STATE OF NEBRASKA
DEPARTMENT OF ROADS
ADDENDUM NO. 1
PROJECT NO. PEP-63-2(1010)
CONTROL NO. 12698
CALL ORDER N05
ON N-63, NORTH OF GREENWOOD
LETTING DATE: JUNE 26, 2003

On page 33 of the Special Provisions, the provision titled HYDRATED LIME SLURRY STABILIZATION (S10-9-0603) is void and superseded by the following:

HYDRATED LIME SLURRY STABILIZATION
(Contractor QAQC)
(S10-13-0703)

Description

1. This work shall consist of constructing a Hydrated Lime Slurry base course. Produce the stabilized base course by milling the bituminous pavement, mixing the reclaimed bituminous pavement material with hydrated lime slurry and emulsified asphalt. Spread and compact the mixture in accordance with these specifications, as shown on the plans or directed by the Engineer.

Materials

2.a. The hydrated lime slurry shall be manufactured at the jobsite by slaking pebble quicklime. Pebble quicklime shall conform to the requirements listed in these Special Provisions. Each load of quicklime shall be accompanied by a certification stating the purity of that load.

2.b. The Emulsified Asphalt to be used shall be CSS-1H or CSS-1.

2.c. Water used for the hydrated lime slurry shall conform to the requirements of Section 1005 of the Standard Specifications.

Pebble Quicklime

2.d. This Specification covers pebble quicklime that is suitable for treatment of soil and soil-aggregate mixtures for purposes of stabilization. Pebble quicklime is a calcined material, the major part of which is calcium oxide or calcium oxide in natural association with a lesser amount of magnesium oxide capable of slaking with water. This specification applies to limes made from calcium type limestone.

Requirements

2.e. Provide materials that comply with the requirements of AASHTO M 216 (ASTM C 977).

2.f. Receipt and approval of certification stating purity and type.

Mix Design

3.a. A mixture design is required before the start of the project. The Contractor shall complete the mix design or have a mix design performed by a testing laboratory familiar with this type of recycling. The Contractor shall submit the mixture design to the Engineer for approval.

3.b. The proposed mix design shall have the properties as listed below and as indicated by the criteria given in Table 1.

TABLE 1

50 blow Marshall Design

Property	Criteria
Cured Marshall Stability*, ASTM D 1559, Part 5, 40°C, min., lb.	1250
Retained Marshall Stability* after soaking based on cured stability, min., %	70
*Cured stability determined on 60°C curing to constant weight (<72 hours). Retained stability determined after 23-hour water soak at 25°C followed by 40°C soak for one hour.	

3.c. Pebble quicklime shall be added by mass to the required quantity of water to provide uniform hydrated lime slurry having dry solids content of not less than 30 percent.

3.d. The milled bituminous material shall pass a 1.25-inch (31.5 mm) sieve.

3.e. The quantity of hydrated lime shall be determined by the mix design but shall have a minimum of 1.0 percent hydrated lime, based on the mass of dry RAP, added to the RAP.

3.f. The quantity of asphalt emulsion and mixing water shall be determined by the mixture design.

Sampling and Processing

3.g. Obtain cores from the areas to be recycled. If cores show significant differences in various areas, such as different type or thickness of layers between cores, then separate mix designs shall be performed for each of these pavement segments. It is recommended to take at a minimum, one core for each lane mile and where visual differences in the pavement are noticed. Cores shall be cut in the laboratory to the depth specified for the cold-in-place recycling project. Cores shall be crushed in the laboratory. This material shall be crushed to simulate field processed conditions. Perform a mix design(s) using the recycled asphalt pavement millings.

3.h. A target gradation using the following sieve sizes shall be submitted with the mix design and shall conform to the tolerances shown during field production.

