5.84	5.87	5.81
Average Diameter, in.	3.00	3.02	3.01
Length / Diameter (L/D)	1.95	1.94	1.93
Cross-Sectional Area, in <sup>2</sup>	7.07	7.16	7.12

**Compressive Strength and Fracture Pattern**

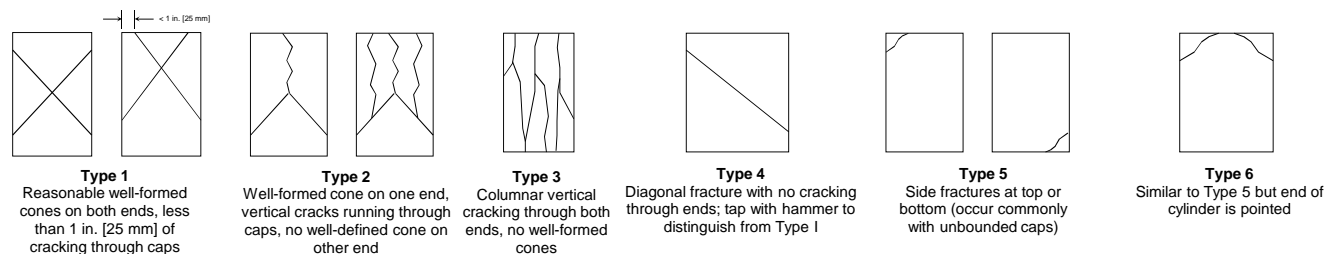
Maximum Load, lb	60,044	59,523	59,378
Compressive Strength, psi	8,490	8,310	8,340
Fracture Pattern	Type 1	Type 1	Type 1

Average Compressive Strength, psi	8,380
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**Schematic of Typical Fracture Patterns**



**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	NF - A	NF - B	NF - C
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/2018	10/4/2018	10/4/2018
Test Date / Time	10/11/2018	10/11/2018	10/11/2018
Loading Rate, psi/sec	145	145	145

**Concrete Description**

Concrete Age at Test, days	7	7	7
Moisture Condition at Test	SSD	SSD	SSD
Curing Conditions (Temp/RH)	73°F/100% RH	73°F/100% RH	73°F/100% RH
Cylinder End Preparation	Ground	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.01	3.01	3.01
Diameter 2, in.	3.00	3.01	3.01
Length, in.	5.82	5.87	5.85
Average Diameter, in.	3.00	3.01	3.01
Length / Diameter (L/D)	1.94	1.95	1.94
Cross-Sectional Area, in <sup>2</sup>	7.07	7.12	7.12

**Compressive Strength and Fracture Pattern**

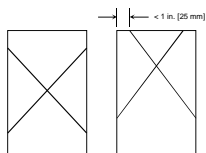
Maximum Load, lb	105,543	105,162	104,785
Compressive Strength, psi	14,930	14,770	14,720
Fracture Pattern	Type 1	Type 1	Type 1

Average Compressive Strength, psi	14,810
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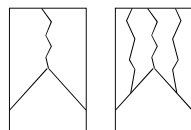
**Notes:**

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**Schematic of Typical Fracture Patterns**



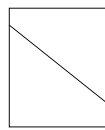
**Type 1**  
Reasonable well-formed cones on both ends, less than 1 in. [25 mm] of cracking through caps



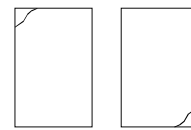
**Type 2**  
Well-formed cone on one end, vertical cracks running through both caps, no well-defined cone on other end



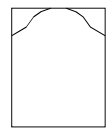
**Type 3**  
Columnar vertical cracking through both ends, no well-formed cones



**Type 4**  
Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1



**Type 5**  
Side fractures at top or bottom (occur commonly with unbounded caps)



**Type 6**  
Similar to Type 5 but end of cylinder is pointed

Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Report Date: **October 18, 2018**

CTL Project No.: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved by: **M. Salguero**

**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	NF - A	NF - B
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/2018	10/4/2018
Test Date / Time	10/18/2018	10/18/2018
Loading Rate, psi/sec	145	145

**Concrete Description**

Concrete Age at Test, days	14	14
Moisture Condition at Test	SSD	SSD
Curing Conditions (Temp/RH)	73°F/100% RH	73°F/100% RH
Cylinder End Preparation	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.00	3.01
Diameter 2, in.	3.01	3.01
Length, in.	5.86	5.88
Average Diameter, in.	3.00	3.01
Length / Diameter (L/D)	1.95	1.95
Cross-Sectional Area, in <sup>2</sup>	7.07	7.12

**Compressive Strength and Fracture Pattern**

Maximum Load, lb	115,161	113,019
Compressive Strength, psi	16,290	15,870
Fracture Pattern	Type 1	Type 1

Average Compressive Strength, psi	16,080
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**Schematic of Typical Fracture Patterns**

**Type 1**  
Reasonable well-formed cones on both ends, less than 1 in. [25 mm] of cracking through caps

**Type 2**  
Well-formed cone on one end, vertical cracks running through both caps, no well-defined cone on other end

**Type 3**  
Columnar vertical cracking through both ends, no well-formed cones

**Type 4**  
Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1

**Type 5**  
Side fractures at top or bottom (occur commonly with unbounded caps)

**Type 6**  
Similar to Type 5 but end of cylinder is pointed

Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Report Date: **October 25, 2018**

CTL Project No.: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved by: **M. Salguero**

**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	NF - A	NF - B	NF - C
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/2018	10/4/2018	10/4/2018
Test Date / Time	10/25/2018	10/25/2018	10/25/2018
Loading Rate, psi/sec	145	145	145

**Concrete Description**

Concrete Age at Test, days	21	21	21
Moisture Condition at Test	SSD	SSD	SSD
Curing Conditions (Temp/RH)	73°F/100% RH	73°F/100% RH	73°F/100% RH
Cylinder End Preparation	Ground	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.01	3.01	3.01
Diameter 2, in.	3.01	3.00	3.01
Length, in.	5.89	5.85	5.87
Average Diameter, in.	3.01	3.00	3.01
Length / Diameter (L/D)	1.96	1.95	1.95
Cross-Sectional Area, in <sup>2</sup>	7.12	7.07	7.12

**Compressive Strength and Fracture Pattern**

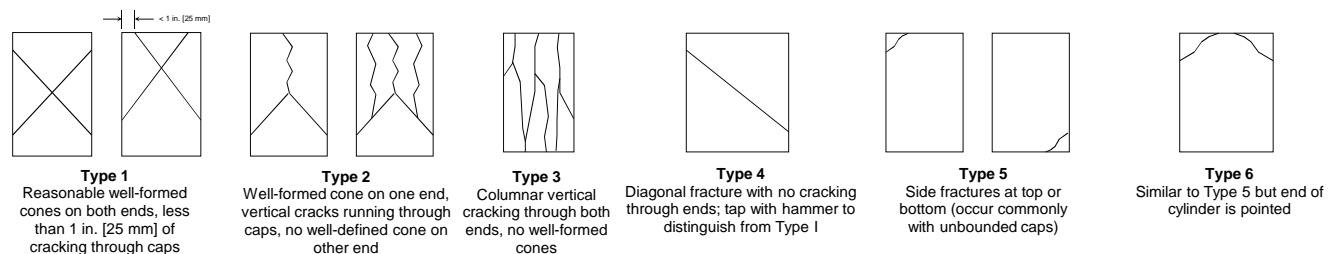
Maximum Load, lb	117,161	115,029	116,334
Compressive Strength, psi	16,460	16,270	16,340
Fracture Pattern	Type 1	Type 1	Type 1

Average Compressive Strength, psi	16,350
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**Notes:**

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**Schematic of Typical Fracture Patterns**





Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Report Date: **November 1, 2018**

CTL Project No.: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved by: **M. Salguero**

**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	NF - A	NF - B	NF - C
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/2018	10/4/2018	10/4/2018
Test Date / Time	11/1/2018	11/1/2018	11/1/2018
Loading Rate, psi/sec	145	145	145

**Concrete Description**

Concrete Age at Test, days	28	28	28
Moisture Condition at Test	SSD	SSD	SSD
Curing Conditions (Temp/RH)	73°F/100% RH	73°F/100% RH	73°F/100% RH
Cylinder End Preparation	Ground	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.00	3.01	3.01
Diameter 2, in.	3.01	3.01	3.01
Length, in.	5.84	5.89	5.87
Average Diameter, in.	3.01	3.01	3.01
Length / Diameter (L/D)	1.94	1.96	1.95
Cross-Sectional Area, in <sup>2</sup>	7.12	7.12	7.12

**Compressive Strength and Fracture Pattern**

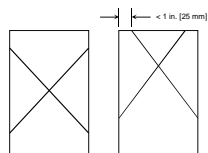
Maximum Load, lb	132,251	129,458	131,664
Compressive Strength, psi	18,570	18,180	18,490
Fracture Pattern	Type 1	Type 1	Type 1

Average Compressive Strength, psi	18,420
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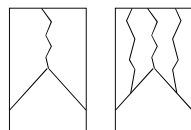
**Notes:**

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**Schematic of Typical Fracture Patterns**



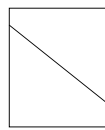
**Type 1**  
Reasonable well-formed cones on both ends, less than 1 in. [25 mm] of cracking through caps



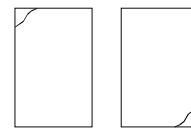
**Type 2**  
Well-formed cone on one end, vertical cracks running through both caps, no well-defined cone on other end



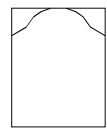
**Type 3**  
Columnar vertical cracking through both ends, no well-formed cones



**Type 4**  
Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1



**Type 5**  
Side fractures at top or bottom (occur commonly with unbounded caps)



**Type 6**  
Similar to Type 5 but end of cylinder is pointed

Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Report Date: **October 18, 2018**

CTL Project No.: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved by: **M. Salguero**

**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	S5X - A	S5X - B	S5X - C
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/2018	10/4/2018	10/4/2018
Test Date / Time	10/18/2018	10/18/2018	10/18/2018
Loading Rate, psi/sec	145	145	145

**Concrete Description**

Concrete Age at Test, days	14	14	14
Moisture Condition at Test	Dry	Dry	Dry
Curing Conditions (Temp/RH)	Note 3	Note 3	Note 3
Cylinder End Preparation	Ground	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.01	3.01	3.01
Diameter 2, in.	3.01	3.00	3.01
Length, in.	5.84	5.89	5.87
Average Diameter, in.	3.01	3.00	3.01
Length / Diameter (L/D)	1.94	1.96	1.95
Cross-Sectional Area, in <sup>2</sup>	7.12	7.07	7.12

**Compressive Strength and Fracture Pattern**

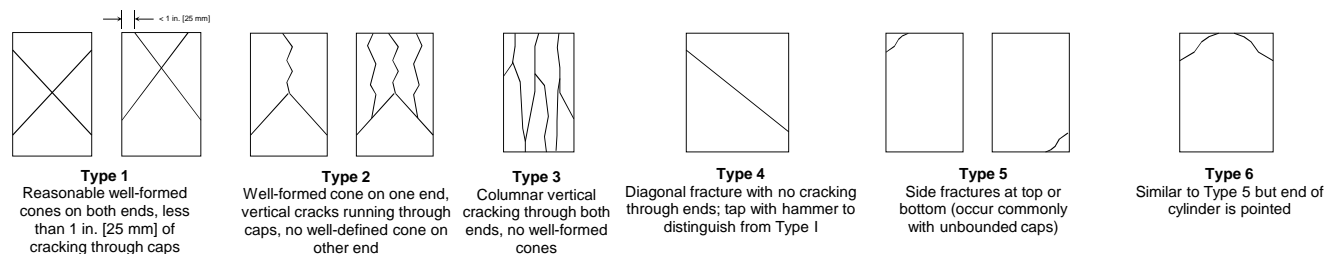
Maximum Load, lb	201,660	203,681	202,489
Compressive Strength, psi	28,320	28,810	28,440
Fracture Pattern	Type 1	Type 1	Type 1

Average Compressive Strength, psi	28,520
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**Notes:**

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2. Samples cast by CTLGroup using concrete mixture provided by others.
3. Specimens moist-cured (100% RH, 73°F) for 7 days, followed by a 5-day immersion period in limewater at 190°F and a 2-day drying period in an oven at 190°F.

