

STATE OF NEBRASKA
DEPARTMENT OF ROADS
ADDENDUM NO. 4
PROJECT NO. S-2-3(1015)
CONTROL NO. 60894
CALL ORDER N29
N-2, BERWYN - ANSLEY
LETTING DATE: DECEMBER 19, 2002

The Special Provisions are amended to include the following:

PORTLAND CEMENT CONCRETE PAVEMENT SMOOTHNESS

Section 602 in the Standard Specifications and Supplemental Specifications is void and superseded by the following:

602.01 – General

1. This specification establishes a standard for Portland cement concrete pavement smoothness, and defines defective pavement smoothness. The intent of the specification is to produce a finished Portland cement concrete pavement driving surface with a Profile Index no greater than 20 inches per mile.
2. Pavement smoothness will be evaluated as prescribed in this section when the pay item “Portland Cement Concrete Smoothness Testing” is included in the contract.

602.02 – Equipment

1. The Contractor shall furnish a 25-foot California profilograph approved by the Nebraska Department of Roads.
2. The profilograph shall have multiple, non-uniformly spaced, articulated support wheels arranged such that no two wheels pass the same location on the pavement surface at the same time (ASTM Designation: E 1274, Paragraph 5.1.2)
3. The profilograph shall be equipped with a computerized system that will record, analyze, and print the test data.

4. The profilograph shall produce a printed pavement profile trace (profilogram) with a vertical scale of 1:1, and a horizontal scale of 1:300 (1" paper=25' pavement). The profilogram shall include the following information.
 - a. Project number
 - b. Test date
 - c. Traffic lane
 - d. Test direction
 - e. Test path
 - f. Pass number (1 for initial test; 2,3,etc. for repeat runs)
 - g. Operator's name
 - h. Project stations
 - i. Data filter values
 - j. Blanking (Null) band width
 - k. Profile counts for each test section
 - l. Profile Index for each test section
 - m. Bump locations for each test section

602.03 – Certification and Independent Assurance Testing

1. The Department shall calibrate and certify the Contractor's profilograph annually at a test site established by the Department.
 - a. The profilograph shall be inspected for compliance with general equipment requirements, including wheel configuration, effective length, data analysis system, guidance system, and overall condition.
 - b. The profilograph shall be calibrated for distance measurement by moving it over the prescribed path of a premeasured test distance at walking speed, and determining its distance calibration factor.
 - c. The profilograph shall be checked for vertical measurement accuracy by placing a 1-inch and 2-inch calibration block, measured to the nearest 0.01 inch, under the sensing wheel while the profilograph is stationary. The vertical measurement indicated by the profilograph shall be within 4.0% tolerance of the actual pre-measured block height.
 - d. The profilograph shall be checked for overall performance by moving it over the prescribed path of a premeasured pavement test section at walking speed.
 - e. Distance measurement indicated by the profilograph shall be within 0.2 percent tolerance of the actual premeasured test section distance. To ensure accurate distance measurement during test runs, the air pressure of the distance measurement tire must always be maintained at the same level used for calibration.

- f. The Profile Index reported by the profilograph for the test section shall be within 10.0 percent tolerance of the Profile Index reported by a Nebraska Department of Roads profilograph for the same test section.
 - g. A dated and signed decal will be placed on the profilograph to certify its acceptability for use on Nebraska Department of Roads pavement construction projects.
 2. The Department shall certify the Contractor's profilograph operator at least every 5 years. The operator may be certified by presenting certification from another state highway agency or by completing certification training conducted by the Nebraska Department of Roads.
 3. The Department shall schedule and perform Independence Assurance tests for the Contractor's profilographs and operators at least once per construction season. Independent Assurance testing shall be conducted at a randomly selected time on an active construction project. The criteria for the test will be similar to those used for certification.

602.04 – Profilograph Test Procedures

1. The Contractor shall perform all pavement smoothness specification tests except the 10-foot straight edge testing as shown in Paragraph 15, below.
2. The Engineer shall furnish a report form to the Contractor identifying all required test sections.
 - a. The pavement surface shall be divided into lane-width segments that end at a bridge, railroad crossing, or other designated termini.
 - b. The lane-width segments shall be further divided into individual 528 feet (0.10 mile) long test sections, in the direction of project stationing. The last test section in a segment is usually shorter than 528 feet.
 - c. If a test section is less than 300 feet long, it shall be combined with the preceding 528 feet long test section for analysis.
3. The Contractor's certified profilograph operator shall perform smoothness specification tests in the Engineer's presence. Smoothness testing shall be performed during normal daylight working hours unless otherwise approved by the Engineer. If the Contractor notifies the Engineer of a proposed test, and the Engineer elects not to be present, then the Contractor may proceed unaccompanied.
4. The Contractor shall report test results to the Engineer within 72 hours after initial concrete placement or surface corrective work. The Contractor shall report additional test results to the Engineer as soon as possible, but *not* later than 7 calendar days after completion of the mainline pavement.

