CONCRETE CYLD. MIX DESIGN RESULTS

North Dakota Department of Transportation--Materials & Research Division

300 Airport Road, Bismarck, ND 58504-6005
Scott Wutzke Test Lab Supervisor 701-328-6902

Terry Fuchs Transportation Project Manager 701-328-6920

Year: **2010-2011**

Mix Design by: Industury

Project: ASTM / GU Cement
29% Old Ash / Exshaw

Trial	Date	Time	Temp	Slump	Unit Wt.	Air %	Sack/ CY	Water/ CEM.	Age of Cyl. Days	4x8 Cyl (PSI)	Break Type	Cyl Avg (PSI)	Beam Trial	Age of Beams	Beams PSI	Beam Avg (PSI)	Date of Break
1	13-Apr	11:30	64	1.75	147.6	5.3	6	0.40	1	**1620**	**d**						**14-Apr**
1A	13-Apr	1:30	65	1.50	145.8	4.8	6	0.40	1	**1500**	**d**						**14-Apr**
1A	13-Apr	1:30							1	**1620**	**d**	**1580**					**14-Apr**
1A	13-Apr	1:30							3	**2800**	**d**		1	**3**	**440**		**16-Apr**
1A	13-Apr	1:30							3	**2780**	**d**		1	**3**	**450**	**445**	**16-Apr**
1	13-Apr	11:30	64	1.75	147.6	5.3			3	**2830**	**d**	**2800**					**16-Apr**
1	13-Apr								7	**4090**	**d**		1	**7**	**560**		**20-Apr**
1A	13-Apr	1:30	65	1.50	145.8	4.8			7	**3620**	**d**		1	**7**	**510**	**535**	**20-Apr**
1A	13-Apr								7	**3760**	**d**	**3820**					**20-Apr**
1A	13-Apr								28	**5000**	**d**		1	**28**	**625**		**11-May**
1A	13-Apr								28	**5520**	**d**		1A	**28**	**585**	**605**	**11-May**
1A	13-Apr								28	**5510**	**d**	**5340**					**11-May**
1A	13-Apr								56	**6740**	**d**						**8-Jun**
1A	13-Apr								56	**6340**	**d**	**6540**					**8-Jun**
1A	13-Apr								90	**7010**	**d**						**12-Jul**
1A	13-Apr								90	**6570**	**d**						**12-Jul**
1A	13-Apr								90	**6460**	**d**	**6680**					**12-Jul**
	13-Apr								365								**4/14/2011**
	13-Apr								365								**4/14/2011**
	13-Apr								365								**4/14/2011**

CONCRETE MIX DESIGN RESULTS

North Dakota Department of Transportation--Materials & Research Division

300 Airport Road, Bismarck, ND 58504-6005
Scott Wutzke Test Lab Supervisor 701-328-6902
Terry Fuchs Transportation Project Manager 701-328-6920

Year: **2010-2011**

Mix Design by: **Industry**

Project: ASTM / GU Cement
29% Old Ash / GU

Trial	Date	Time	Temp	Slump	Unit Wt.	Air %	Sack / CY	Water/ CEM.	Age of Cyl. Days	4x8 Cyl (PSI)	Break Type	Cyl Avg (PSI)	Beam Trial	Age of Beam Days	Beams PSI	Beam Avg (PSI)	Date of Break
2	13-Apr	2:15	66	1.50	145.1	5.3	6	0.40	1	1290	d						14-Apr
2A	13-Apr	2:47	66	1.50	145.5	5.1	6	0.40	1	1380	d						14-Apr
2A	13-Apr	2:47							1	1410	d	1360					14-Apr
2	13-Apr	2:15	66	1.50	145.1	5.3			3	2590	d		2	3	400		16-Apr
2A	13-Apr	2:47							3	2760	d		2	3	430	415	16-Apr
2A	13-Apr	2:47							3	2680	d	2680					16-Apr
2	13-Apr	2:15	66	1.50	145.1	5.3			7	3760	d		2	7	515		20-Apr
2A	13-Apr	2:47	66	1.50	145.5	5.1			7	3530	d		2A	7	500	510	20-Apr
2A	13-Apr	2:47							7	3550	d	3610					20-Apr
2A	13-Apr	2:47							28	5400	d		2A	28	680		11-May
2A	13-Apr	2:47							28	5200	d		2	28	640	660	11-May
2A	13-Apr	2:47							28	5430	d	5340					11-May
2A	13-Apr	2:47							56	6650	d						8-Jun
2A	13-Apr	2:47							56	6480	d						8-Jun
2A	13-Apr	2:47							56	6520	d	6550					8-Jun
2A	13-Apr	2:47							90	6880	d						12-Jul
2A	13-Apr	2:47							90	6990	d						12-Jul
2A	13-Apr	2:47							90	6980	d	6950					12-Jul
	13-Apr	2:47							365								4/14/2011
	13-Apr	2:47							365								4/14/2011
	13-Apr	2:47							365								4/14/2011
									Spare								
									Spare								