Sieve Size	**Tolerance During Production**
1¼ inch (31.5 mm)	0
1 inch (25 mm)	±10
¾ inch (19 mm)	±10
No. 4 (4.75 mm)	±10
No. 30 (600 µm)	±10
No. 200 (75 µm)	±10

Equipment

4. Cold Recycling shall consist of a unit or a combination of units, which will satisfactorily perform the following requirements:

4.A. Configuration

1. Slake pebble quicklime and transport the hydrated lime slurry to the milling operation.

2. Mill the bituminous pavement, add the hydrated lime slurry to the RAP, and pick up the RAP.

3. Process the RAP to meet the specified gradation.

4. Add the emulsified asphalt to the RAP and mix the RAP uniformly with the hydrated lime slurry and emulsified asphalt.

5. Deposit the mixture in a paver.

4.B. Performance

1. The slaking equipment shall be specifically manufactured for this purpose. Tank trucks or trailers used to transport hydrated lime slurry shall have mechanical agitators.

2.(I) The milling unit shall be capable of milling the asphalt pavement to a depth shown in the plans and 12 feet (3.66 meters) wide in one pass, unless otherwise specified. It shall have automatic controls capable of maintaining uniform grade and cross-slope.

2.(II) The milling chamber shall have a spray bar to incorporate hydrated lime slurry into the RAP. The metering device for the spray bar shall be calibrated to, and controlled by, the continuous weighing system for the RAP.

3. The RAP processing unit shall be a crusher with a scalper screen, or other approved devices capable of reducing the RAP to the specified gradation.

4. The mixing unit shall have a continuous weighing system for the RAP, coupled with meters to maintain the proper proportion of RAP material, hydrated lime slurry and emulsified asphalt. The mixing unit shall be capable of producing a homogenous mixture of processed RAP material, hydrated lime slurry and emulsified asphalt and depositing the recycled mixture into a paver, without segregation.

5. The liquid metering systems shall deliver the additive to within 0.2 percentage points of the desired application rate, and shall shut off automatically if the delivery of RAP material is stopped.

6. Positive means shall be provided for calibration of the weighing and metering devices.

Construction Requirements:

5. Cold mill the existing bituminous surfacing in such a manner that does not disturb the underlying material in the existing roadway. The Contractor shall conduct his operations to prevent segregation of hydrated lime slurry stabilization material. Areas of segregated lime stabilized material shall be removed and replaced with non segregated material or the type of Asphaltic Concrete used on the project at no additional charge.

Spreading and finishing

5.a. The RAP, lime and emulsion mixture shall be delivered to the paver immediately after mixing the lime with the RAP. The recycled material shall be spread and finished true to crown and grade, in one or more lifts with a bituminous paver meeting the requirements of Section 503 or other equipment approved by the Engineer.

Compaction and Density Requirements

5.b. Compaction and density requirements for this project shall be a minimum of 97 percent of the target density obtained on a test strip compacted under the following conditions: The Mix temperature of the test strip shall be 50 degrees F (10° C) or higher. At least two test strips shall be completed to determine the target density and optimum sequence of rollers. These test strips will remain in place as part of the completed work. The depth of the lift shall be representative of the project.

5.c. Target density shall be the highest density achieved on the test strip using the rolling procedure approved by the Engineer. The rolling procedure, used on the test strip, shall have a minimum of six roller coverage's. The Engineer will use a nuclear gauge to establish a density growth curve for each procedure. Rolling shall be discontinued when four consecutive coverage's of the rollers fail to increase the density 1 pound per cubic foot (16 kg per cubic meter).

5.d. The Contractor shall have, as a minimum, the following self-propelled rollers for use on the project: a double drum vibratory steel roller and a pneumatic tire roller. The vibratory roller shall meet the requirements of Subsection 503 of the Standard Specifications and also have a minimum operating weight of 18,000 pounds (8165 kg) and a drum width of not less than 66 inches (1.68 meters). The vibratory roller may be used in the static mode. The pneumatic tired roller shall weigh at least 30 tons (27 Mg) and have a minimum tire pressure of 90 pounds per square inch (psi) (620 kPa). The air pressure in each of the pneumatic tires will be within 5 (psi) (34 kPa) of each other. The Contractor shall supply a suitable tire pressure gauge. The rollers shall have watering systems to keep drums and tires wetted as required to prevent mixture pickup.

