ASH GROVE CEMENT COMPANY

PO Box 38069 HWY 132
Leamington, Utah 84638
Phone: 435-857-1212
FAX: 435-857-1288

Type II-V

Production Period: January 1 thru January 31, 2017 **Date: 2/13/2017**

The following information is based on average test data during the production period. The data is typical of cement shipped from the Leamington, Utah plant. Individual shipments may vary.

STANDARD REQUIREMENTS
ASTM C150-16, Tables 1 and 3

CHEMICAL

Item	A.S.T.M. Test Method	Spec. Limit	Test Result
SiO_2 (%)	C114	*A*	21.80
Al_2O_3 (%)	C114	6.0 max	3.88
Fe_2O_3 (%)	C114	6.0 max	3.60
CaO (%)	C114	*A*	64.94
MgO (%)	C114	6.0 max	3.03
SO_3 (%)	C114	*D*	2.80
Loss on ignition (%)	C114	3.5 max	2.38
Na_2O (%)	C114	*A*	0.06
K_2O (%)	C114	*A*	0.76
Insoluble Residue (%)	C114	1.5 max	0.19
CO_2 (%)	C114	*A*	1.39
Limestone (%)	C114	5.0 max	3.5
$CaCO_3$ in limestone (%)	C114	70 min	90.5
Potential compounds (%)			
C_3S	C114	*A*	54
C_2S	C114	*A*	21
C_3A	C114	S max	4
C_4AF	C114	*A*	11
$C_4AF + 2(C_3A)$	C114	25 max	20

PHYSICAL

Item	A.S.T.M. Test Method	Spec. Limit	Test Result
Air content of mortar (volume %)	C185	12 max	8
Fineness (cm^2/g):			
Air permeability	C204	2600 min	4290
Autoclave expansion (%)	C151	0.80 max	0.08
Compressive strength (psi)			
1 Day	C109	*A*	2273
3 Days	C109	1450 min	4028
7 Days	C109	2470 min	5044
28 Days	C109	3050 min	*C*
Time of setting (minutes) (Vicat)			
Initial: Not less than	C191	45	101
Not more than		375	101
Mortar Bar Expansion	C1038	0.020 max	0.009

OPTIONAL REQUIREMENTS
ASTM C150-16, Tables 2 and 4

CHEMICAL

Item	A.S.T.M. Test Method	Spec. Limit	Test Result
Equivalent alkalies (%)	C114	0.60	0.56

A = Not applicable.
B = Limit not specified by purchaser, test result provided for information only.
C = Test results for this period not available.
D = C 1038 expansion in water does not exceed 0.020% at 14 days

PHYSICAL

Item	A.S.T.M. Test Method	Spec. Limit	Test Result
False set (%)	C451	S0 min	78
Heat of hydration (kJ /kg)			
7 days	C186	*A*	*C*
Compressive strength (psi)			
28 Days	C109	4060	*C*

We certify that the above described cement, at the time of shipment, meets the chemical and physical requirements of ASTM C1S0/C1S0M-16 (Types II & V) or (other)_____specification.

Signature: Heath Hall

Title: Chief Chemist

ASH GROVE CEMENT COMPANY

PO Box 38069 HWY 132
Leamington, Utah 84638
Phone: 435-857-1212
FAX: 435-857-1288

Type II-V

Production Period: January 1 thru January 31, 2017 **Date: 2/13/2017**

The following information is based on average test data during the production period. The data is typical of cement shipped from the Leamington, Utah

Additional Data

Inorganic Processing Addition Data	
Type	Limestone
Amount(%)	3.49
SiO_2 (%)	6.82
Al_2O_3 (%)	0.63
Fe_2O_3 (%)	1.24
CaO (%)	50.37
SO_3 (%)	0.12

Base Cement Phase Composition	
C_3S	56
C_2S	22
C_3A	4
C_4AF	11

Signature: Heath Hall

Title: Chief Chemist

3990 E Concours Street
Suite 200
Ontario, CA 91764
Telephone (909) 974-5469
FAX (909) 974-5525

CEMENT MILL TEST REPORT

Cement Identified as: **Date:** 12/8/2017

Plant: Cemex Construction Materials Pacific LLC

Location: Victorville, CA **Prod dates:** **Beginning:** 11/24/2017 **Ending:** 11/30/2017 **Ref. No** 43077

STANDARD CHEMICAL REQUIREMENTS (ASTM C114)	ASTM C150 / AASHTO M 85 SPECIFICATIONS	TYPE I	TYPE II	TYPE V	TEST RESULTS
Silicon Dioxide (SiO2), %	Minimum	----	----	----	20.5
Aluminum Oxide (Al2O3), %	Maximum	----	6.0	----	4.1
Ferric Oxide (Fe2O3), %	Maximum	----	6.0	----	3.7
Calcium Oxide (CaO), %		----	----	----	63.0
Magnesium Oxide (MgO), %	Maximum	6.0	6.0	6.0	3.9
Sulfur Trioxide (SO3), % **	Maximum	3.0	3.0	2.3	2.8
Loss on Ignition (LOI), %	Maximum	3.5	3.5	3.5	2.1
Insoluble Residue, %	Maximum	1.5	1.5	1.5	0.77
Sodium Oxide (Na2O), % *		----	----	----	0.26
Potassium Oxide (K2O), % *		----	----	----	0.50
Equivalent Alkalies (Na2O+.658K2O), %	Maximum	0.60	0.60	0.60	0.59
CO2(%)		----	----	----	1.0
Limestone (%)	Maximum	5.0	5.0	5.0	2.7
CaCO3 in limestone	Minimum	70.0	70.0	70.0	85.3
Inorganic addition	Maximum	5.0	5.0	5.0	1.3
Tricalcium Silicate (C3S), %	Maximum	----	----	----	56
Dicalcium Silicate (C2S), %		----	----	----	16
Tricalcium Aluminate (C3A), %	Maximum	----	8	5	5
Tetracalcium Aluminoferrite (C4AF), %		----	----	----	11
Heat Index (C3S + 4.75C3A)	Maximum		100		77
(C4AF + 2C3A) or (C4AF + C2F), %	Maximum	----	----	25	20
PHYSICAL REQUIREMENTS					
Heat of Hydration (ASTM C1702)	Informational data only				
7 days, kj/kg (cal/g)	Most recent value				310(74.2)
(ASTM C204) Blaine Fineness, cm^2/gm	Minimum	2600	2600	2600	4230
(ASTM C430) -325 Mesh, %		----	----	----	99
(ASTM C191) Time of Setting (Vicat)					
Initial Set, minutes	Minimum / Maximum	45 / 375	45 / 375	45 / 375	115
Final Set, minutes		---	---	---	332
(ASTM C451) False Set, %	Minimum	50	50	50	87
(ASTM C185) Air Content, %	Maximum	12	12	12	4.8
(ASTM C151) Autoclave Expansion, %	Maximum	0.80	0.80	0.80	0.09
(ASTM C87) Normal Consistency, %		----	----	----	26
(ASTM C1038) Expansion in Water %	Maximum	0.020	0.020	0.020	0.003
(ASTM C109) Compressive Strength, psi (MPa)					
1 Day		----	----	----	2040(14.1)
3 Day	Minimum	1740(12.0)	1450(10.0)	1160(8.0)	3870(26.7)
7 Day		2760(19.0)	2470(17.0)	2180(15.0)	5020(34.6)
28 Day (strength for Ref. No. 43049)	Minimum			3050(21.0)	6310(43.5)

* Na2O and K2O determined by ASTM C114-15 section 4 and AASHTO T105-16 Section 3

*** The performance of CEMEX Type II, Type V has proven to be improved with sulfur trioxide levels in excess of the 2.3% limit for Type V. Note D in ASTM C150 allows for additional sulfate, provided expansion as measured by ASTM C1038 does not exceed 0.020%.*

CEMEX hereby certifies that this cement meets or exceeds the chemical and physical Specifications of:

ASTM C150-16 Type I, Type II, and Type V Low Alkali portland cements
ASTM C1157-11 Type GU Hydraulic Cement
AASHTO M 85-16 Type I, Type II, and Type V Low Alkali portland cements
CalTrans, Section 90-2.01 T II Modified and Type V (2006)
CalTrans, Section 90-1.02B (2) (2010-2015)
Arizona DOT Standard Specification 1006-2.01 Hydraulic Cement
Nevada DOT Specification 701.03.01
C465 qualification data will be made available upon request

By:

Quality Control Manager
CEMEX - Victorville Cement Plant
16888 North "E" St., Victorville, CA 92394

3990 E Concours Street
Suite 200
Ontario, CA 91764
Telephone (909) 974-5469
FAX (909) 974-5525

CEMENT MILL TEST REPORT

Cement Identified as: **Date:** **12/8/2017**

Plant: Cemex Construction Materials Pacific LLC
Location: Victorville, CA
Production Dates:

Beginning	**November 24, 2017**	**Reference No.**	**43077**
Ending	**November 30, 2017**		

Additional Data

Inorganic and Limestone Addition

Inorganic Addition		Limestone Addition	
Amount (%)	1.34	Amount (%)	2.7
SiO2 (%)	10.02	SiO2 (%)	9.34
Al2O3 (%)	3.16	Al2O3 (%)	1.72
Fe2O3 (%)	2.11	Fe2O3 (%)	0.55
CaO (%)	42.78	CaO (%)	47.16
SO3 (%)	0.28	SO3 (%)	0.04

Base Cement Phase Composition

C3S (%)	58
C2S (%)	16
C3A (%)	5
C4AF (%)	12

We certify that the above described data represents the materials used in the cement manufacured during the production period indicated

By:
Quality Control Manager
CEMEX - Victorville Cement Plant
16888 North "E" St., Victorville, CA 92394

PORTLAND CEMENT
CERTIFICATE OF COMPLIANCE

CERTIFICATION OF CEMENT SHIPPED FROM: **CEMEX Construction Materials Pacific LLC**
Victorville, CA

CEMENT TYPE: **Portland Cement Type II and Type V**

I hereby certify that all of the cement shipped from the above location complies with all applicable requirements of the following specifications:

ASTM C1157-11 Type GU Hydraulic Cement,
ASTM C150-16 Type I, Type II, and Type V,
AASHTO M 85 Type I, Type II, and Type V,
Arizona Department of Transportation
Standard Specification 1006-2.01 Hydraulic Cement,
California Department of Transportation
Standard Specification Section 90-1.02B(2) Portland Cement (2010-2015)
and
Nevada DOT Specification 701.03.01

Reference Number: 43077

Date Shipped: 11/24/2017 through 11/30/2017

Quantity: As Required

James W. Martin
Quality Control Manager

CEMEX – Victorville Plant, 16888 North E. Street, Victorville, CA 92394 Ph: (760) 381-7632

PORTLAND CEMENT
CERTIFICATE OF COMPLIANCE

CERTIFICATION OF CEMENT SHIPPED FROM: **CEMEX Construction Materials Pacific LLC**
Victorville, CA

CEMENT TYPE: **Portland Cement Type II and Type V**

I hereby certify that all of the cement shipped from the above location complies with all applicable requirements of the following specifications:

ASTM C1157-11 Type GU Hydraulic Cement,
ASTM C150-16 Type I, Type II, and Type V,
AASHTO M 85 Type I, Type II, and Type V,
Arizona Department of Transportation
Standard Specification 1006-2.01 Hydraulic Cement,
California Department of Transportation
Standard Specification Section 90-1.02B(2) Portland Cement (2010-2015)
and
Nevada DOT Specification 701.03.01

Reference Number: 43070

Date Shipped: 11/17/2017 through 11/23/2017

Quantity: As Required

James W. Martin
Quality Control Manager

CEMEX – Victorville Plant, 16888 North E. Street, Victorville, CA 92394 Ph: (760) 381-7632

3990 E Concours Street
Suite 200
Ontario, CA 91764
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FAX (909) 974-5525

CEMENT MILL TEST REPORT

Cement Identified as: **Date:** 12/1/2017

Plant: Cemex Construction Materials Pacific LLC

Location: Victorville, CA **Prod dates:** **Beginning:** 11/17/2017

Ending: 11/23/2017 **Ref. No** 43070

STANDARD CHEMICAL REQUIREMENTS (ASTM C114)	ASTM C150 / AASHTO M 85 SPECIFICATIONS	TYPE I	TYPE II	TYPE V	TEST RESULTS
Silicon Dioxide (SiO2), %	Minimum	----	----	----	20.5
Aluminum Oxide (Al2O3), %	Maximum	----	6.0	----	4.0
Ferric Oxide (Fe2O3), %	Maximum	----	6.0	----	3.6
Calcium Oxide (CaO), %		----	----	----	62.9
Magnesium Oxide (MgO), %	Maximum	6.0	6.0	6.0	4.0
Sulfur Trioxide (SO3), % **	Maximum	3.0	3.0	2.3	2.9
Loss on Ignition (LOI), %	Maximum	3.5	3.5	3.5	2.2
Insoluble Residue, %	Maximum	1.5	1.5	1.5	0.68
Sodium Oxide (Na2O), % *		----	----	----	0.21
Potassium Oxide (K2O), % *		----	----	----	0.53
Equivalent Alkalies (Na2O+.658K2O), %	Maximum	0.60	0.60	0.60	0.56
CO2(%)		----	----	----	1.2
Limestone (%)	Maximum	5.0	5.0	5.0	2.9
CaCO3 in limestone	Minimum	70.0	70.0	70.0	85.3
Inorganic addition	Maximum	5.0	5.0	5.0	1.2
Tricalcium Silicate (C3S), %	Maximum	----	----	----	56
Dicalcium Silicate (C2S), %		----	----	----	15
Tricalcium Aluminate (C3A), %	Maximum	----	8	5	4
Tetracalcium Aluminoferrite (C4AF), %		----	----	----	11
Heat Index (C3S + 4.75C3A)	Maximum		100		77
(C4AF + 2C3A) or (C4AF + C2F), %	Maximum	----	----	25	19
PHYSICAL REQUIREMENTS					
Heat of Hydration (ASTM C1702)	Informational data only				
7 days, kj/kg (cal/g)	Most recent value				310(74.2)
(ASTM C204) Blaine Fineness, cm^2/gm	Minimum	2600	2600	2600	4244
(ASTM C430) -325 Mesh, %		----	----	----	99
(ASTM C191) Time of Setting (Vicat)					
Initial Set, minutes	Minimum / Maximum	45 / 375	45 / 375	45 / 375	113
Final Set, minutes		---	---	---	328
(ASTM C451) False Set, %	Minimum	50	50	50	88
(ASTM C185) Air Content, %	Maximum	12	12	12	4.6
(ASTM C151) Autoclave Expansion, %	Maximum	0.80	0.80	0.80	0.08
(ASTM C87) Normal Consistency, %		----	----	----	26
(ASTM C1038) Expansion in Water %	Maximum	0.020	0.020	0.020	0.011
(ASTM C109) Compressive Strength, psi (MPa)					
1 Day		----	----	----	2200(15.2)
3 Day	Minimum	1740(12.0)	1450(10.0)	1160(8.0)	4300(29.7)
7 Day		2760(19.0)	2470(17.0)	2180(15.0)	5350(36.9)
28 Day (strength for Ref. No. 43042)	Minimum			3050(21.0)	6290(43.4)

* Na2O and K2O determined by ASTM C114-15 section 4 and AASHTO T105-16 Section 3

*** The performance of CEMEX Type II, Type V has proven to be improved with sulfur trioxide levels in excess of the 2.3% limit for Type V. Note D in ASTM C150 allows for additional sulfate, provided expansion as measured by ASTM C1038 does not exceed 0.020%.*

CEMEX hereby certifies that this cement meets or exceeds the chemical and physical Specifications of:

ASTM C150-16 Type I, Type II, and Type V Low Alkali portland cements
ASTM C1157-11 Type GU Hydraulic Cement
AASHTO M 85-16 Type I, Type II, and Type V Low Alkali portland cements
CalTrans, Section 90-2.01 T II Modified and Type V (2006)
CalTrans, Section 90-1.02B (2) (2010-2015)
Arizona DOT Standard Specification 1006-2.01 Hydraulic Cement
Nevada DOT Specification 701.03.01
C465 qualification data will be made available upon request

By:

Quality Control Manager
CEMEX - Victorville Cement Plant
16888 North "E" St., 'Victorville, CA 92394

3990 E Concours Street
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Ontario, CA 91764
Telephone (909) 974-5469
FAX (909) 974-5525

CEMENT MILL TEST REPORT

Cement Identified as: **Date:** **12/1/2017**

Plant: Cemex Construction Materials Pacific LLC
Location: Victorville, CA
Production Dates:

Beginning	**November 17, 2017**	**Reference No.**	**43070**
Ending	**November 23, 2017**		

Additional Data

Inorganic and Limestone Addition

Inorganic Addition		Limestone Addition	
Amount (%)	1.18	Amount (%)	2.9
SiO2 (%)	10.02	SiO2 (%)	9.34
Al2O3 (%)	3.16	Al2O3 (%)	1.72
Fe2O3 (%)	2.11	Fe2O3 (%)	0.55
CaO (%)	42.78	CaO (%)	47.16
SO3 (%)	0.28	SO3 (%)	0.04

Base Cement Phase Composition

C3S (%)	59
C2S (%)	16
C3A (%)	4
C4AF (%)	11

We certify that the above described data represents the materials used in the cement manufacured during the production period indicated

By:
Quality Control Manager
CEMEX - Victorville Cement Plant
16888 North "E" St., Victorville, CA 92394

PORTLAND CEMENT
CERTIFICATE OF COMPLIANCE

CERTIFICATION OF CEMENT SHIPPED FROM: **CEMEX Construction Materials Pacific LLC**
Victorville, CA

CEMENT TYPE: **Portland Cement Type II and Type V**

I hereby certify that all of the cement shipped from the above location complies with all applicable requirements of the following specifications:

ASTM C1157-11 Type GU Hydraulic Cement,
ASTM C150-16 Type I, Type II, and Type V,
AASHTO M 85 Type I, Type II, and Type V,
Arizona Department of Transportation
Standard Specification 1006-2.01 Hydraulic Cement,
California Department of Transportation
Standard Specification Section 90-1.02B(2) Portland Cement (2010-2015)
and
Nevada DOT Specification 701.03.01

Reference Number: 43063

Date Shipped: 11/10/2017 through 11/16/2017

Quantity: As Required

James W. Martin
Quality Control Manager

CEMEX – Victorville Plant, 16888 North E. Street, Victorville, CA 92394 Ph: (760) 381-7632

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CEMENT MILL TEST REPORT

Cement Identified as: **Date: 11/24/2017**

Plant: Cemex Construction Materials Pacific LLC

Location: Victorville, CA **Prod dates:** **Beginning: 11/10/2017** **Ending: 11/16/2017** **Ref. No 43063**

STANDARD CHEMICAL REQUIREMENTS (ASTM C114)	ASTM C150 / AASHTO M 85 SPECIFICATIONS	TYPE I	TYPE II	TYPE V	TEST RESULTS
Silicon Dioxide (SiO2), %	Minimum	----	----	----	20.6
Aluminum Oxide (Al2O3), %	Maximum	----	6.0	----	4.0
Ferric Oxide (Fe2O3), %	Maximum	----	6.0	----	3.7
Calcium Oxide (CaO), %		----	----	----	63.0
Magnesium Oxide (MgO), %	Maximum	6.0	6.0	6.0	3.8
Sulfur Trioxide (SO3), % **	Maximum	3.0	3.0	2.3	2.9
Loss on Ignition (LOI), %	Maximum	3.5	3.5	3.5	2.0
Insoluble Residue, %	Maximum	1.5	1.5	1.5	0.77
Sodium Oxide (Na2O), % *		----	----	----	0.22
Potassium Oxide (K2O), % *		----	----	----	0.52
Equivalent Alkalies (Na2O+.658K2O), %	Maximum	0.60	0.60	0.60	0.56
CO2(%)		----	----	----	1.1
Limestone (%)	Maximum	5.0	5.0	5.0	2.8
CaCO3 in limestone	Minimum	70.0	70.0	70.0	85.3
Inorganic addition	Maximum	5.0	5.0	5.0	1.3
Tricalcium Silicate (C3S), %	Maximum	----	----	----	55
Dicalcium Silicate (C2S), %		----	----	----	17
Tricalcium Aluminate (C3A), %	Maximum	----	8	5	4
Tetracalcium Aluminoferrite (C4AF), %		----	----	----	11
Heat Index (C3S + 4.75C3A)	Maximum		100		75
(C4AF + 2C3A) or (C4AF + C2F), %	Maximum	----	----	25	20
PHYSICAL REQUIREMENTS					
Heat of Hydration (ASTM C1702)	Informational data only				
7 days, kj/kg (cal/g)	Most recent value				310(74.2)
(ASTM C204) Blaine Fineness, cm^2/gm	Minimum	2600	2600	2600	4284
(ASTM C430) -325 Mesh, %		----	----	----	99
(ASTM C191) Time of Setting (Vicat)					
Initial Set, minutes	Minimum / Maximum	45 / 375	45 / 375	45 / 375	115
Final Set, minutes		---	---	---	333
(ASTM C451) False Set, %	Minimum	50	50	50	89
(ASTM C185) Air Content, %	Maximum	12	12	12	4.9
(ASTM C151) Autoclave Expansion, %	Maximum	0.80	0.80	0.80	0.14
(ASTM C87) Normal Consistency, %		----	----	----	26
(ASTM C1038) Expansion in Water %	Maximum	0.020	0.020	0.020	0.011
(ASTM C109) Compressive Strength, psi (MPa)					
1 Day		----	----	----	2080(14.3)
3 Day	Minimum	1740(12.0)	1450(10.0)	1160(8.0)	4100(28.2)
7 Day		2760(19.0)	2470(17.0)	2180(15.0)	5040(34.8)
28 Day (strength for Ref. No. 43035)	Minimum			3050(21.0)	6240(43)

* Na2O and K2O determined by ASTM C114-15 section 4 and AASHTO T105-16 Section 3

*** The performance of CEMEX Type II, Type V has proven to be improved with sulfur trioxide levels in excess of the 2.3% limit for Type V. Note D in ASTM C150 allows for additional sulfate, provided expansion as measured by ASTM C1038 does not exceed 0.020%.*

CEMEX hereby certifies that this cement meets or exceeds the chemical and physical Specifications of:

ASTM C150-16 Type I, Type II, and Type V Low Alkali portland cements
ASTM C1157-11 Type GU Hydraulic Cement
AASHTO M 85-16 Type I, Type II, and Type V Low Alkali portland cements
CalTrans, Section 90-2.01 T II Modified and Type V (2006)
CalTrans, Section 90-1.02B (2) (2010-2015)
Arizona DOT Standard Specification 1006-2.01 Hydraulic Cement
Nevada DOT Specification 701.03.01
C465 qualification data will be made available upon request

By:
Quality Control Manager
CEMEX - Victorville Cement Plant
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CEMENT MILL TEST REPORT

Cement Identified as: **Date:** **11/24/2017**

Plant: Cemex Construction Materials Pacific LLC
Location: Victorville, CA
Production Dates:

Beginning	**November 10, 2017**	**Reference No.**	**43063**
Ending	**November 16, 2017**		

Additional Data

Inorganic and Limestone Addition

Inorganic Addition		Limestone Addition	
Amount (%)	1.33	Amount (%)	2.8
SiO2 (%)	10.02	SiO2 (%)	9.34
Al2O3 (%)	3.16	Al2O3 (%)	1.72
Fe2O3 (%)	2.11	Fe2O3 (%)	0.55
CaO (%)	42.78	CaO (%)	47.16
SO3 (%)	0.28	SO3 (%)	0.04

Base Cement Phase Composition

C3S (%)	57
C2S (%)	17
C3A (%)	4
C4AF (%)	12

We certify that the above described data represents the materials used in the cement manufacured during the production period indicated

By:
Quality Control Manager
CEMEX - Victorville Cement Plant
16888 North "E" St., Victorville, CA 92394

ASH GROVE CEMENT COMPANY

PO Box 38069 HWY 132
Leamington, Utah 84638
Phone: 435-857-1212
FAX: 435-857-1288

Type V

Production Period: May 1 thru May 31, 2017 **Date: 6/14/2017**

The following information is based on average test data during the production period. The data is typical of cement shipped from the Leamington, Utah plant. Individual shipments may vary.