**Schematic of Typical Fracture Patterns**



Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Report Date: **October 25, 2018**

CTL Project No.: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved by: **M. Salguero**

**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	S5X - A	S5X - B
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/2018	10/4/2018
Test Date / Time	10/25/2018	10/25/2018
Loading Rate, psi/sec	145	145

**Concrete Description**

Concrete Age at Test, days	21	21
Moisture Condition at Test	SSD	SSD
Curing Conditions (Temp/RH)	Note 3	Note 3
Cylinder End Preparation	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.00	3.00
Diameter 2, in.	3.00	3.01
Length, in.	5.84	5.87
Average Diameter, in.	3.00	3.01
Length / Diameter (L/D)	1.95	1.95
Cross-Sectional Area, in <sup>2</sup>	7.07	7.12

**Compressive Strength and Fracture Pattern**

Maximum Load, lb	205,161	204,569
Compressive Strength, psi	29,020	28,730
Fracture Pattern	Type 1	Type 1

Average Compressive Strength, psi	28,880
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**Schematic of Typical Fracture Patterns**

**Type 1**  
Reasonable well-formed cones on both ends, less than 1 in. [25 mm] of cracking through caps

**Type 2**  
Well-formed cone on one end, vertical cracks running through caps, no well-defined cone on other end

**Type 3**  
Columnar vertical cracking through both ends, no well-formed cones

**Type 4**  
Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1

**Type 5**  
Side fractures at top or bottom (occur commonly with unbounded caps)

**Type 6**  
Similar to Type 5 but end of cylinder is pointed

Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Report Date: **November 1, 2018**

CTL Project No.: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved by: **M. Salguero**

**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	S5X - A	S5X - B	S5X - C
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/2018	10/4/2018	10/4/2018
Test Date / Time	11/1/2018	11/1/2018	11/1/2018
Loading Rate, psi/sec	145	145	145

**Concrete Description**

Concrete Age at Test, days	28	28	28
Moisture Condition at Test	SSD	SSD	SSD
Curing Conditions (Temp/RH)	Note 3	Note 3	Note 3
Cylinder End Preparation	Ground	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.00	3.01	3.00
Diameter 2, in.	3.00	3.00	3.01
Length, in.	5.83	5.85	5.87
Average Diameter, in.	3.00	3.00	3.01
Length / Diameter (L/D)	1.94	1.95	1.95
Cross-Sectional Area, in <sup>2</sup>	7.07	7.07	7.12

**Compressive Strength and Fracture Pattern**

Maximum Load, lb	206,119	207,961	206,491
Compressive Strength, psi	29,150	29,410	29,000
Fracture Pattern	Type 1	Type 1	Type 1

Average Compressive Strength, psi	29,190
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**Schematic of Typical Fracture Patterns**

**Type 1**  
Reasonable well-formed cones on both ends, less than 1 in. [25 mm] of cracking through caps

**Type 2**  
Well-formed cone on one end, vertical cracks running through both caps, no well-defined cone on other end

**Type 3**  
Columnar vertical cracking through both ends, no well-formed cones

**Type 4**  
Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1

**Type 5**  
Side fractures at top or bottom (occur commonly with unbounded caps)

**Type 6**  
Similar to Type 5 but end of cylinder is pointed

Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Report Date: **November 29, 2018**

CTL Project No.: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved by: **M. Salguero**

**ASTM C39 and AASHTO T 22**  
**Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTL Identification	S5X - A
Client Identification	Cor-Tuf UHPC
Casting Date	10/4/2018
Test Date / Time	11/29/2018
Loading Rate, psi/sec	145

**Concrete Description**

Concrete Age at Test, days	56
Moisture Condition at Test	SSD
Curing Conditions (Temp/RH)	Note 3
Cylinder End Preparation	Ground

**Concrete Dimensions**

Diameter 1, in.	3.00
Diameter 2, in.	3.00
Length, in.	5.84
Average Diameter, in.	3.00
Length / Diameter (L/D)	1.95
Cross-Sectional Area, in <sup>2</sup>	7.07

**Compressive Strength and Fracture Pattern**

Maximum Load, lb	208,961
Compressive Strength, psi	29,560
Fracture Pattern	Type 1

**Notes:**

1. This report may not be reproduced except in its entirety.
2. Samples cast by CTLGroup using concrete mixture provided by others.
3. Specimens moist-cured (100% RH, 73°F) for 7 days, followed by a 5-day immersion period in limewater at 190°F and a 2-day drying period in an oven at 190°F. Subsequently, specimens were stored in limewater at 73° until testing.

**Schematic of Typical Fracture Patterns**

**Type 1**  
Reasonable well-formed cones on both ends, less than 1 in. [25 mm] of cracking through caps

**Type 2**  
Well-formed cone on one end, vertical cracks running through caps, no well-defined cone on other end

**Type 3**  
Columnar vertical cracking through both ends, no well-formed cones

**Type 4**  
Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1

**Type 5**  
Side fractures at top or bottom (occur commonly with unbounded caps)

**Type 6**  
Similar to Type 5 but end of cylinder is pointed

**ASTM C39 COMPRESSIVE STRENGTH OF CONCRETE CYLINDERS  
 ASTM C469 STATIC MODULUS OF ELASTICITY OF CYLINDRICAL CONCRETE SPECIMENS**

**Specimen Identification**

CTLGroup Identification	S2 - Comp A	S2 - Comp B	S2 - 01	S2 - 02
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/2018	10/4/2018	10/4/2018	10/4/2018
Test Date / Time	10/11/2018	10/11/2018	10/11/2018	10/11/2018
Loading Rate, psi/sec	150	150	150	150

**Concrete Description**

Concrete Age at Test, days	7	7	7	7
Moisture Condition at Test	SSD	SSD	SSD	SSD
Curing Conditions (Temp/RH)	74°F/100% RH	74°F/100% RH	74°F/100% RH	74°F/100% RH
Cylinder End Preparation	Ground	Ground	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.01	3.00	3.01	3.00
Diameter 2, in.	3.01	3.00	3.01	3.00
Length, in.	5.89	5.85	5.86	5.83
Average Diameter, in.	3.01	3.00	3.01	3.00
Length / Diameter (L/D)	1.96	1.95	1.95	1.94
Cross-Sectional Area, in <sup>2</sup>	7.12	7.07	7.12	7.07

**Compressive Strength and Fracture Pattern**

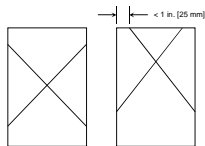
Maximum Load, lb	99,652	98,475	102,908	100,019
Compressive Strength, psi	14,000	13,930	14,450	14,150
Fracture Pattern	Type 1	Type 1	Type 1	Type 1
Chord Modulus of Elasticity, ksi	--	--	5,350	5,300
Poisson's Ratio	--	--	0.21	0.21

Average Compressive Strength of Companion Specimens	13,960 psi
Average Compressive Strength of Modulus Specimens	14,300 psi
Average Elastic Modulus	5,350 ksi

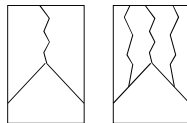
**Notes:**

1. Samples cast by CTLGroup using concrete mixture provided by others.
2. Companion specimen were tested for the determination of compressive strength only.
3. The compressive strength of samples '01' and '02' were determined after obtaining strain values for the modulus of elasticity.
4. This report may not be reproduced except in its entirety.

**Schematic of Typical Fracture Patterns:**



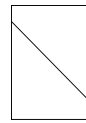
**Type 1**  
Reasonable well-formed cones on both ends, less than 1 in. [25 mm] of cracking through caps



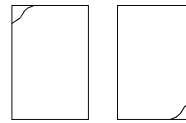
**Type 2**  
Well-formed cone on one end, vertical cracks running through caps, no well-defined cone on other end



**Type 3**  
Columnar vertical cracking through both ends, no well-formed cones



**Type 4**  
Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type



**Type 5**  
Side fractures at top or bottom (occur commonly with unbounded caps)



**Type 6**  
Similar to Type 5 but end of cylinder is pointed

**ASTM C39 COMPRESSIVE STRENGTH OF CONCRETE CYLINDERS  
 ASTM C469 STATIC MODULUS OF ELASTICITY OF CYLINDRICAL CONCRETE SPECIMENS**

**Specimen Identification**

CTLGroup Identification	S2 - Comp A	S2 - Comp B	S2 - Comp C	S2 - 01	S2 - 02
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC	Cor-Tuf UHPC	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/2018	10/4/2018	10/4/2018	10/4/2018	10/4/2018
Test Date / Time	11/1/2018	11/1/2018	11/1/2018	11/1/2018	11/1/2018
Loading Rate, psi/sec	145	145	145	145	145

**Concrete Description**

Concrete Age at Test, days	28	28	28	28	28
Moisture Condition at Test	SSD	SSD	SSD	SSD	SSD
Curing Conditions (Temp/RH)	73°F/100% RH	73°F/100% RH	73°F/100% RH	74°F/100% RH	74°F/100% RH
Cylinder End Preparation	Ground	Ground	Ground	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.01	3.01	3.00	3.00	3.01
Diameter 2, in.	3.01	3.01	3.00	3.00	3.01
Length, in.	7.89	7.86	7.87	5.86	5.87
Average Diameter, in.	3.01	3.01	3.00	3.00	3.01
Length / Diameter (L/D)	2.62	2.61	2.62	1.95	1.95
Cross-Sectional Area, in <sup>2</sup>	7.12	7.12	7.07	7.07	7.12

**Compressive Strength and Fracture Pattern**

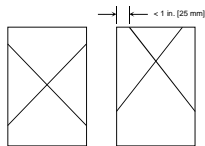
Maximum Load, lb	133,584	130,058	131,121	134,067	136,042
Compressive Strength, psi	18,760	18,270	18,550	18,960	19,110
Fracture Pattern	Type 1	Type 1	Type 1	Type 1	Type 1
Chord Modulus of Elasticity, ksi	--	--	--	5,750	5,800

Average Compressive Strength of Companion Specimens	18,520 ksi
Average Compressive Strength of Modulus Specimens	19,030 ksi
Average Elastic Modulus	5,750 ksi

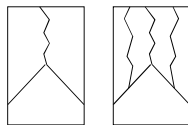
**Notes:**

1. Samples cast by CTLGroup using concrete mixture provided by others.
2. Companion specimens were tested for the determination of compressive strength only.
3. The compressive strength of samples '01' and '02' were determined after obtaining strain values for the modulus of elasticity.
4. This report may not be reproduced except in its entirety.

