



Maura Healey, Governor
Kimberley Driscoll, Lieutenant Governor
Gina Fiandaca, Secretary & CEO
Jonathan L. Gulliver, Highway Administrator



March 28, 2023

Mr. Chris Dauphinais
President
Dauphinais Concrete
P.O. Box 461
Sutton, MA 01590

Dear Mr. Dauphinais,

Your proposed cement concrete mix design formulations have been reviewed by the MassDOT Research and Materials Section (RMS) and are approved as identified on the enclosed RMS 043 Cement Concrete Mix Design Sheet, for the duration of the annual approval cycle, and will **expire on April 1, 2024**.

Approved Plant: DAUPHINAIS CONCRETE
Approved Plant Location: DOUGLAS, MA
Mix Design Sheet Identification No.: 22-09-19-11-59-37

Modifications to the approved mix design formulations, including source of constituent materials, design proportions, mix type, combined aggregate system targets, paste system targets, slump targets, air content targets, and compressive strength targets are prohibited. At no point shall the water-cementitious (w/cm) ratio exceed the design target. Approval is subject to performance at the plant and project site, as well as conformance to MassDOT protocols and specifications.

Sincerely,

Mary A. Grieco, P.E.
Director of Research and Materials

MAG/gg/rfm
Enclosures
CC: District Materials Engineer

2023 CEMENT CONCRETE MIX DESIGN SHEET RMS 043

PLANT INFORMATION		MAILING ADDRESS				MIX SHEET IDENTIFICATION	
PLANT NAME	LOCATION	STREET NO. & ADDRESS	CITY/TOWN	EMAIL ADDRESS	CONTRACT	SHEET IDENTIFICATION NO.	
DAUPHINAIS CONCRETE	DOUGLAS, MA	P.O. Box 461	Sutton, MA 01590	chris@dauphinaisconcrete.com		22-09-19-11-59-37	

CONSTITUENT MATERIALS																							
ID	MANUFACTURER	LOCATION	NMAS	DESCRIPTION	SPEC.	SG	UW (PCF)	VC (%)	PERCENT PASSING BY MASS (%)														
									2 IN.	1 1/2 IN.	1 IN.	3/4 IN.	1/2 IN.	3/8 IN.	#4	#8	#16	#30	#50	#100	#200	FM	
FINE	PYNE SAND AND GRAVEL	DOUGLAS, MA	FINE	NORMAL WEIGHT	M 6	2.65	96.3	41.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.8	87.0	66.8	46.2	21.8	6.2	1.8	2.74
CA1	P J KEATING	LUNENBURG, MA	3/4 IN.	NORMAL WEIGHT - 6	M 80	2.74	105.7	38.1	100.0	100.0	100.0	90.2	38.4	3.1	1.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	7.00
CA2	P J KEATING	LUNENBURG, MA	1/2 IN.	NORMAL WEIGHT - 8	M 80	2.74	107.6	37.0	100.0	100.0	100.0	100.0	100.0	86.1	10.5	2.8	2.2	1.7	1.5	1.0	1.0	1.0	5.94
CA3	P J KEATING	LUNENBURG, MA	1 1/2 IN.	NORMAL WEIGHT - 4	M 80	2.80	101.3	41.9	100.0	100.0	54.1	14.8	3.9	1.1	1.0	1.0	1.0	1.0	0.9	0.8	0.8	0.8	7.78

HYDRAULIC CEMENT, SUPPLEMENTARY CEMENTITIOUS MATERIALS, MORTAR, AND FIBER SOURCES										CHEMICAL ADMIXTURE SOURCES									
ID	MANUFACTURER	PRODUCT / LOCATION	TYPE	DESCRIPTION	SPEC.	SG	ID	MANUFACTURER	PRODUCT	TYPE	DESCRIPTION	SPEC.	SG						
CEM	HEIDELBERG MATERIALS	SILFKE, TURKEY (I / II)	I / II	GENERAL / MOD. SULFATE	M 85	3.15	AD1	GCP APPLIED TECHNOLOGIES	ADVA 140M	F	HIGH RANGE WATER REDUCING	M 194	1.10						
SCM1	HEIDELBERG MATERIALS	CAMDEN, NJ	SLAG	HIGH ACTIVITY (120)	M 302	2.82	AD2	GCP APPLIED TECHNOLOGIES	DAREX II AEA	AEA	AIR ENTRAINING	M 154	1.04						
SCM2	ECO MATERIAL TECHNOLOGIES	STRATTON, OH	FA	LOW CALCIUM (F)	M 295	2.49	AD3	GCP APPLIED TECHNOLOGIES	EXP 950	F	HIGH RANGE WATER REDUCING	M 194	1.10						
SCM3	GCP APPLIED TECHNOLOGIES	FORCE 10,000 D	SF	SILICA FUME	M 307	2.20	AD4	GCP APPLIED TECHNOLOGIES	DCI-S	CIA	CORROSION INHIBITING	C1582	1.28						
PKG							AD5	GCP APPLIED TECHNOLOGIES	RECOVER	D	ATER REDUCING AND RETARDING	M 194	1.15						
FIBER							AD6	GCP APPLIED TECHNOLOGIES	DARAFIL CLSM	CLSM	CLSM ENHANCING	TDS	cd						