5.e. When there is a significant change in mix proportions, weather conditions or other controlling factors the Engineer may require construction of another test strip(s) to check target density.

5.f. Stabilization will not be performed when the ambient air temperature is less than 50 degrees F (10 degrees C). Also, the weather must not be foggy or rainy. The above requirement may be waived, but only in writing by the Engineer.

Preparation of Roadway

6. Remove vegetation from cracks, joints and other areas such as along edges of the roadway to prevent the contamination of the reclaimed asphalt pavement during the milling operation. If foreign matter or debris exists (dirt, leaves, etc.), the roadway shall be cleaned by power brooming.

Patching

7. The Contractor will repair all areas in the recycled roadway, which develop cracking and/or settlement after the cold recycling process. These areas shall be repaired by deep patching and completed prior to placement of the asphaltic concrete surfacing. The existing asphalt surfacing material, base and subgrade soil as required, shall be removed and replaced with the type of asphaltic concrete being produced on the project at that time and properly compacted to produce a stable repair.

Sampling and Testing

8. The Contractor shall randomly sample the recycled mixture for each 2500-foot (760 meter) lane section to verify that the mix design and density requirements are being met. If a sample fails to meet any of the mix design or density requirements the Contractor shall make any necessary adjustments and retest to verify that the mixture is meeting the requirements. All test results shall be reported to the State project personnel and a copy of the test reports submitted to the Engineer.

Method of Measurement

9.a. Patching shall be measured for payment in accordance with Subsection 516.05 of the Standard Specifications.

9.b. Hydrated Lime Slurry Stabilization shall be measured for payment by the station of completed and accepted work measured along the project centerline.

9.c. The Hydrated Lime will be measured by the Ton (Mg) of hydrated lime used in the slurry. Using the relationship of Pure Quicklime (CaO) x 1.32 = Hydrated Lime Ca(OH2), the basis of pay for jobsite slaked hydrated lime shall be the “calculated method” using the certified lime purity for each load as follows:

Quicklime Delivered x % purity x 1.32 = A
Quicklime Delivered x % inert material x 1.0 = B
A+B = Total Hydrated Lime Produced (Pay Quantity)

9.d. Emulsified Asphalt for Hydrated Lime Slurry Stabilization shall be measured for payment by the gallon (liter). The refinery certified volume shall be used as a basis of measurement if the entire shipment is used.

Basis of Payment

10.a. “Hydrated Lime Slurry Stabilization” shall be paid for at the Contract unit price per station. This price shall include the milling, processing, addition and mixing of the lime slurry and emulsified asphalt, shaping, compaction, finishing, vegetation removal, roadway sweeping, tests strips and for all equipment, labor, tools, and incidentals necessary to complete the work.

10.b. The accepted quantity of “Hydrated Lime” will be paid at the Contract unit price per ton (Mg).

10.c. The accepted quantity of “Emulsified Asphalt for Hydrated Lime Slurry Stabilization” will be paid at the Contract unit price per gallon (liter). If the actual type of Emulsified Asphalt used is different than that shown in these provisions, the unit price will be adjusted, up or down, by the difference in the invoice price of the material.

10.d. Patching, measured as provided herein, shall be paid for in accordance with Subsection 516.06 of the Standard Specifications.

10.e. Water used in the hydrated lime slurry will not be measured for payment but shall be considered subsidiary to the item “Hydrated Lime”.

CHECKING PERCENT SOLIDS OF LIME SLURRY

When requested by the Engineer, the Contractor shall determine the solids content of the hydrated lime slurry using Table 1, Table 2 and the Slurry Worksheet. The Contractor shall provide and use the standard weight per 83.205-ml Gardner cup meeting the requirements of ASTM D 244.

After a batch of lime slurry has been produced, use the following procedures to verify that the intended percent solids have been achieved.

Table 2, “Correction Factors to Adjust Density of Temperature”, for accurate measurement of solids if slurry is not at 24 degrees C.