**Schematic of Typical Fracture Patterns:**



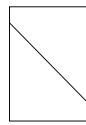
**Type 1**  
Reasonable well-formed cones on both ends, less than 1 in. [25 mm] of cracking through caps



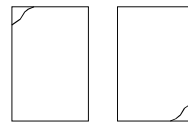
**Type 2**  
Well-formed cone on one end, vertical cracks running through caps, no well-defined cone on other end



**Type 3**  
Columnar vertical cracking through both ends, no well-formed cones



**Type 4**  
Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type



**Type 5**  
Side fractures at top or bottom (occur commonly with unbounded caps)



**Type 6**  
Similar to Type 5 but end of cylinder is pointed

**ASTM C39 COMPRESSIVE STRENGTH OF CONCRETE CYLINDERS  
 ASTM C469 STATIC MODULUS OF ELASTICITY OF CYLINDRICAL CONCRETE SPECIMENS**

**Specimen Identification**

CTLGroup Identification	S5X - 01	S5X - 02
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/2018	10/4/2018
Test Date / Time	11/5/2018	11/5/2018
Loading Rate, psi/sec	150	150

**Concrete Description**

Concrete Age at Test, days	32	32
Moisture Condition at Test	SSD	SSD
Curing Conditions (Temp/RH)	Note 4	Note 4
Cylinder End Preparation	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	3.01	3.01
Diameter 2, in.	3.01	3.00
Length, in.	5.87	5.89
Average Diameter, in.	3.01	3.01
Length / Diameter (L/D)	1.95	1.96
Cross-Sectional Area, in <sup>2</sup>	7.12	7.12

**Compressive Strength and Fracture Pattern**

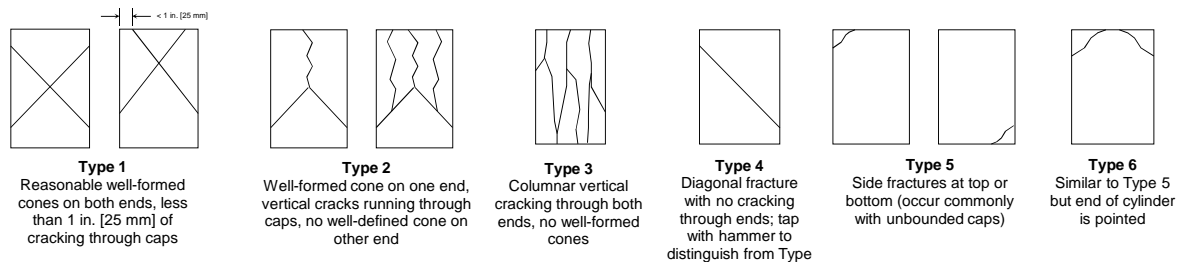
Maximum Load, lb	209,324	207,996
Compressive Strength, psi	29,400	29,210
Fracture Pattern	Type 1	Type 1
Chord Modulus of Elasticity, ksi	6,300	6,250

Average Compressive Strength	29,310 ksi
Average Elastic Modulus	6,250 ksi

**Notes:**

1. Samples cast by CTLGroup using concrete mixture provided by others.
2. Companion specimen not tested. Ultimate compressive strength assumed based on values obtained for 3x6-in. cylinders at 28 days.
3. The compressive strength of samples '01' and '02' were determined after obtaining strain values for the modulus of elasticity.
4. Specimens moist-cured (100% RH, 73°F) for 7 days, followed by a 5-day immersion period in limewater at 190°F and a 2-day drying period in an oven at 190°F. Subsequently, specimens were stored in limewater at 73° until testing.
5. This report may not be reproduced except in its entirety.

**Schematic of Typical Fracture Patterns:**





**ASTM C39 COMPRESSIVE STRENGTH OF CONCRETE CYLINDERS  
 ASTM C469 STATIC MODULUS OF ELASTICITY OF CYLINDRICAL CONCRETE SPECIMENS**

**Specimen Identification**

CTLGroup Identification	S3 - A	S3 - B
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/2018	10/4/2018
Test Date / Time	11/1/2018	11/1/2018
Loading Rate, psi/sec	145	145

**Concrete Description**

Concrete Age at Test, days	28	28
Moisture Condition at Test	SSD	SSD
Curing Conditions (Temp/RH)	74°F/100% RH	74°F/100% RH
Cylinder End Preparation	Ground	Ground

**Concrete Dimensions**

Diameter 1, in.	4.02	4.03
Diameter 2, in.	4.01	4.02
Length, in.	7.84	7.87
Average Diameter, in.	4.02	4.03
Length / Diameter (L/D)	1.95	1.95
Cross-Sectional Area, in <sup>2</sup>	12.69	12.76

**Compressive Strength and Fracture Pattern**

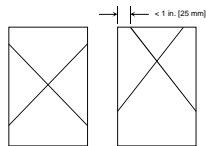
Maximum Load, lb	219,579	221,573
Compressive Strength, psi	17,300	17,360
Fracture Pattern	Type 1	Type 1
Chord Modulus of Elasticity, ksi	5,650	5,600

Average Compressive Strength of Modulus Specimens	17,330 ksi
Average Elastic Modulus	5,650 ksi

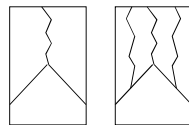
**Notes:**

1. Samples cast by CTLGroup using concrete mixture provided by others.
2. Companion specimen not tested. Ultimate compressive strength assumed based on values obtained for 3x6-in. cylinders at 28 days.
3. The compressive strength of samples A and B were determined after obtaining strain values for the modulus of elasticity.
4. This report may not be reproduced except in its entirety.

**Schematic of Typical Fracture Patterns:**



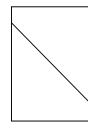
**Type 1**  
Reasonable well-formed cones on both ends, less than 1 in. [25 mm] of cracking through caps



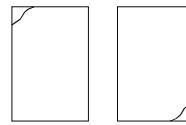
**Type 2**  
Well-formed cone on one end, vertical cracks running through caps, no well-defined cone on other end



**Type 3**  
Columnar vertical cracking through both ends, no well-formed cones



**Type 4**  
Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 5



**Type 5**  
Side fractures at top or bottom (occur commonly with unbounded caps)



**Type 6**  
Similar to Type 5 but end of cylinder is pointed



Client: **AIISite Contracting**  
Project: **Cor-Tuf UHPC**  
Contact: **Rich Burgess**  
Date Reported: **October 11, 2018**

CTL Project No: **059301**  
CTL Project Mgr.: **J. Vosahlik**  
Technician: **W. Demharter**  
Approved: **M. Salguero**

**ASTM C496, Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens**

**Specimen Identification**

CTLGroup Identification	S3 - A	S3 - B	S3 - C
Client Identification	Cor-Tuf UHPC	Cor-Tuf UHPC	Cor-Tuf UHPC
Casting Date	10/4/2018	10/4/2018	10/4/2018
Test Date	10/11/2018	10/11/2018	10/11/2018
Type of Specimen	4"x8" Conc. Cyl.	4"x8" Conc. Cyl.	4"x8" Conc. Cyl.
Defects in Specimen	N/A	N/A	N/A

**Concrete Description**

Concrete Age at Test, days	7	7	7
Curing History	74°F / 100%	74°F / 100%	74°F / 100%
Moisture Condition at Test	SSD	SSD	SSD

**Concrete Dimensions**

Diameter 1, in.	4.01	4.03	4.02
Diameter 2, in.	4.01	4.02	4.02
Diameter 3, in.	4.01	4.02	4.01
Length 1, in.	8.08	8.07	8.08
Length 2, in.	8.08	8.07	8.07
Average Diameter, in.	4.01	4.02	4.02
Average Length, in.	8.10	8.10	8.10

**Strength and Fracture Pattern**

Maximum Load, lbf	86,721	84,014	87,881
Splitting Tensile Strength, psi	1,700	1,645	1,720
Type of Fracture	Center Vertical	Center Vertical	Center Vertical
Estimated proportion of coarse aggregate fractured during test	N/A	N/A	N/A

<i>Average Splitting Tensile Strength</i>	<i>1,690 psi</i>
---	------------------

**Notes:**

1. Specimens fabricated by CLTGroup on October 4, 2018 using mixture provided by others.
2. This report may not be reproduced except in its entirety.

Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Date Reported: **January 22, 2019**

CTL Project No: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Analyst: **J. Juliano**  
 Approved: **B. Birch**

### ASTM C1609 Standard Test Method for Flexural Performance of Fiber-Reinforced Concrete (Using Beam With Third-Point Loading)

#### Specimen Identification

CTLGroup ID	S3 - B
Client Identification	N/A
Casting Date	10/4/2019
Test Date	11/1/2019

#### Concrete Description

Concrete Age at Test, days	28
Moisture Condition at Test	SSD
Curing Conditions (Temp/RH)	73°F/100%
Specimen Type	Molded
Surface Preparation	leather shims

#### First-Peak and Peak Strength and Deflection

First-Peak Load, lb	10,395
First-Peak Strength, psi	1,880
First-Peak Deflection, in	0.0190
Peak Load, lb	10,395
Peak Strength, psi	1,880
Peak Deflection, in	0.0190

#### Concrete Dimensions

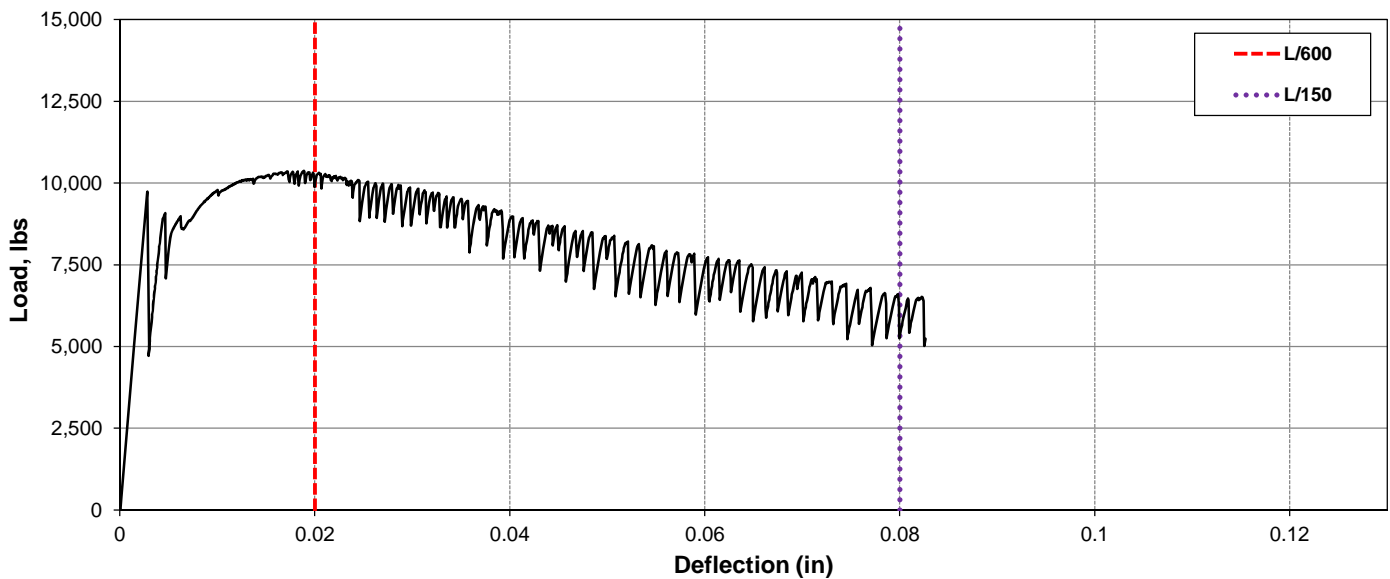
Nominal Specimen Length, in	14.0
Average Width at Fracture, in	4.05
Span, in	12.0
Average Depth at Fracture, in	4.05

#### Residual Strengths and L/150 and L/600

Residual Load (L/600), lb	9,872
Residual Strength (L/600), psi	1,785
Residual Load (L/150), lb	5,258
Residual Strength (L/150), psi	950

#### Toughness and Flexural Strength Ratio

Toughness, in-lb	672
Flexural Strength Ratio, %	81%



#### Notes:

1. This report may not be reproduced except in its entirety.
2. Samples cast by CTLGroup using concrete mixture provided by others.
3. Three days prior to testing, the sample was immersed in a limewater bath at 73.4 ± 3.6°F.
4. The rate of increase in net deflection was 0.003 in/min for the entirety of the test.

Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Date Reported: **January 22, 2019**

CTL Project No: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Analyst: **J. Juliano**  
 Approved: **B. Birch**

**ASTM C1609 Standard Test Method for Flexural Performance of  
 Fiber-Reinforced Concrete (Using Beam With Third-Point Loading)**

**Specimen Identification**

CTLGroup ID	S3 - C
Client Identification	N/A
Casting Date	10/4/2019
Test Date	11/1/2019

**Concrete Description**

Concrete Age at Test, days	28
Moisture Condition at Test	SSD
Curing Conditions (Temp/RH)	73°F/100%
Specimen Type	Molded
Surface Preparation	leather shims

**First-Peak and Peak Strength and Deflection**

First-Peak Load, lb	12,334
First-Peak Strength, psi	2,255
First-Peak Deflection, in	0.0225
Peak Load, lb	12,334
Peak Strength, psi	2,255
Peak Deflection, in	0.0225

**Concrete Dimensions**

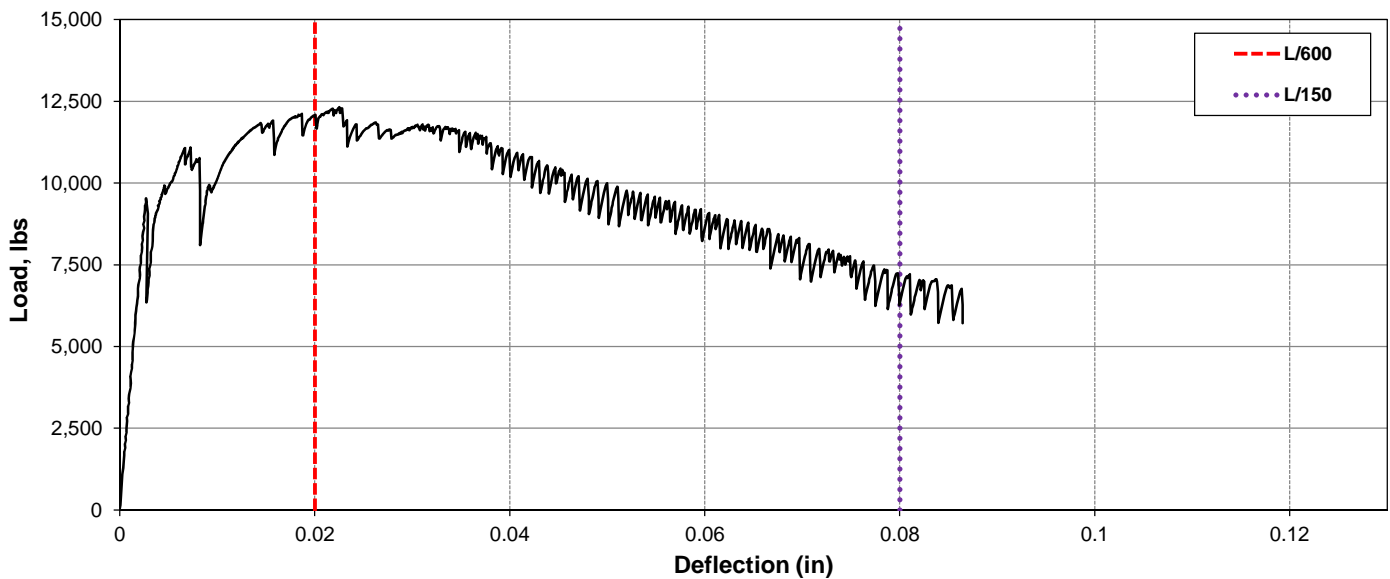
Nominal Specimen Length, in	14.0
Average Width at Fracture, in	4.00
Span, in	12.0
Average Depth at Fracture, in	4.05

**Residual Strengths and L/150 and L/600**

Residual Load (L/600), lb	12,052
Residual Strength (L/600), psi	2,205
Residual Load (L/150), lb	6,334
Residual Strength (L/150), psi	1,160

**Toughness and Flexural Strength Ratio**

Toughness, in-lb	823
Flexural Strength Ratio, %	84%



**Notes:**

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3. Three days prior to testing, the sample was immersed in a limewater bath at 73.4 ± 3.6°F.
4. The rate of increase in net deflection was 0.003 in/min for the entirety of the test.

Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Date Reported: **January 22, 2019**

CTL Project No: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Analyst: **J. Juliano**  
 Approved: **B. Birch**

### ASTM C1609 Standard Test Method for Flexural Performance of Fiber-Reinforced Concrete (Using Beam With Third-Point Loading)

#### Specimen Identification

CTLGroup ID	S3 - D
Client Identification	N/A
Casting Date	10/4/2019
Test Date	11/1/2019

#### Concrete Description

Concrete Age at Test, days	28
Moisture Condition at Test	SSD
Curing Conditions (Temp/RH)	73°F/100%
Specimen Type	Molded
Surface Preparation	leather shims

#### First-Peak and Peak Strength and Deflection

First-Peak Load, lb	11,124
First-Peak Strength, psi	2,010
First-Peak Deflection, in	0.0175
Peak Load, lb	11,124
Peak Strength, psi	2,010
Peak Deflection, in	0.0175

#### Concrete Dimensions

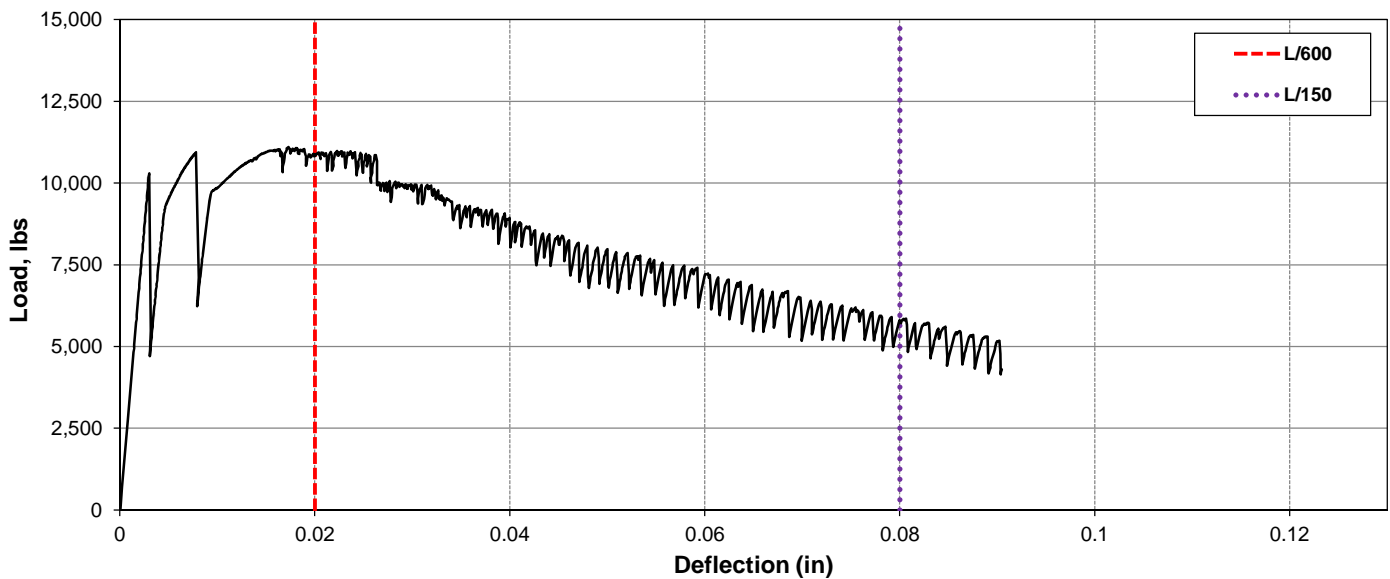
Nominal Specimen Length, in	14.0
Average Width at Fracture, in	4.05
Span, in	12.0
Average Depth at Fracture, in	4.05

#### Residual Strengths and L/150 and L/600

Residual Load (L/600), lb	10,797
Residual Strength (L/600), psi	1,950
Residual Load (L/150), lb	5,801
Residual Strength (L/150), psi	1,050

#### Toughness and Flexural Strength Ratio

Toughness, in-lb	710
Flexural Strength Ratio, %	80%



#### Notes:

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2. Samples cast by CTLGroup using concrete mixture provided by others.
3. Three days prior to testing, the sample was immersed in a limewater bath at 73.4 ± 3.6°F.
4. The rate of increase in net deflection was 0.003 in/min for the entirety of the test.



Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Date Reported: **October 5, 2018**

CTL Project No: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Analyst: **N/A**  
 Approved: **J. Pacheco**

**REPORT of ANALYSIS**

**AASHTO T 358**

Surface Resistivity Indication of Concrete's Ability to Resist Chloride Ion Penetration

Concrete Mixture	Date of fabrication	Date of testing	Age	Curing condition	Dimensions
NF	10/4/2018	10/5/2018	1	Moist Room	4x8"

Sample	Surface resistivity (SR), kΩ-cm								Average
	0°	90°	180°	270°	0°	90°	180°	270°	
NF - A	2.7	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
NF - B	2.8	2.8	2.7	2.9	2.8	2.8	2.8	2.8	2.8
NF - C	3.1	2.9	3.2	3.1	3.1	3.0	3.1	3.1	3.1
								Set average, kΩ-cm	2.8
								Set average with correction coefficient <sup>Note 3</sup> , kΩ-cm	2.8
								Chloride ion penetration	<b>High</b>

**Interpretation of Results:**

AASHTO TP 358-17, Table 1: Chloride Ion Penetration

Chloride Ion Penetration	100-mm x 200-mm (4-in. x 8-in.) Cylinder (kΩ-cm) a=1.5	150-mm x 300-mm (6-in. x 12-in.) Cylinder (kΩ-cm) a=1.5
High	<12	<9.5
Moderate	12-21	9.5-16.5
Low	21-37	16.5-29
Very Low	37-254	29-199
Negligible	>254	>199

**Notes:**

1. Specimens fabricated by CLTGroup on October 4, 2018 using mixture provided by others.
2. Readings were carried on SSD condition at 73°F.
3. Specimens were cured at 73°F/100% RH prior to testing. Correction coefficient was not applied as per the test method requirements.
4. Mixture proportions and fresh concrete properties shown on the provided ASTM C192 summary sheet.
5. This report may not be reproduced except in its entirety.



Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Date Reported: **October 11, 2018**

CTL Project No: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Analyst: **N/A**  
 Approved: **J. Pacheco**

**REPORT of ANALYSIS**

**AASHTO T 358**

Surface Resistivity Indication of Concrete's Ability to Resist Chloride Ion Penetration

Concrete Mixture	Date of fabrication	Date of testing	Age	Curing condition	Dimensions
NF	10/4/2018	10/11/2018	7	Moist Room	4x8"

Sample	Surface resistivity (SR), kΩ-cm								Average
	0°	90°	180°	270°	0°	90°	180°	270°	
NF - A	23.3	22.5	24.5	24.2	24.3	24.0	24.8	23.3	23.9
NF - B	23.6	24.6	24.0	26.0	25.0	24.8	24.2	23.1	24.4
NF - C	23.1	23.8	23.1	21.7	22.9	23.6	23.8	22.2	23.0
								Set average, kΩ-cm	23.8
								Set average with correction coefficient <sup>Note 3</sup> , kΩ-cm	23.8
								Chloride ion penetration	<b>Low</b>

**Interpretation of Results:**

AASHTO TP 358-17, Table 1: Chloride Ion Penetration

Chloride Ion Penetration	100-mm x 200-mm (4-in. x 8-in.) Cylinder (kΩ-cm) a=1.5	150-mm x 300-mm (6-in. x 12-in.) Cylinder (kΩ-cm) a=1.5
High	<12	<9.5
Moderate	12-21	9.5-16.5
Low	21-37	16.5-29
Very Low	37-254	29-199
Negligible	>254	>199

**Notes:**

1. Specimens fabricated by CLTGroup on October 4, 2018 using mixture provided by others.
2. Readings were carried on SSD condition at 73°F.
3. Specimens were cured at 73°F/100% RH prior to testing. Correction coefficient was not applied as per the test method requirements.
4. Mixture proportions and fresh concrete properties shown on the provided ASTM C192 summary sheet.
5. This report may not be reproduced except in its entirety.



Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Date Reported: **October 18, 2018**

CTL Project No: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Analyst: **N/A**  
 Approved: **J. Pacheco**

**REPORT of ANALYSIS**

**AASHTO T 358**

Surface Resistivity Indication of Concrete's Ability to Resist Chloride Ion Penetration

Concrete Mixture	Date of fabrication	Date of testing	Age	Curing condition	Dimensions
NF	10/4/2018	10/18/2018	14	Moist Room	4x8"

Sample	Surface resistivity (SR), kΩ-cm								Average
	0°	90°	180°	270°	0°	90°	180°	270°	
NF - A	38.0	39.2	38.7	38.2	38.1	36.1	39.1	39.6	38.4
NF - B	39.6	39.1	39.7	39.5	40.0	37.7	38.8	41.4	39.5
NF - C	36.8	37.1	39.1	37.4	37.7	37.3	38.2	36.6	37.5
								Set average, kΩ-cm	38.5
								Set average with correction coefficient <sup>Note 3</sup> , kΩ-cm	38.5
								Chloride ion penetration	<b>Very Low</b>

**Interpretation of Results:**

AASHTO TP 358-17, Table 1: Chloride Ion Penetration

Chloride Ion Penetration	100-mm x 200-mm (4-in. x 8-in.) Cylinder (kΩ-cm) a=1.5	150-mm x 300-mm (6-in. x 12-in.) Cylinder (kΩ-cm) a=1.5
High	<12	<9.5
Moderate	12-21	9.5-16.5
Low	21-37	16.5-29
Very Low	37-254	29-199
Negligible	>254	>199

**Notes:**

1. Specimens fabricated by CLTGroup on October 4, 2018 using mixture provided by others.
2. Readings were carried out on SSD condition at 73°F.
3. Specimens were cured at 73°F/100% RH prior to testing. Correction coefficient was not applied as per the test method requirements.
4. Mixture proportions and fresh concrete properties shown on the provided ASTM C192 summary sheet.
5. This report may not be reproduced except in its entirety.





Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Date Reported: **October 25, 2018**

CTL Project No: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Analyst: **N/A**  
 Approved: **J. Pacheco**

**REPORT of ANALYSIS**

**AASHTO T 358**

Surface Resistivity Indication of Concrete's Ability to Resist Chloride Ion Penetration

Concrete Mixture	Date of fabrication	Date of testing	Age	Curing condition	Dimensions
NF	10/4/2018	10/25/2018	21	Moist Room	4x8"

Sample	Surface resistivity (SR), kΩ-cm								Average
	0°	90°	180°	270°	0°	90°	180°	270°	
NF - A	55.8	58.5	52.1	50.0	54.6	58.0	52.2	56.2	54.7
NF - B	53.2	56.3	57.9	59.4	52.7	56.0	58.1	58.6	56.5
NF - C	54.5	54.1	56.8	57.1	52.9	52.5	56.5	56.8	55.2
Set average, kΩ-cm									55.5
Set average with correction coefficient <sup>Note 3</sup> , kΩ-cm									55.5
Chloride ion penetration									<b>Very Low</b>

**Interpretation of Results:**

AASHTO TP 358-17, Table 1: Chloride Ion Penetration

Chloride Ion Penetration	100-mm x 200-mm (4-in. x 8-in.) Cylinder (kΩ-cm) a=1.5	150-mm x 300-mm (6-in. x 12-in.) Cylinder (kΩ-cm) a=1.5
High	<12	<9.5
Moderate	12-21	9.5-16.5
Low	21-37	16.5-29
Very Low	37-254	29-199
Negligible	>254	>199

**Notes:**

1. Specimens fabricated by CLTGroup on October 4, 2018 using mixture provided by others.
2. Readings were carried on SSD condition at 73°F.
3. Specimens were cured at 73°F/100% RH prior to testing. Correction coefficient was not applied as per the test method requirements.
4. Mixture proportions and fresh concrete properties shown on the provided ASTM C192 summary sheet.
5. This report may not be reproduced except in its entirety.



Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Date Reported: **November 1, 2018**

CTL Project No: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Analyst: **N/A**  
 Approved: **J. Pacheco**

**REPORT of ANALYSIS**

**AASHTO T 358**

Surface Resistivity Indication of Concrete's Ability to Resist Chloride Ion Penetration

Concrete Mixture	Date of fabrication	Date of testing	Age	Curing condition	Dimensions
NF	10/4/2018	11/1/2018	28	Moist Room	4x8"

Sample	Surface resistivity (SR), kΩ-cm								Average
	0°	90°	180°	270°	0°	90°	180°	270°	
NF - A	84.0	83.7	84.1	89.3	80.6	89.1	82.4	90.8	85.5
NF - B	93.0	84.1	77.8	88.1	90.4	90.9	83.4	85.7	87.1
NF - C	84.6	78.2	72.3	89.8	94.2	84.2	88.2	89.7	85.2
Set average, kΩ-cm									85.9
Set average with correction coefficient <sup>Note 3</sup> , kΩ-cm									85.9
Chloride ion penetration									<b>Very Low</b>

**Interpretation of Results:**

AASHTO TP 358-17, Table 1: Chloride Ion Penetration

Chloride Ion Penetration	100-mm x 200-mm (4-in. x 8-in.) Cylinder (kΩ-cm) a=1.5	150-mm x 300-mm (6-in. x 12-in.) Cylinder (kΩ-cm) a=1.5
High	<12	<9.5
Moderate	12-21	9.5-16.5
Low	21-37	16.5-29
Very Low	37-254	29-199
Negligible	>254	>199

**Notes:**

1. Specimens fabricated by CLTGroup on October 4, 2018 using mixture provided by others.
2. Readings were carried on SSD condition at 73°F.
3. Specimens were cured at 73°F/100% RH prior to testing. Correction coefficient was not applied as per the test method requirements.
4. Mixture proportions and fresh concrete properties shown on the provided ASTM C192 summary sheet.
5. This report may not be reproduced except in its entirety.



Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Date Reported: **November 29, 2018**

CTL Project No: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Analyst: **N/A**  
 Approved: **J. Pacheco**

**REPORT of ANALYSIS**

**AASHTO T 358**

Surface Resistivity Indication of Concrete's Ability to Resist Chloride Ion Penetration

Concrete Mixture	Date of fabrication	Date of testing	Age	Curing condition	Dimensions
NF	10/4/2018	11/29/2018	56	Moist Room	4x8"

Sample	Surface resistivity (SR), kΩ-cm								Average
	0°	90°	180°	270°	0°	90°	180°	270°	
NF - A	230.0	227.0	231.0	238.0	237.0	236.0	216.0	228.0	230.4
NF - B	240.0	231.0	227.0	235.0	226.0	228.0	215.0	226.0	228.5
NF - C	224.0	236.0	230.0	215.0	221.0	234.0	226.0	218.0	225.5
								Set average, kΩ-cm	228.1
								Set average with correction coefficient <sup>Note 3</sup> , kΩ-cm	228.1
								Chloride ion penetration	<b>Very Low</b>

**Interpretation of Results:**

AASHTO TP 358-17, Table 1: Chloride Ion Penetration

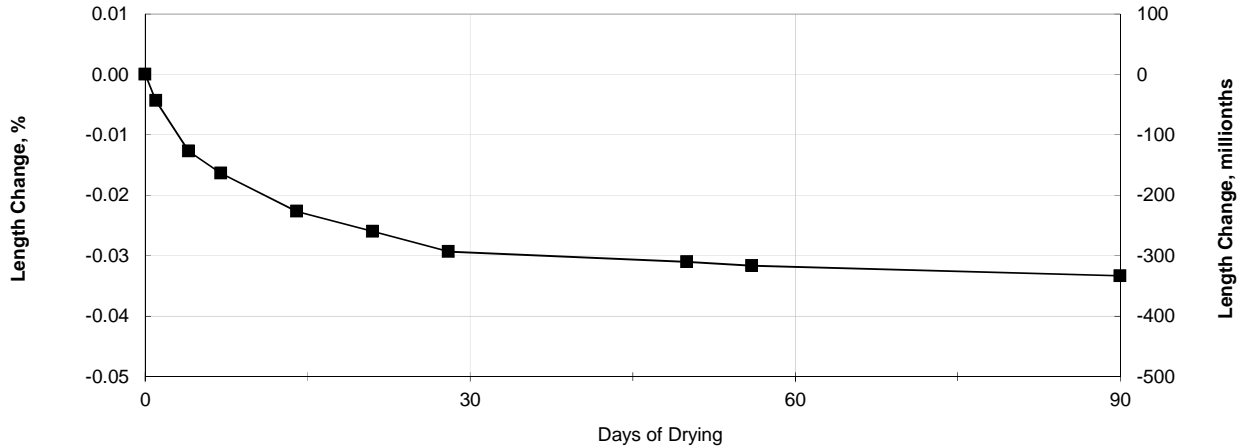
Chloride Ion Penetration	100-mm x 200-mm (4-in. x 8-in.) Cylinder (kΩ-cm) a=1.5	150-mm x 300-mm (6-in. x 12-in.) Cylinder (kΩ-cm) a=1.5
High	<12	<9.5
Moderate	12-21	9.5-16.5
Low	21-37	16.5-29
Very Low	37-254	29-199
Negligible	>254	>199

**Notes:**

- Specimens fabricated by CLTGroup on October 4, 2018 using mixture provided by others.
- Readings were carried on SSD condition at 73°F.
- Specimens were cured at 73°F/100% RH prior to testing. Correction coefficient was not applied as per the test method requirements.
- Mixture proportions and fresh concrete properties shown on the provided ASTM C192 summary sheet.
- This report may not be reproduced except in its entirety.