5. The profilograph operator shall perform pavement smoothness measurements in the right-hand or left-hand wheel path of all driving lanes, as directed by the Engineer, including climbing and fly-by lanes. In urban areas, where inlet block-outs or manholes are in the right or left-hand wheel path, the pavement smoothness measurements shall be made in a location determined by the Engineer. All wheels of the profilograph shall be on the new pavement for which the Contractor is responsible. The wheel path to be tested shall be designated by the Engineer prior to the beginning of construction.
6. The Contractor shall remove all objects and foreign material from the pavement surface before testing.
7. The profilograph operator shall guide the profilograph along the specified wheel path of each traffic lane at walking speed. Propulsion may be by personnel pushing manually, or by a suitable propulsion unit that does not exceed a speed of 4 miles per hour. Excessive speed can produce erratic test results.
8. A lateral location indicator shall be used to keep the profilograph in the required test path during testing. Pavement edges, longitudinal joints or longitudinal pavement markings may be used as reference lines. An additional person may be required to hold the back end of the profilograph on the required path on horizontal curves.
9. Before testing, the profilograph operator shall lower the profilograph's recording wheel to the pavement surface and move the profilograph forward to the beginning location of a test section to stabilize the measurement system. To ensure consistent distance measurement, the profilograph operator shall also check and adjust the recording wheel tire pressure several times a day.
10. All station references on the profilograms and report forms shall be actual project stations. Stations shall be accurately noted on the profilogram at least every 200 feet.
11. The profilograph operator and the Engineer shall sign the profilograms immediately after completion of the tests. If the Engineer was not present at the time of the tests, then the absence shall be noted on the profilograms.
12. The Engineer shall perform or schedule verification tests on at least 10 percent of the pavement surface, using a profilograph owned by the Department.
13. If the verification test, Independent Assurance tests, or other observations indicate that the Contractor's procedures and/or results are not acceptable or accurate, the Engineer may do any of the following:
 - a. Require the Contractor to calibrate the profilograph and re-run the tests.
 - b. Disqualify the Contractor's equipment and/or operator.

- c. Perform the tests for part, or all, of the project with a profilograph owned by the Department, and charge the Contractor \$500.00 per lane mile for all testing done by the Department.
14. The following areas of pavement shall be excluded from the Profile Index, unless otherwise specified in the special provisions.
 - a. Pavement on horizontal curves having a centerline radius of curvature of less than 1,000 feet, and pavement within the superelevation transition of such curves.
 - b. Pavement within 50 feet of a transverse joint that separates the pavement from an approach slab to a bridge deck or existing pavement not constructed under the contract.
 - c. Pavement for truck weigh stations or rest areas, acceleration/deceleration lanes, and interchange ramps and loops.
 - d. Pavement within 50 feet of railroad crossing and associated transitions.
 - e. Pavement with a posted speed limit of 45 miles per hour or less.
 - f. Mandated blockouts for access at intersections and driveways including 50 feet on either side.
 - g. Pavement that would require handwork by normal industry practices.
 - h. Additional exceptions shown on the summary sheet in the plans.
15. Excluded pavement sections shall be measured for bumps with either a profilograph or a 10-foot straight edge. If the profilograph is used, the deviation shall not exceed 0.30 inch. The deviation of the surface shall not exceed 1/8 inch, if a 10-foot straight edge is used.

602.05 – Evaluation

1. The Contractor shall determine a Profile Index and number of correctable bumps for each test section, record the information on the report form, and provide a copy of the report, along with the corresponding profilograms, to the Engineer.
 - a. The Profile Index shall be calculated by adding the absolute value of the vertical deviations (inches) outside of a 0.1 inch blanking band and dividing the sum by the length of the test section (miles). The resulting Profile Index is in units of inches per mile.
 - b. Correctable bumps shall be separately identified on the profilograms. They appear as high points on the profilogram, and correspond to high points on the pavement surface. Correctable bumps are vertical deviations on the pavement surface that exceed 0.30 inch in height above a base line span of 25 feet.