I. Fill a quart container 3/4 full with lime slurry. Samples can be taken from ports located at either end of the vessel. Do not use glass.

II. Weigh a dry, empty Gardner (WPG) cup and cover to the nearest 0.01 of a gram. Record this weight.

III. Shake the lime slurry sample well. Immediately fill the WPG cup.

IV. Tap the WPG cup lightly on an immovable object to allow for the escape of air bubbles.

V. Slowly turn the cap of the WPG cup until it is completely seated. If the cover is pushed on quickly, lime slurry will squirt out through the hole in the center. Be sure to point the top of the WPG away from you (or others) while putting on the cap.

VI. Hold the WPG cup by the top and bottom with thumb and forefinger. Be sure to cover the hole in the cap.

VII. Rinse the WPG cup under running water to remove any lime from the outside of the cup.

VIII. Dry the outside of the cup thoroughly.

IX. Weigh the dry, filled WPG cup to the nearest 0.01 of a gram. Record this weight.

X. Promptly remove the cover and insert thermometer. Record temperature.

XI. Subtract the empty cup weight (step 2) from the filled cup weight (step 9). Record the difference.

XII. Multiply the difference by 0.1. This number is the density (lbs./gallon) of the lime slurry. Record this number.

XIII. Look up the temperature correction in Table 2. Record.

XIV. Multiply the slurry density times the temperature correction. This is the adjusted slurry density. Record on the slurry worksheet.

XV. Find the nearest density to that recorded above on the “Slurry Solids Chart” on Table 1, Slurry Solids Chart - 24 degrees C. The corresponding number is the percent solids of the lime slurry sample. Record on worksheet.

Table 1, Page 1
Slurry Solids Chart – 24°C

Density lbs./gal.	Slurry Solids %	Density lbs./gal.	Slurry Solids %	Density lbs./gal.	Slurry Solids %	Density lbs./gal.	Slurry Solids %
9.108	15.1	9.402	20.1	9.715	25.1	10.050	30.1
9.114	15.2	9.406	20.2	9.722	25.2	10.057	30.2
9.120	15.3	9.414	20.3	9.728	25.3	10.064	30.3
9.128	15.4	9.420	20.4	9.735	25.4	10.071	30.4
9.131	15.5	9.426	20.5	9.741	25.5	10.078	30.5
9.137	15.6	9.433	20.6	9.748	25.6	10.085	30.6
9.143	15.7	9.439	20.7	9.755	25.7	10.092	30.7
9.148	15.8	9.445	20.8	9.761	25.8	10.099	30.8
9.154	15.9	9.451	20.9	9.768	25.9	10.106	30.9
9.160	16.0	9.457	21.0	9.774	26.0	10.113	31.0
9.166	16.1	9.463	21.1	9.781	26.1	10.120	31.1
9.171	16.2	9.469	21.2	9.787	26.2	10.127	31.2
9.177	16.3	9.476	21.3	9.794	26.3	10.134	31.3
9.183	16.4	9.482	21.4	9.800	26.4	10.141	31.4
9.189	16.5	9.488	21.5	9.807	26.5	10.148	31.5
9.195	16.6	9.494	21.6	9.814	26.6	10.155	31.6
9.200	16.7	9.500	21.7	9.820	26.7	10.163	31.7
9.206	16.8	9.506	21.8	9.827	26.8	10.170	31.8
9.212	16.9	9.513	21.9	9.833	26.9	10.177	31.9
9.218	17.0	9.519	22.0	9.840	27.0	10.184	32.0
9.224	17.1	9.525	22.1	9.847	27.1	10.191	32.1
9.230	17.2	9.531	22.2	9.853	27.2	10.198	32.2
9.235	17.3	9.538	22.3	9.860	27.3	10.205	32.3
9.241	17.4	9.544	22.4	9.867	27.4	10.212	32.4
9.247	17.5	9.550	22.5	9.873	27.5	10.220	32.5
9.253	17.6	9.556	22.6	9.880	27.6	10.227	32.6
9.259	17.7	9.563	22.7	9.887	27.7	10.234	32.7
9.265	17.8	9.569	22.8	9.894	27.8	10.241	32.8
9.271	17.9	9.575	22.9	9.900	27.9	10.248	32.9
9.277	18.0	9.581	23.0	9.907	28.0	10.255	33.0
9.282	18.1	9.588	23.1	9.914	28.1	10.263	33.1
9.288	18.2	9.594	23.2	9.920	28.2	10.270	33.2
9.294	18.3	9.600	23.3	9.927	28.3	10.277	33.3
9.300	18.4	9.607	23.4	9.934	28.4	10.284	33.4
9.306	18.5	9.613	23.5	9.941	28.5	10.292	33.5
9.312	18.6	9.619	23.6	2.948	28.6	10.299	33.6
9.318	18.7	9.626	23.7	9.954	28.7	10.306	33.7
9.324	18.8	9.632	23.8	9.961	28.8	10.314	33.8
9.330	18.9	9.638	23.9	9.968	28.9	10.321	33.9
9.336	19.0	9.645	24.0	9.975	29.0	10.328	34.0
9.342	19.1	9.651	24.1	9.982	29.1	10.335	34.1
9.348	19.2	9.658	24.2	9.988	29.2	10.343	34.2
9.354	19.3	9.664	24.3	9.995	29.3	10.350	34.3
9.360	19.4	9.670	24.4	10.002	29.4	10.358	34.4
9.366	19.5	9.677	24.5	10.009	29.5	10.365	34.5
9.372	19.6	9.683	24.6	10.016	29.6	10.372	34.6
9.378	19.7	9.690	24.7	10.023	29.7	10.380	34.7
9.384	19.8	9.696	24.8	10.030	29.8	10.387	34.8
9.390	19.9	9.703	24.9	10.037	29.9	10.394	34.9
9.396	20.0	9.709	25.0	10.044	30.0	10.402	35.0