MIX DESIGN FORMULATION																													
MIX IDENTIFICATION NO.		T 22 (PSI)	NMAS (IN.)	SLUMP (IN.)	AC (%)	W/CM RATIO	PC (%)	AGGREGATE (LBS.)				CEMENT, SCM, PACKAGED, AND FIBER (LBS.)						TOTAL WATER (GAL.) AND CHEMICAL ADMIXTURES (OZ)						YIELD (CF)					
MASSDOT	PRODUCER							MIX DESIGN TYPE	CA1	CA2	CA3	CEM	SCM1	SCM2	SCM3	PKG	FIBER	W1	AD1	AD2	AD3	AD4	AD5		AD6				
22-09-19-11-59-37-01	MHDCDFEX	70	FINE	10.00	25.0	3.65	18.9	2500.0				80.0											35.0					1.0	27.0
22-09-19-11-59-37-02	MHDCDFNONE	200	FINE	10.00	20.0	1.46	21.1	2620.0				200.0											35.0					1.0	27.0
22-09-19-11-59-37-03	3034SMHD	3000	3/4	5.00	6.0	0.50	25.4	1330.0	1030.0	750.0		388.0	130.0										31.0	35.0	1.0				27.0
22-09-19-11-59-37-04	3515SMHD	3500	1 1/2	5.00	5.0	0.47	25.2	1290.0	500.0	500.0	900.0	399.0	133.0										30.0	37.2	2.0				27.0
22-09-19-11-59-37-05	4038SMHD	4000	3/8	5.00	7.0	0.45	30.7	1230.0		1600.0		496.0	166.0										36.0	46.0	5.0				27.0
22-09-19-11-59-37-06	4034SMHD	4000	3/4	5.00	6.0	0.44	30.1	1170.0	1020.0	710.0		493.0	165.0										35.0	46.0	3.5				27.0
22-09-19-11-59-37-07	4015SMHD	4000	1 1/2	5.00	5.0	0.45	28.1	1160.0	500.0	500.0	900.0	454.0	152.0										33.0	42.0	4.0				27.0
22-09-19-11-59-37-08	5034SMHD	5000	3/4	5.00	6.0	0.40	30.5	1210.0	1079.0	600.0		529.0	177.0										34.0	49.4	5.5				27.0
22-09-19-11-59-37-09	5034SHPMHD	HP	5000	3/4	6.00	6.0	0.40	30.0	1220.0	1050.0	630.0	481.0	161.0			43.0							33.0	3.5	30.0	384.0	14.0		26.9
22-09-19-11-59-37-10	5038SHPMHD	HP	5000	3/8	6.00	7.0	0.40	31.3	1160.0	1650.0		504.0	169.0			43.0							34.5	6.0	29.0	384.0	13.0		27.0
22-09-19-11-59-37-11	4034SWMHD	SIDEWALK	4000	3/4	5.00	6.0	0.45	28.6	1191.0	1164.0	613.0	496.0	124.0										33.5	43.4	3.0				27.0
22-09-19-11-59-37-12	3034MHD		3000	3/4	5.00	6.0	0.51	26.1	1316.0	1110.0	655.0	442.0			78.0								32.0	35.0	2.0				27.0
22-09-19-11-59-37-13	4038MHD		4000	3/8	5.00	7.0	0.45	30.9	1173.0		1650.0	570.0			100.0								36.0	46.0	3.0				27.0
22-09-19-11-59-37-14	4034MHD		4000	3/4	5.00	6.0	0.40	28.8	1190.0	1030.0	750.0	560.0			100.0								32.0	46.0	3.0				27.0
22-09-19-11-59-37-15	4015MHD		4000	1 1/2	5.00	5.0	0.44	27.7	1180.0	500.0	500.0	900.0	515.0			91.0							32.0	42.0	3.5				27.0
22-09-19-11-59-37-16	5034MHD		5000	3/4	5.00	6.0	0.47	29.0	1260.0	1079.0	610.0	454.0			152.0								34.0	42.0	3.5				27.0