CONCRETE MIX DESIGN RESULTS

North Dakota Department of Transportation--Materials & Research Division

300 Airport Road, Bismarck, ND 58504-6005

Scott Wutzke Test Lab Supervisor 701-328-6902

Terry Fuchs Transportation Project Manager 701-328-6920

Year: **2010-2011**

Mix Design by: **Industry**

Project: ASTM / GU Cement
20% Old Ash / Exshaw

Trial	Date	Time	Temp	Slump	Unit Wt.	Air %	Sack/CY	Water/ Cem.	Age of Cyl. Days	4x8 Cyl (PSI)	Break Type	Cyl Avg (PSI)	Beam Trial	Age of Beam Days	Beams PSI	Beam Avg (PSI)	Date of Break
3	13-Apr	3:20	67	1.75	145.1	?	6	0.40									
3A	13-Apr	3:43	66	2.50	144.4	?	6	0.40	1	**1960**	**d**						**14-Apr**
3A	13-Apr								1	**2000**	**d**						**14-Apr**
3A	13-Apr								1	**1850**	**d**	**1940**					**14-Apr**
3A	13-Apr								3	**3070**	**d**		3	**3**	**485**		**16-Apr**
3A	13-Apr								3	**3010**	**d**		3	**3**	**490**	**490**	**16-Apr**
3A	13-Apr								3	**3260**	**d**	**3110**					**16-Apr**
3A	13-Apr								7	**3750**	**d**		3	**7**	**530**		**20-Apr**
3A	13-Apr								7	**3580**	**d**		3A	**7**	**555**	**540**	**20-Apr**
3A	13-Apr								7	**3860**	**d**	**3730**					**20-Apr**
3A	13-Apr								28	**5180**	**d**		3A	**28**	**625**		**11-May**
3A	13-Apr								28	**5220**	**d**		3	**28**	**610**	**620**	**11-May**
3A	13-Apr								28	**5110**	**d**	**5170**					**11-May**
3A	13-Apr								56	**6010**	**d**						**8-Jun**
3A	13-Apr								56	**6140**	**d**						**8-Jun**
3A	13-Apr								56	**6070**	**d**	**6070**					**8-Jun**
3A	13-Apr								90	**6150**	**d**						**12-Jul**
3A	13-Apr								90	**6060**	**d**	**6110**					**12-Jul**
	13-Apr								365								**4/14/2011**
	13-Apr								365								**4/14/2011**
	13-Apr								365								**4/14/2011**

CONCRETE MIX DESIGN RESULTS

North Dakota Department of Transportation--Materials & Research Division

300 Airport Road, Bismarck, ND 58504-6005
Scott Wutzke Test Lab Supervisor 701-328-6902
Terry Fuchs Transportation Project Manager 701-328-6920

Year: **2010-2011**

Mix Design by: **Industry**

Project: ASTM / GU Cement
20% Old Ash / GU / Accelerated

Trial	Date	Time	Temp	Slump	Unit Wt.	Air %	Sack/ CY.	Water/ CEM.	Age of Cyl. Days	4x8 Cyl (PSI)	Break Type	Cyl Avg (PSI)	Beam Trial	Age of Beam Days	Beams PSI	Beam Avg (PSI)	Date of Break
4	13-Apr	4:53	67	1.75	145.0	?	6	0.40	1	1780	d						14-Apr
4A	13-Apr	5:14	67	3.00	143.0	?	6	0.40	1	1600	d						14-Apr
4A	13-Apr								1	1700	d	1690					14-Apr
4	13-Apr	4:53	67	1.75	145.0				3	2550	d		4	3	450		16-Apr
4A	13-Apr								3	2760	d		4	3	430	440	16-Apr
4A	13-Apr								3	2580	d	2630					16-Apr
4	13-Apr	4:53	67	1.75	145.0				7	3310	d		4	7	565		20-Apr
4A	13-Apr	5:14	67	3.00	143.0				7	3750	d		4A	7	490	525	20-Jul
4A	13-Apr								7	3890	d	3650					20-Apr
4A	13-Apr								28	5060	d		4A	28	585		11-May
4A	13-Apr								28	5080	d		4	28	655	620	11-May
4A	13-Apr								28	5130	d	5090					11-May
4A	13-Apr								56	5750	d						8-Jun
4A	13-Apr								56	5800	d						8-Jun
4	13-Apr	4:53	67	1.75	145.0				56	5400	d	5650					8-Jun
4	13-Apr								90	5580	d						12-Jul
4	13-Apr	4:53	67	1.75	145.0				90	6320	d						12-Jul
4A	13-Apr								90	6370	d	6090					12-Jul
	13-Apr								365								4/14/2011
	13-Apr								365								4/14/2011
	13-Apr								365								4/14/2011