**AASHTO T 160 / ASTM C157/C157M**  
**Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete**

**Mixture ID: S5**



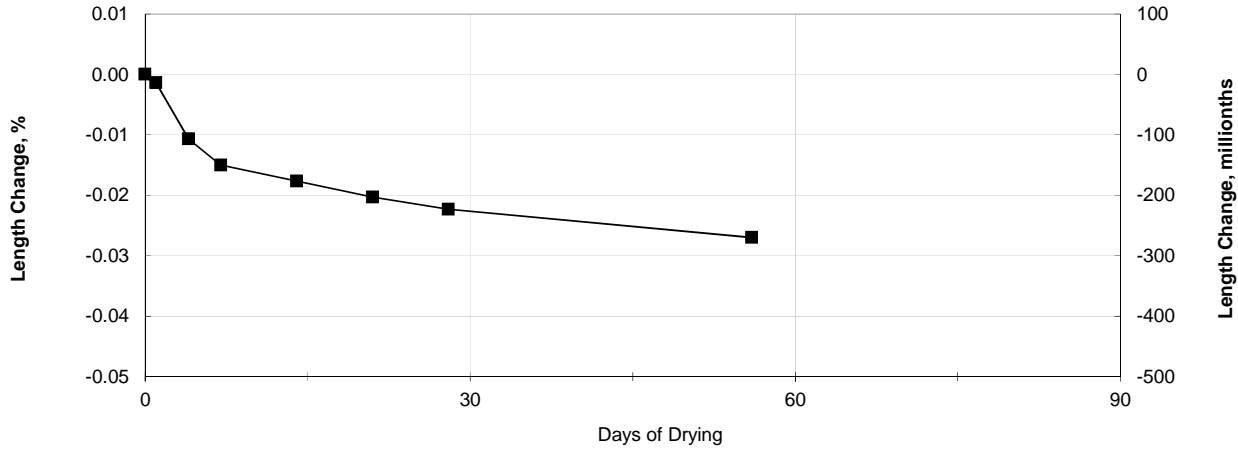
Date	Age, days	Days of Drying	Condition	Comparator Measurement, in.			Length Change, %			Average, %	Length Change, millionths			Average, millionths
				A	B	C	A	B	C	A	B	C		
10/5/2018	1	---	Initial	-0.0423	-0.0284	0.0512	-0.003	-0.003	-0.004	<b>-0.003</b>	-30	-30	-40	<b>-33</b>
10/11/2018	7	0	Start dry	-0.0420	-0.0281	0.0516	0.000	0.000	0.000	<b>0.000</b>	0	0	0	<b>0</b>
10/12/2018	8	1	Dry	-0.0425	-0.0285	0.0512	-0.005	-0.004	-0.004	<b>-0.004</b>	-50	-40	-40	<b>-43</b>
10/15/2018	11	4	Dry	-0.0432	-0.0294	0.0503	-0.012	-0.013	-0.013	<b>-0.013</b>	-120	-130	-130	<b>-127</b>
10/18/2018	14	7	Dry	-0.0436	-0.0297	0.0499	-0.016	-0.016	-0.017	<b>-0.016</b>	-160	-160	-170	<b>-163</b>
10/25/2018	21	14	Dry	-0.0443	-0.0303	0.0493	-0.023	-0.022	-0.023	<b>-0.023</b>	-230	-220	-230	<b>-227</b>
11/1/2018	28	21	Dry	-0.0447	-0.0306	0.0490	-0.027	-0.025	-0.026	<b>-0.026</b>	-270	-250	-260	<b>-260</b>
11/8/2018	35	28	Dry	-0.0450	-0.0309	0.0486	-0.030	-0.028	-0.030	<b>-0.029</b>	-300	-280	-300	<b>-293</b>
11/30/2018	57	50	Dry	-0.0451	-0.0311	0.0484	-0.031	-0.030	-0.032	<b>-0.031</b>	-310	-300	-320	<b>-310</b>
12/6/2018	63	56	Dry	-0.0452	-0.0312	0.0484	-0.032	-0.031	-0.032	<b>-0.032</b>	-320	-310	-320	<b>-317</b>
1/9/2019	97	90	Dry	-0.0454	-0.0313	0.0482	-0.034	-0.032	-0.034	<b>-0.033</b>	-340	-320	-340	<b>-333</b>

**Notes:**

- Specimens fabricated on October 04, 2018 by CTLGroup using provided mixture.
- Test specimens were 3x3x11.25-in. concrete prisms.
- After demolding, specimens were stored at 73°F ± 3°F in saturated lime water for 7 days, then stored in a controlled environment kept nominally at 73°F ± 3°F and 50 ± 4% RH for the remainder of the test.
- Length change calculated based on the length at the initiation of drying.
- This report might not be reproduced except in its entirety.

**AASHTO T 160 / ASTM C157/C157M**  
**Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete**

**Mixture ID: S5**



Date	Age, days	Days of Drying	Condition	Comparator Measurement, in.			Length Change, %			Average, %	Length Change, millionths			Average, millionths
				A	B	C	A	B	C	A	B	C		
10/5/2018	1	---	Initial	-0.0410	-0.0573	-0.0549	-0.005	-0.006	-0.007	<b>-0.006</b>	-50	-60	-70	<b>-60</b>
11/1/2018	28	0	Start dry	-0.0405	-0.0567	-0.0542	0.000	0.000	0.000	<b>0.000</b>	0	0	0	<b>0</b>
11/2/2018	29	1	Dry	-0.0407	-0.0568	-0.0543	-0.002	-0.001	-0.001	<b>-0.001</b>	-20	-10	-10	<b>-13</b>
11/5/2018	32	4	Dry	-0.0416	-0.0578	-0.0552	-0.011	-0.011	-0.010	<b>-0.011</b>	-110	-110	-100	<b>-107</b>
11/8/2018	35	7	Dry	-0.0421	-0.0582	-0.0556	-0.016	-0.015	-0.014	<b>-0.015</b>	-160	-150	-140	<b>-150</b>
11/15/2018	42	14	Dry	-0.0423	-0.0585	-0.0559	-0.018	-0.018	-0.017	<b>-0.018</b>	-180	-180	-170	<b>-177</b>
11/22/2018	49	21	Dry	-0.0426	-0.0587	-0.0562	-0.021	-0.020	-0.020	<b>-0.020</b>	-210	-200	-200	<b>-203</b>
11/29/2018	56	28	Dry	-0.0428	-0.0589	-0.0564	-0.023	-0.022	-0.022	<b>-0.022</b>	-230	-220	-220	<b>-223</b>
12/27/2018	84	56	Dry	-0.0432	-0.0594	-0.0569	-0.027	-0.027	-0.027	<b>-0.027</b>	-270	-270	-270	<b>-270</b>

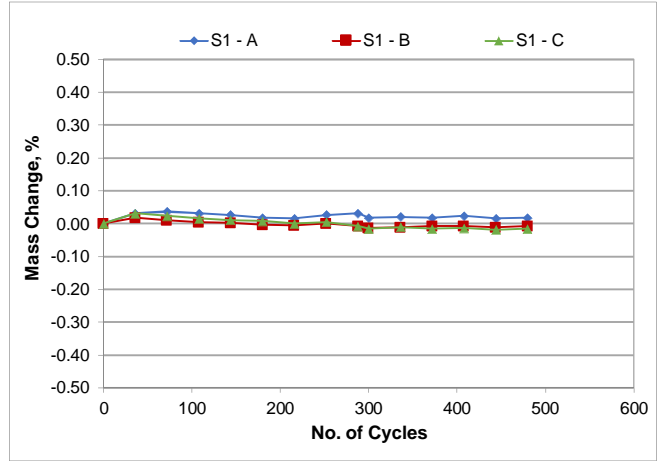
**Notes:**

- Specimens fabricated on October 04, 2018 by CTLGroup using provided mixture.
- Test specimens were 3x3x11.25-in. concrete prisms.
- After demolding, specimens were stored at 73°F ± 3°F in saturated lime water for 28 days, then stored in a controlled environment kept nominally at 73°F ± 3°F and 50 ± 4% RH for the remainder of the test.  
Length change calculated based on the length at the initiation of drying.
- This report might not be reproduced except in its entirety.

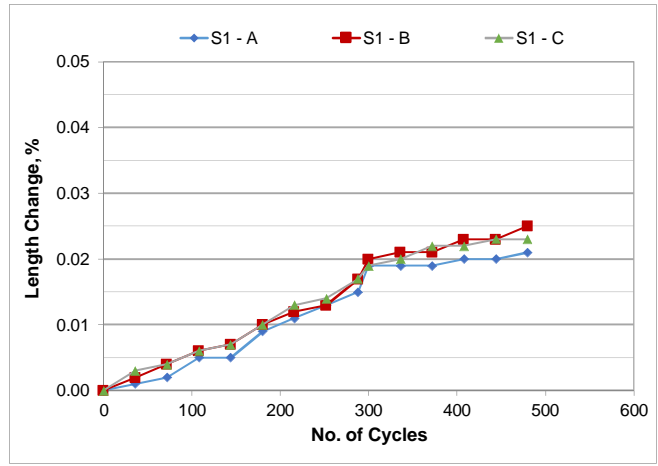
**ASTM C666, Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing  
 Procedure A, Freezing and Thawing in Water**

**Mixture ID: S1**

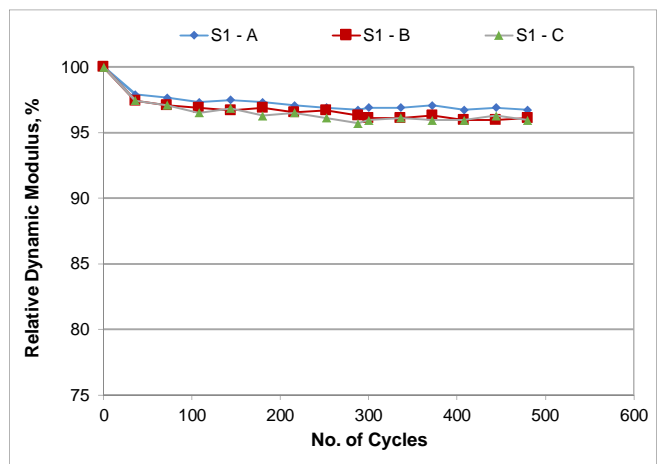
Freeze-Thaw Cycles	Mass Change, %			
	S1 - A	S1 - B	S1 - C	Average
Initial Mass	3823.4g	3814.9g	3800.7g	--
0	0.00	0.00	0.00	0.00
36	0.03	0.02	0.03	0.03
72	0.04	0.01	0.02	0.02
108	0.03	0.01	0.02	0.02
144	0.03	0.00	0.01	0.01
180	0.02	0.00	0.01	0.01
216	0.02	-0.01	0.00	0.00
252	0.03	0.00	0.01	0.01
288	0.03	-0.01	-0.01	0.01
300	0.02	-0.01	-0.02	0.00
336	0.02	-0.01	-0.01	0.00
372	0.02	-0.01	-0.02	0.00
408	0.02	-0.01	-0.01	0.00
444	0.02	-0.01	-0.02	0.00
480	0.02	-0.01	-0.02	0.00
516		<i>pending</i>		
552		<i>pending</i>		
588		<i>pending</i>		
600		<i>pending</i>		