STANDARD REQUIREMENTS
ASTM C150-16, Tables 1 and 3

CHEMICAL

Item	A.S.T.M. Test Method	Spec. Limit	Test Result
SiO_2 (%)	C114	*A*	19.97
Al_2O_3 (%)	C114	*A*	3.89
Fe_2O_3 (%)	C114	*A*	3.65
CaO (%)	C114	*A*	62.09
MgO (%)	C114	6.0 max	2.59
SO_3 (%)	C114	*D*	2.79
Loss on ignition (%)	C114	3.5 max	2.57
Na_2O (%)	C114	*A*	0.10
K_2O (%)	C114	*A*	0.67
Insoluble Residue (%)	C114	1.5 max	0.26
CO_2 (%)	C114	*A*	1.72
Limestone (%)	C114	5.0 max	4.4
$CaCO_3$ in limestone (%)	C114	70 min	89.4
Potential compounds (%)			
C_3S	C114	*A*	56
C_2S	C114	*A*	14
C_3A	C114	5 max	4
C_4AF	C114	*A*	11
$C_4AF + 2(C_3A)$	C114	25 max	19

PHYSICAL

Item	A.S.T.M. Test Method	Spec. Limit	Test Result
Air content of mortar (volume %)	C185	12 max	9
Fineness (cm^2/g):			
Air permeability	C204	2600 min	4203
Autoclave expansion (%)	C151	0.80 max	0.06
Compressive strength (psi)			
1 Day	C109	*A*	1899
3 Days	C109	1160 min	3272
7 Days	C109	2180 min	4361
28 Days	C109	3050 min	C
Time of setting (minutes) (Vicat)			
Initial: Not less than	C191	45	116
Not more than		375	116
Mortar Bar Expanison	C1038	0.020 max	0.008

OPTIONAL REQUIREMENTS
ASTM C150-16, Tables 2 and 4

CHEMICAL

Item	A.S.T.M. Test Method	Spec. Limit	Test Result
Equivalent alkalies (%)	C114	0.60	0.53

PHYSICAL

Item	A.S.T.M. Test Method	Spec. Limit	Test Result
False set (%)	C451	50 min	72
Heat of hydration (kJ /kg)			
7 days	C186	*A*	*C*

A = Not applicable.
B = Limit not specified by purchaser, test result provided for information only.
C = Test results for this period not available.
D = C 1038 expansion in water does not exceed 0.020% at 14 days

We certify that the above described cement, at the time of shipment, meets the chemical and physical requirements of ASTM C1S0-16 (Type V) or (other)_____specification.

Signature: Heath Hall

Title: Chief Chemist

Material Safety Data Sheet
For
Portland Cement

Section I - Identity

Manufacturer's name and address: Ash Grove Cement Company 11011 Cody Overland Park, KS 66210

Emergency Telephone Number: (913) 451-8900

Chemical Name and Synonyms: Portland Cement (CAS #65997-15-1)

Trade Name and Synonyms: Type I, IA, II, III, V

Revision Date: March 2010 (This revision supercedes all previous versions)

Chemical Family: Calcium Salts

Formula: Portland cement consists of finely ground portland cement clinker mixed with a small amount of calcium sulfate (gypsum) to control set. No specific formula applies to portland cement.

Section II - Hazardous Ingredients

Ingredients: Substances similar to the following are known to be present in portland cement:

$3CaO.SiO_2$	(CAS # 12168-85-3)
$2CaO.SiO_2$	(CAS # 10034-77-2)
$3CaO.Al_2O_3$	(CAS # 12042-78-3)
$4CaO.Al_2O_3.Fe_2O_3$	(CAS # 12068-35-8)
$CaSO_4.XH_2O$	(CAS # 13397-24-5)

Small amounts of CaO, MgO, K_2SO_4, Na_2SO_4 may also be present.

Hazardous Components(s):

Substance	CAS Number	OSHA PEL	ACGIH TLV-TWA	MSHA Exposure Limits
Portland Cement – total dust	65997-15-1	15 mg/m^3	1 mg/m^3 (2010) * (Respirable Dust)	10 mg/m^3
Portland Cement - respirable dust	65997-15-1	5 mg/m^3	Not Applicable	Not Applicable
Quartz	14808-60-7	10 mg/m^3 (% silica ÷ 2)	0.025 mg/m^3 (2006) (respirable fraction)	10 mg/m^3 (% silica ÷ 2)

Note: Some portland cements may contain small amounts of crystalline silica (slightly more than 0.1%).
*** Applicable if <1% crystalline silica is present.**

Section III - Physical Data

Boiling Point: Not applicable.

Vapor Pressure: Not applicable.

Vapor Density: Not applicable.

Solubility in Water: Slight (0.1-1.0%)

pH (in water) (ASTM D 1293-95): 12 - 13

Specific Gravity: (H_2O=1) 2.9 - 3.1

Evaporation Rate: Not applicable.

Appearance and Odor: Gray powder; no odor.

Melting Point: Not applicable

Section IV - Fire and Explosion Hazard Data

Flash Point: Portland cement is noncombustible and not explosive.

Flammable or Explosive Limits: Not applicable.

Extinguishing Media: Not applicable

Special Firefighting Procedures: Not applicable. (Although portland cement poses no fire-related hazards, a self-contained breathing apparatus is recommended to limit exposure to combustion products when fighting any fire.)

Unusual Fire and Explosion Hazards: Not applicable.

Lower Explosive Limit: Not applicable.

Upper Explosive Limit: Not applicable.

Section V - Health Hazard Data

Acute Effects: Wet cement on unprotected skin, whether direct or through saturated clothing, can cause severe, third degree caustic burns. **NOTE: Portland cement burns skin with little warning; discomfort or pain cannot be relied upon to alert a person to a hazardous skin exposure. The severity of the burn may not be detected until several hours after the damage begins.** Dry portland cement can produce mild irritation to severe burns of the eye; it can irritate the upper respiratory system.

Chronic Effects: Dry portland cement can cause inflammation of the lining of the nose and the cornea. Repeated exposure to portland cement may result in drying of the skin and may lead to thickening, cracking, or fissuring of the skin. Hypersensitive individuals may develop an allergic dermatitis (possibly due to trace amounts of hexavalent chromium at less than 0.005%). This reaction may appear in several forms including a mild rash to severe skin ulcers. Persons already sensitized may react to their first contact with the product. Other persons may experience this effect after years of exposure to portland cement products.

While portland cement typically has less than 0.2% crystalline silica, other additives to portland cement and those components (e.g. aggregates) added to produce portland cement concrete may significantly increase the amount of crystalline silica that is present. Exposure to respirable crystalline silica without the use of a respirator can cause silicosis and may aggravate other lung conditions.

Signs and Symptoms of Exposure: Burning sensation around moist tissue areas (i.e., eyes, nose, upper respiratory system); painful burning on exposed skin that can develop with little warning. **Exposure of sufficient duration to wet portland cement can cause serious, potentially irreversible tissue (skin or eye) destruction in the form of chemical (caustic) burns, including third degree burns.** The same kind of destruction can occur if wet or moist areas of the body are exposed for sufficient duration to dry portland cement. **DO NOT ALLOW WET PORTLAND CEMENT TO GET INSIDE BOOTS, SHOES, OR GLOVES AND DO NOT ALLOW WET, SATURATED CLOTHING TO REMAIN AGAINST THE SKIN.**

Medical Conditions Generally Aggravated by Exposure: Pre-existing skin conditions may be worsened. Silicosis may aggravate other chronic pulmonary conditions and may increase the risk of pulmonary tuberculosis infection.