COMBINED AGGREGATE SYSTEM, PASTE SYSTEM, AND UNIT WEIGHT																											
MIX IDENTIFICATION NUMBERS		PERCENT BY MASS PASSING (%)												TARANTULA CURVE		SHILSTONE WF-CF ZONE		SCM1 (%)	SCM2 (%)	SCM3 (%)	EPC (%)	VC (%)	PC/VC RATIO	UW (PCF)			
MASSDOT	PRODUCER	2 IN.	1 1/2 IN.	1 IN.	3/4 IN.	1/2 IN.	3/8 IN.	#4	#8	#16	#30	#50	#100	#200													
22-09-19-11-59-37-01	MHDCDFEX	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.8	87.0	66.8	46.2	21.8	6.2	1.8	OUTSIDE LIMITS	IV: EXCESSIVE FINES	0.0	0.0	0.0	20.5	23.4	0.81	106.5			
22-09-19-11-59-37-02	MHDCDFNONE	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.8	87.0	66.8	46.2	21.8	6.2	1.8	OUTSIDE LIMITS	IV: EXCESSIVE FINES	0.0	0.0	0.0	16.6	24.5	0.86	115.4			
22-09-19-11-59-37-03	3034SMHD	100.0	100.0	100.0	96.8	79.6	64.6	45.0	38.2	29.4	20.5	10.0	3.2	1.3	WITHIN LIMITS	II: OPTIMUM (3/4 - 2 IN. NMAS)	25.1	0.0	0.0	4.4	27.0	0.94	144.1				
22-09-19-11-59-37-04	3515SMHD	100.0	100.0	87.1	74.4	63.2	54.7	41.8	36.1	27.8	19.4	9.5	3.0	1.3	WITHIN LIMITS	II: OPTIMUM (3/4 - 2 IN. NMAS)	25.0	0.0	0.0	2.0	28.2	0.89	147.2				
22-09-19-11-59-37-05	4038SMHD	100.0	100.0	100.0	100.0	100.0	92.1	48.4	39.4	30.3	21.0	10.3	3.3	1.3	OUTSIDE LIMITS	III: OPTIMUM (< 3/4 IN. NMAS)	25.1	0.0	0.0	13.3	24.4	1.26	140.5				
22-09-19-11-59-37-06	4034SMHD	100.0	100.0	100.0	96.6	78.3	62.5	42.7	36.1	27.8	19.4	9.5	3.1	1.3	WITHIN LIMITS	II: OPTIMUM (3/4 - 2 IN. NMAS)	25.1	0.0	0.0	11.0	25.1	1.20	142.7				
22-09-19-11-59-37-07	4015SMHD	100.0	100.0	86.5	73.3	61.7	52.8	39.4	33.9	26.1	18.2	8.9	2.9	1.2	OUTSIDE LIMITS	II: OPTIMUM (3/4 - 2 IN. NMAS)	25.1	0.0	0.0	6.1	27.0	1.04	146.1				
22-09-19-11-59-37-08	5034SMHD	100.0	100.0	100.0	96.3	77.0	60.9	43.8	37.4	28.8	20.1	9.8	3.2	1.3	WITHIN LIMITS	II: OPTIMUM (3/4 - 2 IN. NMAS)	25.1	0.0	0.0	11.5	25.0	1.22	143.5				
22-09-19-11-59-37-09	5034SHPMHD	100.0	100.0	100.0	96.5	77.7	61.9	44.1	37.6	28.9	20.2	9.9	3.2	1.3	WITHIN LIMITS	II: OPTIMUM (3/4 - 2 IN. NMAS)	23.5	0.0	6.3	10.8	25.2	1.19	143.3				
22-09-19-11-59-37-10	5038SHPMHD	100.0	100.0	100.0	100.0	100.0	91.8	46.5	37.6	28.9	20.1	9.9	3.1	1.3	OUTSIDE LIMITS	III: OPTIMUM (< 3/4 IN. NMAS)	23.6	0.0	6.0	14.2	24.1	1.30	141.1				
22-09-19-11-59-37-11	4034SWMHD	100.0	100.0	100.0	96.2	75.8	59.1	42.1	35.9	27.7	19.3	9.4	3.1	1.3	OUTSIDE LIMITS	II: OPTIMUM (3/4 - 2 IN. NMAS)	20.0	0.0	0.0	8.9	25.7	1.11	143.5				
22-09-19-11-59-37-12	3034MHD	100.0	100.0	100.0	96.5	77.8	62.1	44.7	38.1	29.4	20.5	10.0	3.2	1.3	WITHIN LIMITS	II: OPTIMUM (3/4 - 2 IN. NMAS)	0.0	15.0	0.0	5.3	26.8	0.97	143.5				
22-09-19-11-59-37-13	4038MHD	100.0	100.0	100.0	100.0	100.0	91.9	46.8	37.8	29.0	20.2	9.9	3.2	1.3	OUTSIDE LIMITS	III: OPTIMUM (< 3/4 IN. NMAS)	0.0	14.9	0.0	13.7	24.2	1.28	140.4				
22-09-19-11-59-37-14	4034MHD	100.0	100.0	100.0	96.6	78.6	62.9	42.5	35.9	27.7	19.3	9.5	3.1	1.3	OUTSIDE LIMITS	II: OPTIMUM (3/4 - 2 IN. NMAS)	0.0	15.2	0.0	9.2	25.6	1.13	144.2				
22-09-19-11-59-37-15	4015MHD	100.0	100.0	86.6	73.5	61.9	53.1	39.8	34.2	26.4	18.4	9.0	2.9	1.2	WITHIN LIMITS	II: OPTIMUM (3/4 - 2 IN. NMAS)	0.0	15.0	0.0	5.5	27.2	1.02	146.4				
22-09-19-11-59-37-16	5034MHD	100.0	100.0	100.0	96.4	77.5	61.7	44.6	38.1	29.4	20.5	10.0	3.2	1.3	WITHIN LIMITS	II: OPTIMUM (3/4 - 2 IN. NMAS)	0.0	25.1	0.0	9.4	25.6	1.13	142.3				