Table 1, Page 2
Slurry Solids Chart – 24°C

Density lbs./gal.	Slurry Solids %	Density lbs./gal.	Slurry Solids %	Density lbs./gal.	Slurry Solids %	Density lbs./gal.	Slurry Solids %
10.409	35.1	10.795	40.1	11.210	45.1	11.658	50.1
10.417	35.2	10.803	40.2	11.218	45.2	11.667	50.2
10.424	35.3	10.811	40.3	11.227	45.3	11.677	50.3
10.432	35.4	10.819	40.4	11.236	45.4	11.686	50.4
10.439	35.5	10.827	40.5	11.244	45.5	11.695	50.5
10.447	35.6	10.835	40.6	11.253	45.6	11.705	50.6
10.454	35.7	10.843	40.7	11.262	45.7	11.714	50.7
10.462	35.8	10.851	40.8	11.270	45.8	11.724	50.8
10.469	35.9	10.859	40.9	11.279	45.9	11.733	50.9
10.477	36.0	10.867	41.0	11.288	46.0	11.743	51.0
10.484	36.1	10.875	41.1	11.297	46.1	11.752	51.1
10.492	36.2	10.883	41.2	11.305	46.2	11.762	51.2
10.499	36.3	10.892	41.3	11.314	46.3	11.771	51.3
10.507	36.4	10.900	41.4	11.323	46.4	11.781	51.4
10.514	36.5	10.908	41.5	11.332	46.5	11.790	51.5
10.522	36.6	10.916	41.6	11.341	46.6	11.800	51.6
10.530	36.7	10.924	41.7	11.349	46.7	11.809	51.7
10.537	36.8	10.932	41.8	11.358	46.8	11.819	51.8
10.545	36.9	10.941	41.9	11.367	46.9	11.828	51.9
10.552	37.0	10.949	42.0	11.376	47.0	11.838	52.0
10.560	37.1	10.957	42.1	11.385	47.1	11.848	52.1
10.568	37.2	10.965	42.2	11.394	47.2	11.857	52.2
10.575	37.3	10.974	42.3	11.403	47.3	11.867	52.3
10.583	37.4	10.982	42.4	11.412	47.4	11.877	52.4
10.591	37.5	10.990	42.5	11.421	47.5	11.886	52.5
10.599	37.6	10.998	42.6	11.430	47.6	11.896	52.6
10.606	37.7	11.007	42.7	11.439	47.7	11.906	52.7
10.614	37.8	11.015	42.8	11.447	47.8	11.915	52.8
10.622	37.9	11.023	42.9	11.456	47.9	11.925	52.9
10.629	38.0	11.032	43.0	11.465	48.0	11.935	53.0
10.637	38.1	11.040	43.1	11.475	48.1	11.945	53.1
10.645	38.2	11.048	43.2	11.484	48.2	11.954	53.2
10.653	38.3	11.057	43.3	11.493	48.3	11.964	53.3
10.661	38.4	11.065	43.4	11.502	48.4	11.974	53.4
10.668	38.5	11.074	43.5	11.511	48.5	11.984	53.5
10.676	38.6	11.082	43.6	11.520	48.6	11.994	53.6
10.684	38.7	11.090	43.7	11.529	48.7	12.004	53.7