Chemical Listed as Carcinogenic or Potential Carcinogen: Portland cements are not considered carcinogenic.

However, the International Agency for Research on Cancer (IARC) has determined, primarily through animal studies, that silica is a known human carcinogen. The National Toxicology Program (NTP) has characterized respirable quartz silica as reasonably anticipated to be a carcinogen. OSHA does not regulate silica as a carcinogen.

Emergency and First Aid Procedures: Irrigate eyes immediately and repeatedly with large amount of clean water for at least 15 minutes and get prompt medical attention. Wash exposed skin areas with pH-neutral soap and clean water. Apply sterile dressings; seek medical treatment in all cases of prolonged exposure to wet portland cement, portland cement mixtures, liquids from fresh portland cement products, or prolonged wet skin exposure to dry portland cement. If ingested, consult a physician immediately. Do not induce vomiting. If conscious, have the victim drink plenty of water and call a physician immediately. In the event of inhalation, remove to fresh air. Seek medical attention if coughing and other symptoms do not subside. Inhalation of gross amounts of portland cement requires immediate medical attention.

Section VII-Reactivity Data

Stability: Product is stable. Keep dry until used.

Incompatibility: Aluminum powder and other alkali and alkaline earth elements will react in wet mortar or concrete, liberating hydrogen gas. Portland cement is highly alkaline and will react with acids to produce a violent, heat-generating reaction. Toxic gases or vapors may be given off depending on the acid involved.

Hazardous Decomposition Products: None

Hazardous Polymerization: Will not occur.

Section VII - Spill Procedures

Steps to be taken in case material is spilled: Use dry cleanup methods that do not disperse the dust into the air. Avoid breathing the dust. Emergency procedures are not required.

Disposal Method: Small amounts of material can be returned to the container for later use if it is not contaminated. Dispose of waste material in accordance with Federal, State and local requirements. Portland cement is not a hazardous waste as defined by the Resource Conservation and Recovery Act (40 CFR 261).

Section VIII - Special Protection Information

Respiratory Protection: Avoid actions that cause dust to become airborne. Use local or general ventilation to control exposures below applicable exposure limits.

Use NIOSH/MSHA-approved (under 30 CFR 11) or NIOSH-approved (under 42 CFR 84) respirators in poorly ventilated areas, if an applicable exposure limit is exceeded, or when dust causes discomfort or irritation. (Advisory: Respirators and filters purchased after July 10, 1998 must be certified under 42 CFR 84.)

Ventilation: Local exhaust can be used to control airborne dust levels.

Eye Protection: When engaged in activities where portland cement dust or wet portland cement or concrete could contact the eye, wear goggles or safety glasses with sideshields. In extremely dusty environments and unpredictable environments, wear unvented or indirectly vented goggles to avoid eye irritation or injury. Contact lenses should not be worn when working with portland cement or wet portland cement products.

Skin Protection: Prevention is essential to avoiding potentially severe skin injury. Avoid contact with unhardened (wet) portland cement products. If contact occurs, promptly wash affected area with soap and water. **DO NOT ALLOW WET PORTLAND CEMENT TO GET INSIDE BOOTS, SHOES, OR GLOVES AND DO NOT ALLOW WET, SATURATED CLOTHING TO REMAIN AGAINST THE SKIN.**

Do not rely on barrier creams; barrier creams should not be used in place of gloves. Use impervious, abrasion- and alkali-resistant gloves, boots and protective clothing to protect the skin from prolonged contact with wet portland cement in plastic concrete, mortar or slurries.

Work/Hygienic Practices: Periodically wash areas contacted by dry portland cement or by wet portland cement or concrete fluids with a pH neutral soap and clean, uncontaminated water. Wash again at the end of the work. If irritation occurs, immediately wash the affected area and seek treatment. If clothing becomes saturated with wet portland cement or concrete, it should be removed and replaced with clean dry clothing. Follow listed precautions as appropriate during repair or maintenance work on contaminated equipment.

Section IX – Transportation Information

Hazardous materials/proper shipping name description:
Portland cement is not hazardous under U.S. Department of Transportation (DOT) regulations.

Hazard class:
Not applicable

Identification number:
Not applicable

Required label text:
Not applicable

Hazardous substances / reportable quantities (RQ)
Not applicable

Section X – Other Regulatory Information

Status under USDOL-OSHA Hazard Communication Standard (29 CFR 1910.1200)
Portland cement is considered a "hazardous chemical" under this regulation and should be a part of any Hazard Communication Program.

Status under CERCLA / Superfund 40 CFR 117 and 302
Not listed.

Status under SARA (Title III), Sections 311 and 312
Portland cement qualifies as a "hazardous substance" with delayed health effects.

Status under SARA (Title III), Section 313
This product may contain constituents listed under SARA (Title III) Section 313, but not in amounts requiring supplier notification under 40 CFR Part 372 Subpart C.

Status under TSCA (as of May 1997)
Portland cement and some of the substances in portland cement are on the TSCA inventory list.

Status under the Federal Hazardous Substances Act
Portland cement is a "hazardous substance" subject to statutes promulgated under the subject act.

Status under California Proposition 65
This product contains crystalline silica and chemicals (trace metals) known to the State of California to cause cancer, birth defects or other reproductive harm. California law requires the above warning in the absence of definitive testing to prove the defined risks do not exist.

Status under the Canadian Environmental Protection Act
Not listed.

Status under WHMIS
Portland cement is considered to be a hazardous material under the Hazardous Products Act as defined by the Controlled Products Regulations (Class E – Corrosive Material) and is therefore subject to the labeling and MSDS requirements of the Workplace Hazardous Materials Information System (WHMIS).

Other Important Information
Portland cement should only be used by knowledgeable persons. A key to using the product safely requires the user to recognize that portland cement reacts with water, and that some of the intermediate products of this reaction (that is, those present while portland cement is "setting") pose a far more severe hazard than does portland cement itself.

While the information provided in this material safety data sheet is thought to provide a useful summary of the hazards of portland cement as it is commonly used, the sheet cannot anticipate and provide all the information that might be needed in every situation. Inexperienced product users should obtain training before using this product.

In particular, the data provided in this sheet do not address hazards that may be posed by other materials that may be added to portland cement to produce portland cement products. Users should review other relevant material safety data sheets before working with this portland cement or on portland cement products, for example portland cement concrete.

SELLER MAKES NO WARRANTY, EXPRESS OR IMPLIED, CONCERNING THE PRODUCT OR THE MERCHANTABILITY OR FITNESS THEREOF FOR ANY PURPOSE OR CONCERNING THE ACCURACY OF ANY INFORMATION PROVIDED BY ASH GROVE CEMENT COMPANY, except that the product shall conform to contracted specifications. The information provided herein was believed by Ash Grove Cement Company to be accurate at the time of preparation or prepared by sources by believed to be reliable, but it is the responsibility of the user to investigate and understand other pertinent sources of information to comply with all laws and procedures applicable to the safe use and handling of product and to determine the suitability of the product for its intended use.

This product neither contains nor is directly manufactured with any controlled ozone depleting substances, Class I and II.

MATERIAL SAFETY DATA SHEET

LANXESS
Energizing Chemistry

LANXESS Corporation
Product Safety & Regulatory Affairs
111 RIDC Park West Drive
Pittsburgh, PA 15275-1112
USA

TRANSPORTATION EMERGENCY

CALL CHEMTREC:	(800) 424-9300
INTERNATIONAL:	(703) 527-3887

NON-TRANSPORTATION

LANXESS Emergency Phone:	(800) 410-3063
LANXESS Information Phone:	(800) LANXESS

1. Product and Company Identification

Product Name:	BAYFERROX 920G
Material Number:	525743
Chemical Family:	Inorganic Metal Oxide
Color Index Name:	Pigment yellow 42 mixture
Color Index-No.:	77492
Chemical Name:	Mixture of hydrated iron oxide and a proprietary binding agent
Synonyms:	Bayferrox colorflow pigment
Formula:	Mixture containing FeOOH

2. Hazards Identification

Emergency Overview

Color: Yellow **Form:** solid Powder **Odor:** Odorless.