Freeze-Thaw Cycles	Length Change, %			
	S1 - A	S1 - B	S1 - C	Average
0	0.000	0.000	0.000	0.000
36	0.001	0.002	0.003	0.002
72	0.002	0.004	0.004	0.003
108	0.005	0.006	0.006	0.006
144	0.005	0.007	0.007	0.006
180	0.009	0.010	0.010	0.010
216	0.011	0.012	0.013	0.012
252	0.013	0.013	0.014	0.013
288	0.015	0.017	0.017	0.016
300	0.019	0.020	0.019	0.019
336	0.02	0.02	0.02	0.02
372	0.02	0.02	0.02	0.02
408	0.02	0.02	0.02	0.02
444	0.02	0.02	0.02	0.02
480	0.02	0.03	0.02	0.02
516		<i>pending</i>		
552		<i>pending</i>		
588		<i>pending</i>		
600		<i>pending</i>		



Freeze-Thaw Cycles	Relative Dynamic Modulus, %			
	S1 - A	S1 - B	S1 - C	Average
0	100	100	100	100
36	98	97	97	98
72	98	97	97	97
108	97	97	97	97
144	97	97	97	97
180	97	97	96	97
216	97	97	97	97
252	97	97	96	97
288	97	96	96	96
300	97	96	96	96
336	97	96	96	96
372	97	96	96	96
408	97	96	96	96
444	97	96	96	96
480	97	96	96	96
516		<i>pending</i>		
552		<i>pending</i>		
588		<i>pending</i>		
600		<i>pending</i>		



**Notes:**

1. Samples cast by CTLGroup using concrete mixture provided by others.
2. Samples cured in saturated limewater at 73°F for 14 days prior to testing.
3. Test specimens measured approximately 3"x3"x11" at 0 cycles.
4. A negative mass change indicates mass loss; a positive mass change indicates a mass gain.
5. The relative dynamic modulus was determined by the transverse frequency method of ASTM C215, Section 9.
6. This report may not be reproduced except in its entirety.

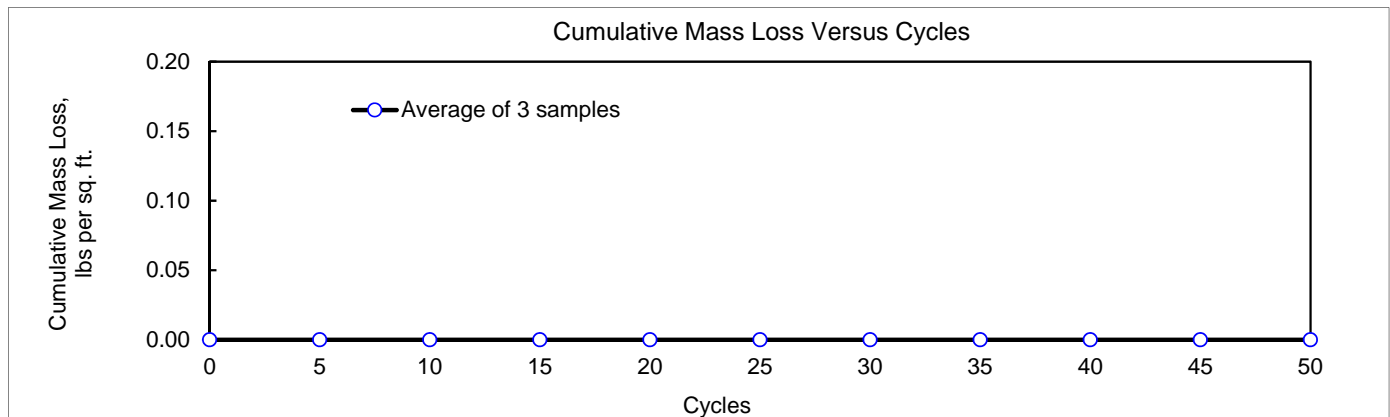
Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Date Reported: **January 22, 2019**

CTL Project No: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Technician: **W. Demharter**  
 Approved: **B. Birch**

**ASTM C672 - Standard Test Method for Scaling Resistance of  
 Concrete Surfaces Exposed to Deicing Chemicals**

**Mixture ID: 'S2'**

Cycle	Cumulative Mass Loss, lbs per sq. ft.				Visual Scale Rating			
	S2-A	S2-B	S2-C	Ave	S2-A	S2-B	S2-C	Ave
0	0.00	0.00	0.00	0.00	0	0	0	0
5	0.00	0.00	0.00	0.00	0	0	0	0
10	0.00	0.00	0.00	0.00	0	0	0	0
15	0.00	0.00	0.00	0.00	0	0	0	0
20	0.00	0.00	0.00	0.00	0	0	0	0
25	0.00	0.00	0.00	0.00	0	0	0	0
30	0.00	0.00	0.00	0.00	0	0	0	0
35	0.00	0.00	0.00	0.00	0	0	0	0
40	0.00	0.00	0.00	0.00	0	0	0	0
45	0.00	0.00	0.00	0.00	0	0	0	0
50	0.00	0.00	0.00	0.00	0	0	0	0



**Notes:**

1. Specimens fabricated on October 4, 2018 by CTLGroup using provided concrete mixture.
2. At 24 hours of age, test specimens were removed from their molds and transferred to a lime water tank kept at  $73.5 \pm 3.5^\circ\text{F}$  for 14 days, followed by curing in an environment maintained at  $73.5 \pm 3.5^\circ\text{F}$  and 50% RH for 14 days.
3. 4%  $\text{CaCl}_2$  was used as the deicer solution.
4. These results specifically refer to the submitted samples.

Rating / Condition of Surface

- 0 - No scaling
- 1 - Very slight scaling (1/8 in. depth max, no coarse aggregate visible)
- 2 - Slight to moderate scaling
- 3 - Moderate scaling (some coarse aggregate visible)
- 4 - Moderate to severe scaling
- 5 - Severe scaling (coarse aggregate visible over entire surface)

Client: **AllSite Contracting**  
 Project: **Cor-Tuf UHPC**  
 Contact: **Rich Burgess**  
 Date Reported: **January 22, 2019**

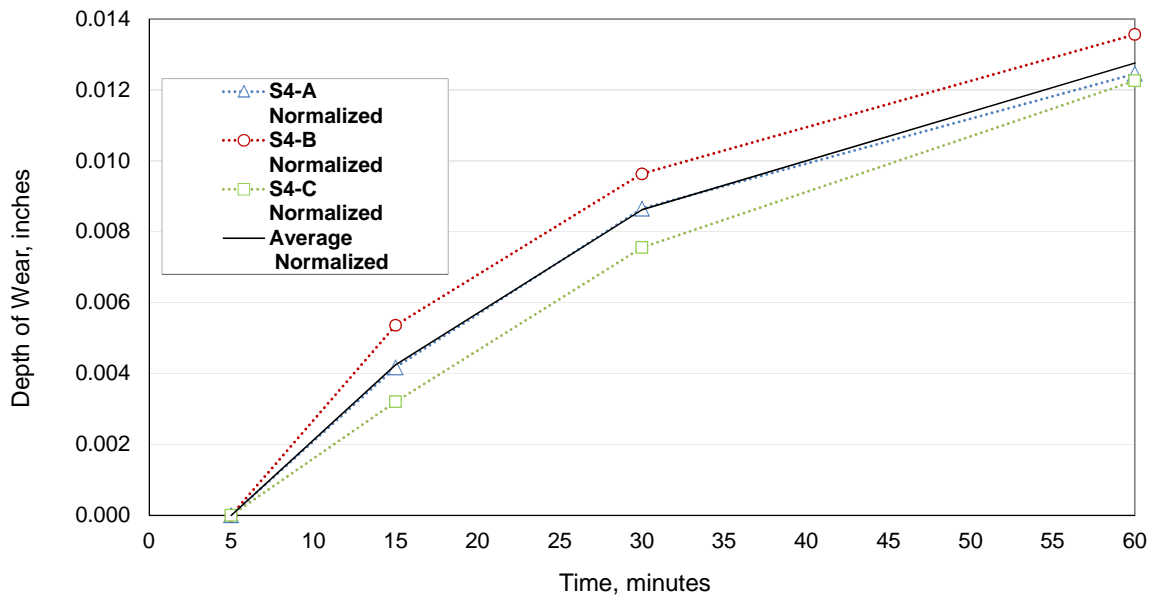
CTL Project No: **059301**  
 CTL Project Mgr.: **J. Vosahlik**  
 Analyst: **B. Szczerowski**  
 Approved: **B. Birch**

**Test Results of ASTM C779 Abrasion Resistance  
 Procedure B - Dressing Wheels**

Mixture ID: **S4 - cast 10/4/2018**  
 Testing performed **10/30/2018**

**Depth of Wear, inches**

<u>Sample ID</u>	<u>0 minutes</u>	<u>5 minutes</u>	<u>15 minutes</u>	<u>30 minutes</u>	<u>60 minutes</u>
S4-A Total	0.000	0.002	0.006	0.011	0.015
S4-A Normalized	n/a	0.000	0.004	0.009	0.012
S4-B Total	0.000	0.005	0.010	0.014	0.018
S4-B Normalized	n/a	0.000	0.005	0.010	0.014
S4-C Total	0.000	0.006	0.010	0.014	0.019
S4-C Normalized	n/a	0.000	0.003	0.008	0.012
Average Total	0.000	0.004	0.009	0.013	0.017
Average Normalized	n/a	0.000	0.004	0.009	0.013



**Notes:**

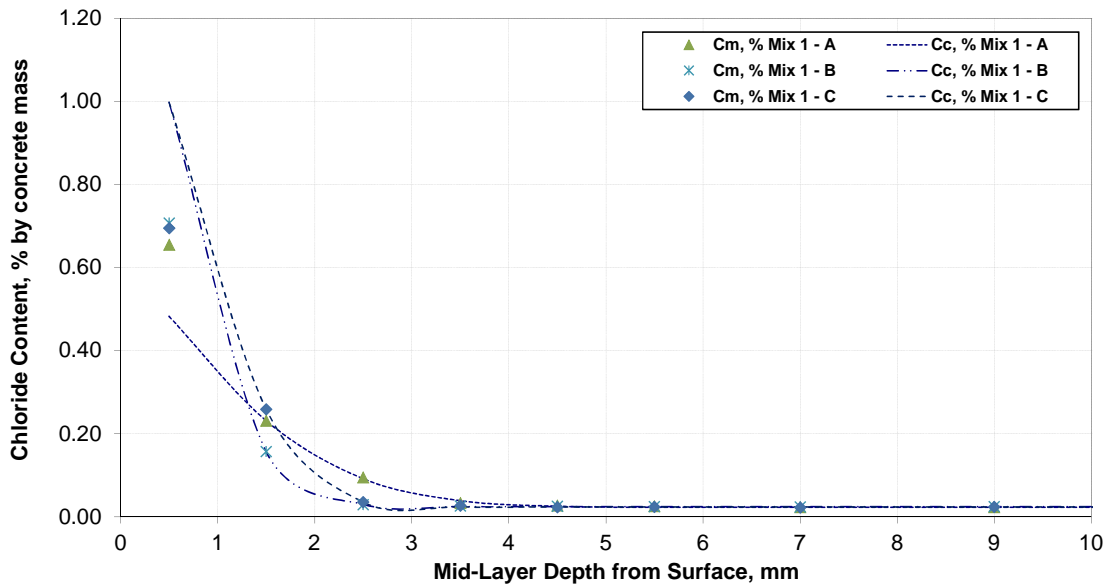
1. Specimens fabricated by CTLGroup on October 4, 2018 using provided concrete mixture.
2. Mixture proportions reported on a separate C192 sheet.
3. LA abrasion testing was not conducted.
4. This report may not be reproduced except in its entirety.