CONCRETE MIX DESIGN RESULTS

North Dakota Department of Transportation--Materials & Research Division

300 Airport Road, Bismarck, ND 58504-6005
Scott Wutzke Test Lab Supervisor 701-328-6902
Terry Fuchs Transportation Project Manager 701-328-6920

Year: **2010-2011**

Mix Design by: **Industry**

Project: ASTM / GU Cement
29% Old Ash / Exshaw/ Delvo

NO BEAMS

Trial	Date	Time	Temp	Slump	Unit Wt.	Air %	Sack/ CY	Water/ CEM.	Age of Cyl Days	4x8 Cyl (PSI)	Break Type	Cyl Avg (PSI)	Beam Trial	Age of Beam Days	Beams PSI	Beam Avg (PSI)	Date of Break
5	14-Apr	8:45	59	2.00	144.2	?	6	0.40	1	**0**							**15-Apr**
5	14-Apr	8:45							1	**1650**	**d**						**15-Apr**
5	14-Apr	8:45							1	**1620**	**d**	**1640**					**15-Apr**
5	14-Apr	8:45							3	**2930**	**d**						**17-Apr**
5	14-Apr	8:45							3	**2970**	**d**						**17-Apr**
5	14-Apr	8:45							3	**2830**	**d**	**2910**					**17-Apr**
5	14-Apr	8:45							7	**3520**	**d**						**21-Apr**
5	14-Apr	8:45							7	**3650**	**d**						**21-Apr**
5	14-Apr	8:45							7	**3530**	**d**	**3570**					**21-Apr**
5	14-Apr	8:45							28	**5180**	**d**						**12-May**
5	14-Apr	8:45							28	**5090**	**d**						**12-May**
5	14-Apr	8:45							28	**5260**	**d**	**5180**					**12-May**
5	14-Apr	8:45							56	**6110**	**d**						**9-Jun**
5	14-Apr	8:45							56	**5810**	**d**						**9-Jun**
5	14-Apr	8:45							56	**5910**	**d**	**5940**					**9-Jun**
5	14-Apr	8:45							90	**6750**	**d**						**13-Jul**
5	14-Apr	8:45							90	**6810**	**d**						**13-Jul**
5	14-Apr	8:45							90	**6380**	**d**	**6650**					**13-Jul**
5	14-Apr	8:45							365								**4/14/2011**
5	14-Apr	8:45							365								**4/14/2011**
5	14-Apr	8:45							365								**4/14/2011**
									spare								
									spare								

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North Dakota Department of Transportation--Materials & Research Division

300 Airport Road, Bismarck, ND 58504-6005
Scott Wutzke Test Lab Supervisor 701-328-6902
Terry Fuchs Transportation Project Manager 701-328-6920

Year: **2010-2011**

Mix Design by: **Industry**

Project: ASTM / GU Cement
25% Old Ash / 25% Pozzolan / Exshaw

NO BEAMS

Trial	Date	Time	Temp	Slump	Unit Wt.	Air %	Sack/ CY.	Water/ CEM.	Age of Cyl. Days	4x8 Cyl (PSI)	Break Type	Cyl Avg (PSI)	Beam Trial	Age of Beam Days	Beams PSI	Beam Avg (PSI)	Date of Break
6	14-Apr	9:17	61	2.00	145.2	5.3	6	0.40	1	1140	d						15-Apr
6	14-Apr	9:17							1	1000	d						15-Apr
6	14-Apr	9:17							1	1100	d	1080					15-Apr
6	14-Apr	9:17							3	2450	d						17-Apr
6	14-Apr	9:17							3	2460	d						17-Apr
6	14-Apr	9:17							3	2550	d	2490					17-Apr
6	14-Apr	9:17							7	3360	d						21-Apr
6	14-Apr	9:17							7	3500	d						21-Apr
6	14-Apr	9:17							7	3540	d	3470					21-Apr
6	14-Apr	9:17							28	5150	d						12-May
6	14-Apr	9:17							28	4980	d						12-May
6	14-Apr	9:17							28	4810	d	4980					12-May
6	14-Apr	9:17							56	6280	d						9-Jun
6	14-Apr	9:17							56	6130	d						9-Jun
6	14-Apr	9:17							56	6090	d	6170					9-Jun
6	14-Apr	9:17							90	6500	d						13-Jul
6	14-Apr	9:17							90	6710	d						13-Jul
6	14-Apr	9:17							90	6340	d	6520					13-Jul
6	14-Apr	9:17							365								4/14/2011
6	14-Apr	9:17							365								4/14/2011
6	14-Apr	9:17							365								4/14/2011
									spare								
									spare								