Product poses little or no hazard if spilled. May cause mechanical irritation (abrasion).

Potential Health Effects

Primary Routes of Entry:	Inhalation, Skin Contact, Eye Contact, Ingestion
Medical Conditions Aggravated by Exposure:	Respiratory disorders

HUMAN EFFECTS AND SYMPTOMS OF OVEREXPOSURE

Inhalation
Acute Inhalation
For Product: BAYFERROX 920G
Not expected to be irritating.

For Component: Binding Agent

Causes respiratory tract irritation with symptoms of coughing, sore throat and runny nose.

Skin
Acute Skin
For Product: BAYFERROX 920G
Not expected to be irritating.

For Component: Binding Agent
Causes irritation with symptoms of reddening, itching, and swelling.

Chronic Skin
For Component: Binding Agent
Prolonged or repeated skin contact may cause dermatitis with symptoms of red, itchy, dry skin.

Eye
Acute Eye
For Product: BAYFERROX 920G
Not expected to be irritating.

For Component: Binding Agent
Causes irritation with symptoms of reddening, tearing, stinging, and swelling.

Ingestion
Acute Ingestion
For Product: BAYFERROX 920G
Expected to be essentially non-toxic.

For Component: Binding Agent
Symptoms of ingestion may include abdominal pain, nausea, vomiting, and diarrhea.

Carcinogenicity:
No Carcinogenic substances as defined by IARC, NTP and/or OSHA.

3. Composition/Information on Ingredients

Hazardous Components

Weight %	Components	CAS-No.
1 - 5%	Binding Agent	CAS# is a trade secret

4. First Aid Measures

Eye Contact
In case of contact, flush eyes with plenty of lukewarm water. Get medical attention if irritation develops.

Skin Contact
In case of skin contact, wash affected areas with soap and water.

Inhalation
If inhaled, remove to fresh air. Get medical attention if irritation develops.

Ingestion
If ingested, do not induce vomiting unless directed to do so by medical personnel. Get medical attention.

5. Fire-Fighting Measures

Suitable Extinguishing Media: Material is not combustible. Use extinguishing media suitable for other combustible materials in the area.

Special Fire Fighting Procedures
Firefighters should be equipped with self-contained breathing apparatus to protect against potentially toxic and irritating fumes.

6. Accidental release measures

Spill and Leak Procedures
Spills should be swept up and placed in appropriate containers for disposal. Clean up promptly by scoop or vacuum. Avoid creating dusty conditions.

7. Handling and Storage

Storage Period
If stored under the correct conditions (no climatic influence, kept dry and no extreme fluctuations in temperature) we expect that our products would have a shelf life of 5 years provided, however, the material has been stored correctly and the packaging materials remain unchanged.

Handling/Storage Precautions
Protect against weathering. Store in a dry place and avoid extreme fluctuations in temperature. Special conditions for opened packaging: Close bags after use to prevent the absorption of moisture and contamination. Avoid breathing dust.

Further Info on Storage Conditions
Material can be stored safely at ambient temperatures.

8. Exposure Controls / Personal Protection

Country specific exposure limits have not been established or are not applicable

Industrial Hygiene/Ventilation Measures
Under normal conditions of use, special ventilation is not required.

Respiratory Protection
Although no exposure limit has been established for this product, the OSHA PEL for Particulates Not Otherwise Regulated (PNOR) of 15 mg/m3 - total dust, 5 mg/m3 - respirable fraction is recommended. In addition, the ACGIH recommends 3 mg/m3 - respirable particles and 10 mg/m3 - inhalable particles for Particles (insoluble or poorly soluble) Not Otherwise Specified (PNOS)., The following respirator is recommended if airborne concentrations exceed the appropriate standard/guideline., NIOSH approved, air-purifying particulate respirator with N-95 filters.

Eye Protection
safety glasses.

Skin and body protection
No special skin protection requirements during normal handling and use.

Additional Protective Measures
Employees should wash their hands and face before eating, drinking, or using tobacco products. Educate and train employees in the safe use and handling of this product.

9. Physical and chemical properties

Form:	solid
Appearance:	Powder
Color:	Yellow
Odor:	Odorless
pH:	4 - 8 @ 50 g/l
Melting Point:	Begins at 1,000 °C (1,832 °F)
Flash Point:	not applicable
Lower Explosion Limit:	Not Established
Upper Explosion Limit:	Not Established
Vapor Pressure:	not applicable
Specific Gravity:	4 - 5 @ 20 °C (68 °F)
Solubility in Water:	Insoluble
Autoignition Temperature:	Not Applicable
Viscosity, Dynamic:	not applicable
Bulk Density:	300 - 1,000 kg/m3

10. Stability and Reactivity

Hazardous Reactions
Hazardous polymerization does not occur.

Stability
Stable

Conditions to avoid
At temperatures greater than 356 F (180 C) the product will be converted to Fe_2O_3.

11. Toxicological Information

Toxicity Data for C.I. Pigment Yellow 42
Acute Oral Toxicity
LD50: > 5,000 mg/kg (Rat)

Skin Irritation
rabbit, Non-irritating

Eye Irritation
rabbit, Non-irritating

Carcinogenicity
Rat, Male/Female, intraperitoneal, 8 w,

ambiguous

Toxicity Data for Binding Agent
Acute Oral Toxicity
LD50: 3,900 mg/kg (Rat)

Acute dermal toxicity
LD50: > 7,940 mg/kg (rabbit)

Skin Irritation
rabbit, Non-irritating
rabbit, Draize, Exposure Time: 24 hrs, Moderately irritating

Mutagenicity
Genetic Toxicity in Vitro:
Ames: Negative results were reported in various in vitro studies. (Salmonella typhimurium, Metabolic Activation: with/without)

Toxicity to Reproduction/Fertility
Three generation study, oral, (Rat, Male/Female)
No effects on Reproductive parameters observed at doses tested.

12. Ecological Information

Ecological Data for C.I. Pigment Yellow 42
Acute and Prolonged Toxicity to Fish
EC50: > 1,000 mg/l (Golden orfe (Leuciscus idus), 48 h)

Toxicity to Microorganisms
> 10,000 mg/l, (Pseudomonas putida)

Ecological Data for Binding Agent
Biodegradation
The methods for determining the biological degradability are not applicable to inorganic substances.

Acute and Prolonged Toxicity to Fish
LC50: > 100 mg/l (Rainbow trout (Salmo gairdneri), 96 hrs)
LC50: > 100 mg/l (Silverside Minnow (Menidia peninsulae), 96 hrs)

Acute Toxicity to Aquatic Invertebrates
EC50: 1,089 mg/l (Water flea (Daphnia magna), 50 hrs)

Toxicity to Microorganisms
EC50: > 1,000 mg/l, (Activated sludge microorganisms, 3 hrs)

13. Disposal considerations

Waste Disposal Method
Waste disposal should be in accordance with existing federal, state, provincial, and/or local environmental control laws.

Empty Container Precautions

Recondition or dispose of empty container in accordance with governmental regulations.

14. Transport information

Land transport (DOT)
Non-Regulated

Sea transport (IMDG)
Non-Regulated

Air transport (ICAO/IATA)
Non-Regulated

15. Regulatory Information

United States Federal Regulations

OSHA Hazcom Standard Rating: Hazardous

US. Toxic Substances Control Act: Listed on the TSCA Inventory.