602.06 – Pavement Surface Correction

1. The Contractor shall locate and perform all required pavement surface corrective work, with the approval of and in the presence of, the Engineer. The Contractor may also locate and perform voluntary corrective work as described in Paragraphs 4 & 5 of this Subsection.
 - a. Corrective work, including bump correction, shall be accomplished by diamond grinding or by removal and replacement, at no cost to the Department.
 - b. Diamond grinding equipment used for surface correction shall be power driven, self-propelled units specifically designed to grind and texture pavements. The cutting head shall be at least 36 inches wide and consist of many diamond blades with spacers. The Engineer may approve equipment with a narrower width for irregular and confined areas which will not accommodate larger equipment and for bumps of limited number and area.
 - c. The Contractor shall re-test all corrected test sections with the profilograph.
2. All bumps, as defined in Subsection 602.05, Paragraph 2, shall be corrected until they are at or below the 0.30 inch maximum height.
3. When the initial Profile Index of a test section is 20 in/mi, or less, mandatory bump correction is the only corrective work allowed for that section.
4. When the Profile Index of a test section exceeds 20 in/mi, the Contractor may perform voluntary corrective work in that section, in addition to mandatory bump correction work.
5. When the Profile Index of a test section exceeds 30 in/mi, mandatory corrective work shall be performed to reduce the Profile Index of that section to a value of 30 in/mi or less. The Contractor may perform voluntary corrective work in that section, in addition to mandatory work.
6. When pavement removal and replacement is used for correction, the Contractor shall furnish the replacement material and construction at no cost to the Department.
 - a. All replacement material shall meet the original specifications for the material removed.
 - b. Removal and replacement shall be for the full lane width for a distance determined by the Engineer.
 - c. Replacement material must meet the same smoothness requirements as the removed pavement.

602.07 – Traffic Control

The Contractor shall provide all traffic control for smoothness testing and corrective work at no cost to the Department.

602.08 – Method of Measurement

1. The unit price of the accepted quantity of Portland concrete pavement in each profilograph test section shall be adjusted according to the schedule in Table 602.01, subject to the limitations in Paragraphs 2, 3 and 4 of this Subsection. Pavement sections excluded from this smoothness specification shall not qualify for incentive pay.

Table 602.01

Payment Adjustment Schedule	
Profile Index Inches per Lane Mile	Percent of Contract Prices
0 to 4	106
Greater than 4 to 8	104
Greater than 8 to 12	102
Greater than 12 to 20	100
Greater than 20 to 22	98
Greater than 22 to 24	96
Greater than 24 to 26	94
Greater than 26 to 28	92
Greater than 28 to 30	90
Greater than 30	Corrective work required

2. When the initial Profile Index of a test section is 20 in/mi or less, that value shall determine the percent of incentive pay for the section. Mandatory bump correction work performed in that section may increase the percent of pay.
3. When the initial Profile Index of a test section is greater than 20 in/mi, mandatory bump correction and/or voluntary corrective work performed in that section may increase the percent of pay up to the 100 percent level.
4. When the initial Profile Index of a test section is greater than 30 in/mi, mandatory or voluntary corrective work performed in that section may increase the percent of pay up to the 100 percent level indicated in Table 602.01.

602.09 – Basis of Payment

1. The overall pay factor for the accepted quantity of Portland cement concrete pavement in all profilograph test sections shall be determined according to the formula in Table 602.02.

Table 602.02

Pay Factor Formula
$PF = \frac{A(1.06) + B(1.04) + C(1.02) + D(1.00) + E(0.98) + F(0.96) + G(0.94) + H(0.92) + I(0.90)}{A + B + C + D + E + F + G + H + I}$
Where:
A=Length of pavement with a Profile Index of 0 to 4 inches per mile.
B= Length of pavement with a Profile Index greater than 4 to 8 inches per mile.
C=Length of pavement with a Profile Index greater than 8 to 12 inches per mile.
D=Length of pavement with a Profile Index greater than 12 to 20 inches per mile.
E=Length of pavement with a Profile Index greater than 20 to 22 inches per mile.
F=Length of pavement with a Profile Index greater than 22 to 24 inches per mile.
G=Length of pavement with a Profile Index greater than 24 to 26 inches per mile.
H=Length of pavement with a Profile Index greater than 26 to 28 inches per mile.
I=Length of pavement with a Profile Index greater than 28 to 30 inches per mile.

2. The work of smoothness testing shall be paid for at the lump sum contract unit price. This price shall be full compensation for all smoothness testing as set forth in this specification.

DEPARTMENT OF ROADS

Claude Oie
Construction Engineer

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NOTICE: Only the contractors issued bidding proposals receive this addendum and responsibility for notifying any potential subcontractors or suppliers remains with the contractor.