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Year: **2010-2011**

Mix Design by: **Industry**

Project: ASTM / GU Cement
No Ash / HE / Exshaw

Trial	Date	Time	Temp	Slump	Unit Wt.	Air %	Sack/ CY	Water/ CEM.	Age of Cyl. Days	4x8 Cyl (PSI)	Break Type	Cyl Avg (PSI)	Beam Trial	Age of Beam Days	Beams PSI	Beam Avg (PSI)	Date of Break
8	14-Apr	10:25	65	3.25	141.5	7.2	7.2	0.39	1	2080	d						15-Apr
8A	14-Apr	11:35	69	3.00	140.6	?	7.2	0.39	1	1980	d						15-Apr
8A	14-Apr	11:35							1	2060	d	2040					15-Apr
8A	14-Apr	11:35							3	2980	d		8	3	545		17-Apr
8A	14-Apr	11:35							3	2940	d		8	3	580	560	17-Apr
8A	14-Apr	11:35							3	2930	d	2950					17-Apr
8	14-Apr	10:25	65	3.25	141.5	7.2			7	3450	d		8	7	585		21-Apr
8A	14-Apr	11:35	69	3.00	140.6	?			7	3260	d		8A	7	595	590	21-Apr
8A	14-Apr	11:35							7	3470	d	3390					21-Apr
8A	14-Apr	11:35							28	4360	d		8A	28	620		12-May
8A	14-Apr	11:35							28	4810	d		8	28	675	650	12-May
8	14-Apr	10:25	65	3.25	141.5	7.2			28	4960	d	4710					12-May
8A	14-Apr	11:35	69	3.00	140.6	?			56	5150	d						9-Jun
8A	14-Apr	11:35							56	4950	d						9-Jun
8A	14-Apr	11:35							56	4990	d	5030					9-Jun
8A	14-Apr	11:35							90	5380	d						13-Jul
8A	14-Apr	11:35							90	5350	d						13-Jul
8A	14-Apr	11:35							90	5000	d	5240					13-Jul
	14-Apr	11:35							365								4/14/2011
	14-Apr	11:35							365								4/14/2011
	14-Apr	11:35							365								4/14/2011
									spare								
									spare								
									spare								

CONCRETE MIX DESIGN RESULTS

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Scott Wutzke Test Lab Supervisor 701-328-6902
Terry Fuchs Transportation Project Manager 701-328-6920

Year: **2010-2011**

Mix Design by: **Industry**

Project: ASTM / GU Cement
NO ASH / HE / GU

Trial	Date	Time	Temp	Slump	Unit Wt.	Air	Sack/	Water/	Age of Cyl.	4x8	Break	Cyl	Beam	Age of Beam	Beams	Beam	Date
						%	CY	CEM.	Days	Cyl (PSI)	Type	Avg (PSI)	Trial	Days	PSI	Avg (PSI)	of Break
9	14-Apr	11:40	71	3.00	140.6	6.4	7.2	3.9	1	2160	d						15-Apr
9A	14-Apr	12:10	72	3.75	143.0	?	7.2	3.9	1	2190	d						15-Apr
9A	14-Apr	12:10							1	2180	d	2180					15-Apr
9A	14-Apr	12:10							3	3180	d		9	3	535		17-Apr
9A	14-Apr	12:10							3	3240	d		9	3	545	540	17-Apr
9a	14-Apr	12:10							3	3410	d	3280					17-Apr
9	14-Apr	12:10	71	3.00	140.6	6.4			7	3660	d		9	7	605		21-Apr
9A	14-Apr	12:10	72	3.75	143.0	?			7	3810	d		9A	7	550	580	21-Apr
9A	14-Apr	12:10							7	3750	d	3740					21-Apr
9A	14-Apr	12:10							28	4700	d		9A	28	615		12-May
9A	14-Apr	12:10							28	4880	d		9	28	665	640	12-May
9A	14-Apr	12:10							28	4830	d	4800					12-May
9A	14-Apr	12:10							56	5240	d						9-Jun
9A	14-Apr	12:10							56	5480	d						9-Jun
9A	14-Apr	12:10							56	5250	d	5320					9-Jun
9A	14-Apr	12:10							90	5530	d						13-Jul
9A	14-Apr	12:10							90	5550	d						13-Jul
9A	14-Apr	12:10							90	5530	d	5540					13-Jul
	14-Apr	12:10							365								4/14/2011
	14-Apr	12:10							365								4/14/2011
	14-Apr	12:10							365								4/14/2011
	14-Apr	12:10							spare								
	14-Apr	12:10							spare								
									spare								