US. EPA CERCLA Hazardous Substances (40 CFR 302):
Components
Binding Agent Reportable quantity: 5,000 lbs

SARA Section 311/312 Hazard Categories:
Non-hazardous under Section 311/312

US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 302 Extremely Hazardous Substance (40 CFR 355, Appendix A):
Components
None

US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 313 Toxic Chemicals (40 CFR 372.65) - Supplier Notification Required:
Components
None

US. EPA Resource Conservation and Recovery Act (RCRA) Composite List of Hazardous Wastes and Appendix VIII Hazardous Constituents (40 CFR 261):
If discarded in its purchased form, this product would not be a hazardous waste either by listing or by characteristic. However, under RCRA, it is the responsibility of the product user to determine at the time of disposal, whether a material containing the product or derived from the product should be classified as a hazardous waste. (40 CFR 261.20-24)

State Right-To-Know Information
The following chemicals are specifically listed by individual states; other product specific health and safety data in other sections of the MSDS may also be applicable for state requirements. For details on your regulatory requirements you should contact the appropriate agency in your state.

Potential exposure to some or all of the California Proposition 65 chemicals in this product have been determined to be below the No Significant Risk Level (NSRL)., Trace heavy metal content reported below is based on random sample analyses and content may vary from batch to batch.

Massachusetts, New Jersey or Pennsylvania Right to Know Substance Lists:

Weight %	Components	CAS-No.
>=1%	C.I. Pigment Yellow 42	20344-49-4
1 - 5%	Binding Agent	CAS# is a trade secret
1%	Water	7732-18-5

MA Right to Know Extraordinarily Hazardous Substance List:

Weight %	Components	CAS-No.
25 ppm	Arsenic	7440-38-2
350 ppm	Chromium	7440-47-3
200 ppm	Nickel (Ni)	7440-02-0

California Prop. 65:
To the best of our knowledge, this product does not contain any of the listed chemicals, which the state of California has found to cause cancer, birth defects or other reproductive harm.

16. Other Information

NFPA 704M Rating

Health	1
Flammability	0
Reactivity	0
Other	

0=Insignificant 1=Slight 2=Moderate 3=High 4=Extreme

HMIS Rating

Health	1
Flammability	0
Physical Hazard	0

0=Minimal 1=Slight 2=Moderate 3=Serious 4=Severe
* = Chronic Health Hazard

LANXESS Corporation's method of hazard communication is comprised of Product Labels and Material Safety Data Sheets. HMIS and NFPA ratings are provided by LANXESS Corporation as a customer service.

Contact Person:	Product Safety Department
Telephone:	(800) LANXESS
MSDS Number:	R304951
Version Date:	07/18/2008
Report Version:	4.0

This information is furnished without warranty, express or implied. This information is believed to be accurate to the best knowledge of LANXESS Corporation. The information in this MSDS relates only to the specific material designated herein. LANXESS Corporation assumes no legal responsibility for use of or reliance upon the information in this MSDS.

Changes since the last version will be highlighted in the margin. This version replaces all previous versions.

ASH GROVE CEMENT COMPANY

PO Box 38069 HWY 132
Leamington, Utah 84638
Phone: 435-857-1212
FAX: 435-857-1288

Type V

Production Period: June 1 thru June 30, 2017

Date: 7/11/2017

The following information is based on average test data during the production period. The data is typical of cement shipped from the Leamington, Utah plant. Individual shipments may vary.

STANDARD REQUIREMENTS
ASTM C150-16, Tables 1 and 3

CHEMICAL

Item	A.S.T.M. Test Method	Spec. Limit	Test Result
SiO_2 (%)	C114	*A*	19.76
Al_2O_3 (%)	C114	*A*	3.84
Fe_2O_3 (%)	C114	*A*	3.57
CaO (%)	C114	*A*	61.44
MgO (%)	C114	6.0 max	2.23
SO_3 (%)	C114	*D*	2.74
Loss on ignition (%)	C114	3.5 max	2.49
Na_2O (%)	C114	*A*	0.09
K_2O (%)	C114	*A*	0.67
Insoluble Residue (%)	C114	1.5 max	0.27
CO_2 (%)	C114	*A*	1.74
Limestone (%)	C114	5.0 max	4.4
$CaCO_3$ in limestone (%)	C114	70 min	89.8
Potential compounds (%)			
C_3S	C114	*A*	55
C_2S	C114	*A*	14
C_3A	C114	5 max	4
C_4AF	C114	*A*	11
$C_4AF + 2(C_3A)$	C114	25 max	19

PHYSICAL

Item	A.S.T.M. Test Method	Spec. Limit	Test Result
Air content of mortar (volume %)	C185	12 max	9
Fineness (cm^2/g):			
Air permeability	C204	2600 min	4271
Autoclave expansion (%)	C151	0.80 max	0.06
Compressive strength (psi)			
1 Day	C109	*A*	1935
3 Days	C109	1160 min	3246
7 Days	C109	2180 min	4279
28 Days	C109	3050 min	C
Time of setting (minutes) (Vicat)			
Initial: Not less than	C191	45	102
Not more than		375	102
Mortar Bar Expanison	C1038	0.020 max	0.008

OPTIONAL REQUIREMENTS
ASTM C150-16, Tables 2 and 4

CHEMICAL

Item	A.S.T.M. Test Method	Spec. Limit	Test Result
Equivalent alkalies (%)	C114	0.60	0.53

PHYSICAL

Item	A.S.T.M. Test Method	Spec. Limit	Test Result
False set (%)	C451	50 min	74
Heat of hydration (kJ /kg)			
7 days	C186	*A*	*C*

A = Not applicable.
B = Limit not specified by purchaser, test result provided for information only.
C = Test results for this period not available.
D = C 1038 expansion in water does not exceed 0.020% at 14 days

We certify that the above described cement, at the time of shipment, meets the chemical and physical requirements of ASTM C150-16 (Type V) or (other)_____specification.

Signature: Heath Hall

Title: Chief Chemist

ASH GROVE CEMENT COMPANY

PO Box 38069 HWY 132
Leamington, Utah 84638
Phone: 435-857-1212
FAX: 435-857-1288

Type V

Production Period: August 1 thru August 31, 2017

Date: 9/15/2017

The following information is based on average test data during the production period. The data is typical of cement shipped from the Leamington, Utah plant. Individual shipments may vary.

STANDARD REQUIREMENTS
ASTM C150-16, Tables 1 and 3

CHEMICAL

Item	A.S.T.M. Test Method	Spec. Limit	Test Result
SiO_2 (%)	C114	*A*	19.25
Al_2O_3 (%)	C114	*A*	3.85
Fe_2O_3 (%)	C114	*A*	3.67
CaO (%)	C114	*A*	61.36
MgO (%)	C114	6.0 max	2.36
SO_3 (%)	C114	*D*	2.77
Loss on ignition (%)	C114	3.5 max	2.55
Na_2O (%)	C114	*A*	0.09
K_2O (%)	C114	*A*	0.73
Insoluble Residue (%)	C114	1.5 max	0.24
CO_2 (%)	C114	*A*	1.68
Limestone (%)	C114	5.0 max	4.2
$CaCO_3$ in limestone (%)	C114	70 min	92.1
Potential compounds (%)			
C_3S	C114	*A*	58
C_2S	C114	*A*	11
C_3A	C114	5 max	4
C_4AF	C114	*A*	12
$C_4AF + 2(C_3A)$	C114	25 max	20

PHYSICAL

Item	A.S.T.M. Test Method	Spec. Limit	Test Result
Air content of mortar (volume %)	C185	12 max	9
Fineness (cm^2/g):			
Air permeability	C204	2600 min	4211
Autoclave expansion (%)	C151	0.80 max	0.05
Compressive strength (psi)			
1 Day	C109	*A*	1976
3 Days	C109	1160 min	3348
7 Days	C109	2180 min	4449
28 Days	C109	3050 min	C
Time of setting (minutes) (Vicat)			
Initial: Not less than	C191	45	106
Not more than		375	106
Mortar Bar Expanison	C1038	0.020 max	0.010

OPTIONAL REQUIREMENTS
ASTM C150-16, Tables 2 and 4

CHEMICAL

Item	A.S.T.M. Test Method	Spec. Limit	Test Result
Equivalent alkalies (%)	C114	0.60	0.57

PHYSICAL

Item	A.S.T.M. Test Method	Spec. Limit	Test Result
False set (%)	C451	50 min	70
Heat of hydration (kJ /kg)			
7 days	C186	*A*	*C*

A = Not applicable.
B = Limit not specified by purchaser, test result provided for information only.
C = Test results for this period not available.
D = C 1038 expansion in water does not exceed 0.020% at 14 days

We certify that the above described cement, at the time of shipment, meets the chemical and physical requirements of ASTM C150-16 (Type V) or (other)_____specification.