10.692	38.8	11.099	43.8	11.538	48.8	12.014	53.8
10.700	38.9	11.107	43.9	11.547	48.9	12.023	53.9
10.707	39.0	11.116	44.0	11.556	49.0	12.033	54.0
10.715	39.1	11.124	44.1	11.566	49.1	12.043	54.1
10.723	39.2	11.133	44.2	11.575	49.2	12.053	54.2
10.731	39.3	11.141	44.3	11.584	49.3	12.063	54.3
10.739	39.4	11.150	44.4	11.593	49.4	12.073	54.4
10.747	39.5	11.158	44.5	11.602	49.5	12.083	54.5
10.755	39.6	11.167	44.6	11.612	49.6	12.093	54.6
10.763	39.7	11.175	44.7	11.621	49.7	12.103	54.7
10.771	39.8	11.184	44.8	11.630	49.8	12.113	54.8
10.779	39.9	11.193	44.9	11.639	49.9	12.123	54.9
10.787	40.0	11.201	45.0	11.649	50.0	12.134	55.0

Table 2
Correction Factor to Adjust Slurry Densities for Temperature

Temp (C)	Factor	Temp (C)	Factor
20	0.99927	61	1.01176
21	0.99944	62	1.01218
22	0.99962	63	1.01262
23	0.99981	64	1.01305
24	1.00000	65	1.01349
25	1.00002	66	1.01394
26	1.00041	67	1.01439
27	1.00063	68	1.01485
28	1.00085	69	1.01531
29	1.00109	70	1.01578
30	1.00132	71	1.01626
31	1.00157	72	1.01673
32	1.00182	73	1.01722
33	1.00208	74	1.01770
34	1.00234	75	1.01820
35	1.00261	76	1.01870
36	1.00289	77	1.01920
37	1.00318	78	1.01971
38	1.00347	79	1.02022
39	1.00376	80	1.02074
40	1.00407	81	1.02126
41	1.00438	82	1.02179
42	1.00469	83	1.02232
43	1.00501	84	1.02286
44	1.00534	85	1.02341
45	1.00567	86	1.02395
46	1.00601	87	1.02451
47	1.00635	88	1.02506
48	1.00670	89	1.02563
49	1.00706	90	1.02619
50	1.00742	91	1.02677
51	1.00779	92	1.02734
52	1.00816	93	1.02793
53	1.00854	94	1.02851
54	1.00892	95	1.02911
55	1.00931	96	1.02970
56	1.00970	97	1.03031
57	1.01010	98	1.03091
58	1.01051	99	1.03152
59	1.01092	100	1.03214
60	1.01134	101	1.03276

DEPARTMENT OF ROADS

Claude Oie
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Issued: June 13, 2003

CO:N05AD106

NOTICE: Only the contractors issued bidding proposals receive this addendum and

responsibility for notifying any potential subcontractors or suppliers remains with the contractor.