**ASTM C1556 Standard Test Method for Determining the Apparent Chloride Diffusion Coefficient of Cementitious Mixtures by Bulk Diffusion**

**Mixture S5 - w/cm < 0.25**

Mid-Layer Depth, mm	Cm, % Mix 1 - A	Cm, % Mix 1 - B	Cm, % Mix 1 - C	Cc, % Mix 1 - A	Cc, % Mix 1 - B	Cc, % Mix 1 - C
0.5	0.655	0.707	0.694	0.483	0.998	0.998
1.5	0.231	0.157	0.259	0.232	0.157	0.259
2.5	0.095	0.029	0.035	0.092	0.030	0.036
3.5	0.034	0.026	0.027	0.039	0.025	0.024
4.5	0.027	0.026	0.023	0.026	0.025	0.024
5.5	0.026	0.025	0.024	0.023	0.025	0.024
7.0	0.024	0.024	0.023	0.023	0.025	0.024
9.0	0.023	0.025	0.024	0.023	0.025	0.024
55.0	0.027	0.027	0.026	0.023	0.025	0.024
<b>Exposure time, t, days</b>				35	35	35
<b>Initial Chloride Content, Ci, %</b>				0.023	0.025	0.024
<b>Surface Chloride Content, Cs, %</b>				0.64	1.78	2.75
<b>Apparent Diffusion Coefficient, Da, m<sup>2</sup>/s (x10<sup>-12</sup>)</b>				0.410	0.118	0.126
<b>Apparent Diffusion Coefficient, Da, in<sup>2</sup>/yr</b>				0.02	0.01	0.01



Notes:

1. Samples fabricated by CTLGroup using provided mixture on October 4, 2018.
2. Samples stored in a saturated limewater at 73°F until testing preparations.
3. Samples were exposed to a 165 ± 1 g/l NaCl solution for 35 days.
4. Concrete mixture was ultra-high performance concrete (UHPC). Mixture proportions are proprietary.
5. Acid-soluble chloride concentrations determined per ASTM C1152.
6. This report may not be reproduced except in its entirety.



Client: **AllSite Contracting**  
Project: **Cor-Tuf UHPC**  
Contact: **Rich Burgess**  
Date Reported: **November 3, 2018**

CTL Project No: **059301**  
CTL Project Mgr.: **J. Vosahlik**  
Approved: **J. Pacheco**  
Date Analyzed: **November 3, 2018**

**REPORT of ANALYSIS**

**ASTM C1202 (AASHTO T277)**

Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration

<u>Sample ID</u>	<u>Cast Date</u>	<u>Test Date</u>	<u>Age on Test Date</u>	<u>Charge Passed (coulombs)</u>	<u>Chloride Ion Penetrability</u>
NF - A	10/4/2018	11/3/2018	30	393	Very Low
NF - B	10/4/2018	11/3/2018	30	393	Very Low
NF - C	10/4/2018	11/3/2018	30	399	Very Low
<b>Average</b>				<b>395</b>	<b>Very Low</b>

Interpretation of results:

ASTM C1202 - 18, Table X1.1: Chloride Ion Penetrability Based on Charge Passed

<u>Charge Passed (coulombs)</u>	<u>Chloride Ion Penetrability</u>
>4000	High
2000 - 4000	Moderate
1000 - 2000	Low
100 - 1000	Very Low
< 100	Negligible

Notes:

1. Specimens fabricated by CTLGroup using provided mixture on October 4, 2018.
2. One 4x2-inch nominal disk was saw-cut from the center of each 4x8-inch concrete cylinder.
3. Specimens were stored in a 73°F limewater bath until testing.
4. This analysis specifically represents the submitted samples.
5. Concrete mixture proportions were not provided by the client.
6. This report may not be reproduced except in its entirety.



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Client:	<b>Allsite Contracting, Manassas, VA</b>	CTL Project No:	<b>059301</b>
Project:	<b>Cor-Tuf UHPC Specimens</b>	CTL Proj. Mgr.:	<b>J. Vosahlik</b>
Contact:	<b>Rich Burgess</b>	Analyst:	<b>M. Strow</b>
Report Date:	<b>December 5, 2018</b>	Approved:	<b>J. Randolph</b>

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**REPORT OF AIR-VOID SYSTEM ANALYSIS  
ASTM C457 Modified Point-Count Method (Procedure B)**

<b>Client Sample ID</b>	<b>Area Tested (in.<sup>2</sup>)</b>	<b>Length of Traverse (in.)</b>	<b>Number of Points</b>	<b>Total Air Content (%)</b>	<b>Spacing Factor (in.)</b>	<b>Specific Surface (in.<sup>2</sup>/in.<sup>3</sup>)</b>	<b>No. Voids/ Inch</b>	<b>Paste Content (%)</b>	<b>Paste-Air Ratio</b>
S2	12.5	55.2	1001	4.6	0.035	218	2.5	68.6	14.93

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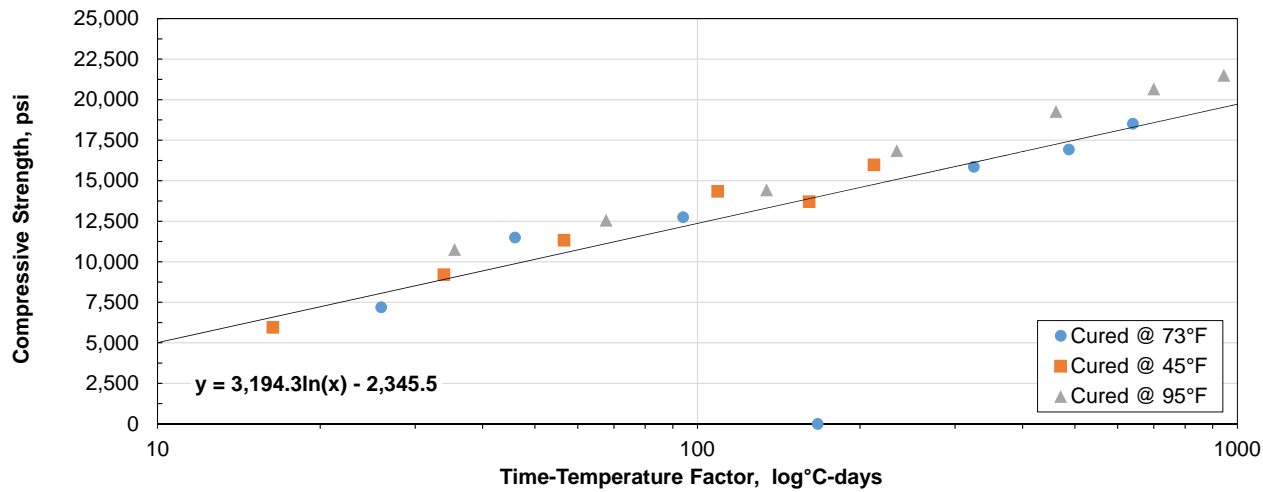
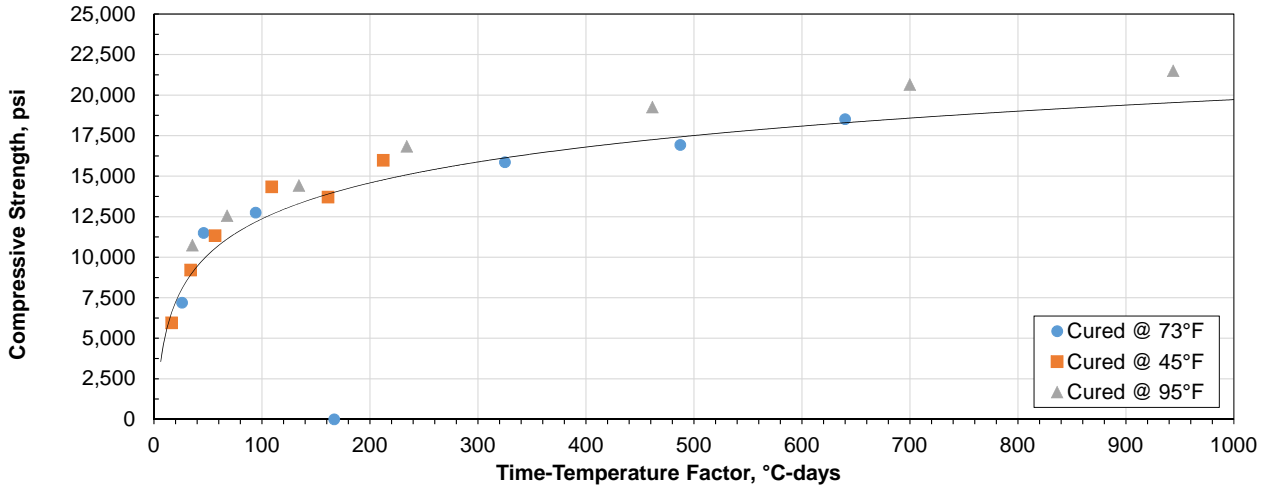
Notes:

1. Specimen cast by CTLGroup on October 4, 2018.
  2. Orientation and Position of Cut Surface: The cylinder was cut in half longitudinally and one half was lapped for testing.
  3. Magnification during Test: 100x.
  4. Results refer specifically to the sample submitted.
  5. Paste content was calculated from the data collected from the point-count analysis.
  6. For additional information consult ASTM C457-16, Appendix (X1. Interpretation of Results).
  7. This report may not be reproduced except in its entirety.
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Client:	<b>AllSite Contracting</b>	CTLGroup Project:	<b>059301</b>
Project:	<b>Cor-Tuf UHPC</b>	Project Manager:	<b>J. Vosahlik</b>
Contact:	<b>Rich Burgess</b>	Technician:	<b>W. Demharter</b>
Report Date:	<b>January 22, 2019</b>	Approved by:	<b>J. Pacheco</b>

**ASTM C 1074 Standard Practice for Estimating Concrete Strength by the Maturity Method**

Mixture ID:	S2	S1	S1
Fabricated:	10/4/2018	10/4/2018	10/4/2018
Curing Conditions:	45°F/limewater	73°F/100% RH	95°F/limewater
Age, days	Compressive Strength, psi		
1	--	7,200	10,740
2	5,940	11,500	12,550
4	9,200	12,750	14,420
7	11,320	0	16,840
14	14,330	15,860	19,260
21	13,700	16,930	20,650
28	15,970	18,520	21,500



- Notes:**
- The maturity relationship was determined from the average of two specimens with temperature loggers and corresponding compressive strength measurements. Temperature recording at 10-minute intervals since casting.
  - Test specimens were cast by CTLGroup using provided concrete mixture.
  - Maturity relationship was developed using the Time-Temperature Factor approach. Datum temperature of 0°C was used for the calculations.
  - Test specimens were cured in three different environments.
  - Compressive strength test reports provided separately.
  - This report may not be reproduced except in its entirety.