Signature: Heath Hall

Title: Chief Chemist

ASH GROVE CEMENT COMPANY

PO Box 38069 HWY 132
Leamington, Utah 84638
Phone: 435-857-1212
FAX: 435-857-1288

Type I-II

Production Period: January 1 thru January 31, 2017

Date: 2/13/2017

The following information is based on average test data during the production period. The data is typical of cement shipped from the Leamington, Utah plant. Individual shipments may vary.

STANDARD REQUIREMENTS
ASTM C150-16, Tables 1 and 3

CHEMICAL

Item	A.S.T.M. Test Method	Spec. Limit	Test Result
SiO_2 (%)	C114	*A*	21.80
Al_2O_3 (%)	C114	6.0 max	3.88
Fe_2O_3 (%)	C114	6.0 max	3.60
CaO (%)	C114	*A*	64.94
MgO (%)	C114	6.0 max	3.03
SO_3 (%)	C114	*D*	2.80
Loss on ignition (%)	C114	3.5 max	2.38
Na_2O (%)	C114	*A*	0.06
K_2O (%)	C114	*A*	0.76
Insoluble Residue (%)	C114	1.5	0.19
CO_2 (%)	C114	*A*	1.39
Limestone (%)	C114	5.0 max	3.5
$CaCO_3$ in limestone (%)	C114	70 min	90.5
Potential compounds (%)			
C_3S	C114	*A*	54
C_2S	C114	*A*	21
C_3A	C114	8 max	4
C_4AF	C114	*A*	11
$C_4AF + 2(C_3A)$	C114	*A*	20

PHYSICAL

Item	A.S.T.M. Test Method	Spec. Limit	Test Result
Air content of mortar (volume %)	C185	12 max	8
Fineness (cm^2/g):			
Air permeability	C204	2600 min	4290
Autoclave expansion (%)	C151	0.80 max	0.08
Compressive strength (psi)			
1 Day	C109	*A*	2273
3 Days	C109	1740 min	4028
7 Days	C109	2760 min	5044
28 Days	C109	*A*	*C*
Time of setting (minutes) (Vicat)			
Initial: Not less than	C191	45	101
Not more than		375	101
Mortar Bar Expansion	C1038	0.020 max	0.009

OPTIONAL REQUIREMENTS
ASTM C150-16, Tables 2 and 4

CHEMICAL

Item	A.S.T.M. Test Method	Spec. Limit	Test Result
Equivalent alkalies (%)	C114	0.60	0.56

PHYSICAL

Item	A.S.T.M. Test Method	Spec. Limit	Test Result
False set (%)	C451	50 min	78
Heat of hydration (kJ /kg)			
7 days	C186	*A*	*C*
Compressive strength (psi)			
28 Days	C109	4060	*C*

A = Not applicable.
B = Limit not specified by purchaser, test result provided for information only.
C = Test results for this period not available.
D = C 1038 expansion in water does not exceed 0.020% at 14 days

We certify that the above described cement, at the time of shipment, meets the chemical and physical requirements of ASTM C150/C150M-16 (Types I/II) or (other)_____specification.

Signature: Heath Hall

Title: Chief Chemist

ASH GROVE CEMENT COMPANY

PO Box 38069 HWY 132
Leamington, Utah 84638
Phone: 435-857-1212
FAX: 435-857-1288

Type I-II

Production Period: January 1 thru January 31, 2017

Date: 2/13/2017

The following information is based on average test data during the production period. The data is typical of cement shipped from the Leamington, Utah plant. Individual shipments may vary.

Additional Data

Inorganic Processing Addition Data	
Type	Limestone
Amount(%)	3.49
SiO_2 (%)	6.82
Al_2O_3 (%)	0.63
Fe_2O_3 (%)	1.24
CaO (%)	50.37
SO_3 (%)	0.12

Base Cement Phase Composition	
C_3S	56
C_2S	22
C_3A	4
C_4AF	11

Signature:

Heath Hall

Title: Chief Chemist

ASH GROVE CEMENT COMPANY

PO Box 38069 HWY 132
Leamington, Utah 84638
Phone: 435-857-1212
FAX: 435-857-1288

Type II-V

Production Period: January 1 thru January 31, 2017

Date: 2/13/2017

The following information is based on average test data during the production period. The data is typical of cement shipped from the Leamington, Utah plant. Individual shipments may vary.

STANDARD REQUIREMENTS
ASTM C150-16, Tables 1 and 3

CHEMICAL

Item	A.S.T.M. Test Method	Spec. Limit	Test Result
SiO_2 (%)	C114	*A*	21.80
Al_2O_3 (%)	C114	6.0 max	3.88
Fe_2O_3 (%)	C114	6.0 max	3.60
CaO (%)	C114	*A*	64.94
MgO (%)	C114	6.0 max	3.03
SO_3 (%)	C114	*D*	2.80
Loss on ignition (%)	C114	3.5 max	2.38
Na_2O (%)	C114	*A*	0.06
K_2O (%)	C114	*A*	0.76
Insoluble Residue (%)	C114	1.5 max	0.19
CO_2 (%)	C114	*A*	1.39
Limestone (%)	C114	5.0 max	3.5
$CaCO_3$ in limestone (%)	C114	70 min	90.5
Potential compounds (%)			
C_3S	C114	*A*	54
C_2S	C114	*A*	21
C_3A	C114	5 max	4
C_4AF	C114	*A*	11
$C_4AF + 2(C_3A)$	C114	25 max	20

PHYSICAL

Item	A.S.T.M. Test Method	Spec. Limit	Test Result
Air content of mortar (volume %)	C185	12 max	8
Fineness (cm^2/g):			
Air permeability	C204	2600 min	4290
Autoclave expansion (%)	C151	0.80 max	0.08
Compressive strength (psi)			
1 Day	C109	*A*	2273
3 Days	C109	1450 min	4028
7 Days	C109	2470 min	5044
28 Days	C109	3050 min	*C*
Time of setting (minutes) (Vicat)			
Initial: Not less than	C191	45	101
Not more than		375	101
Mortar Bar Expansion	C1038	0.020 max	0.009

OPTIONAL REQUIREMENTS
ASTM C150-16, Tables 2 and 4

CHEMICAL

Item	A.S.T.M. Test Method	Spec. Limit	Test Result
Equivalent alkalies (%)	C114	0.60	0.56

PHYSICAL

Item	A.S.T.M. Test Method	Spec. Limit	Test Result
False set (%)	C451	50 min	78
Heat of hydration (kJ /kg)			
7 days	C186	*A*	*C*
Compressive strength (psi)			
28 Days	C109	4060	*C*

A = Not applicable.
B = Limit not specified by purchaser, test result provided for information only.
C = Test results for this period not available.
D = C 1038 expansion in water does not exceed 0.020% at 14 days

We certify that the above described cement, at the time of shipment, meets the chemical and physical requirements of ASTM C150/C150M-16 (Types II & V) or (other)_____specification.

Signature: Heath Hall

Title: Chief Chemist

ASH GROVE CEMENT COMPANY

PO Box 38069 HWY 132
Leamington, Utah 84638
Phone: 435-857-1212
FAX: 435-857-1288

Type II-V

Production Period: January 1 thru January 31, 2017

Date: 2/13/2017

The following information is based on average test data during the production period. The data is typical of cement shipped from the Leamington, Utah

Additional Data

Inorganic Processing Addition Data	
Type	Limestone
Amount(%)	3.49
SiO_2 (%)	6.82
Al_2O_3 (%)	0.63
Fe_2O_3 (%)	1.24
CaO (%)	50.37
SO_3 (%)	0.12

Base Cement Phase Composition	
C_3S	56
C_2S	22
C_3A	4
C_4AF	11

Signature:

Heath Hall

Title: Chief Chemist